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Regional Policy, Integration and the Location of Industry

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Draft, June 2003

Abstract

Many countries devote a large part of their national budget to regional policy. This paper analyses the interaction of economic integration and some typical regional policies in a new economic geography model with three regions of different size. The policies analysed are the relocation of government activities, infrastructure investments and subsidies to the establishment of industry. It is shown how regional policy can easily be misdirected.

JEL Classification: F12, F15, F21, R12

Keywords: agglomeration, economic geography, regional policy

1 Introduction

Many countries devote a large part of their national budget to regional policy. These policies aim at improving the economic conditions in regions where, for some reason, conditions are substantially below the average of other regions in the country. In the typical case, the receiving regions are less densely populated peripheral regions with an eroding industrial base. Examples are abundant: Southern Italy (the so called "mezzogiorno" region) receives large transfers from the highly industrialised northern Italy and, at the other end of Europe, northern Norway is largely supported from the southern industrial area. Regional policy is also prevalent on a supranational level. For instance, a considerable part of the EU budget is devoted to regional policy; 37 percent of the EU budget for the year 2000 were allocated to structural/cohesion funds with the objective of reducing regional imbalances and promoting regional development; another 47% were allocated to the CAP (common agricultural policy) which, by definition, is strongly biased in favour of rural regions.

One explicit argument for regional policy in Europe and elsewhere is that the policy evens out the gains from increased economic integration, and reduces the risk of some regions ending up losing from the integration process. However, data indicate a limited success in this respect.

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[†]Financial support from The Bank of Sweden Tercentenary Foundation (Dnr J2001-0684:1) is gratefully acknowledged.

Midelfart-Knarvik and Overman (2002) find that the overall manufacturing activity in the EU has a fairly constant distribution at the national level between 1980 and 1995, while industry is becoming more concentrated at the regional level. Similarly, GDP per capita has been converging slightly between countries since the mid 1980s, whereas incomes are diverging at the regional level as illustrated by Combes and Overman (2003).

This paper analyses the interaction of economic integration and some typical regional policies in a simple new economic geography model with three regions of different size. Regional policies are considered to be exogenous, and we analyse three types of policies: relocation of government activities to peripheral regions, infrastructure investments and subsidies to the establishment of industry. It is shown how regional policy can easily be misdirected.

Martin and Rogers (1995) analyse the impact of public infrastructure on industrial location in a two country model similar to that used in this paper. They find that domestic infrastructure investments in a poor region draw industry to that region, whereas investments in international infrastructure have the opposite effect. A similar analysis, including growth effects, is found in Baldwin et. al. (2003) ch.17. The section on infrastructure policy in this paper yields related results, even though the analysis is conducted in an asymmetric three-country setting with international trade costs.

Puga and Venables(1997) simulate numerically the effects of preferential trade agreements as well as hub and spoke arrangements in a version of the Krugman Venables (1995) model with three regions of symmetric size. The infrastructure investment experiment in our paper is related to, but distinctly different from, their analysis.

Dupont and Martin (2003) analyse regional subsidies and their welfare effects using a similar model, but in a two region setting.

The paper is organised as follows: Section 2 develops the model and section 3 analyses the effect of economic integration on the long run equilibrium location of industry. The interaction of economic integration and regional policies are analysed in section 4, and finally section 5 concludes.

2 The Model

This paper uses a three-country version of the Martin and Rogers (1995) model, which is considerably simpler than the seminal new economic geography models by Krugman (1991), Venables (1996) and Krugman and Venables (1995). The models show how the manufacturing sector, which consists of firms producing differentiated products under increasing returns to scale, may agglomerate in one region when trade costs are low. Agglomeration of the manufacturing sector is the result of demand and supply linkages. With the Chamberlinian large group assumption firms set price as a constant mark-up on marginal cost, which in turn implies that operation profit is a constant fraction of nominal sales. Firms therefore prefer to locate in a large market to maximise sales, if there are trade costs. Consequently there will be a *proportionally* larger share of manufacturing firms in a large market. This is the 'home-market' effect identified by

Krugman (1980) and Helpman and Krugman (1985). Combining this effect with expenditure shifting creates a circular causality that can produce agglomeration. This is achieved in Krugman (1991) by having labour moving with firms, and in Krugman and Venables (1995) and Venables (1996) by assuming that firms buy goods from each other as intermediate inputs. The home market effect and expenditure shifting are together named the demand link in the new economic geography literature. The second agglomeration force is called the supply link. It stems from the fact that a region with many firms has a lower price index with CES preferences. The demand- and supply-link imply positive feedbacks creating possibilities of very non-linear dynamics.

The model in this paper is similar in structure to the core-periphery model. However, the mobile factor is physical capital rather than labour, and the returns to capital is repatriated to immobile owners. This implies that the supply link is absent since physical capital move according to nominal returns, and is therefore unaffected by the price index. Second, there is no expenditure shifting since the return to capital is repatriated. This implies that there is no circular causality, which in turn makes the dynamics much simpler. In particular, starting from a symmetric equilibrium, there will be no relocation of capital and industry as trade costs are reduced. However, when regions are of asymmetric size, the home market effect will still gradually cause agglomeration as trade costs are reduced. Thus, the model is simple and analytically solvable, but can still produce agglomeration of industry when regions are of asymmetric size.

2.1 Basics

There are three regions, 1, 2 and 3 (interchangeably referred to as countries), two sectors and two factors. Physical capital, amounting to K^W worldwide, can move between regions but capital owners do not. Workers can move freely between sectors but are immobile between regions. Country, j , is endowed with the share s_j of the world endowment of labour L^W , and capital K^W , that is, countries may be of different size, but they have identical capital labour ratios. A homogeneous good is produced with a constant-returns technology only using labour, while differentiated manufactures are produced with increasing-returns technologies using both capital and labour. All individuals have the utility function

$$U = C_M^\mu C_A^{1-\mu}, \quad (1)$$

where $\mu \in (0, 1)$ and $\gamma > 0$ are constants, and C_A is consumption of the homogenous good. Manufactures enter the utility function through the index C_M , defined by

$$C_M = \left[\int_0^N c_i^{(\sigma-1)/\sigma} di \right]^{\sigma/(\sigma-1)}, \quad (2)$$

N being the mass of varieties consumed, c_i the amount of variety i consumed, and $\sigma > 1$ the elasticity of substitution.

Each consumer spends a share μ of his income on manufactures, and the total demand for a domestically produced variety i in country j is therefore

$$x_i = \mu \cdot \frac{p_i^{-\sigma}}{N \int_{k=0}^1 p_k^{1-\sigma} dk} \cdot Y_j, \quad (3)$$

where p_i is the price of variety i , and Y_j income in country j .

The unit factor requirement of the homogeneous good is one unit of labour. This good is freely traded, and since we also choose this good as the numeraire we have

$$p_A = w = 1, \quad (4)$$

w being the wage of workers in all countries.

We assume ownership of capital to be fully internationally diversified, that is, if one region owns x percent of the world capital stock, the region will own x percent of the capital in each region. Income in country j is therefore given by

$$Y_j = s_j (L^W + \bar{\pi} K^W), \quad (5)$$

where $\bar{\pi}$ is the average return to capital, determined by the condition $K^W \bar{\pi} = \mu E^W / \sigma$. Thus, the world return to capital equals world operating profit, since we assume free entry in the M-sector. World expenditure in turn equals world factor income $E^W = L^W + \mu E^W / \sigma$, which gives $E^W = \frac{L^W}{1-\mu/\sigma}$. The average return to capital is therefore constant and given by

$$\bar{\pi} = g \frac{L^W}{K^W}, \quad g \equiv \frac{\mu}{\sigma - \mu}. \quad (6)$$

In the production of differentiated goods, the fixed cost consists of capital whereas the variable cost consists of labour. The total cost of producing x_i units of manufactured commodity i in region j is

$$TC_j = \alpha \pi_j + \beta x_i, \quad (7)$$

where α is the fixed cost of capital, and β the requirement of unskilled labour per unit x . We will choose units of capital so that $\alpha = 1$, which implies that the world capital stock equals the world mass of firms $K^W = N^W$.

Distance is represented by trading costs. Shipping the manufactured good involves a frictional trade cost of the "iceberg" form: for one unit of good from country j to arrive in country k , $\tau_{jk} > 1$ units must be shipped. Trade costs are also assumed to be equal in both directions so that $\tau_{jk} = \tau_{kj}$.

Profit maximisation by manufacturing firms leads to price

$$p_j = \frac{\sigma}{\sigma - 1} \beta, \quad (8)$$

of each differentiated commodity; choosing units of x so that $\beta \equiv (\sigma - 1)/\sigma$ gives $p_j = 1$.

With a fixed capital stock and free entry the reward to capital will be bid up until the entire operating surplus goes to capital. That is

$$(1 - \beta)x_j = \pi_j, \quad (9)$$

implying that

$$x_j = \sigma\pi_j. \quad (10)$$

2.2 Short-run equilibrium

In the short run, the allocation of N^W is taken to be fixed. The model is closed by the M-sector market-clearing condition, where the left-hand side (supply) is derived from (10) and the right-hand side follows from the demand functions in (3) exploiting that all varieties have producer price 1,

$$\sigma\pi_j = \frac{1}{n_j + \phi_{jk}n_k + \phi_{jl}n_l} \mu Y_j + \frac{\phi_{jk}}{\phi_{jk}n_j + n_k + \phi_{kl}n_l} \mu Y_k + \frac{\phi_{jl}}{\phi_{jl}n_j + \phi_{kl}n_k + n_l} \mu Y_l, \quad (11)$$

$j, k, l \in 1, 2, 3, j \neq k, k \neq l, \text{ and } j \neq l,$

where n_j is the mass of varieties produced in region j . The object $\phi_{jk} = \tau_{jk}^{1-\sigma}$, ranging between 0 and 1, stands for "freeness" of trade between j and k (0 is autarchy and 1 is zero trade costs).

The amount of unskilled labour in manufacturing equals $N^W \beta x$. Substituting x from (10) gives $N^W \beta x_j = (\sigma - 1)\pi_j N^W$. We rule out corner solutions by assuming that for any region j hosting an agglomeration, $s_j \geq (\sigma - 1)\bar{\pi} N^W / L^W = g(\sigma - 1)$ holds.¹ This ensures that the agricultural sector is active in all regions.

2.3 Long-run equilibrium

In the long run, human capital is fully mobile between regions and responsive to the incentives provided by the relative returns that can be attained in the three regions. There are two types of long-run equilibria. Interior equilibria are characterised by the allocation of some capital in each region and an equal return to capital in all regions. Corner solution type of equilibria entails one or two regions without capital, since capital would enjoy a lower return in that location.

Contrary to most new economic geography models the model in this paper does not display circular causality and accordingly, does not display multiple equilibria or bifurcations. The reason is that the usual demand and supply links are absent, since return to capital is repatriated and capital move according to nominal return which cuts the price index effect. However, due to the 'home market effect', the model still produces agglomeration when regions are of

¹ $a(\sigma - 1) = 0.24$ for $\sigma = 4, \mu = 0.3$, which are standard parameter values used here. In the three region case agglomeration never occurs in a region with $s_j < 1/3$, so the condition never binds in our case.

different size. Essentially this is a market access effect; the M-sector saves transport costs by concentrating in larger markets. However, increased competition when firms concentrate in one market dampens this effect, and precludes full agglomeration from always being the equilibrium.

Assuming symmetric trade costs, and using (5), (6), and (11) to solve the model for interior equilibria where $\pi_1 = \pi_2 = \pi_3$, gives

$$n_j = \frac{1}{3} + \left(s_j - \frac{1}{3}\right) \frac{2\phi + 1}{1 - \phi}. \quad (12)$$

Thus, the mass of firms in a region depends on its size and the level of trade costs. Note that the only parameters determining location are ϕ and s_j ; μ is absent since only relative market size is of importance.

The agglomeration effect is easily seen from (12). Differentiating n_j with respect to s_j gives:

$$\frac{dn_j}{ds_j} = \frac{2\phi + 1}{1 - \phi}, \quad (13)$$

which shows that n_j increases more than proportionate to s_j for $\phi > 0$. The effect increases in trade freeness, and becomes arbitrarily large as trade costs approach zero. This implies that even if we start out with one region just slightly larger than the others it will obtain the entire M-industry if trade costs are sufficiently low. To establish which region gets the industry in a different way, note that the derivative

$$\frac{dn_j}{d\phi} = \left(s_j - \frac{1}{3}\right) \frac{3}{(1 - \phi)^2}, \quad (14)$$

is positive whenever $s_j > 1/3$. That is, a region with larger than average endowments will always gain industry as trade costs fall as long as these costs are symmetric.

Solving the model for $n_l = 0$ shows that as one of the regions lose its entire industry, the industry locates in the remaining two regions according to

$$n_j = \frac{s_j - \phi s_k}{(s_j + s_k)(1 - \phi)}, \quad (15)$$

where $j, k, l \in 1, 2, 3$, $j \neq k$, $k \neq l$, and $j \neq l$. Differentiating w.r.t. ϕ gives

$$\frac{dn_j}{d\phi} = \frac{s_j - s_k}{(s_j + s_k)(1 - \phi)^2}. \quad (16)$$

Thus, the region with larger endowments of the remaining two regions will gain industry as trade costs are reduced.

2.4 Welfare

The wage is constant and equal in all countries, as is the return to capital, given by (6). It therefore suffices to study the price index to compare welfare between regions. Solving the model for an interior equilibrium using (5), (6), and (11) implies that the price index may be written:

$$P_j = [s_j (2\phi + 1)]^{-a}, \quad a \equiv \frac{\mu}{\sigma - 1}, \quad j \in 1, 2, 3 \quad (17)$$

As region l loses its industry the price indices are

$$\begin{aligned} P_j &= \left[\frac{s_j}{s_j + s_k} (\phi + 1) \right]^{-a}, \\ P_l &= \phi^{-a}, \quad j, k, l \in 1, 2, 3, \quad j \neq k, k \neq l, j \neq l \end{aligned} \quad (18)$$

and finally when the industry is fully agglomerated in j the price indices are

$$\begin{aligned} P_j &= 1, \\ P_k &= P_l = \phi^{-a}, \quad j, k, l \in 1, 2, 3, \quad j \neq k, k \neq l, j \neq l. \end{aligned} \quad (19)$$

In the following we will use the inverse price index as welfare indicator.

3 Economic Integration

We now turn to a specific regional structure where regions are of different size, in particular $s_1 > s_2 > s_3$. The largest region 1 could be the area around the capital, while region 2 may be a regional centre. Trade costs between region are for the time being assumed symmetric, and economic integration is represented by a gradual fall in these costs.

3.1 The base case

In the base case industry relocate in response to economic integration without governmental intervention. In all numerical illustrations we assume standard parameter values, $\sigma = 4$, $\mu = 0.3$. We also assume the following regional endowment shares throughout the paper: $s_1 = 0.45$, $s_2 = 0.35$, and $s_3 = 0.2$. Figure 1 plots the share of industry in the three regions as trade freeness ϕ is increased. As can be seen from equation (14), during the first stage of integration, there is a rapid increase in industry in the central region 1 and a rapid decline in the smallest region 3, whereas there is a slow increase in region 2. Once region 3 is completely deindustrialised further integration, as shown by equations (15) and (16), leads to a rapid decline in region 2, and a somewhat slower increase in the central region.

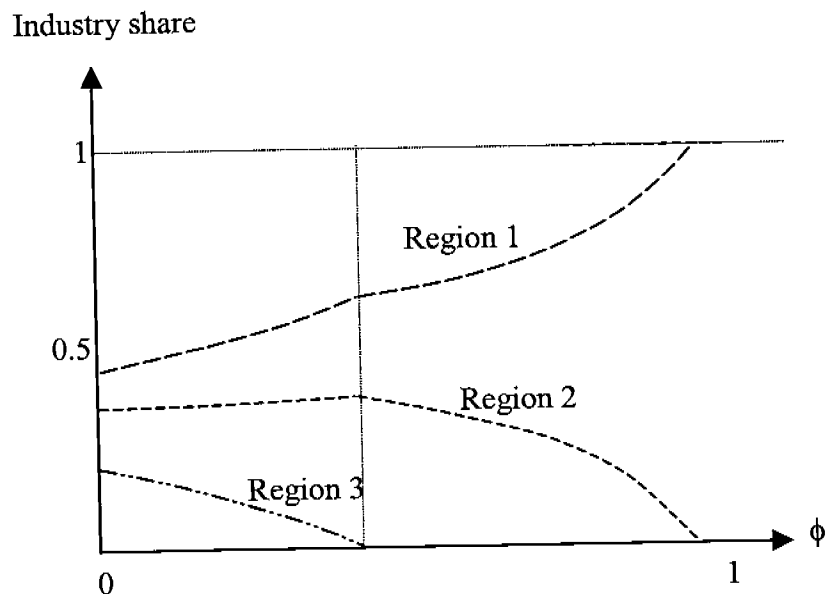


Figure 1: The base case

Clearly the scenario outlined in Figure 1, where economic integration leads to the deindustrialisation of the periphery, lies at the heart of many politicians worries. Several types of regional policies are attempted to counteract such a development. Before turning to this, however, we will briefly discuss welfare issues.

3.1.1 Welfare in the base case

In order to study welfare, the points at which region 3 and region 2 become deindustrialised must be established. Using (12) the first region j loses its industrial base when $\phi' = \frac{s_j}{1-2s_j}$. Solving the model with $n_3 = 0$ makes it easy to calculate the point at which the second region becomes deindustrialised: $\phi'' = \frac{s_2}{s_1}$. In our numerical example $\phi' = 1/3$, and $\phi'' = 7/9$. Figure 2 plots the inverse price indices from (17), (18), and (19) as welfare measure corresponding to Figure 1. It is not surprising that welfare increases with integration in large regions gaining industry. In small regions, on the other hand, the gain from cheap import of foreign varieties is larger since a larger share of consumption consists of imported varieties. As can be seen from (17), (18), and (19) this effect will always outweigh the effect of delocating industry.

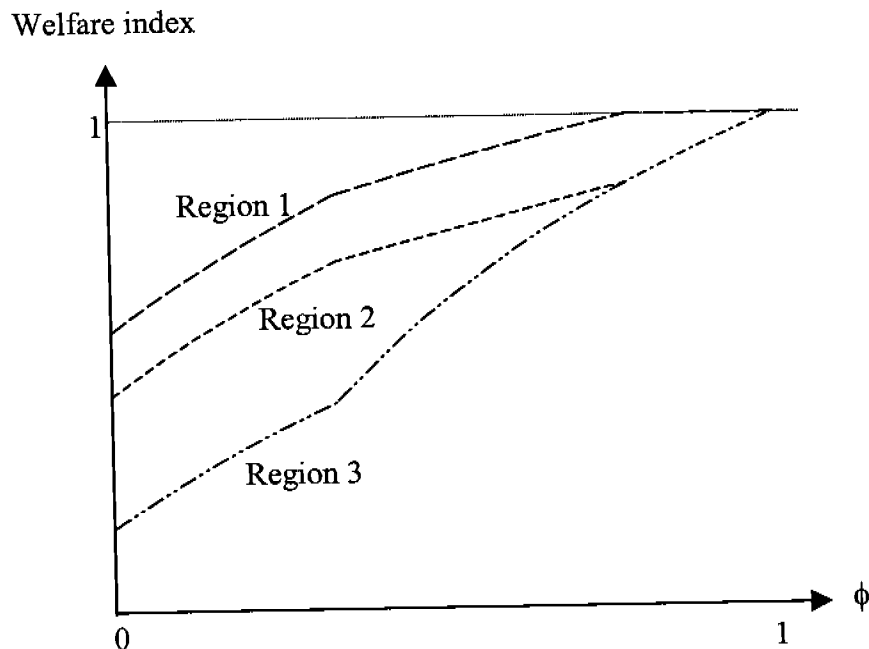


Figure 2: Welfare in the base case

Thus, economic integration gives rising welfare in all regions as well as convergence in welfare levels. Note, however, that we have assumed an equal per capita endowment of capital in all regions. If capital ownership were unequally distributed among regions the price index effect would lead to converging but never equal welfare, since income would be higher in regions rich in capital, even as the price index is equalised everywhere.

4 Regional policy

As indicated by the welfare analysis above, it is not clear in this model that governments would want to pursue regional policy to counteract concentration of industry. However, the model is clearly too stylised for a serious welfare assessment. Many rationales for regional policy are outside the model, e.g. localised pure externalities associated with production, and adjustment costs associated with changes in employment or location. Therefore, we will not report welfare effects in the following policy experiments.

Note also that political economy considerations could lead to regional policy even if overall welfare effects of the policy were negative.² Here the locational consequences of different types of regional policies are analysed simply taking the policy as exogenous.

4.1 Relocation of governmental activities to the periphery

An often proposed, and sometimes enacted, policy is to relocate governmental agencies and similar institutions to peripheral regions. In terms of our model, imagine that part of the capital

²See Robert-Nicoud and Sbergami (2001), and Baldwin and Robert-Nicoud (2002).

stock $s_G K^W$ is under government command, which implements regional policy by locating the capital to the periphery. For simplicity, also assume that the distribution of the return to capital is unaffected by the relocation of governmental capital.

First assume that the government places its capital in the smallest region 3. This implies that

$$n_3 = \min\left\{\frac{s_3(2\phi + 1) - \phi}{1 - \phi}, s_G K^W\right\}. \quad (20)$$

Figure 3 shows the equilibrium location of industry as solid lines when $s_G = 0.1$, compared to the base case. The policy does decrease the dominance of region 1. However, it also hurts region 2 - the other small region. The net gain in industry for the two peripheral regions is thus considerably lower than $s_G K^W$, at least until the level of integration reaches the point where all industry would end up in region 1 absent the regional policy.

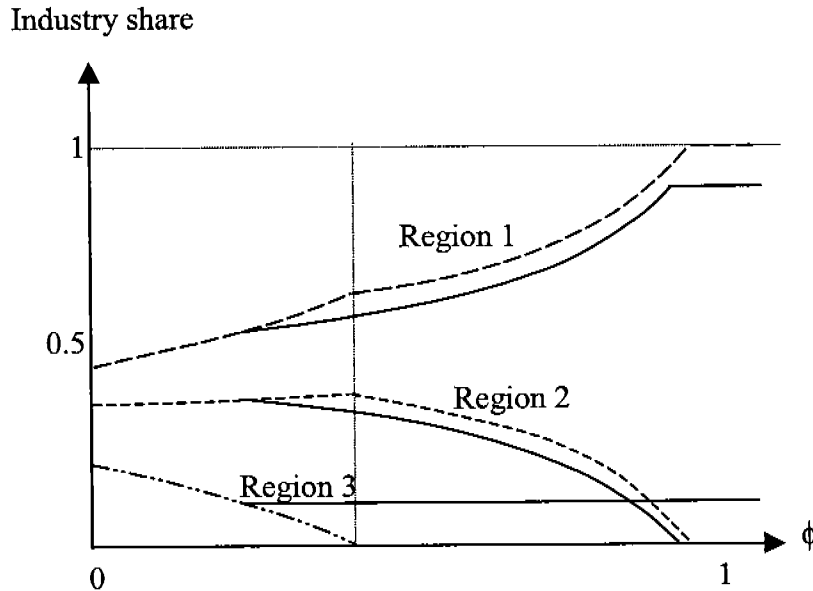


Figure 3: Location of capital to the periphery

The effect of placing governmental capital in region 2 can also be inferred from Figure 3. The base case applies until the industry share in region 2 reaches s_G , at which point regions 2 and 1 stays flat at 10 and 90.

The policy described so far implied moving capital but not labour, that is, it corresponds to moving a government agency but not it's personnel. However, another possibility is that the employees move with the agency. In terms of the model this means a shift in s_j rather than n_j . Consider, for instance, a 5 percent shift in s_j from region 1 to region 3. The solid lines in Figure 4 show the resulting configuration of industry given by equations (12) and (15). Once more, the outcome is compared to the base case. The policy does not prevent almost all industry from agglomerating in the large region when integration is sufficiently deep. However, it gives a boost to industry in both peripheral regions before full agglomeration occurs, and contrary to

the previous case the policy leads to gains for region 3 *and* region 2. This happens since region 2 has increased in size compared to region 1 (see equation (16)).

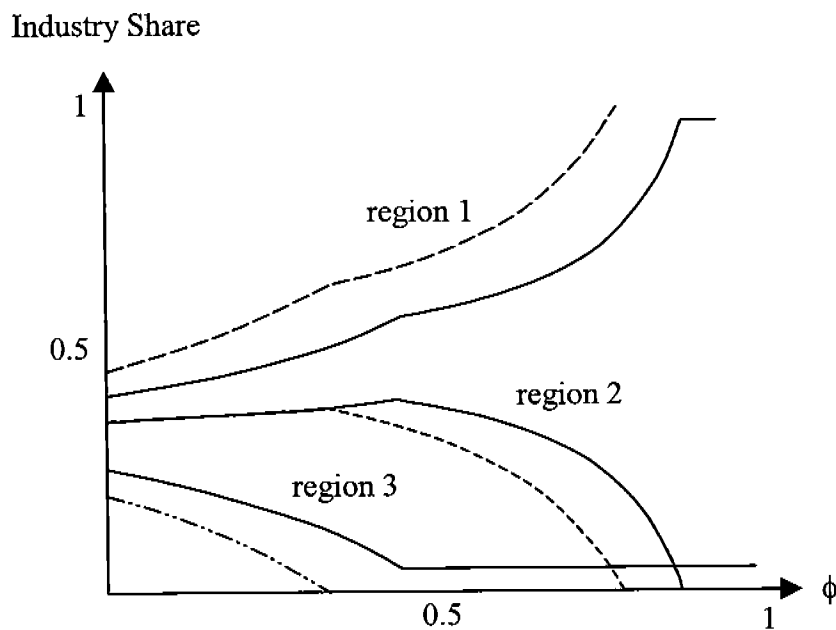


Figure 4: Locating capital and labour to the small region

Finally consider instead shifting 5 percent of s_j from region 1 to region 2. This leads to a radically different effect compared to relocating to region 3, as illustrated in Figure 5. While region 3 is unaffected compared to the base case, region 2 is nudged into parity with the large region and thus, the outcome is a symmetric allocation of industry in region 1 and 2.

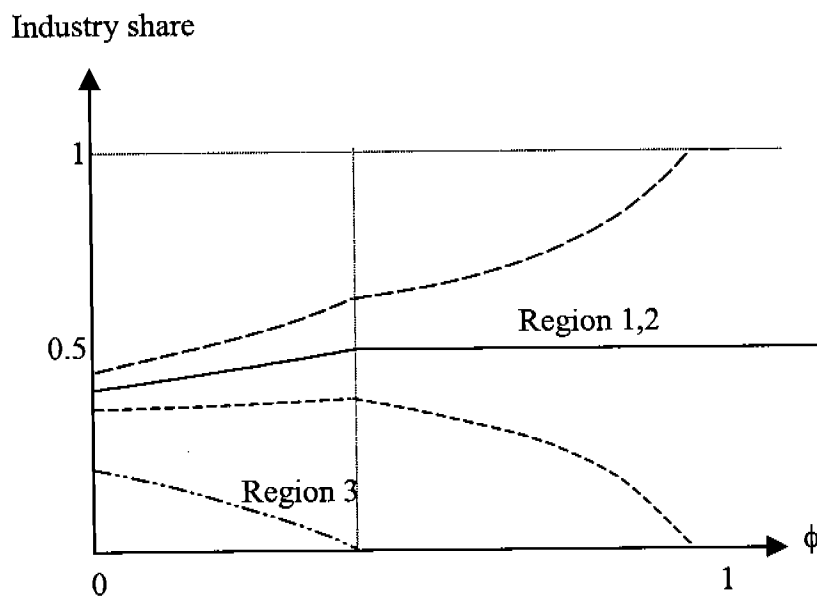


Figure 5: Locating capital and labour to the regional centre

4.2 Infrastructure projects

Infrastructure projects constitute a common form of regional policy. This type of policy has often come in the form of new roads or new railroads, and a more recent example is the construction of fiber optic nets for high speed data transmission. The typical policy involves improving communication between the centre and smaller regions. In terms of the model, consider a policy that consisting of reducing trade costs between region 1 and the other regions, whereas trade costs remain unchanged between region 2 and 3. Solving the model with $\phi_{12} = \phi_{13} = \phi$, gives

$$n_1 = \frac{2(1 - s_1)\phi^2 + (s_1 - \phi)(1 + \phi_{23})}{(1 - \phi)\phi_{23} - \phi(3 - 2\phi) + 1}. \quad (21)$$

The effect of increasing ϕ , evaluated at symmetric trade costs, is shown by

$$\frac{dn_1}{d\phi}_{\phi_{23}=\phi} = \frac{s_1(2\phi + 3) - 1}{(1 - \phi)^2}. \quad (22)$$

Region 1 will always gain industry from this policy if $s_1 > 1/3$. Consequently the other regions will lose industry as region 1 becomes the hub.³ Thus, this policy aggravates the deindustrialisation of the periphery. Note also that the derivative in (22) is negative if s_1 is small and ϕ is low. This implies that a small region with less than average endowments may lose industry if it becomes the hub. The explanation for this is simply that a small region is interesting as a location exactly because high trade costs protect its market. This 'tariff jumping' argument for locating in a small market vanishes as trade costs fall.

Next consider instead a policy of improving infrastructure in the periphery, that is, an increase in ϕ_{23} keeping ϕ unchanged. Differentiating (21) with respect to ϕ_{23} gives

$$\frac{dn_1}{d\phi_{23}} = -\frac{2\phi s_1}{(1 + \phi_{23} - 2\phi)^2}, \quad (23)$$

which is always negative. Thus, improving infrastructure *within* the periphery leads industry to locate away from the centre to the periphery. The effect also becomes stronger with an increasing ϕ .

To be specific, consider an infrastructure policy, which increases ϕ_{23} so that $\phi_{23} = 1.1\phi$. Figure 6 shows industry shares as ϕ is increased. Clearly, compared to the base case, the policy moves industry out of region 1 as indicated by (23). The winner is region 2 which now has a fairly constant and for high ϕ increasing industry share. The reason why region 2 rather than region 3 gains industry is the same as the mechanism making the derivative in (22) negative for small s_1 : A region with endowments below average loses industry when trade costs are reduced.

³A hub effect is also shown in Baldwin et.al. (2003) and Puga and Venables (1997).

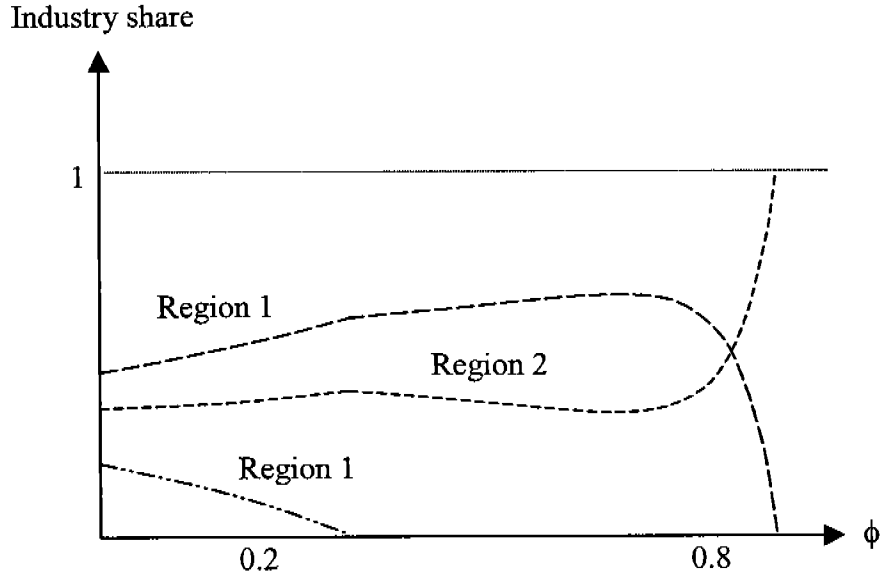


Figure 6: Improving infrastructure between peripheral regions

4.3 Regional Subsidies

A third form of regional policy is outright subsidies to disadvantaged regions. The form of this subsidy and its financing can vary, but in a typical case regional subsidies are financed through the regular budget. It is here assumed that subsidies are financed by a proportional countrywide income tax t which, because of the inelastic labour supply, is lump-sum in nature. Subsidies z_j are proportional and region specific, and are for simplicity given to capital only. That is, they may be viewed as investment subsidies.

The introduction of subsidies to capital means that the free entry condition (9) is modified according to:

$$(1 - \beta)x_j = \frac{\pi_j}{1 + z_j}, \quad (24)$$

which means that

$$x_j = \frac{\sigma \pi_j}{1 + z_j}. \quad (25)$$

The new M-sector market clearing condition, corresponding to equation (11), incorporate this and the fact that demand is based on after tax income $(1 - t)Y_j$ in each region j . The long-run equilibrium location of capital is determined by the condition that the after subsidy return is equalised among regions:

$$(1 + z_1)\pi_1 = (1 + z_2)\pi_2 = (1 + z_3)\pi_3. \quad (26)$$

Finally, balanced budget is assumed

$$\sum_j z_j \pi_j n_j = t \sum_j Y_j = t \frac{\sigma}{\sigma - \mu} L^W. \quad (27)$$

This condition determines the tax rate for any given subsidy scheme. Note, however, that the uniform tax rate can be factored out of the expressions for relative returns to capital. That is, the tax rate does not affect the long run locational equilibrium since taxes enter as a proportional factor on income in all regions.

Solving the model in a case where region j receives subsidies gives the mass of varieties in the subsidised region

$$n_j^{subs} = \frac{(1 + z_j)^2 [2\phi^2(s_j - 1) - s_j(1 + \phi)] + \phi^2 + \phi}{(\phi - 1) [(2z_j + z_j^2)(2\phi + 1)s_j - 2(z_j + 1)^2\phi + \phi + 1]}. \quad (28)$$

By inspection the expression goes to infinity as ϕ goes to one. This reflects the fact that any subsidy will dominate the locational choice of firms when trade costs are sufficiently low, since firms, *ceteris paribus*, are indifferent to location at free trade.

For concreteness, consider our usual integration experiment, but with a subsidy, $z_3 = 0.03$, to capital in the small region 3 financed by a tax on labour in all regions. Figure 7 plots (28) as well as the number of varieties in regions 1 and 2 as trade costs are reduced. Once more, the outcome is compared to the base case. The effect of the subsidy is small for a large range of trade costs. The deindustrialisation of region 3 is somewhat postponed but not avoided. However, when trade costs become sufficiently low the subsidy to region 3 comes to dominate the locational choice of firms. Consequently region 3 reindustrialises as seen in Figure 7.

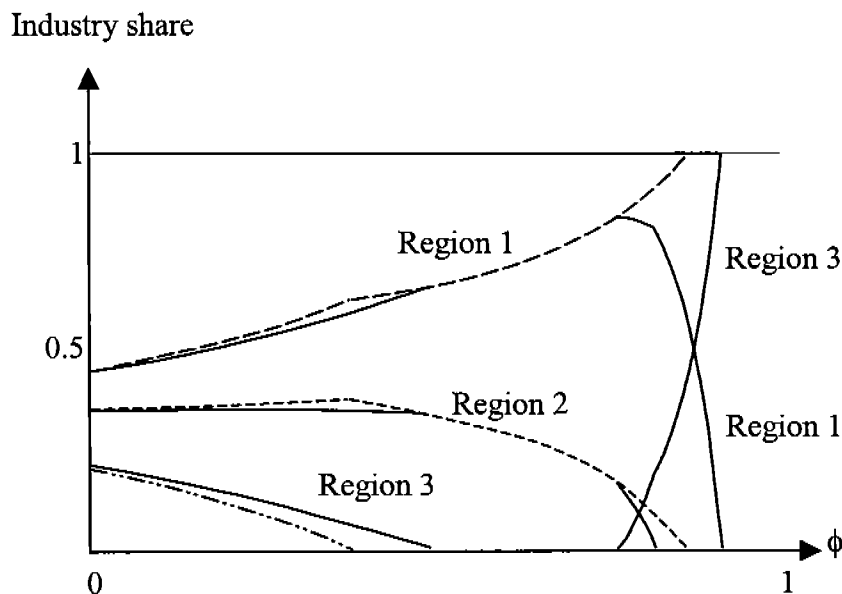


Figure 7: Investment subsidy to region 3

As a mirror image to Figure 7, Figure 8 plots the subsidy necessary to keep the industry share

in region 3 constant at its autarchy level of 20 percent.⁴ Agglomeration rents are bellshaped in ϕ in this type of model, and the disadvantage of the smallest region is therefore maximal for intermediate trade costs.⁵ Thus, the analysis points out that the efficiency of regional subsidies is very much dependent on the level of integration. The cost of maintaining industry in the periphery may be moderate if integration is allowed to proceed sufficiently far.

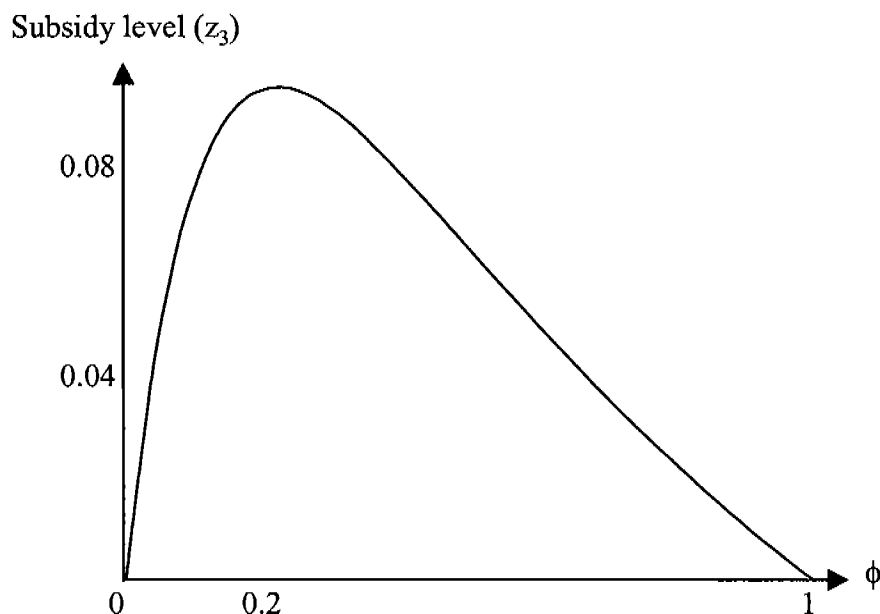


Figure 8: Subsidy necessary to keep $n_3 = s_3$

5 Conclusion

This paper analyses several regional policies aiming at keeping or increasing industrial activity in peripheral regions. It is first shown how economic integration can lead to a complete deindustrialisation of the periphery absent government policy. In this model, integration still leads to increasing welfare in all regions, as well as a convergence in welfare between region. Even though the model is too stylized for a serious welfare assessment, this result indicate that the basis for regional policy may be weaker than is commonly believed.

In any case, the real world offers abundant examples of regional policy, and it is therefore of interest to analyse its impact on industry location. The first policy treated involves relocating government agencies and similar institutions to peripheral regions. The conclusion from this experiment is that is important to locate activities in regional centers rather than in the absolute periphery if the goal is to produce a viable agglomeration, which can serve as a counterweight to the large region. Second for this policy to be effective care should be taken to ensure that expenditures rise in the periphery. Just relocating capital, where the return is repatriated, will

⁴The algebraic expression for the subsidy is not very revealing, and we therefore suppress it.

⁵See Baldwin et.al. (2003) chapter 2, for a discussion of the bellshaped agglomeration rents.

not help industrialising the periphery.

Second, infrastructure policies are analysed. It is shown how the common policy of improving the infrastructure (e.g. building roads) between the large central region and peripheral regions can actually speed up the deindustrialisation of the periphery. However, an improved infrastructure between peripheral regions can strongly increase the attractiveness of some of these regions.

Finally, subsidies are analysed. These tend to be effective when agglomeration forces are weak. Since these forces are hump-shaped in trade costs, subsidies are effective both at a low and high degree of economic integration. Relating to the mixed success of EU's regional policy, it is possible that this policy will be more effective as integration in Europe is deepened.

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