Interdependent Specialization and International Growth Effect of Geographical Agglomeration

Soon-chan Park

KOREA INSTITUTE FOR INTERNATIONAL ECONOMIC POLICY
300-4 Yonggok-Dong, Seocho-Gu, Seoul 137-747, Korea
Tel: (822) 3460-1114
Fax: (822) 3460-1122
URL: http://www.kiep.go.kr

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Executive Summary

New economic geography theory predicts a catastrophic agglomeration of economic activities in the sense that income inequality among countries or regions is inevitable. However, such a result relies heavily on the assumptions that economic activities are independent of each other. In this paper, a two-country three-sector model is developed, encompassing new economic geography theory and endogenous growth theory. Unlike the previous economic geography literature, we construct a model in which the three sectors are interdependent. Several interesting results are obtained from small changes in the model setting. Geographical agglomeration causes interdependent specialization between countries. The core and periphery grow at the same rate in the specialization steady states. Further, this growth rate exceeds that in the symmetric steady states. In a world, in which economic activities are interdependent, the growth effect of geographical agglomeration is international rather than national. Hence, the periphery might, in the long run, be better off than under dispersion. Moreover, economic integration may reduce the income inequality between countries that arises from the agglomeration process. Economic integration also has growth effects.

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Soon-chan Park, a associated research fellow, received Ph. D. degree in Economics from Ludwig-Maximilians University Munich. He has served as a research fellow at Institute of Economic Research, Korea University.
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I. Introduction

New economic geography theory predicts a catastrophic agglomeration of economic activities in the sense that agglomeration gives rise to income inequality among countries or regions. However, such a result is sensitive to certain assumption about the relationship between sectors. The static (Krugman 1991, Krugman and Venables 1995) as well as dynamic (Martin and Ottaviano 1999, Baldwin et al. 1998) geography models assume that economic activities are divided into two groups. There is typically one constant return to scale activity, and one increasing return to scale activity. But these two activities have no direct relationship, except in terms of the resource allocation. Hence, if the industry with increasing return to scale is concentrated in one country, this country will be better off at the expense of the other. Countries specialize in independent activities. However, it appears that in reality economic activities are today not completely

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independent. The steel industry, for example, can raise its productivity with the development of the IT industry. Indeed, it is not easy to find an industry that does not benefit from the development of another industry and that is completely independent of other industries.

In this paper, starting from the presumption that economic activities are interdependent, a two-country three-sector model is developed. There are the final, intermediate and R&D sectors. The final and intermediate sectors are vertically linked while the R&D sector provides designs for the production of intermediates. This framework is similar to that of endogenous growth models (Grossman and Helpman 1991, Romer 1990), but we incorporate the basic assumption of new geography models (Krugman and Venables 1995) that firms are mobile.

There are a few contributions that explore the relation between growth and location of firms. Baldwin and Forslid (1997), Baldwin et al. (1998) and Martin and Ottaviano (1999), combining new geography theory and endogenous growth theory, show that agglomeration matters for growth and higher growth in one country is necessarily associated with lower growth in another country. Walz (1995) shows also that, with factor mobility, trade liberalization has a growth effect, but the initial asymmetry between countries is assumed. Since our approach is based on new economic geography and endogenous growth theory, it is more or less related to those contributions that study the interaction of economic geography with growth. But different from them, in this paper economic activities are regarded as interdependent.

Several interesting results arise from small changes in the model
setting. Geographical agglomeration of industry, as in new geography literature, leads to international specialization. But the international specialization pattern is characterized by interdependent rather than independent specialization. Furthermore, two countries grow at the same rate in the specialization steady state, as long as innovative intermediates developed in one country is available to other country via trade. This is because in our model assuming horizontal differentiated intermediates, the growth rate does not depend on their absolute quantity but on their number. More important is the point that geographical agglomeration has growth effects for both countries, not only one. In our model, in which the specialization pattern is interdependent, the growth effect of geographical agglomeration is not national but international even in the absence of international technology spillovers. This point is strikingly different from the previous economic geography literature and closely related to Ethier’s (1982) argument that increasing returns to scale are not national but international. Geographical agglomeration might not be catastrophic. Rather, the periphery can eventually be better off under agglomeration than under dispersion. This point is in line with the recent contribution of Fujita and Thisse (2002), in which labor mobility within a country provides a basis for agglomeration of economic activities.

Here, it is also necessary to stress the impacts of economic integration on the income levels of countries and international specialization patterns. Geographical agglomeration creates absolute income differences between core and periphery. This income discrepancy, as in the previous economic geography literature, can be reduced by deepening economic integration, i.e., by sinking trade costs. However, our model has quite a different mechanism for income convergence.
While in the previous economic geography literature, income convergence arises only if firms relocate from core to periphery, in our model income inequality can be reduced without relocation of firms. That is, income convergence is possible without changes in the specialization pattern. Moreover, economic integration has international growth effects. The reduction in trade costs increases the demand for intermediates in the periphery, which raises the profits of firms in the core. As a result, R&D activities become more attractive. Because countries specialize in the interdependent industries, innovation in the core raises the productivity of industries not only in the core but also in the periphery.

In addition, this paper shows that the self-reinforcing process of growth and agglomeration is driven by the interaction between pecuniary and technological externalities. Static models of new economic geography address commonly pecuniary externalities as driving forces for spatial agglomeration. In contrast, endogenous growth theory stresses technological externalities as driving forces for sustained growth. Indeed, since Scitovsky (1954) has divided externalities into pecuniary and technological, these two externalities have been studied separately in economic theory. But little work has been done to draw a close relation between them. An exception is the recent contribution of Martin and Ottaviano (2001). In this paper, not only pecuniary externalities but also technological externalities matter for agglomeration and growth. The interaction among these two externalities amplifies the circular causality between growth and the geographical agglomeration of economic activities.

The remainder of this paper is organized as follows. The model is presented in Section 2. The equilibrium conditions are analyzed in
Section 3. The mechanism creating agglomeration forces is discussed in Section 4. Section 5 analyzes under which conditions the equilibrium is stable. Section 6 shows the implications of the equilibria for growth and income among countries. Section 7 explores the effects of economic integration. Finally, Section 8 provides some concluding remarks.
II. A Dynamic Geography Model

Consider a world economy with two countries, North and South, which are identical in technology, preferences, and endowments. Each economy has three sectors: final, intermediate, and R&D sectors. The final and intermediate sectors are vertically linked. The R&D sector produces designs for the production of intermediate goods. A final good is produced by the use of labour and a composite good, and its production function in North is

\[ Y = L_y^{1-\mu} D^\mu, \quad 0 < \mu < 1, \quad (1) \]

where \( L_y \) is the employment of labour in the final sector. Following Dixit and Stiglitz (1977) and Ethier (1982), a composite good \( D \) consists of a number of differentiated products and the intermediate sector is assumed to be monopolistic competitive.

\[ D = \left[ \int_0^n x_i^\beta di + \int_0^{n^*} (m_i^*)^\beta di \right]^{1/\beta}, \quad 0 < \beta < 1, \quad (2) \]

where \( n \) and \( n^* \) are the number of varieties produced in North and South, respectively. \( x_i \) and \( m_i^* \) denote the Northern usage of domestically produced and imported intermediates \( i \). Variables labeled by an asterisk refer to the country South.

The final sector is perfectly competitive and produces a consumption good, which can be costlessly traded. The final good \( Y \) can be used for consumption and for the production of intermediates. A
unit of final good is used for the production of a unit of intermediate. Following the standard assumption of the new economic geography model (Krugman 1991, Krugman and Venables 1995), trade in intermediates incurs iceberg transport costs at a rate \( \tau (\tau \geq 1) \). This implies that only a proportion \( 1/\tau \) of the intermediates arrives and the price is then \( p^* \tau \). The final sector in North spending an amount \( p_y Y \) for intermediates minimizes production costs by purchasing

\[
x = p^{-\epsilon} Q_M^{-1} \mu p_y Y \quad \text{and} \quad m^* = (p^*)^{-\epsilon} \tau^{-\epsilon} Q_M^{-1} \mu p_y Y , \quad (3a)
\]

where \( \epsilon = 1/(1 - \beta) \) is the price elasticity of demand.

Analogously, the demands for locally produced and imported intermediates in South are

\[
x^* = (p^*)^{-\epsilon} (Q^*_M)^{\epsilon-1} \mu p_y^* Y^* \quad \text{and} \quad m = p^{-\epsilon} \tau^{-\epsilon} (Q^*_M)^{\epsilon-1} \mu p_y^* Y^* \quad (3b)
\]

\( Q_M \) is the price index of differentiated intermediates in North, and is defined by

\[
Q_M = \left[ n p^{1-\epsilon} + n^* \phi (p^*)^{1-\epsilon} \right]^{\frac{1}{1-\epsilon}} \quad (4)
\]

where \( \phi \equiv \tau^{1-\epsilon} \) and \( 0 \leq \phi \leq 1 \).

Since the two countries are symmetric, we describe below only North, noting that analogue conditions hold in South. Intermediate firms as monopolist set the mark up price over marginal costs, i.e.
\[ p(1 - \frac{1}{\varepsilon}) = p_y, \quad (5) \]

In equilibrium it will turn out to be \( p = p^* \), because the perfect competitiveness and free trade of the final good ensure that \( p_y = p_{y*}^* \). The profit of a representative firm in North is then

\[ \pi = \mu(p - p_y) p^{-\varepsilon} p_y \left[ Q_{M}^{\varepsilon-1} Y + (Q_{M}^{\varepsilon})^{\varepsilon-1} \phi Y^* \right], \quad (6) \]

We now introduce the R&D sector. Following the basic idea of Romer (1990) and Grossman and Helpman (1991) the R&D sector uses the existing stock of knowledge capital and labour to produce designs for new intermediates. It is also assumed that designs can not be traded and there is no international knowledge diffusion. An intermediate firm must purchase a design for intermediate products before production.

As is usual in endogenous growth theory, the aggregate stock of designs evolves according to

\[ \dot{n} = \lambda \cdot K_n L_R, \]

where \( K_n \) is knowledge stock in North, \( L_R \) represents aggregate employment in the R&D sector and \( \lambda \) is a constant productivity parameter.

Each research project contributes to a stock of knowledge capital \( K_n \) that will be useful to later R&D activities. That is, R&D activities generate technological externalities, which make sustained growth possible. Knowledge capital \( K_n \) is a public good. In order to explore
the interaction between growth and location of firms, we need to specify the relation between the number of firms \( n \) and the knowledge stock \( K_n \). Endogenous growth theory assumes typically that the level of technology corresponds to the number of intermediate products, \( K_n = n \). This specification is no problem in an endogenous growth model, in which firms are immobile. Changes in the number of firms are, therefore, possible only through a country’s own R&D (internal growth). However, when firms freely choose their locations, one cannot simply equalize \( K_n \) to \( n \) without any mechanism that links the number of firms and the stock of knowledge. When the number of firms in each country changes through the relocation, the proportional relation between \( K_n \) and \( n \) may no longer hold.

To construct a plausible relation between \( K_n \) and \( n \), we should understand the interaction between the process of growth and agglomeration of economic activities. When pecuniary externalities, following Krugman (1991) and Krugman and Venables (1995), create forces for the agglomeration of firms, and when market size is an issue, then we should first ask how a market expands. Market size can be extended not only through the relocation of foreign firms but also through internal growth. Conversely a country grows faster than others not only through faster innovation but also through an external increase of production (e.g., by attracting foreign firms).

Suppose that the innovation rate in North is greater than in South; new firms would be created faster in North, and therefore differences in market size between the two countries would arise. This makes North a more attractive location for the production of industrial goods, because demand would be larger. It would lead to the relocation of firms from South to North. In this case technological ex-
ternalities generate pecuniary externalities. On the contrary, suppose that one country has a larger intermediate sector than the other. This country might offer favorable circumstances for R&D activity. There would be better contracts between researchers and producers in this country. One could also expect a greater scope of learning by doing gained through production. An empirical study by Audretsch and Feldman (1996) has shown that there is a tendency for production and innovation activities to cluster geographically together. In this case pecuniary externalities strengthen technological externalities.

Industrial production will tend to concentrate where there is a large market, but the market will be large where innovation activities are attractive. Innovation activities may also be attractive where industrial production is concentrated. Growth and agglomeration proceed simultaneously and feed on each other. That is, pecuniary externalities can be reinforced by technological externalities, and technological externalities can also be generated by pecuniary externalities. In this case, the change in the number of firms is positively related to that of the knowledge capital stock. With this close relation between pecuniary and technological externalities we can now assume that in the long run $K_n$ and $n$ are proportional. Hence, the innovation function can be expressed as

$$\dot{n} = \delta \cdot n \cdot L_R$$

(7)

where $\delta$ is a constant productivity parameter.

The population in North (South) supplies $L$ ($L^*$) units of labour services where $L = L^*$. These labour services are devoted either to R&D or to the production of the final good. At the aggregate level, $L$, and
$L_R$ are related by the constraint

$$L = L_y + L_R$$  \hfill (8)$$

The population growth rate is neglected here. To close the model, we need to specify the preference of households. It is assumed that the representative household maximizes utility over an infinite horizon:

$$U = \int_t^\infty e^{-\rho(v-t)} \ln C(v) dv ,$$  \hfill (9)$$

where $C(v)$ represents consumption of the final good at time $v$ and $\rho$ is the rate of time preference.
III. Intermediate Analysis

Free entry into the intermediate sector ensures that the price of a design $P_n$ equals the present value of the net revenue obtainable from selling the intermediate good. That is

$$p_n(t) = \int_t^\infty \pi(v) e^{r(v-t)} dv,$$  \hspace{1cm} (10)

where $r$ is the average interest rate between times $v$ and $t$. It is simply assumed that the interest rate $r$ remains constant over time. With free capital mobility, the interest rates in all countries are the same ($r=r^*$). Differentiation of (10) with respect to time yields the no-arbitrage condition relating the return for an investment on a design of value $p_n$ in a firm to current profits plus the change in the value of designs over time.

$$rp_n = \pi + \dot{p}_n$$ \hspace{1cm} (11)

From (7), the production cost of a design is $\omega_R/\delta \cdot n$. If there is free entry into the R&D sector, profits must be driven to zero. Thus it must be true that

$$p_n = \frac{\omega_R}{\delta \cdot n}, \hspace{1cm} \text{for} \hspace{1cm} n > 0$$ \hspace{1cm} (12)

The wage of labour in the final sector is equal to its marginal
product while in the R&D sector, it is \( \omega_R = \delta \cdot p_n \cdot n \). The conditions determining the allocation of labour between the final and R&D sectors is the same wage in each sector, so that

\[
\delta \cdot p_n \cdot n = \rho_y (1 - \mu) L_M^{-\mu} D^\mu
\]  

(13)

Let \( E \) denote the consumption expenditures of households, so that \( E = p_y \cdot C \). Maximizing (9) subject to an inter-temporal budget constraint yields the following evolution path for consumption expenditures:

\[
\frac{\dot{E}}{E} = r - \rho
\]  

(14)

Following Grossman and Helpman (1991), nominal expenditures remain constant so that \( E = 1 \). This implies, from (14), that the nominal interest rate is equal to the time preference rate, \( r = \rho \). Furthermore, it must be true that in the steady state the growth rate of the nominal wage is zero.1)

Before we proceed to an analysis of this model it is convenient to

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1) Note that in the aggregate an economy has labour income \( \omega L \) and total assets worth \( P_n n \). Households yield the returns for the investment. In equilibrium the static budget constraint must be satisfied: \( E = \omega L + r P_n n \). In a steady state, the aggregate value of the stock market of all intermediate firms, \( P_n n \), is constant. Using (12) we can write the budget constraint as \( E = \omega (L + r/\delta) \) so that \( E \) and \( \omega \) have the same growth rate and are constant.
characterize the possible steady states in which variables \( n, \ Y \) and \( C \) grow at constant rates. Our attention mainly focuses on the geographical distribution of firms and its effects on growth. Baldwin et al. (1998) provide a useful method for the solution of the equilibrium. Following them, we define a new variable \( s(t) = n(t)/[n(t)+n^*(t)] \), the share of North in the number of intermediate firms worldwide at time \( t \). Differentiating the definition with respect to time yields the following equation:

\[
\dot{s} = s(1 - s)(g - g^*)
\]

(15)

where \( g = \dot{n}/n \) and \( g^* = \dot{n}^*/n^* \).

By definition of steady state, \( s \) is constant (\( \dot{s} = 0 \)) so (15) implies that this model has two types of steady states: \( g = g^* \) and \( s = 0 \) or 1. We refer to these steady states as the symmetric and specialization steady states, respectively.

Recall that the market for the final good \( Y \) is perfectly competitive, and that this good is costlessly traded. From the Cobb-Douglas production function in (1), we have the unit cost function.

\[
c_y = A\omega^{1-\mu} Q_M^{\mu} \quad \text{and} \quad c_y^* = A(\omega^*)^{1-\mu}(Q_M^*)^\mu,
\]

(16)

where \( A = \mu^{-\mu}(1-\mu)^{\mu-1} \) and \( \omega \) and \( \omega^* \) are the wage of labour in North and South, respectively.

If the final good is manufactured in both countries (that is true in equilibrium), then unit costs must be the same in both locations. From \( c_y = c_y^* \) and (4) we get the expression for the relative wage rates
in both countries:

$$\frac{\omega^*}{\omega} = \left( \frac{Q_M}{Q^*_M} \right)^{\frac{\mu}{1-\mu}}$$

$$= \left( \frac{n + n^*}{n \phi + n^*} \right)^{\frac{\mu}{(1-\varepsilon)(1-\mu)}}$$

(17)

If transport costs exist ($\phi > 1$), equation (17) shows that the wage rate in the location with a greater number of firms cannot be lower than in the other location. From (1), it is easy to verify that the marginal product of labour in the final sector increases with the increase in the number of intermediate firms. This implies that the relative wage relationship between countries depends on the number of intermediate products used in the final sector.

From equation (17) and the first-order condition for profit maximization in the final sector, $\omega L_y = (1-\mu)P_y Y$, we get

$$\frac{Y^*}{Y} = \left( \frac{n + n^* \phi}{n \phi + n^*} \right)^{\frac{\mu}{(1-\varepsilon)(1-\mu)}} \cdot \frac{L^*_y}{L_y}$$

(18)

If there is no difference in employment in the final good sector between the two countries, then the output will be greater in the country with the greater number of firms. If each country has the same number of intermediate firms, a higher $L_y$ leads to higher output. Final good producers tend to concentrate in the country with a larger number of intermediate firms and a larger labour force.
IV. Centripetal and Centrifugal Forces

Before analyzing the stability of the steady state, we discuss the forces at work in this model. As is common in the economic geography literature, there are centripetal and centrifugal forces. The first leads to the agglomeration of economic activities while the latter disperses economic activities in space.

In this model, industries are vertically linked through an input-output structure so that there are, like Venables (1996) and Krugman and Venables (1995), forward (cost) and backward (demand) linkages. An increase in $n$ reduces the price index $Q_M$ in (4) and therefore the unit cost of the final good in (16) decreases. From the production function of the final good, we can easily verify that output $Y$ is increasing in $n$.\(^2\) This is the forward linkage. When the output $Y$ in North is greater than in South, then demand for intermediate products in North is higher (eq. (3a)). This leads to an increase in profits of intermediate firms located in North (eq. (6)). Because there are transport costs, it is profitable for intermediate firms to locate in North and to sell a larger fraction of their products in the larger market. This is the backward linkage. These two link-

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2) Krugman and Venables (1995) assume that the final good sector is monopolistically competitive, so that the market size of final goods is measured by the number of firms. In our model, however, the final sector is perfectly competitive. The difference in market size between both countries is represented as the differences in output quantities. Venables (1996) argues that an incentive for agglomeration of activity depends on market imperfection; we show that it need not be the case.
ages as pecuniary externalities, which are mediated by markets, create forces for agglomeration of industries in a country. Moreover, the concentration of the intermediate industry offers a relatively favorable environment for innovation, so that innovation costs in North are lower than in South (eq. (12)). The higher innovation rate means faster enlargement in the intermediate sector and also faster growth in the final sector. This in turn leads to a further shift of Southern industries to North and to faster growth in North.

Suppose now that innovation costs are lower in North. Innovation will take place only in North. As the Northern R&D sector produces designs, new firms are created there and the market size of intermediates will be enlarged. The growth of the intermediate sector also leads to the enlargement of the final sector because of input-output linkages between industries (eq. (1)). Then, forward and backward linkages are at work and firms will concentrate in North where innovation is active. In the long run, technological externalities create forces for the agglomeration of the economic activities.

Pecuniary and technological externalities generate the cumulative processes leading to agglomeration of economic activities. The interaction between agglomeration and growth, i.e. the circular causality between pecuniary and technological externalities creates the cumulative mechanism in which the geographical distribution of economic activities and growth interact.

There are also centrifugal forces, which stabilize symmetric equilibrium. The first is the well-known local competition effect. An increase in \( n \) reduces the price index \( Q_M \) in (2), thus reducing the demand for local intermediates in (3a) and reducing the profits of firms in (6). This competition effect has further a dynamic effect. Namely,
raising $n$ reduces the price of designs in (10), which corresponds to the present value of a firm’s future profits. Thus it becomes less attractive to engage in R&D and the growth rate decreases. Another force opposing agglomeration is the allocation effect. An increase in $n$ implies that the price index of intermediates used in the final sector decreases while the wage rate increases, thus reducing labour demand in the final sector. The reduction of employment may result in a decrease of output.
V. Stability Analysis

As mentioned above, this model has two steady states: One is the symmetric steady state, in which economic activities are symmetrically distributed. The other is the specialization steady state, in which innovation and the production of intermediates take place only in one country. The analysis (in appendix) shows that the stability of the steady state depends on trade costs. We get two critical levels of trade costs, which make the steady state unstable.

\[
\tau^s = \left( \frac{2\epsilon\mu + 2 - 2\epsilon - \mu}{\mu} \right)^{\frac{1}{1-\epsilon}} 
\]

(19)

\[
\tau^A = \left[ \left( \frac{\epsilon(1-\mu)[\epsilon(1-\mu) + \mu]}{\epsilon + \epsilon\mu - \mu} \right) \frac{\rho + \delta L}{\mu\delta L} \right]^{\frac{\mu-1}{\mu}}
\]

(20)

At high levels of trade costs (\(\tau > \tau^s\)), the symmetric steady state is stable. However, when trade costs fall to the critical point \(\tau^s\), then the symmetric steady state becomes unstable. As noted above, the reason is that at trade costs \(\tau^s\) centripetal forces become dominant.

When trade costs are higher than \(\tau^A\) and less than \(\tau^s\), then the specialization steady state is stable. When trade costs, however, fall below this critical level, the specialization steady state becomes unstable. The reason is the presence of the backward linkages between the final and intermediate sectors. Inserting \(n^*=0\) into (18) yields the output relation between South and North.
\[
\frac{Y^*}{Y} = \phi (\varepsilon - 1)(1 - \mu) \frac{L}{L_y}
\]

(21)

In the specialization steady state the whole work force of South is employed in the final sector, thus \( L > L_y \). When transport costs become very small (\( \phi \approx 1 \)), then \( Y^* > Y \). This implies that in (3a) and (3b) the demand for intermediate products is greater in South than in North. Because of the backward linkages the relocation of intermediate firms to South arise and therefore the specialization steady state becomes unstable.

As is usual in new geography models, the critical levels of trade costs (19) and (20) are not so revealing. Table 1 shows the numerical example of critical levels of trade costs for a range of \( \mu \) and \( \varepsilon \). The symmetric steady state is stable only in a narrow range. For example, at \( \mu = 0.6 \) and \( \varepsilon = 1.5 \) the symmetric steady state is stable when \( \tau^s > 9 \) or only when there are no transport costs. Hence, the specialization steady state is stable for a greater range of trade costs.

<table>
<thead>
<tr>
<th>( \varepsilon )</th>
<th>( \mu = 0.6 )</th>
<th>( \mu = 0.7 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>( \tau^s )</td>
<td>9</td>
<td>-</td>
</tr>
<tr>
<td>( \tau^A )</td>
<td>1.2</td>
<td>1.04</td>
</tr>
</tbody>
</table>

* The symbol “-” indicates the indefinite \( \tau \)

3) The values for \( \phi \) and \( \delta \) are chosen 0.01 and 0.07, respectively.
VI. Growth and Income in the Steady States

1. Growth rate in the steady state

1) The specialization steady state

In the specialization steady state, all intermediate firms are located in North and innovation arises only in North. South specializes completely in the production of final goods. With $n^* = 0$, the production function of the final sector in North is given by

$$Y = L^{-\mu} \left( (nx)^\beta n^{1-\beta} \right)^{\frac{\mu}{\beta}}$$

Since the total amount of intermediates $nx$ and labour $L_y$ are constant in the steady state, the growth rate of final sector $g_y(p)$ is proportional to the innovation rate $g(p)$.

$$g_y(p) = \frac{\mu}{\varepsilon - 1} g(p) \quad (22)$$

In order to get the growth rate in the R&D sector, we need to have labour input $L_R$ in (7). From (3a), (4) and (18), using the relation $L = L^*$, $n^* = 0$ in the specialization steady state, the profits of intermediate firms can be expressed as

$$\pi = \frac{\mu}{\varepsilon - 1} \frac{p_y^2 Y}{n \bar{p}} \left( 1 + \phi \frac{(\varepsilon - 1)\mu}{(1-\varepsilon)(1-\mu)} \frac{L}{L_y} \right) \quad (23)$$
In the steady state, it must be the case that \(-\dot{p}_n/p_n=\dot{n}/n\), which can easily be derived from differentiating the constant wage rate \(\omega=\delta p_a n\). Together with (13) and (23), the no-arbitrage condition (11) gives a relation between the growth rate \(g(p)\) and the interest rate \(r\) where

\[
    r = \left( \frac{\delta}{\epsilon} \right) \left( \frac{\mu}{1-\mu} \right) L_y \left( 1 + \phi \frac{\mu}{(\epsilon-1)(1-\mu)} \frac{L}{L_y} \right) - g(p) \tag{24}
\]

Hence, using (24), \(r=\rho\) from \(E=1\) and (9), we get the growth rate

\[
    g(p) = \delta L_R = \delta (L - L_y) \tag{25}
\]

\[
    = \frac{\delta \mu (1 + \phi \frac{\mu}{(\epsilon-1)(1-\mu)} L - \epsilon (1-\mu) \rho}{\epsilon (1-\mu) + \mu}
\]

Sustained growth is possible, if \(L > \epsilon (1-\mu) \rho / \delta \mu (1 + \phi \mu/(\epsilon-1)(1-\mu))\).

What happens in South? Surprisingly, it turns out that the final sector and the consumption of South grows at the same rate as in North. By using \(n^*=0\), we get the production function of final goods in South in the agglomeration steady state

\[
    Y^* = L^{1-\mu} (n \cdot m)^\mu n^{\mu/(\epsilon-1)}
\]

That is, the growth rate of \(Y^*\) is proportional to that of \(n\) so that \(g_y(p)=g_y^*(p)\). In the long run, geographical agglomeration brings about no disparities in growth rate between countries. The reason is interdependent specialization. North specializes in the production of intermediates and innovation, and South specializes in the production of
final goods. But, in our model setting, the final sector is interdependent with the intermediate and R&D sectors. New products developed in North are also available in South via trade. Whenever intermediates are traded, there is no international difference in the number of intermediate goods available to the final sectors in the two countries. In our model, growth in the final sector does not depend on the absolute amount of intermediate products, but on the number of those available to the final sector. Innovation in North enables the growth of the final sector in South indirectly via trade. Hence, trade can then be considered as an indirect innovation. This is the international interdependence of economic activities.

2) The symmetric steady state

In the symmetric steady state, both countries have the same share of the number of intermediate firms and the knowledge capital stock, s = s* = 1/2. To yield the growth rate in the symmetric steady state, we have to repeat the same procedure used to derive the growth rate in the specialization steady state. From this procedure we can easily obtain the growth rate of the innovation g(s) in the symmetric steady state:

\[
g(s) = g^*(s) = \delta(L - L_y)
\]

\[
= \frac{\delta \mu L - \varepsilon (1 - \mu) \rho}{\mu + \varepsilon (1 - \mu)}
\]

(26)

As long as \( \delta \mu L > \varepsilon (1 - \mu) \rho \), sustained growth is possible. In the symmetric steady state \( g_y(s) \) is also proportional to \( g(s) \).
\[ g_y(s) = s_y^*(s) = \frac{\mu}{\varepsilon - 1} g(s) \] 

(27)

2. Growth effect and specialization

We compare the growth rates in the two steady states. The relation of growth rates between countries and steady states can be derived from (22), (25) and (27).

\[ g_y^*(p) = g_y(p) > g_y^*(s) = g_y(s) \] 

(28)

The growth rate in the final sector and consumption is higher in the specialization steady state than in the symmetric steady state, i.e., agglomeration of economic activities has a growth effect for both countries, not only for the country where R&D activities are concentrated. This result is strikingly different from the implications of the static economic geography models of Krugman and Venables (1995) and Baldwin et al. (1998) that industrialization in one country is associated with de-industrialization in the other, and also of Baldwin (1999) that the long-run growth rate does not depend on the geographical distribution of economic activities.

The higher growth rate in the specialization steady state implies that geographical agglomeration of economic activities will be in the long run beneficial for both countries. This result can be considered as a dynamic version of traditional trade theory in which both countries gain from trade. The difference is that while in traditional theory mutual gains are related to static trade profits, in our model they are realized as higher growth.
Growth effect of geographical agglomeration results from international labour division. North takes over the task of innovation and allocates more labour to research activities. Instead of innovation, South specializes in the production of final goods. Innovation in North makes the final sector in South more productive via trade. This implies, in turn, the enlargement of northern consumption possibilities. In the symmetric steady state both countries must be active in all economic activities, which finally results in a lower growth rate. Since the consumption of both countries grows at the same rate in the specialization steady state and the growth rate is high compared to the symmetric steady state, the geographical agglomeration process can be seen as a process that creates a productive international labour division.

The higher growth rate in the specialization steady state implies that periphery can eventually be better off under agglomeration than under dispersion. This result is in line with Ethier (1979, 1982), who argues that increasing returns depend upon the scale of the world market rather than the national market. Analogously, innovation is international in our model. However, this can not hold if economic activities are independent and the international specialization pattern resulting from geographical agglomeration is independent.

3. Income inequality

Although location of economic activities brings no disparities in growth rate between countries, geographical agglomeration produces differentials in the income level between North and South. North where intermediate firms are concentrated and all innovations arise
has a higher income than South. Substituting zero for \( n^* \) in (17) yields the relative wage between South and North in the specialization steady state depending on trade costs.

\[
\left. \frac{\omega^*}{\omega} \right|_{n^* = 0} = \phi \left( \frac{\varepsilon - 1}{1 - \mu} \right) \frac{\mu}{(1 - \mu)} < 1
\]

From \( E = p_y C \), the relative nominal wage rate between countries represents the relative real income, since the price of final good \( p_y \) is internationally the same and the expenditure \( E \) is a function of \( \omega \). In the presence of trade costs, South imports a smaller quantity of intermediates per dollar compared to North [eq. (3a) and (3b)] and therefore the marginal product of Southern labour in the final sector is low. Note that there are international differences in factor intensity in the production of final goods. Since the price index of intermediate products in South is higher than in North [eq. (4)] and the wage rate is lower, and vice versa, South produces final good relatively labour-intensive and North produces it by using intermediate products intensively.
VII. Economic Integration

This section presents the effects of economic integration on growth and income in the specialization steady state. It is assumed that economic integration takes the form of a reduction of trade costs, i.e., exogenous change in trade costs.

Economic integration has a growth effect, since the growth rate in the specialization steady state given by (25) is negatively related to trade costs. Reduction of trade costs implies a decrease in Southern import prices and an increase in exports from North to South, which raise the profits of intermediate firms in North. As a consequence, design price also increase, implying an increase in the wage rate in the R&D sector [eq.(12)]. Economic integration changes the allocation of labour between final and R&D sectors, in favor of the R&D sector, so that the growth rate increases. This increased growth rate in North is transmitted to South, because of interdependent specialization. Both countries can realize higher growth through economic integration.

Moreover, economic integration reduces income inequality. Differentiating (29) yields

$$\frac{\partial (\omega^*/\omega)}{\partial \phi} = \frac{\mu}{(\varepsilon - 1)(1 - \mu)} \phi^{(\varepsilon - 1)(1 - \mu) - 1} > 0 \quad (30)$$

Income differentials between countries are due to differences in the amount of intermediate products used in the final sector. A reduction in trade costs implies an increase in the quantity of intermediates used in the Southern final sector and therefore an increase
in the marginal product of Southern labour. But economic integration has no effect on the marginal product of labour in North where intermediates are sold without trade costs.

Static geography models also predict that economic integration will lead to income convergence. When the wage rate in South is low enough to offset the locational disadvantage, then firms have an incentive to move from North to South. In other words, income convergence arises only if firms relocate from North to South, i.e. income convergence does not occur without convergence of the two countries’ economic structures. The model developed in this paper, however, has quite a different mechanism for income convergence. Income convergence may arise without relocation of economic activities. As we have seen in Table 1 that the specialization steady state is stable in a wide range of trade costs, economic integration can generate income convergence. Income convergence follows without the expense of the core. Specialization and income convergence can take place simultaneously. This model might explain recent developments in the EU in which, on the one hand, specialization has increased\(^4\), and on the other hand, income differentials between the member countries have greatly decreased (European Commission 1999).

\(^4\) Recently, several papers have assessed empirically whether specialization has increased in the EU. Bürthhart and Tosstensson (1996), Amiti (1999) and Midelfart-Knarvik et al. (2000) show that European countries have become increasingly different from the average of the rest of the EU.
VIII. Concluding Remarks

In this paper, starting from the presumption that economic activities are interdependent, a simple economic geography model is developed, in which agglomeration creates interdependent specialization between countries and has an international growth effect. In the specialization steady state, the world economy splits itself into a core country with a higher income and a periphery country with a lower income. However, since growth is higher in this steady state and both countries grow at the same rate, the periphery country will eventually be better off than in the symmetric steady state. These results depend on the assumption that economic activities are closely related to each other. If there is an economic sector irrelevant to other sectors, the results will not be valid. The previous studies, Krugman and Venables (1995), Baldwin et al. (1998), and many others, assume that there is at least one such an industry. Based on this assumption, geographical agglomeration is necessarily characterized by catastrophe in the sense that it divides countries into winners and losers.

Moreover, it is shown that economic integration will reduce income inequality between countries which arises from geographical agglomeration. Contrary to the previous economic geography models, income inequality can be reduced without convergence of economic structure. Specialization and income convergence can take place simultaneously.

Finally, in the specialization steady state economic integration has international growth effects. Reduction of trade costs implies an increase in the export of intermediates from North to South, which
raise the profits of intermediate firms in North. As a consequence, R&D activities become more attractive. The interdependent specialization ensures the transmission of the increased growth effects from North to South.
References

Amiti, Mary (1999), 'Specialization Patterns in Europe', Weltwirtschaftliche Archiv 135, 573-593.


European Commission (1999), Sixth periodic Report on the social and economic situation and development of the regions of the European Union, Luxemburg.


Appendix: Stability of steady states

Define $V$ and $V^*$ as follows:

$$
V = \frac{p_v Y}{p_n \cdot n} \quad \text{and} \quad V^* = \frac{p_v^* Y^*}{p_n^* \cdot n^*} \quad (A1)
$$

Differentiating (A1) yields

$$
\frac{\dot{V}}{V} = \frac{\dot{p}_v}{p_v} + \frac{\dot{Y}}{Y} - \frac{n}{n} + r - \frac{\pi}{p_n} \quad (A2)
$$

$$
\frac{\dot{V}^*}{V^*} = \frac{\dot{p}_v^*}{p_v^*} + \frac{\dot{Y}^*}{Y^*} - \frac{n^*}{n^*} + r - \frac{\pi^*}{p_n^*} \quad (A3)
$$

From (3a), (3b) and (6) we get

$$
\frac{\pi}{p_n} = \frac{\mu}{\varepsilon} \frac{p_v Y}{p_n \cdot n} \left[ \frac{n}{n + n^*\phi} + \frac{n\phi}{n\phi + n^*} \frac{Y^*}{Y} \right] \quad (A4)
$$

With (18) and the definitions of $V$ and $s$ equation (A4) can be expressed as

$$
\frac{\pi}{p_n} = \frac{\mu}{\varepsilon} \left( \frac{s}{s + \phi - s\phi} \right) V + \frac{\varepsilon}{\mu} \left( \frac{\delta}{1 - \mu} \right) \left( \frac{s\phi}{1 - s + s\phi} \right) \left( \frac{s + \phi - s\phi}{1 - s + s\phi} \right)^{1/\varepsilon} \left( 1 - \mu \right) L_* \quad (A5)
$$
Substituting $\omega_R$ from (12) into the Euler equation $\omega L_y = (1 - \mu) \rho_y Y$ and using the definition of $V$ yield the employment in final good sector.

$$L_y = \frac{1 - \mu}{\delta} V \quad \text{(A6)}$$

With (7), (15), (A5) and (A6), the differential equation for $V$ can be simplified to yield

$$\dot{V} = - (\rho + \delta L) V + (1 - \mu) V^2 + \frac{\mu}{\varepsilon} \left( \frac{s}{s + \phi - s\phi} \right) V^2$$

$$+ \frac{\mu}{\varepsilon} \left( \frac{s\phi}{1 - s + s\phi} \right) \left( \frac{s + \phi - s\phi}{1 - s + s\phi} \right)^{(1 - \varepsilon)(1 - \mu)} V^* \cdot V \quad \text{(A7)}$$

For a steady state, it must be $\dot{V} = \ddot{V} = 0$. There are two types of steady states ($s = 1/2$ and $s = 1$) and the value $V$ in the two steady states, respectively:

$$\overline{V} \bigg|_{s = 1/2} = \frac{\varepsilon(1 - \mu)(1 + \phi)(\delta L + \rho) - \mu \delta \phi L^*_y}{(1 - \mu)[\varepsilon(1 + \phi)(1 - \mu) + \mu]}$$

and

$$\overline{V} \bigg|_{s = 1} = \frac{\varepsilon(1 - \mu)(\delta L + \rho) - \mu \delta \phi \frac{(\varepsilon - 1)(1 - \mu)}{(1 - \mu)[\varepsilon(1 - \mu) + \mu]} L^*_y}$$
The symmetric steady state

Using (7), (A2), (A3) and (A6), the differential equation for \( s \) in the symmetric steady state can be written as

\[
\dot{s} = (1 - \mu)(s - s^2)(V^* - V)
\]  

(A7)

Because \( \frac{\partial \dot{s}}{\partial s} \) in the symmetric steady state equals zero, the stability of this system depends on the signs of \( \frac{\partial \dot{s}}{\partial V} \) and \( \frac{\partial \dot{V}}{\partial s} \). Linearizing (23) and (24) about the equilibrium points \( \bar{s} = 1/2 \) and \( \bar{V}(s=1/2) \) yields

\[
\left. \frac{\partial \dot{V}}{\partial s} \right|_{\bar{V}, \bar{s}} = \frac{\mu}{\varepsilon} \frac{4\phi}{(1+\phi)^2} \left[ V + V^* + \frac{\mu(1-\phi)}{(1-\varepsilon)(1-\mu)} V^* \right] ,
\]

\[
\left. \frac{\partial \dot{s}}{\partial V} \right|_{\bar{V}, \bar{s}} = \frac{(1-\mu)}{4} < 0.
\]

The sign of \( \frac{\partial \dot{V}}{\partial s} \) depends on the trade costs. From \( (\partial \dot{V} / \partial s) = 0 \), we have the critical point of transport costs:

\[
\tau^s = \left( \frac{2\varepsilon\mu + 2 - 2\varepsilon - \mu}{\mu} \right) \frac{1}{1-\varepsilon}
\]  

(A8)

If \( \tau > \tau^s \), the sign of \( \frac{\partial \dot{V}}{\partial s} \) is negative. Therefore, the symmetric steady state is stable. When trade costs fall to the critical point \( \tau^s \), then the symmetric steady state becomes unstable.
In the specialization steady state innovations arise only in North. Hence, the innovation rate in South is equal to zero. Using (7) and (A6), we can rewrite the differential equation for \( s \) in the specialization steady state as follows:

\[
\dot{s} = (s - s^2)g \tag{A9}
\]

\[
= (s - s^2)[\delta L - (1 - \mu) V]
\]

Analogously to the analysis of the symmetric steady state, we linearise the two differential equations (A7) and (A9) about the equilibrium points \( \bar{s} = 1 \) and \( \bar{V}(s = 1) \). The element of the Jacobian-matrix \( \partial \delta / \partial V \) is zero. Therefore, the stability of the agglomeration steady state depends on the sign of \( \partial \bar{V} / \partial V \). When \( \partial \bar{V} / \partial V \) is positive about the equilibrium points, then this system is stable. The critical level of transport costs at which the agglomeration steady state becomes unstable can be determined from \( \partial \bar{V} / \partial V = 0 \) as

\[
\tau^A = \left[ \left( \frac{\varepsilon(1 - \mu)[\varepsilon(1 - \mu) + \mu]}{\varepsilon + \varepsilon \mu - \mu} \right) \frac{\rho + \delta L}{\mu \delta L} \right]^{-\frac{\mu - 1}{\mu}} \tag{A10}
\]
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Soon-chan Park

Korea Institute for International Economic Policy
300-4 Yonggok-Dong, Seocho-Gu, Seoul 137-747, Korea
Tel: (822) 3460-1114
Fax: (822) 3460-1122
URL: http://www.kiep.go.kr