

Chapter 1

Trade, Agglomeration and Growth under Economic Integration: A Survey of Spatial Economic Approaches

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1. INTRODUCTION

In East Asia, a large number of multinational enterprises have vigorously expanded their production networks since the 1990s. In addition, various infrastructures for trade and transportation have been rapidly constructed in recent years. In the mainland part of Southeast Asia, for example, the Greater Mekong Subregion Economic Cooperation Program has been launched to create a large highway network connecting major cities and ports in the area. Then, from the beginning of the twenty-first century, increasing numbers of free trade agreements (FTAs) and economic partnership agreements (EPAs) have been concluded. As a result, the economic integration in East Asia has been rapidly progressing on both *de facto* and *de jure* bases. It is widely expected that the progress in integration will bring about a substantial increase in intraregional trade, investment and some kinds of labor migration.

Economic integration generally creates two different influences on industrial location. First, the structure of comparative advantage leads different industries to different countries. As comparative advantage changes over time, industries would disperse over many countries, and such a tendency becomes clearer as trade becomes more liberalized with economic integration (*the dispersion force of economic integration*). However, when there are significant economies of scale in production,

firms tend to locate in countries/regions close to large markets in order to exploit the scale merits. This likely forms industrial agglomerations in a limited number of countries/regions, leaving other areas sparse (*the agglomeration force of economic integration*). In areas where industrial clusters emerge, this second force serves as a dynamic source of industrialization, but it produces regional disparities, too. A decrease in trade and transport costs accompanying the process of economic integration may encourage the agglomeration force and hence intensifies the economic disparities among the areas.¹

The theory of comparative advantage has been discussed long since Adam Smith and David Ricardo, and hence the dispersion force seems to be widely known. The agglomeration force, in contrast, has been studied in the field of spatial economics mainly since the 1990s, and there appear an increasing number of studies in recent years.² In this Chapter, we will overview the expected influences of economic integration on industrial development in the integrated countries, focusing mainly on the agglomeration force. The next section reviews the chief mechanisms that create the agglomeration force. There are several theoretical models that explain how industrial location is affected by regional market size, labor migration, degree of input-output linkage, structure of transport network, etc. We briefly look at each of them. In Section 3, we discuss the influences of economic integration on industrial location, using the framework presented in Section 2. Then in Section 4, possible consequences of integration in allocation efficiency and regional disparity are argued. Section 5 discusses

¹ For example, Brühlhart and Traeger (2005) reveal that manufacturing sector in EU has increased its geographical concentration during 1975-2000.

² For spatial economic analysis of European integration, see for example, Ciccone (2002), Baldwin and Wyplosz (2004), Keller and Shiue (2004), Brühlhart and Traeger (2005).

some policy implications, and Section 6 gives conclusion.

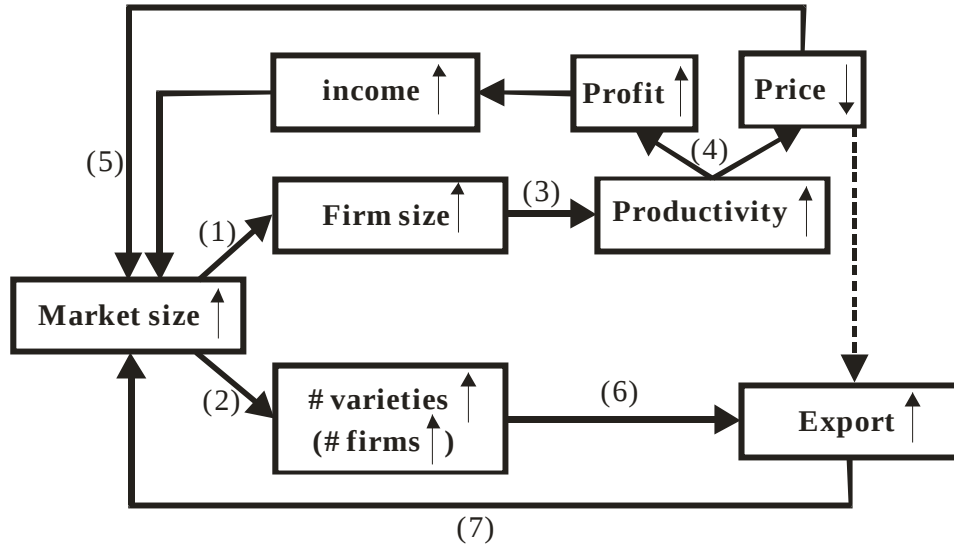
2. SOURCES OF AGGLOMERATION FORCE

2.1 Home Market Effect

The primal source of the agglomeration force is provided by *home market effect*, which was first shown by Krugman (1980) as a determinant of international trade pattern of the goods produced with increasing returns technologies. Figure 1 shows a typical process in which the home market effect emerges in an industry, M , characterized by increasing returns to scale (IRS). Suppose that M -sector produces differentiated goods. When market demand for M (in all varieties) grows, each firm increases its production [shown by arrow (1) in Figure 1], and some new firms enter the market and produce new varieties of M [arrow (2)]. Then, because of the scale economies in M -production, the production increase in individual firms raises their productivity (lowers their average production cost) [arrow (3)], which yields more profit to the firms and/or lowers price of each variety of M [arrows (4)].³ Both the profit increase and the price decrease bring about more market demand for M [arrows (5)], and a circular causation starts working. As a consequence, a country with large domestic market has disproportionately large (in both variety and quantity) IRS sector and exports those IRS products to small countries.

³ In the typical formulation by Dixit and Stiglitz model (1977), the home market effect makes no change in equilibrium price and profit. In the Dixit-Stiglitz equilibrium, all the influences of market size difference are reflected in the number (range) of product variety.

Figure 1: Home Market Effect



Source: author

Note: The dotted arrow does not effective in Dixit and Stiglitz (1977) framework in which the effect of productivity growth is completely absorbed by the increase in product variety.

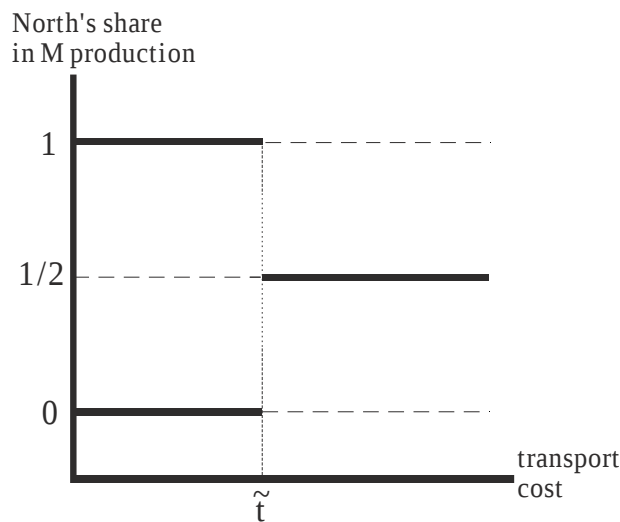
This circular causation of home market effect results in concentration of IRS firms in countries where large market exists. Baldwin, et al (2003) simply extend the model of Figure 1 to show that M -firms in a large country achieve higher operating profit and thus attract disproportionately large amount of capital.⁴ The large country can accordingly enjoy a larger share in M -production than its relative size of home market in the world. This feature is often called “magnification effect.”

Now we consider how location of the IRS industry is affected by a change in international transport costs. To do this, suppose that the world consists of two identical countries in size, North and South. Figure 2 shows the equilibrium location of M -industry as a function of transport cost between the two countries, for the case of the

⁴ Their extended model imposes international mobility of goods and capital (in the footloose capital model), but not of labor. For detail, see the footloose capital model and the constructed capital model by Baldwin, et al (2003).

constructed capital model by Baldwin, et al (2003). If transport cost is prohibitively expensive, the two countries produce the same variety of M -goods, as shown in the right end of Figure 2. By contrast, when transport cost is extremely small, the export-promotion effect [arrow (6) in Figure 1] becomes so large that M -production is more profitable in the country where larger variety of M is produced. In equilibrium for this case, all varieties are to be produced in either country. Between these two extremes, in general, there is a critical level of transport cost, $\tilde{t}$, at which the symmetrical equilibrium becomes unstable, as shown in Figure 2. This tomahawk-shaped diagram suggests that IRS industries are likely to change suddenly their location from dispersive to concentrated pattern, as international transport cost decreases in the process of economic integration. In other words, a core-periphery structure may suddenly emerge in the IRS industry location among integrated countries as integration progresses.

Figure 2: Transport Cost and Agglomeration by Home Market Effect



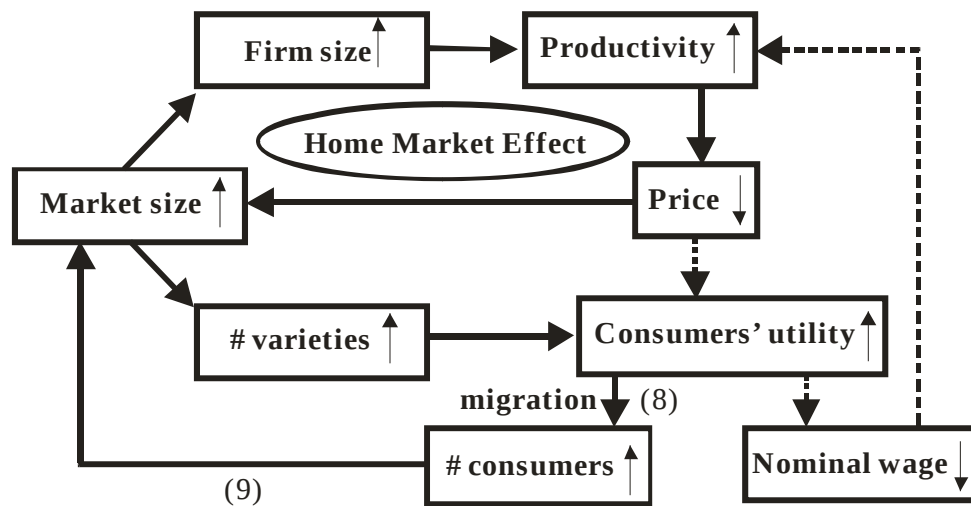
Source: Baldwin et al (2003).

Note: The solid and broken lines in the figure represented stable and unstable equilibria, respectively.

2.2 Labor Mobility

The home market effect works wherever exist scale economies in production and significant costs in transportation. If interregional/international migration of labor is allowed, the circular causation of home market effect is reinforced further as shown in Figure 3. The upper part of the figure demonstrates the home market effect. It encourages a large country to produce wider variety of IRS goods than a small country, as in the case of Figure 1. Then consumers in that large country can achieve higher utility than those in a small country because the large-country residents can purchase greater variety of goods at lower prices (due to the significant transport costs). When workers (= consumers) are mobile across countries, they will migrate to the large country, pursuing a better standard of living [arrow (8) in Figure 3]. This labor migration shifts labor earnings and expenditures from small to large countries, which

Figure 3: Labor Mobility and Agglomeration Force



Source: author

Note: The dotted arrow does not effective in Dixit and Stiglitz (1997) framework in which the effect of productivity growth is completely absorbed by the increase in product variety.

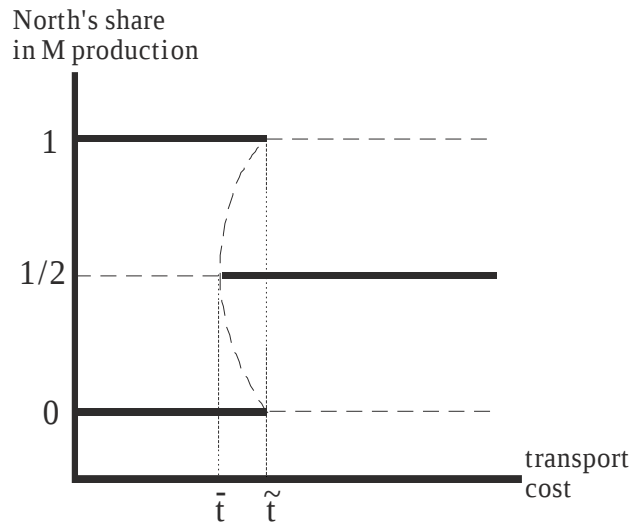
makes the market in the large country even larger [arrow (9)]. As a result, labor mobility intensifies the agglomeration force.

The formal model for analyzing the agglomeration-building process of Figure 3 was developed by Fujita (1988) and Krugman (1991a). Incorporating interregional labor mobility, they show the detail mechanism that creates a core-periphery structure among initially identical regions. Figure 4 depicts the tomahawk diagram about the equilibrium location of IRS industry in a case including two identical regions. As in the case of Figure 2, when transport cost sufficiently decreases, the symmetric equilibrium becomes unstable and a core periphery structure emerges catastrophically. More interestingly, unlike the previous model, there can be multiple equilibria for a certain range of transport cost, such as the range between $\bar{t}$ and $\tilde{t}$ in Figure 4.⁵ When the transport cost is involved in this range, the symmetric equilibrium is stable against small fluctuations in the firm location. However, if a substantial difference happens to appear in the number of local IRS firms (= number of IRS varieties), it leads to labor migration that triggers the loop process shown in the lower part of Figure 3. Either pattern of the industrial location can be realized depending on the historical path or the size of incidental fluctuations in the firm location.⁶

⁵ The two critical levels of transport cost, $\bar{t}$ and $\tilde{t}$, are often called the break point and the sustainable point, respectively.

⁶ This characteristic of non-linear processes is often called path-dependence. For details, see Arthur (1994).

Figure 4: Transport Cost and Agglomeration Force with Mobile Labor



Source: Fujita et al (1999)

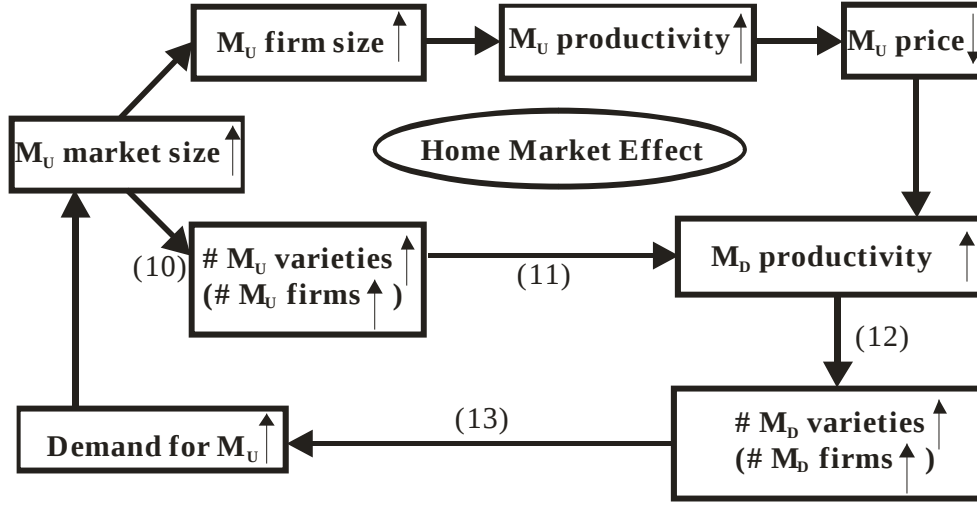
Note: The solid and broken curves in the figure represented stable and unstable equilibria, respectively.

2.3 Vertical Linkage of Industries

Another formulation of the *magnified* home market effect is provided by the vertical linkage model by Krugman and Venables (1995) and Venables (1996). Figure 5 shows the basic framework of the vertical linkage model. It is assumed that the entire process of production of M -good is comprised of the upstream (M_U) and downstream (M_D) processes, where both processes of production are characterized by IRS.⁷ Due to the home market effect on M_U -production, larger variety of M_U -products are supplied in a country where large markets are available [arrow (10) in Figure 5]. This improves the productivity of the downstream firms [arrow (11)], which increases the produced variety of M_D [arrow (12)], leading to a further demand growth for the upstream product [arrow (13)], and so on.

⁷ In their formal models, Krugman and Venables (1995) and Venables (1996) apply a simple setting that M_U and M_D are produced in the same manufacturing process.

Figure 5: Vertical Linkage and Agglomeration Force



Source: author

Note: The dotted arrow does not effective in Dixit and Stiglitz (1997) framework in which the effect of productivity growth is completely absorbed by the increase in product variety.

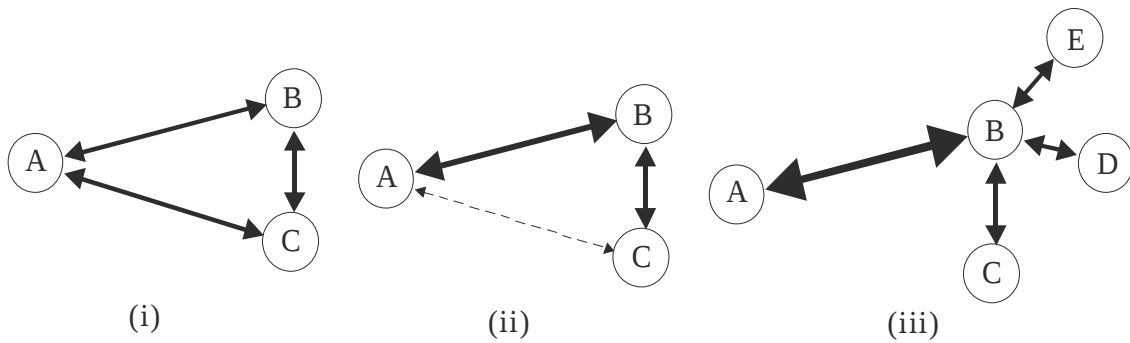
The location effect of transport cost is a little more complicated because there are two groups of firms. If the transport costs between upstream and downstream firms are not too small comparing to those between downstream firms and consumers, the two groups of firms are likely to locate together.⁸ In such cases, the location pattern (of both firms) can be shown by a tomahawk diagram as Figure 4. For the case of vertically linked industry, like the case of labor migration, there is a certain range of transport cost, $\bar{t}$ and $\tilde{t}$, which allows existence of multiple equilibria representing the symmetrical and core-peripheral structures of industrial location. The vertical linkage of IRS industries can bring about a significant magnification of agglomeration forces and a path-dependency in determination of industrial location.

⁸ We will discuss in Section 3.1 the cases where the upstream and downstream firms locate in different regions/countries.

2.4 Hub Formation

Formation of transport hubs gives another source of the agglomeration force. The basic mechanism of hub-formation originates from scale economies in transportation (rather than production), which have been stimulated by the development of large-sized and high-speed carriers, such as large container ships and jumbo jets. The scale economies provide an incentive for collective transportation and hence encourage the development of transport network systems with trunk routes and the hub-spoke structure of transportation.

Figure 6 shows a possible development process of a transport hub. Let us consider three countries, *A*, *B* and *C*, where the transport volumes along *A-B* and *A-C* are initially given almost equal [Panel (i) in Figure 6]. Now suppose that the transport incidentally increases between *A* and *B* comparing to between *A* and *C* [Panel (ii)]. This may enable a regular liner service between *A* and *B*, which substantially reduces the transport cost, due to scale economies in transportation. If the transport cost along *A-B* route decreases enough to offset the cost of *B-C* transport, traders in *C* will use the indirect transport route *A-B-C* rather than the direct route *A-C*, and *A-B* becomes a trunk route of



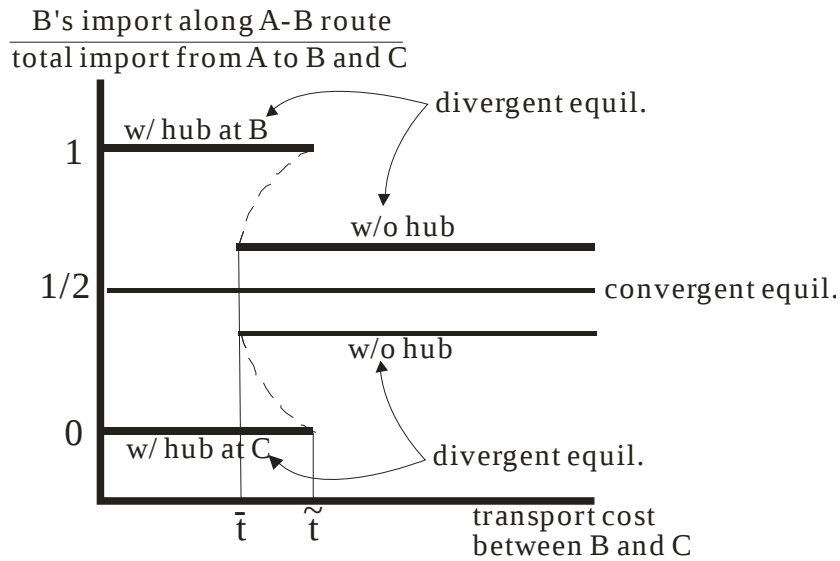
Source: author

transportation. Similarly, other neighboring countries may start using this trunk route, and eventually, a hub-spoke structure of transportation emerges [Panel (iii)].

Once a hub-spoke structure arises in a transportation network, the hub attracts many producers and consumers by its significant transport advantages, i.e., the *hub effect*. This will switch on the reciprocal reinforcement process between transport hub and industrial agglomeration, as comprehensively discussed by Krugman (1993), Fujita and Mori (1996), Konishi (2000), Mori and Nishikimi (2002), Fujita and Mori (2005), Behrens (2007).

Mori and Nishikimi (2002) examine the process of hub formation for a three-country case shown by Figure 6 (i). They show the three kinds of stable equilibria for their model: (1) convergent equilibrium [shown by Panel (i) in Figure 6], (2) divergent equilibrium without hub [Panel (ii)], and (3) divergent equilibrium with hub [Panel (iii)]. Figure 7 depicts the relation between the cost of B - C transport and the equilibrium structure of transportation. The convergent equilibrium is always stable. By contrast, in divergent equilibrium, a transport hub emerges suddenly when the cost of B - C transport lowers to less than $\tilde{t}$. As in the cases of labor mobility (Section 2.2) and vertical linkage of industries (Section 2.3), there is a certain range of transport cost, $\bar{t}$ and $\tilde{t}$, where both patterns with and without a hub are stable. These results suggest that as intraregional trade becomes cheaper by progress in economic integration, transport hubs will be developed within the integrated region. Countries carrying large trade are likely to have hubs, but the location of hubs can be substantially affected by incidental fluctuations in the volume of local transportation, too.

Figure 7: Transport cost between B-C and Hub Formation ^{a), b)}



Source: author

Note: a) The transport cost between A and B is given at a constant level.

b) The solid and broken curves in the figure represented stable and unstable equilibria, respectively.

2.5 Spillover of Technological/Market Information

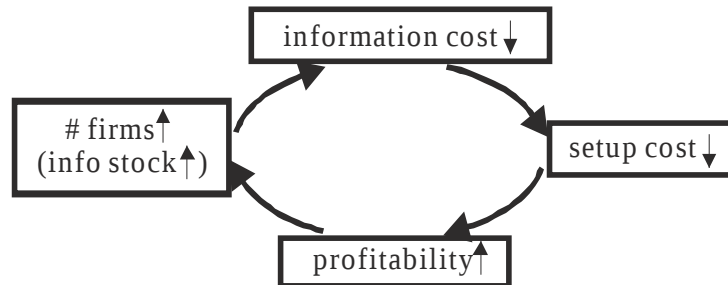
Industrial agglomeration can be also caused by spillover of information. Up-to-date knowledge of production technologies and market trends often plays a key role in many fields of business. Such knowledge and information tend to spill over from one producer to another through direct business contacts, close monitoring of rival firms and other daily communications, all of which should be easy if producers operate together, sharing the same business sphere in a country/region. As a result, firms in the same industry or closely related sectors are likely to be agglomerated. When a large number of firms are clustered in a given country/region, competition among them becomes severe, so that the firms naturally get specialized in slightly different products. This leads to monopolistic competition and creates a circular causation of further

agglomeration via home market effect, as discussed in Section 2.1.

These situations were first formulated by Marshall (1920) as *Marshallian externality* and incorporated more recently in the framework of endogenous growth theory. Then this has been combined with spatial economics by Krugman (1991b), Martin and Ottaviano (1999), Baldwin, et al. (2001), Baldwin, et al. (2003), Baldwin and Martin (2004), Rodriguez-Clare (2007), etc. In their framework, knowledge of technology, marketing and management is treated as a fixed cost factor for setup of a firm, and the accumulated knowledge is assumed to spill over country or locally.⁹ If the number of firms increases in the area of knowledge spillover, then information cost and firms' setup cost decrease. This in turn improves profitability of the operating firms and encourages entry of new firms. As a result, knowledge spillover brings about agglomeration force through the circular causation shown by Figure 8.

Baldwin, et al. (2001) show the tomahawk diagram for the case of knowledge spillover presented in Figure 8. As in the preceding cases, a core-periphery structure appears when transport cost lowers to less than the sustainable point, $\tilde{t}$. However,

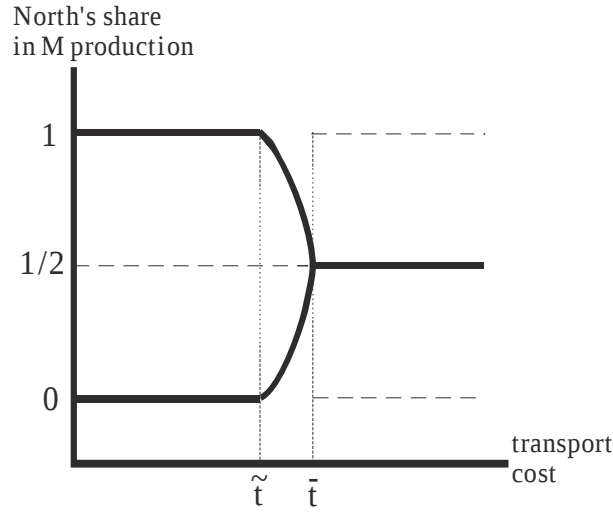
Figure 8: Knowledge Spillover and Agglomeration



Source: author

⁹ Baranes and Tropeano (2003) argue that along with the communicative nature of information transfer, the tough competition among near-by firms tends to encourage knowledge sharing by preventing each firm from free-riding.

Figure 9: Transport Cost and Agglomeration by Knowledge Spillover



Source: Baldwin, et al. (2001)

Note: The solid and broken curves in the figure represented stable and unstable equilibria, respectively.

unlike the other cases, the sustainable point level of transport cost, $\tilde{t}$, is lower than the break point level, $\bar{t}$, and hence the equilibrium pattern of industrial location continuously evolves as transport cost decreases.

3. Economic Integration and Industrial Location

3.1 Trade Liberalization

International trade entails various kinds of costs including transport costs (pecuniary and time costs), policy barriers (tariff and non-tariff), contract enforcement costs, local distribution costs (wholesale and retail costs), information costs, etc. Estimating the ad-valorem-tax equivalent value of those trade costs, Anderson and Wincoop (2004) report that trade costs, broadly defined, account on average for as large as 170% of the

production costs, while the trade costs vary widely across countries and products.¹⁰ Trade liberalization accompanying the process of economic integration can thus largely affect the pattern of international trade and industrial location among the concerned countries.

3.1.1 Comparative Advantage and Agglomeration

A reduction of trade costs, broadly defined, allows firms to think more deal of production advantage rather than transportation advantage when they decide their production sites. Basically, there are two main factors of production advantage to be considered: resource costs and agglomeration merits. Hence the industrial location should be determined by the relative strength of comparative advantage and agglomeration force. In other words, so as to examine fully the location effects of economic integration, we need to combine the results obtained in Section 1 with the conventional arguments on comparative advantage.

Combining the framework of Ricardian comparative advantage with Dixit and Stiglitz model (1977), Ricci (1999) shows that a) an increase in (economic) size of one country makes this country less specialized in the good in which it has a comparative advantage; and b) changes in trade costs may reverse the specialization pattern. However, this does not imply that the comparative advantage makes only slight influences on international location of industries. In fact, Forslid and Wooton (2003)

¹⁰ Of this 170% trade cost, 21% are attributable to transport costs (including 9% of time costs), 44% to border-related trade barriers, and 55% to retail and wholesale costs ($2.7=1.21*1.44*1.55$). Estimation of trade costs generally suffers from serious data limitation. In addition, there is still no established method for indirect estimation of the trade costs. For detail, see Anderson and Wincoop (2004), Hummels (1999), and Bosker and Garretsen (2007).

show that even in a case with international migration,¹¹ trade liberalization leads initially to increased concentration and then to dispersion of production according to the comparative advantage structure among countries.¹² Epifani (2001) also show, using the vertical linkage model with two production factors, that a perverse agglomeration of the labor (resp. capital) intensive industry in the capital (resp. labor) abundant country can be sustained as an equilibrium only in the presence of: a) small international factor abundance differences; b) small intersectoral factor-intensity differences; c) pronounced equilibrium scale economies; d) a high share of intermediates in total costs.

3.1.2 Development of Production Networks: Fragmentation

In Asia, the international division of labor has recently made substantial progress, particularly in the production of intermediate goods. Many enterprises in the automobile and electronics industries, for example, separate several processes of production and relocate them to different countries, according to the market conditions prevalent in each country. This phenomenon is often called *fragmentation* and has been intensively studied since the late 1990s [e.g., Deardorff (1998), Arndt (2004), Amity (2005), Markusen and Strand (2007), Haddad (2007)].

Although fragmentation concerns the location of partial process of production, primal motivations for relocating production activities are basically the same as in the conventional case of final goods production: multinational firms build up their global

¹¹ Recall the discussion in Section 2.2 that labor mobility tends to encourage agglomeration via shift of local expenditure (magnification effect).

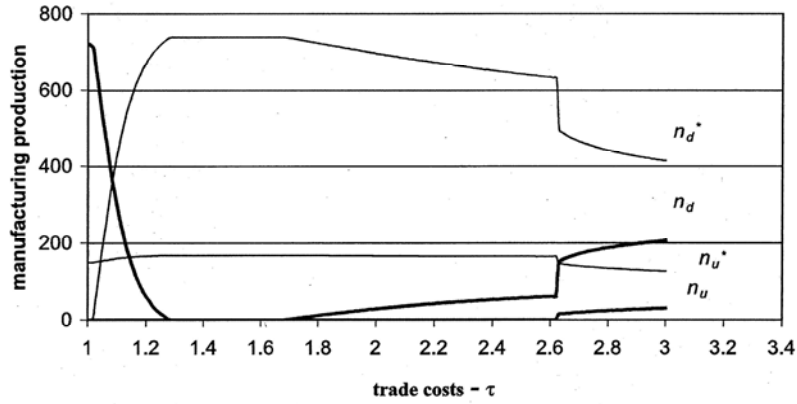
¹² Although Ricci (1999) and Forslid and Wooton (2001) apply the Ricardian type of comparative advantage, their formulations are different. Ricci (1999) assumes difference in marginal cost, while Forslid and Wooton (2001) assume difference in fixed cost in production of IRS goods. In addition, the latter model does not include the parameter of country size (the country size is variable via labor migration).

intra-firm production networks in order to exploit fully the location advantages. Therefore, the location pattern of the fragmented production is also determined by interaction of comparative advantage and agglomeration force. Moreover, it is to be crucially affected by changes in international transportation and communication costs among various location sites, namely, *service link cost*.

Amity (2005) examines the location pattern of vertically linked industries, combining vertical linkage model with Heckscher-Ohlin framework for two-country case (Home and Foreign). She assumes 1) both upstream and downstream industries exhibit scale economies in production; 2) the downstream industry is more labor-intensive than upstream industry; 3) Home and Foreign are respectively labor-abundant and capital-abundant. Figure 10 shows a typical location pattern of the two industries.¹³ When the trade cost is sufficiently high, both countries produce varieties of intermediate and final goods ($n_u > 0, n_d > 0, n_u^* > 0, n_d^* > 0$). As trade cost falls, agglomeration force becomes significant, and the upstream and downstream industries consecutively relocate from Home to Foreign. Then both industries are agglomerated in Foreign and Home becomes an agrarian country ($n_u = 0, n_d = 0, n_u^* > 0, n_d^* > 0$). However, if transport cost declines further, there appears with complete specialization according to comparative advantage ($n_u = 0, n_d > 0, n_u^* > 0, n_d^* = 0$). Fragmentation occurs and the labor-intensive downstream industry relocates from industrialized Foreign to agrarian Home. This may help explaining the current situation in Asia.

¹³ In the Figure 10, the transport cost rates for the two industries are equal.

Figure 10: Trade Costs and Industrial Location



Source: Amity (2005).

Note: n_u and n_d respectively represent the numbers of upstream and downstream firms (=varieties) in Home country. And, the variables with an asterisk represent those in Foreign country.

In recent years, in general, the interactive influences of comparative advantage and agglomeration force have been intensively studied, and an increasing number of analytical results have been accumulated as reviewed above in this section. However, the resulting pattern of industrial location is very complicated, and still do not have a complete picture of it. We need the continuous effort to disentangle the snarled effects of the location factors.

3.2 International Capital Flow

Liberalization of international capital flow makes two different influences on industrial location. First, Lowering of investment barriers encourages firms to relocate to the sites where they can enjoy local advantages in production and marketing. This intensifies the influences of agglomeration force and comparative advantage on industrial location.¹⁴

¹⁴ When capital is freely mobile across countries, capital endowment is no longer a determinant of comparative advantage. In this sense, liberalization of international

In this point, liberalization of international capital flow exhibits similar effects as trade liberalization. Secondly, international capital mobility tends to equalize the rewards to riskless capital. Moreover, international capital mobility allows capital owners to live away from the investment places. Hence, this second factor reduces the regional differences in capital income and local expenditures and abates agglomeration force. The above two influences of capital mobilization often work in opposite ways: the first effect is likely to encourage agglomeration and widen the regional inequalities, while the second effect tends to equalize regional capital income (reduces agglomeration force) and narrow the regional gaps. Thus in general, we cannot predetermine the entire effect of a liberalization of international capital flows.¹⁵

Egger, et al. (2007) makes a welfare analysis of trade and investment liberalization, based on a three-factor model with skilled and unskilled labor and physical capital. Their results of numerical simulation suggest: a) unilateral liberalization is not always preferable; b) bilateral liberalization of trade and investment is preferable for individual countries with similar capital to skilled labor ratios, irrespective of their relative endowment of unskilled labor.¹⁶ This may correspond to the fact that agreement on financial liberalization tends to be concluded between similarly developed countries. Only little evidence is obtained in both theoretical and empirical spheres. Further investigations should be carried out.

capital flow reduces the locational influence of comparative advantage.

¹⁵ In addition to those effects of financial liberalization, Markusen and Venables (1999) show the theoretical possibility that FDI inflow leads, by linkage effect, to establishment of domestic industrial sectors.

¹⁶ By contrast, their simulation exercises suggest that from social planner's view, a combined liberalization of trade and investment is preferable almost everywhere.

3.3 International Labor Migration

As in the case of liberalization of international capital flow, liberalization of labor migration encourages industrial firms to relocate to the site where their major inputs other than labor and large product markets are available. However, the effects via income/expenditure shifts are just opposite to the case of capital flow: labor migration relocates labor's expenditure to their working places and consequently magnifies agglomeration force, as discussed in Section 2.2. Therefore, unlike the case of capital mobilization, liberalization of international labor migration always intensifies the influences of agglomeration force and comparative advantage, which is determined by factor endowment other than the internationally mobile labor.

4. Possible Consequences of Economic Integration

Now we examine the possible consequences of Economic Integration in efficiency of resource allocation and in economic disparities among integrated countries/regions.

4.1 Allocation Efficiency

We briefly look at possible patterns of industrial location and resource allocation in equilibrium.¹⁷ Consider a very simple situation that agglomeration force is caused by

¹⁷ Many authors carry out welfare analyses for each equilibrium pattern of industrial location. However, their implication for allocation efficiency is not necessarily clear because at the core-periphery equilibrium, the factor prices are not equalized among countries/regions. For details of the welfare analyses of major analytical models, see Fujita, et al. (1999) and Baldwin, et al. (2003), for example. Matsuyama and Takahashi (1998), Amity (2007) and Roríguez-Clare (2007) also provide welfare analysis on their models with somewhat specific settings. Along with the effects of agglomeration, trade liberalization improves consumers' welfare by widening the variety of import. According to Broda and Weinstein (2006)'s estimation about the US case in 1972-2001, the welfare effects of the variety expansion in imported goods is equivalent to about 2.6 percent of

Marshallian externality. We introduce another (negative) externality, congestion effect, so that overall effect has an inverse-U shape.¹⁸ As a result, the operating profit rate in manufacturing industry rises first and then falls as manufacturing production increases in a country. The solid curves in Figure 11 show the relation between manufacturing output and profit in Home country, while the broken curves, which is obtained as a mirror image of the solid curve,¹⁹ depict the same relation for manufacturing sector in Foreign country.

Panel (a) shows a case where congestion effect is so strong that the profit reaches the peak at a low level of output. In this case, the symmetric equilibrium, E_0 , is stable, and there is no other equilibrium to choose. When the congestion effect is a little weaker, the peak shifts to a higher level of output as depicted in Panel (b). In this case, the symmetric equilibrium turns to unstable and the core-periphery equilibrium, E_1 (or E'_1), becomes stable. Then, the core-periphery structure will appear in this economy, but it yields lower profit than in the (unstable) symmetric equilibrium. Hence market leads to undesirably concentrated location of industries. Panel (c) shows a case where the congestion effect is further mild than Panel (b)'s case. In this case, market force leads to desirably concentrated location pattern. Finally Panel (d) depicts a little more complicated case. Both the convergent and core-periphery equilibria are stable. While the symmetric equilibrium is more favorable, either of them may arise.

In sum, market force may form either convergent or core-periphery structure of industrial location, and it may also choose either desirable or undesirable location

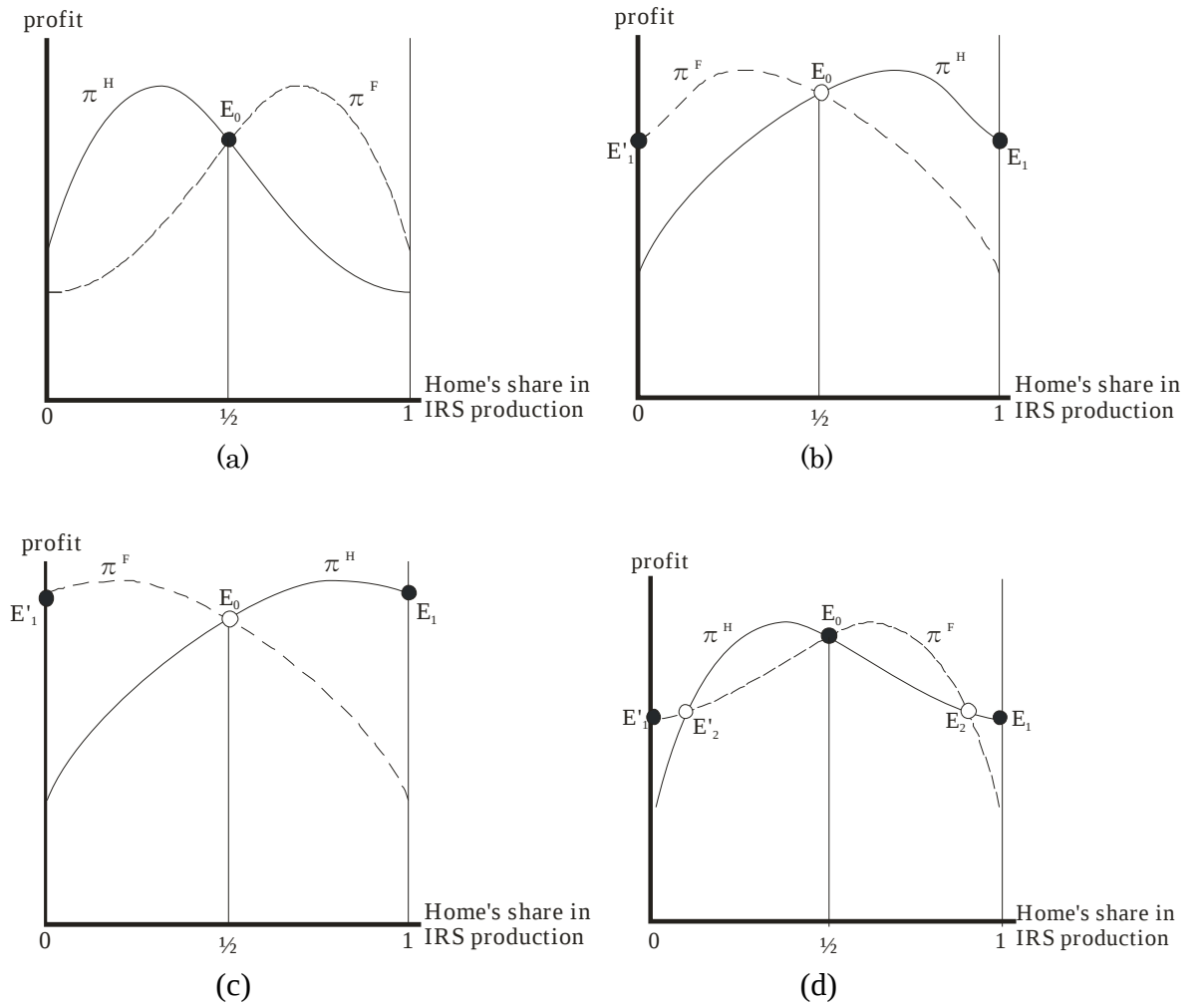
GDP.

¹⁸ Other agglomeration sources, such as labor migration, also exhibit both negative and positive effects of production increase: it is negative if transport cost is very high, while it turns positive if transport cost becomes sufficiently low. Our setting with the inverse-U externality can show these two cases at once.

¹⁹ Here we assume, for the sake of simplicity, that Home and Foreign are identical.

equilibrium. We thus cannot present a clear statement about resource allocation efficiency of the equilibrium under the significant influence of agglomeration force.

Figure 11: Regional welfare at agglomeration equilibrium



Source: author

3.2 Economic Disparities²⁰

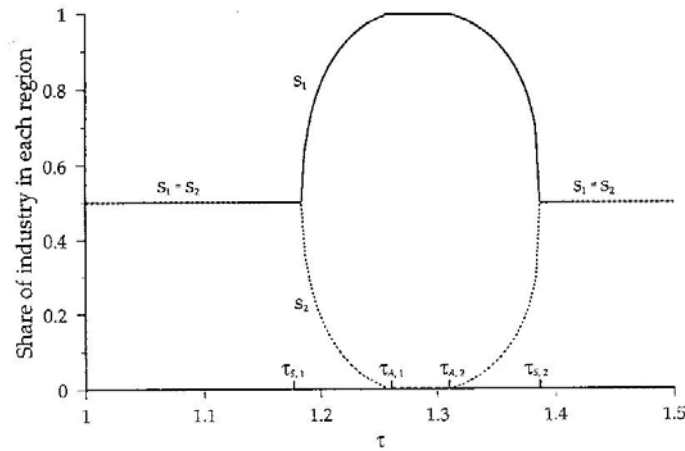
3.2.1 Disparity among countries

Within East Asia, international mobility of products, materials and capital has been increasingly enhanced, but labor mobility is still substantially limited across countries, so far. Thus, in this section, we focus just on the models that allows no labor migration across regions. Krugman and Venables (1995) explore such a case and obtain a tomahawk diagram given in Figure 4. As trade cost falls, the IRS industry catastrophically gets agglomerated in either country. This gives rise to a difference in standard of living between the two countries. However, further decrease of trade cost reduces the consumer price in the peripheral country, so that the gap in the living standard gradually diminishes.

Puga (1999) shows an alternative evolution of industrial location in response to trade liberalization, allowing the decreasing returns in agricultural sector. For his model, the relation between trade cost and the equilibrium location of IRS industry is given by Figure 12. At intermediate levels of trade cost, firms cluster to exploit home market effect. However, agglomeration opens wage differences because of diminishing returns in agriculture. Hence, at low levels of trade cost, firms want to move back to the country where immobile factors are cheaper. Then there appears the symmetric equilibrium again.

²⁰ Other than the literature of spatial economics, there are an increasing number of studies on the relations between globalization and economic inequality. For example, see Bhagwati (2004), Nissanke and Thorbecke (2006), Basu (2006), Ravallion (2006), Bardhan (2006), Edward (2006).

Figure 12: Trade cost and industrial location



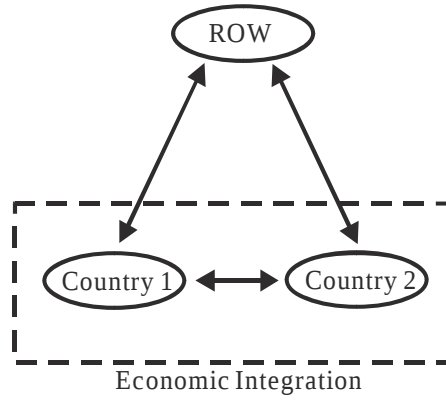
Source: Puga (1999).

Both models noted above examine the case with two identical countries. However, among East Asian countries, large disparities are observed even at the initial stage of integration. Hence, in order to examine properly the East Asian integration, the analytical model should be able to treat the initial differences of economic conditions among countries.

For this purpose, Nishikimi (2007) extends Baldwin *et al.* (2003)'s footloose capital model, which can easily treat differences in economic size of countries. He assumes three countries, Countries 1, 2 and ROW, of which Countries 1 and 2 are forming an economic integration as illustrated by Figure 13.

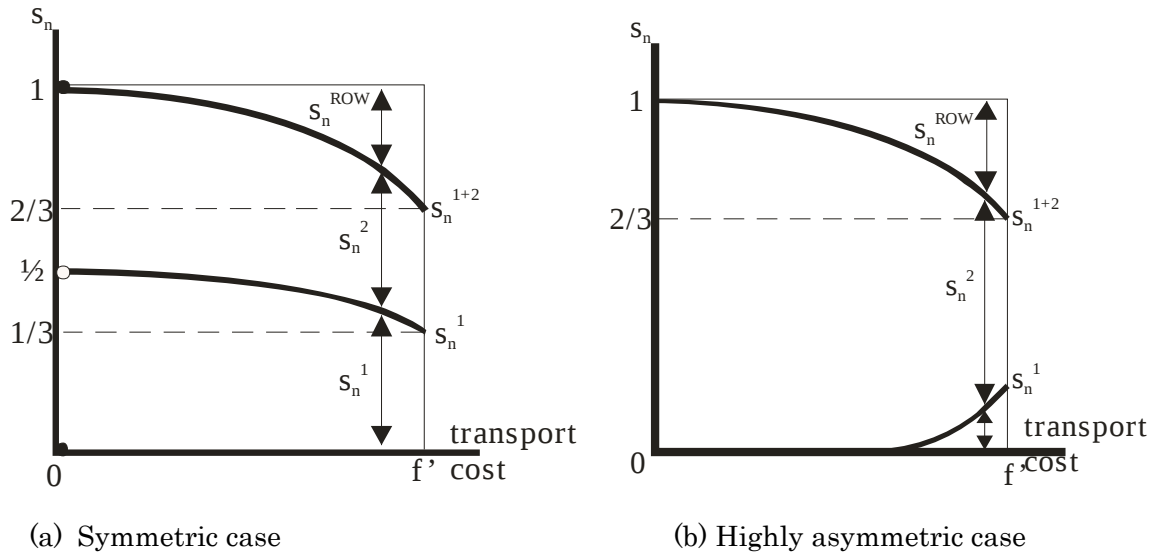
Now, the question is: What geographical distribution of the IRS manufacture will emerge in equilibrium? Figure 14 shows the relationship between transport cost and each county's share in world production of manufactured goods. In both panels of Figure 14, the vertical axis represents each country's share in manufacturing, s_n ($n=1,2$, ROW), while the horizontal axis gives the trade cost between countries 1 and 2.

Fig 13: Three-country model of economic integration



Source: Nishikimi (2007).

Figure 14: Transport cost and production shares



Source: Nishikimi (2007).

These figures are drawn by assuming that the trade cost between ROW and each of Countries 1 and 2, f' , is higher than the trade cost within the integration ($0 \leq f < f'$).

The left panel (a) of Figure 14 depicts the case where the three countries are endowed with identical quantities of labor and capital. When transport cost within the

integrated economy is as low as transport cost in the trade with ROW (i.e., $f=f'$), the three countries are situated in completely the same conditions, and thus in equilibrium. They have the same share of manufacturing industry, $s_n^1 = s_n^2 = s_n^{ROW} = 1/3$. As the freeness, f , increases in the process of economic integration, an increasing number of manufacturing firms relocate from ROW to Countries 1 and 2 because the transport facilitation within the integrated economy makes ROW relatively isolated and less attractive to the global capital. Yet, the shares for Countries 1 and 2 are always equal as they have identical conditions. In this case, therefore, integration does not intensify the disparity between the integrated countries.

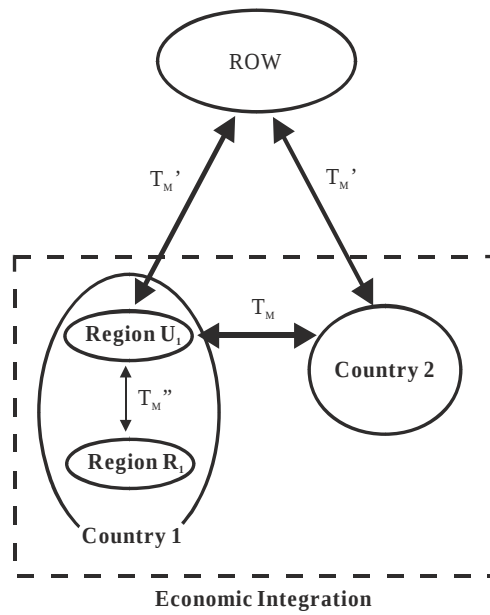
In contrast, if there is a large difference in factor endowment, integration may intensify the disparity between the integrated countries. The right panel (b) of Figure 14 shows a case where Country 1 is much smaller in factor endowment than Countries 2, while keeping all other assumptions the same as the symmetric case of panel (a). As integration progresses (f decreases), the smaller country in the integrated economy, Country 1, loses its share of manufacture. This is because the home market effect works between Countries 1 and 2. Eventually, when $f=0$, all firms are agglomerated in Country 2. In cases where diversified countries with different endowment are forming integration, the economic disparity may expand as trade liberalization progresses in the process of integration.

3.2.2 Disparity among domestic regions within each country

Nishikimi (2007) also examines how integration of countries affects the disparity among domestic regions within each country. To do this, the preceding model is revised in as much as Country 1 is assumed to compose of two regions, U_1 and R_1 , as shown in

Figure 15. It is assumed that all international ports in Country 1 locate in U_1 , while R_1 is situated in deep inland. Domestic transport of the manufactured goods also incurs costs, and, as in the previous model, capital is freely mobile across countries and regions, while labor is mobile only within each country.

Figure 8: Three-country, Two-region Model.



Source: Nishikimi (2007).

It is shown that a decrease in transport cost accompanying the process of integration accelerates localization of the IRS manufacturing industry in urban area, U_1 . This is because market integration provides larger opportunities to Region U_1 , which possesses the advantage of better accessibility to the integrated market than Region R_1 . As a result, economic integration tends to intensify the economic disparity among domestic regions, U_1 and R_1 .²¹

²¹ Behrens, et al. (2007) examine how lowering of transport costs affects regional structure of industrial location, using two-country x two-region model. In their framework, four regions are treated in a completely symmetric manner, unlike

5. Some Policy Implications

Under influence of agglomeration force, drastic progress in long-term economic development can be triggered by a single success of a short-term program for inviting firms, particularly in the initial stage of agglomeration. Individual policies therefore bear great importance in the industrialization process. We look at the possibility of such strategic policies below.

5.1 Strategic Control on Trade Costs

Fujita and Mori (1996) examine the evolution pattern of industrial agglomeration and probe the possibility of industrialization policy with manipulating trade/transport costs. They assume that the integrated economy consists of two countries, which are connected only by one link (highway or sea route) between two transport hubs. In the initial state, a single agglomeration exists at the hub in Country 1.

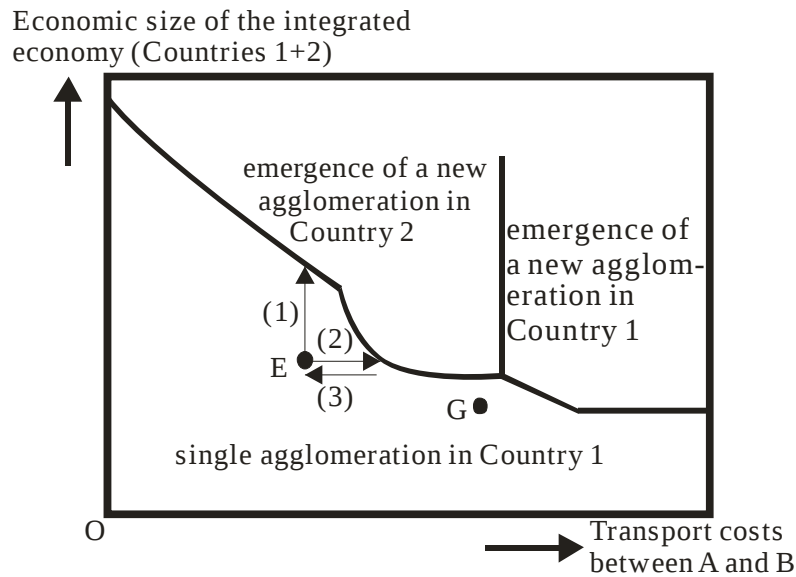
Figure 16 shows the typical evolution pattern of agglomeration formation in this two-country economy.²² In the figure, the horizontal axis represents the cost required for transport of the IRS product between the hubs,²³ while the vertical axis represents the total size of the integrated economy (total labor endowment). When the economy is sufficiently small, only the initial agglomeration can continuously exist in this

Nishikimi (2007)'s model. They verify: a) lower intranational transport costs foster regional divergence when international trade costs are high enough; b) lower international trade costs promote regional convergence when intranational transport costs are high enough.

²² Figure 16 is drawn for the case where labor is freely mobile across countries. In this case, the equilibrium level of consumers' utility (real wage) is equalized between the two countries. If we allow for international difference in the real wage, we can obtain a similar result to Figure 16 for the cases with restrictive labor mobility, too.

²³ We assume that transport of CRS products does not entail any cost.

Figure 16: Bifurcation pattern and alternative transport policies



Source: Fujita and Mori (1996).

integrated economy, no matter how much the transport costs. As the economy becomes large, a new agglomeration emerges in either country. If the international transport cost is sufficiently large, the new cluster appears in Country 1. In contrast, when the trade cost is small, the new cluster appears in Country 2 although it requires a relatively large market because of the strong lock-in effect created by the first cluster.

Now, suppose that the current state of the economy is given by Point *E* in Figure 16. What policy can the government of Country 2 exert so as to establish a new industrial cluster in Country 2? One possible choice is the *laissez-faire* policy: i.e., just wait for a sufficient growth of the integrated market without enforcing any active policy, as indicated by the arrow (1) in Figure 14. If regional integration expands the market enough to overcome the lock-in effect of the existent cluster, Country 2 will obtain a new cluster. If not, it may require a long time to foster the market.

There is such an alternative policy measure as represented by the arrows (2) and

(3). That is, the government can foster a new cluster by increasing the international trade cost by means of tariff and nontariff barriers [arrow (2)]. Then, once the new cluster is established in Country 2, it creates the lock-in effect and can remain at the same place even if the government replaces the policy and lowers the trade cost to the previous level [arrow (3)]. In other words, the government of Country 2 can set up a new cluster by a temporary restriction of international trade, utilizing the lock-in effect. This policy measure sometimes works effectively, especially in cases where infant industries need to be nurtured.

The above arguments suggest that a temporary policy intervention may affect the entire path of economic growth. If the government can manipulate such policy measures accurately according to circumstances, it may be able to achieve the optimal development by carefully choosing the growth path. However, it should be noted here that those policies involve formidable risks of failure. For example, in Figure 14, suppose that the initial state of the integrated economy is represented by Point *G*, instead of Point *E*. In this case, the above policy of increasing the trade cost will lead to the emergence of a new cluster in Country 1 instead of Country 2. This leads economic disparity between the two countries to intensify, which is just the opposite of what is expected. As a matter of fact, it is quite difficult to identify correctly whether the economy is at Point *E* or *G*. Identical policies in similar situations can lead to completely different results. Halfhearted policymaking with superficial information may lead to negative results.

Rodriguez-Clare (2007) also cautions about undervaluation of the price distortion effects caused by the strategic trade policies noted above. He argues that the agglomeration-luring policies like the one represented by arrow (2) in Figure 14 may

entail substantial efficiency loss in resource allocation, especially for small developing counties, where home market effect works only slightly. For such cases, it is clearly unreasonable to pursue the clustering potential of new industries.

We have to remember that under the dominance of the agglomeration force, a temporary failure can affect the entire path to economic development.

5.2 Benefits and Risks of Policy Coordination

5.2.1 Excess investment for agglomeration-luring

As discussed in the preceding sections, long-run industrialization and economic development may be triggered by the success of a short-run program for firm attraction, particularly at the initial stage of agglomeration development. Therefore, the governments of many countries are eager to construct special economic zones (SEZ) and huge international ports/airports, spending large amount of public funds and economic assistances from abroad. This leads to an international competition in luring agglomeration, but unfortunately, not all of the investments can be rewarded because of the limited market size in developing countries.

Figure 16 above shows that when the market is relatively small, only a single cluster can be sustained in the entire area of the integrated countries. A similar situation can also be demonstrated by Figure 11 (b). This figure depicts the home market effect of the clustering industry for the case where market demand in the integrated economy is so small. In this case, there are three equilibria of which the dispersive equilibrium E_0 is unstable. Thus, if two countries compete in investment to attract agglomeration, either of them has to abandon its development plan. As a result, a large amount of investment

will be wasted.²⁴ That is, without any coordination among governments, severe competition among neighboring countries will lead to excess investment for agglomeration-luring.

5.2.2 Benefits and risks of policy coordination

The agglomeration-luring activities by adjacent countries have a game structure that is of the prisoners' dilemma type, and this is the main cause of the excess investments devoted to industrial agglomeration.

At the initial stage, many neighboring countries have an equal opportunity to obtain a new industrial cluster, and the cluster may be set up by a short-run policy, as discussed previously. In such a situation, it is rather natural for governments of those countries to eagerly invest in cluster-building. To avoid the redundant investment by neighboring countries, those countries need to coordinate their policies in this aspect. For example, the number and location of international airports should be determined in cooperation with neighboring countries, so that the countries can efficiently share the optimal number of airports. Otherwise, each country may try to construct an international airport for its own use, and this is clearly an over-investment. Similar problems can occur in the construction of SEZs for large-scale agglomerations, such as that on automobiles, electronics, and heavy chemicals.²⁵

Policy coordination, however, is not a panacea for the efficient resource allocation in agglomeration-luring. It may produce a serious side effect: Coordination can easily

²⁴ The government can avoid the passing of agglomeration by enforcing protectionist policies, but it will be accompanied by large costs of misallocated resources.

²⁵ An effective coordination must be accompanied with some programs to compensate the devolving countries for forgoing benefits of the abandoned facilities, such as international airports and SEZs. It is not easy to design such a compensation program. In practice, this causes difficulty in coordination.

shift to collusion. If geographical distribution of clustering industries is determined by negotiation in the intergovernment assembly, then those industries are likely to be separated from market competition. This would make the industries spoiled and cause serious inefficiency in resource allocation. Of course, inefficient producers cannot survive the market competition, and the industrialization may fail in the long run. We are thus placed in a dilemma over what development strategy can be applied and need to look for a better way of allocating investment.

6. Concluding Remarks

Economic integration creates two different forces on industrial location, *dispersion* and *agglomeration forces*. The dispersion force relocates industries across integrated countries according to each country's comparative advantage and achieves the static efficiency of resource allocation. In contrast, the agglomeration force serves as a dynamic source of industrialization but at the same time, it may produce the economic disparities among integrated countries and among domestic regions within each country. In the recent progress of integration in East Asia, the agglomeration force appears to be more significant.

In this situation, we should try to utilize the agglomeration force wisely, rather than struggle to escape from the gap-making influence of that force. To do so, it is important to develop such strategies that dexterously manage the nonlinear effects, such as *home market effect*, *lock-in effect* and *hub effect*, which are likely to accompany with the process of economic integration.

Under the influence of the agglomeration force, drastic progress in long-term economic development can be triggered by a single success of a short-term program for

inviting firms particularly in the initial stage of agglomeration. Hence individual policies bear great importance in the industrialization process, but the government of each country is likely to face two kinds of difficulties in developing a successful strategy: (1) strategy-building requires extremely accurate information about the state of country, and (2) difficulty in policy coordination to control excess public investment for development. We must carefully elaborate the development policies since a single mishandling of a short-term policy might lead to a long-term failure in economic development under the domination of the agglomeration force.

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