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The effects of globalization on regional inequality in a model of semi-endogenous growth and footloose capital

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Abstract

We show that manufacturing firms locate only in northern regions when transportation costs are not high, and in both northern and southern regions when transportation costs are high; we do so through the use of a

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semi-endogenous research and development growth model with international trade, footloose capital, and local knowledge spillover. Regional income inequality—defined as per-capita expenditure relative to price index—decreases in the latter case, because the northern share of expenditure does not change, on account of a constant and exogenous growth rate. The northern price index does not change, even as the southern price index decreases.

Keywords: trade integration; footloose capital; R&D growth; scale effects; regional inequality; local spillovers; full agglomeration

1. Introduction

Many economists have contributed empirical and theoretical studies on the effects of globalization on regional inequality. Bouvet (2011) shows that income inequality stabilizes among OECD regions, but decreases among those European regions that exhibit greater integration than do the OECD regions. Bouvet (2010) shows that regional inequality decreased within the European Economic and Monetary Union between 1977 and 2003. Likewise, Jian, Sachs, and Warner (1996) show that regional inequality decreased in China from 1978 to the end of the 1980s.[2] While Chen and Fleisher (1996) demonstrate that convergence occurred from 1978 to 1993,[3] Li and Gibson (2013), in contrast, found that convergence occurred only from 2005 onwards.

Several endogenous growth models that assume footloose capital have been used to examine the effect of globalization on economic growth and regional inequality. For instance, Martin and Ottaviano (1999) have shown that the growth rate depends on the location of firms and the level of iceberg transportation costs, in a research and development (R&D)-based growth and trade model with strong scale effects and local R&D spillover.[4] Further, Martin and Ottaviano (2001) found that the growth rate increases as iceberg costs decline, using a lab-equipment growth model with strong scale effects when R&D locates in one country. Martin (1999), in an R&D-based growth and trade model with strong scale effects and local R&D spillovers, shows that it has an ambiguous effect on regional inequality. Due to the higher growth rate, the northern share of expenditure decreases, because it leads to a greater decrease in the

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[2] China has opened its doors to international trade and foreign direct investment.

[3] See also Raiser (1998) and Gundlach (1997) about convergence in China.

[4] See Jones (2005), Dinopoulos and Thompson (1999), and Dinopoulos and Sener (2007) for survey articles about scale effects in the growth literature. See Jones (1995) and Segerstrom (1998) for the semi-endogenous growth model, and Dinopoulos and Thompson (1998) and Howitt (1999) for the fully endogenous growth model.

North in the value of capital. Price indices in the North and South also decrease: the former decreases due to the direct positive effect of a fall in transportation cost and the indirect positive effect of relocation to the North, and the latter decreases the direct positive effect and dominates the negative effect of relocation to the North. The price index in the South can decrease more than that in the North, thus increasing inequality. Moreover, inequality decreases due to the lower share in the North of expenditure, even as the price index does not change at sufficiently low transportation costs.

The findings of these studies are inconsistent with Jones's (1995) empirical evidence of strong scale effects. Minniti and Parello (2011) constructed a two-country semi-endogenous growth model with footloose capital, and showed that there exists no effect on regional inequality when manufacturing firms locate in both countries. This is because the direct positive effects nullify the indirect effects of relocating to the North.[5] This result is consistent with the empirical evidence about OECD regions garnered by Bouvet (2011).

However, this result is still inconsistent with regional inequality in European regions and China, as explained earlier. Based on this motivation, we reinvestigate the

[5] The two countries are the same, except for a larger share of capital in the North.

effects of globalization on regional inequality, in a semi-endogenous growth model. We first show that manufacturing firms locate to the North only when the extent of globalization is not sufficiently low, and in the North and South when it is sufficiently low. In other words, this study shows that Minniti and Parello's (2011) examination concerned only low levels of globalization.[6] We also show that the effect of globalization on regional disparity is unambiguously negative when the level of free trade is not sufficiently low, because globalization does not affect the northern share of expenditure—as in Minniti and Parello (2011)—while the price index in the South decreases due to the direct positive effect, and the price index in the South does not change at all, due to full agglomeration.

This paper is organized as follows: the next section presents the model, section 3 deals with the open economy, and section 4 concludes.

2. The model

[6] Tanaka and Yamamoto (forthcoming) examine the equilibrium where all manufacturing firms agglomerate in either one or both regions. However, they do not consider the effects of trade liberalization on regional inequality.

The open economy model used in the current study is the same as that used by Minniti and Parello (2011), with the exception that R&D and the production of manufactured goods agglomerate in only the North. Consider an economy that consists of a North and a South; each has two production factors (i.e., labor and capital) and three sectors (i.e., a traditional good, a continuum of manufactured goods, and an R&D sector). The two regions are similar in terms of tastes, size of population, and technology in the two manufacturing sectors, but the North has more capital than the South. Workers and capital are mobile among sectors within the same region, but only capital can move between the two regions. Each worker provides an inelastic supply of one unit of labor, and the labor force grows at an exogenous rate g_L. The traditional goods sector is perfectly competitive, and is produced by labor. The manufactured goods sector is monopolistically competitive, and each firm requires one unit of capital as well as units of labor. Exporting entails an iceberg transport cost. An R&D sector for capital creation, as the source of economic growth, is perfectly competitive. We consider local knowledge spillover. Superscript $*$ denotes a variable associated with the South. There exists international trade of traditional goods that are freely traded, and of manufactured goods that face an iceberg cost; capital flow, additionally, is freely traded. Notice that the only equilibrium Minniti and Parello (2011) and we consider is where both regions produce the traditional good whose unit labor requirement and price are at unity, because the related wages are also at unity.

2.1 Consumers

First, we present the household. The utility function of the infinitely lived representative household at time t is given by

$$U = \int_0^{\infty} \log\, [D(t)^{\alpha} Y(t)^{1-\alpha}] e^{-(\rho - g_L)t} \mathrm{d}t, \tag{1}$$

where $Y(t)$ denotes traditional goods and $D(t)$ the consumption index of manufactured goods, $1 > \alpha > 0$, where α (resp. $1-\alpha$) is the expenditure share of the manufactured (resp. traditional) good. $\rho > g_L$ is the subjective discount rate. The quantity index of manufactured goods is given by

$$D(t)^{\frac{\sigma-1}{\sigma}} \equiv \int_0^{n(t)} D_i(t)^{\frac{\sigma-1}{\sigma}} \mathrm{d}i + \int_0^{n^*(t)} D_j^*(t)^{\frac{\sigma-1}{\sigma}} \mathrm{d}i, \tag{2}$$

where $n(t)$ (resp. $n^*(t)$) denotes the total number of manufactured goods produced in the North (resp. South) and $D_i(t)$ (resp. $D_j^*(t)$) is the amount of i (resp. j)-th manufactured goods produced and consumed in the North (resp. produced in the South and consumed in the North). The per-capita expenditure is given by

$$E(t) = \int_0^{n(t)} D_i(t) p_i(t) \mathrm{d}i + \int_0^{n^*(t)} \tau D_j(t) p_j^*(t) \mathrm{d}j + Y(t),$$

where $p_i(t)$ (resp. $p_j^*(t)$) indicates the producer price of manufactured goods produced in the North (resp. produced in the South and consumed in the North) and τ the iceberg cost.

Solving the static problem, the individual demands domestically produced and imported varieties that are respectively obtained by

$$D_i(t) = \frac{p_i(t)^{-\sigma}\alpha E(t)}{P(t)^{1-\sigma}} \text{ and } D_j(t) = \frac{(\tau p_j^*(t))^{-\sigma}\alpha E(t)}{P(t)^{1-\sigma}}, \tag{3}$$

where

$$P(t)^{1-\sigma} \equiv \int_0^{n(t)} p_i(t)^{1-\sigma}\mathrm{d}i + \delta \int_0^{n^*(t)} p_j^*(t)^{1-\sigma}\mathrm{d}i, \tag{4}$$

represents the inverse of the price index of manufactured goods and $\delta \equiv \tau^{1-\sigma} < 1$ is a measure of the freeness of trade. The mirror expression holds for southern consumers.

We turn to the dynamic optimization problem. The individual intertemporal budget constraint is given by

$$\dot{a}(t) = (r(t) - g_L)a(t) + w(t) - E(t), \tag{5}$$

where $a(t)$ is an individual asset, $r(t)$ the rate of return on assets, $w(t)$ the wage (which is *numéraire*), and $E(t)$ the individual expenditure. Maximizing (1)—subject to the individual intertemporal budget constraint (5), after substituting (3) into (2)—yields

$$\frac{\dot{E}(t)}{E(t)} = \frac{\dot{E}^*(t)}{E^*(t)} = r(t) - \rho. \tag{6}$$

On account of the international financial market, $r(t) = r^*(t)$ holds. Thus, individual expenditures in both regions grow at the same rates.

2.2 Firms

Before a firm starts to produce one manufactured good, each firm requires one unit of capital. Thus, the global capital stock must be equal to the total number of varieties, such that $K^w(t) \equiv K(t) + K^*(t) = n(t) + n^*(t) \equiv N(t)$. Moreover, producing one unit of a manufactured good requires β and $\tau\beta$ units of labor to serve domestic and foreign markets, respectively. The profits of a firm producing in region i are given by

$$\pi(t) = p_i(t)D_i(t)L(t) - \beta D_i(t)L(t) + \tau p_i^*(t)D_j^*(t)L(t) -$$

$$\tau\beta D_j^*(t)L(t), \;\; i,j = N,S, \; and \; N \neq S,$$

where $p_i^*(t)$ indicates the producer price of manufactured goods produced in region i and consumed in region j, $D_i(t) = \frac{(p_i(t))^{-\sigma}\alpha E(t)}{P(t)^{1-\sigma}}$ the individual demand for the i-th manufactured goods produced in region i and consumed in region i, and $D_j^*(t) =$

$\frac{(\tau p_i^*(t))^{-\sigma}\alpha E^*(t)}{P^*(t)^{1-\sigma}}$ the individual demand for the i-th manufactured goods produced in region i and consumed in region j. Using individual demands for manufactured goods, the profit-maximizing producer prices are

$$p = p^* = \frac{\sigma\beta}{\sigma-1}. \quad (7)$$

The profit functions for manufactured goods produced in the North and in the South, respectively, are

$$\pi = \frac{\beta x}{\sigma-1} \text{ and } \pi^* = \frac{\beta x^*}{\sigma-1}. \quad (8)$$

Meanwhile, the aggregate sales of manufactured goods produced in the North and South, respectively, are

$$x = \frac{\alpha L(\sigma-1)}{\beta\sigma}\left[\frac{E}{n+\delta n^*} + \frac{\delta E^*}{n^*+\delta n}\right], \text{ and } x^* = \frac{\alpha L(\sigma-1)}{\beta\sigma}\left[\frac{E^*}{n^*+\delta n} + \frac{\delta E}{n+\delta n^*}\right]. \quad (9)$$

Each firm chooses the manufacturing location, contingent on the northern profit minus the southern profit. We consider the equilibrium where the production of manufactured goods and innovation activities agglomerates in the North. In other words, we examine an equilibrium in which the northern profit is strictly higher than that for the southern firm. From (8) and (9), $x > x^*$ implies $\pi > \pi^*$. Thus, the parameter condition for all firms agglomerating in the North is $\frac{E}{n+\delta n^*} + \frac{\delta E^*}{\delta n+n^*} > \frac{E^*}{n^*+\delta n} + \frac{\delta E}{n+\delta n^*}$. Dividing both sides of the inequality by E and N, we get $\frac{s_E}{s_n+\delta(1-s_n)} + \frac{\delta(1-s_E)}{1-s_n+\delta s_n} > \frac{1-s_E}{1-s_n+\delta s_n} +$

$\frac{\delta s_E}{s_n+\delta(1-s_n)}$, where $s_E \equiv \frac{E}{E+E^*}$ and $s_n \equiv \frac{n}{n+n^*}$ measures the northern share of expenditure and manufacturing firms, respectively. The northern share of manufacturing firms affects the northern and southern profits through changes in the inverse of price indices in the North, which is rewritten as $P(t)^{1-\sigma} = N(t)\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}[s_n + \delta(1-s_n)]$; the mirror expression for the South is rewritten as $P^*(t)^{1-\sigma} = N(t)\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}[\delta s_n + (1-s_n)]$.[7] We define the northern profit minus the southern profit as

$$\Delta\pi(s_n) \equiv \pi - \pi^* = (1-\delta)\left[\frac{s_E}{s_n + \delta(1-s_n)} - \frac{1-s_E}{1-s_n+\delta s_n}\right]. \qquad (10)$$

The first (resp. second) term in the rounded brackets is the excess profits of northern (resp. southern) firms in the North (resp. South), which is defined as the profits of northern (resp. southern) firms minus those of southern (resp. northern) firms earned in the northern (resp. southern) market, which in turn depends on the price index in the North (resp. South). This term represents a monotone decrease (resp. increase) in the proportion of northern (resp. southern) firms, because the inverse of the northern (resp. southern) price index negatively affects the first term (resp. second). Minniti and Parello (2011) analyzed the economy in which northern and southern firms exist; put differently, there exists $1 > s_n > 0$, such that $\Delta\pi(s_n) = 0$. (Figure 1) depicts this case. In each of

[7] The northern price index is given by (4); the southern price index is defined as $P^*(t)^{1-\sigma} = \int_0^{n^*(t)} p_j^*(t)^{1-\sigma}\mathrm{d}i + \delta\int_0^{n(t)} p_i(t)^{1-\sigma}\mathrm{d}i$.

the figures, the horizontal axis measures the northern share of manufacturing firms, while in (Figures 1 and 2), the vertical axis measures the first and second terms, respectively. The first term in (10) has a positive slope for all s_n and takes a value of $\frac{s_E}{\delta}$ at $s_n = 0$ and s_E at $s_n = 1$; meanwhile, the second term in (10) has a negative slope for all s_n and takes a value of $1 - s_E$ at $s_n = 0$ and $\frac{1-s_E}{\delta}$ at $s_n = 1$. As further exposure to trade, the first term in (10) shifts down for all $s_n \neq 0$, and the second term in (10) shifts down for all $s_n \neq 1$. Moreover, because the curve representing the second term in (10) shifts more due to $s_n > \frac{1}{2}$, the proportion of northern firms increases monotonically as trade liberalization.[8]

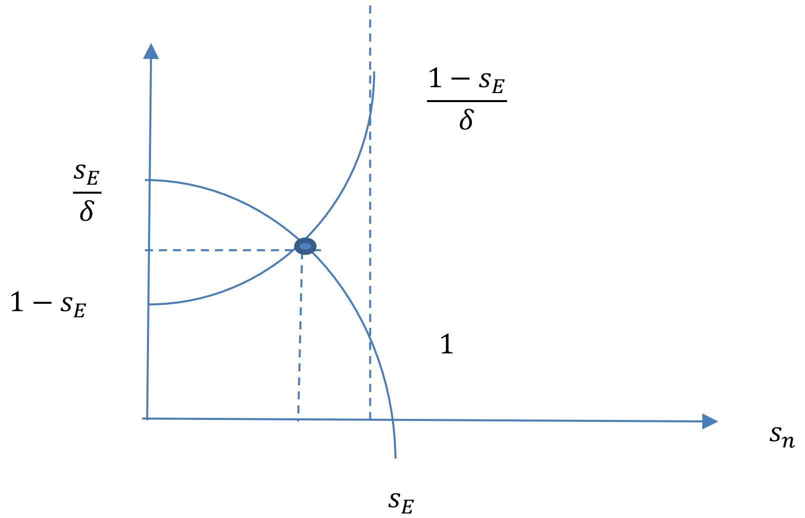

Figure 1

[8] As we see in (22), the northern share of total expenditure does not depend on the level of iceberg costs.

On the other hand, in (Figure 2), we focus on the case of full agglomeration in the North. As already explained, the proportion of northern firms increases monotonically as trade liberalization occurs. Thus, all firms agglomerate in the North for high levels of trade liberalization. This occurs if and only if

$$\Delta\pi(s_n) > 0 \equiv \pi - \pi^* = (1-\delta)\left[\frac{s_E}{s_n+\delta(1-s_n)} - \frac{1-s_E}{1-s_n+\delta s_n}\right] > 0 \Leftrightarrow \frac{s_E}{s_n+\delta(1-s_n)} > \frac{1-s_E}{1-s_n+\delta s_n} \text{ for all } s_n \in [0,1]. \tag{11}$$

(Figure 2) depicts this case.

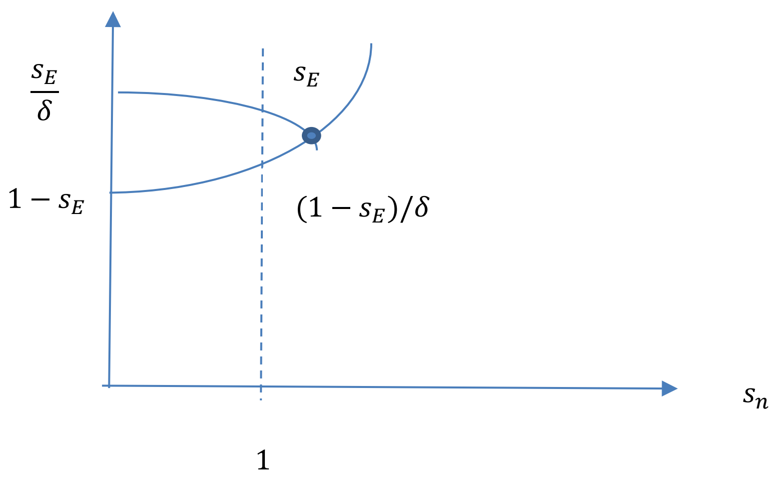

Figure 2

As already explained, the northern profit is monotonically decreasing in the northern share of manufacturing firms, while the southern profit is monotonically increasing in the northern share of manufacturing firms. Thus, when the northern profit is higher than the southern profit at $s_n = 1$, full agglomeration in the North occurs. Substituting $s_n = 1$ into the second inequality in (11) implies

$$\delta > \frac{1-s_E}{s_E} \equiv \bar{\delta}. \tag{12}$$

This condition ensures that in equilibrium, all manufacturing firms agglomerate in the North when the freeness of trade is not low, because we show later in (23) that $\frac{1}{2} > \bar{\delta}$.

2.3 Research and development

The R&D sector is characterized by perfect competition, free entry, and local knowledge spillover. This sector uses labor only as a production factor. The unit labor requirement for capital creation is given by

$$b_I(t) \equiv N(t)^{-\phi}[s_n + \lambda(1 - s_n)]^{-\phi}, \tag{13}$$

where $1 > \phi$ measures the strength of intertemporal knowledge spillover and $\lambda \in [0,1]$ denotes international knowledge spillover. We focus on the economy where $s_n = 1$.[9] Thus, the unit labor requirement for capital creation becomes

$$b_I(t) \equiv N(t)^{-\phi}. \tag{14}$$

Using (9), the flow of new varieties is given by

$$\dot{N}(t) = L_I(t)N(t)^{-\phi}, \tag{15}$$

where $L_I(t)$ is the total amount of labor employed in R&D. Free entry in the R&D sector leads excess profits to zero, and it implies

$$v(t) = b_I(t) = N(t)^{-\phi}. \tag{16}$$

The second equality comes from (10). Using (11), we obtain

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[9] Tanaka and Yamamoto (forthcoming) also investigated an economy that features the full agglomeration of manufacturing firms in one region.

$$\frac{\dot{N}(t)}{N(t)} = g_L(1-\phi)^{-1}. \qquad (17)$$

The return on shares of firms comes from the dividend rate and capital gains. Thus, the no-arbitrage condition on firm share is

$$\frac{\pi(t)}{v(t)} + \frac{\dot{v}(t)}{v(t)} = r(t).$$

We turn to rewrite the no-arbitrage condition to derive the first relationship between worldwide expenditure and R&D difficulty. First, rewriting instantaneous profit by (6) and (7) with $s_n = 1$ derives $\pi(t) = \frac{\alpha L E^W}{\sigma N}$, where $E^W \equiv E + E^*$. We define R&D difficulty as follows: $Z = \frac{N(t)^{1-\phi}}{L(t)}$. Substituting (16), $\pi(t) = \frac{\alpha L E^W}{\sigma N}$, and the definition of R&D difficulty into the no-arbitrage condition yields

$$Z = \frac{\alpha E^w}{\sigma(\rho + \phi g)}. \qquad (18)$$

We used $r(t) = \rho$ in the no-arbitrage condition because—as we see later—the per-capita expenditure must be constant in a steady state from labor constraint, and it holds from the Euler equation.

We turn to the labor market-clearing condition, which characterizes the second relationship between the worldwide expenditure and R&D difficulty. First, we derive the total demand for labor in the manufactured goods sector; this is given by $\beta N x = \frac{\alpha L(\sigma-1)E^W}{\sigma}\left[\frac{s_E}{s_n+\delta(1-s_n)} + \frac{\delta(1-s_E)}{\delta s_n + 1 - s_n}\right]$. We consider an economy where all manufacturing firms agglomerate in one region—that is, $s_n = 1$. Thus, the demand for labor in the manufactured goods sector equals $\beta N x = \frac{\alpha(\sigma-1)E^w L}{\sigma}$. Second, we derive the demand for the other good. Because wage is at unity and the fraction $1-\alpha$ of aggregate expenditure is used for the traditional good, the demand for the latter good is $(1-\alpha)E^w L$. Finally, the demand for labor devoted to R&D activity is $\frac{\dot{N}(t)}{N(t)} N(t)^{1-\phi}$. The worldwide labor market-clearing condition is given by $2L = \frac{\alpha(\sigma-1)E^w L}{\sigma} + (1-\alpha)E^w L + \frac{\dot{N}(t)}{N(t)} N(t)^{1-\phi}$. This can be rearranged to yield the expression

$$2 = \left[\frac{\alpha(\sigma-1) + \sigma(1-\alpha)}{\sigma}\right] E^w + gZ. \quad (19)$$

(18) and (19) characterize the per-capita expenditure and R&D difficulty, and these values are as follows:

$$E^w = \frac{2\sigma(\rho + \phi g)}{(\rho + \phi g)(\sigma - \alpha) + \alpha g} \text{ and } Z = \frac{2\alpha}{(\rho + \phi g)(\sigma - \alpha) + \alpha g}. \quad (20)$$

We turn to deriving the price indices of manufactured goods in the North and South. Substituting (5) and $s_n = 1$ into the price index and conducting the same procedures for the South price index yields

$$P = \frac{\sigma \beta N^{\frac{1}{1-\sigma}}}{\sigma - 1} \text{ and } P^* = \frac{\sigma \beta (\delta N)^{\frac{1}{1-\sigma}}}{\sigma - 1}. \quad (21)$$

Next, we examine regional income inequality. Regional income inequality depends on differences in price indices and per-capita expenditures in the North and

South. In the steady-state equilibrium, per-capita expenditures must be constant; this in turn implies $r(t) = \rho$, as explained above. The equilibrium of the asset market implies $a(t) = \frac{s_K V(t) N(t)}{L(t)} = s_K Z(t)$ and $a^*(t) = \frac{(1-s_K)V(t)N(t)}{L(t)} = (1 - s_K)Z(t)$, where $s_K \equiv \frac{K}{K+K^*}$ measures the northern share of capital. These imply that per-capita assets are constant in the steady state. It implies $E(t) = (r(t) - g_L)a(t) + 1$ and $E^*(t) = 1 + (r(t) - g_L)a^*(t)$, respectively, from the individual intertemporal budget constraints. The intertemporal budget constraints can be solved for each of $E = 1 + (\rho - g_L)s_K Z(t)$ and $E^* = 1 + (\rho - g_L)(1 - s_K)Z(t)$. Using (20), per-capita expenditures are rewritten as follows:

$$E = 1 + \frac{2\alpha s_K(\rho - g_L)}{(\rho+\phi g)(\sigma-\alpha)+\alpha g} \text{ and } E^* = 1 + \frac{2\alpha(1-s_K)(\rho-g_L)}{(\rho+\phi g)(\sigma-\alpha)+\alpha g}. \qquad (22)$$

Per-capita expenditures are the same as those in Minniti and Parello (2011). Using E^W in (20) and E and E^* in (22), we can derive the northern share of expenditure:

$$s_E = \frac{1}{2} + \frac{\alpha(1+\delta)(2s_K - 1)(\rho - g_L)}{2\sigma(\rho + \phi g)(1-\delta)}. \qquad (23)$$

Thus, trade integration appears to have no effect on the northern share of expenditure from (22). Moreover, Minniti and Parello (2011) consider an economy in which manufacturing firms agglomerate in both countries and price indices are given by $P = \frac{\sigma\beta[s_n(1-\delta)+\delta]^{\frac{1}{1-\sigma}} N^{\frac{1}{1-\sigma}}}{\sigma-1}$ and $P^* = \frac{\sigma\beta[1-s_n(1-\delta)]^{\frac{1}{1-\sigma}}(N)^{\frac{1}{1-\sigma}}}{\sigma-1}$. Real income in the North (resp. South) when manufacturing firms fully agglomerate in the North is higher (resp. lower) than that when manufacturing firms agglomerate in both countries. Thus, the levels of regional inequality when there is full agglomeration are strictly higher than those when firms agglomerate in both regions.

3. Trade integration

We now examine the effect of trade integration on price indices in both countries. Using (21), the response of price integration to globalization is given by:

$$\frac{\partial P}{\partial \delta} = 0 \text{ and } \frac{\partial P^*}{\partial \delta} = \frac{1}{1-\delta} \frac{\sigma \beta \delta^{\frac{\sigma}{1-\sigma}} (N)^{\frac{1}{1-\sigma}}}{\sigma - 1} < 0.$$

We can explain why this result occurs, as follows. A direct positive effect of trade liberalization on regional income disparity exists. There are no transaction costs on domestically produced manufactured goods, but they do exist for imported manufactured goods. Moreover, we consider the equilibrium where all manufactured goods are produced in the North. Thus, globalization leads to households in the North consuming the same quantity of manufactured goods, while it leads to households in the South consuming larger amounts of manufactured goods that are produced in the North and exported. This, in turn, does not affect real income in the North, but it does increase the real income in the South. Finally, regional inequality unambiguously decreases, owing to trade integration; additionally, welfare increases in the South, but does not change in the North. This result is different from that derived with a semi-endogenous growth model by Minniti and Parello (2011), who found there to be no effect of real regional inequality via trade liberalization. Due to a constant growth rate—as seen in Jones (1995)—trade liberalization does not affect the northern share of expenditure. Differences in price indices do not change further the direct and positive effects on the North; the indirect effect of reallocation on the North, additionally, affects the North positively and the South negatively.

Martin (1999) derives ambiguous effects of real regional inequality via trade liberalization, in an endogenous growth model. The northern share of expenditure unambiguously decreases. The price index in the North unambiguously decreases through positive reallocation effects and direct positive effects, while the price index in the South ambiguously changes through indirect negative effects and direct positive effects. (In the South, indirect negative effects can dominate over direct positive effects.) Moreover, the price index in the South can decrease more than that in the North. If the transportation cost is sufficiently low, the price index will not change much, and real income inequality will decrease unambiguously through a lower northern share of expenditure via a higher northern share of manufactured firms.

4. Concluding remarks

In this study, we clarified differences in the effect of a decrease in iceberg costs on regional real income inequality, between an endogenous and a semi-endogenous growth model with footloose capital when iceberg costs are not high versus high. We show that in a semi-endogenous growth and footloose capital model, globalization either remains unchanged, or rather decreases, regional inequality. The former (resp. latter) occurs when the level of globalization is sufficiently low (resp. not sufficiently low). Under both scenarios, further exposure to trade does not at all affect the northern share of expenditure. Furthermore, the price index in the North does not change at all, because all manufactured goods are produced in the North; the price index in the South, meanwhile, decreases due to the reduced cost of importing from the North, under the former scenario. In the latter scenario, the price indices in both the North and South decrease by the same amount, because the differences between the northern direct positive effects and the southern direct effects cancel each other out precisely, so that in the northern and southern regions there are indirect positive and indirect negative effects, respectively.

We turn to compare our results to those of Martin (1999), who used an endogenous growth model with scale effect. The northern share of expenditure unambiguously decreases due to a higher growth rate and a higher northern share of capital stock. Under an insufficiently low transportation cost, income inequality ambiguously changes, because the northern price index decreases on account of direct and indirect positive effects; the southern price index, meanwhile, ambiguously changes on account of direct positive and indirect negative effects. Under a sufficiently low transportation cost, however, income inequality ambiguously changes, because the northern price index decreases on account of direct and indirect positive effects, while the southern price index ambiguously changes on account of direct positive and indirect negative effects.

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