Trade Liberalization, Agglomeration and Public Policies: the Case of the European Regional Policies

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Abstract

In many instances trade integration has led to the agglomeration of economic activity in a few core locations while other regions became deindustrialized, its population either unemployed or locked in traditional sectors. The exarcerbation of regional inequalities has been a permanent concern of the EU authorities whose regional policies have tried to mitigate this phenomenon. Building upon Venables (1996) core-periphery model, we examine the ability of different public policies to reverse the agglomeration market equilibria, yielding instead a geographically even distribution of economic activity. We consider policy instruments such as wage subsidies, consumption taxes, discriminatory expenditure and redistributive interregional transfers. We find that redistributive interregional transfers combined with non-discriminatory consumption taxes might do the job. If the transfers are mainly spent on projects in the upstream sector, this policy can deliver dispersed equilibria which are also stable. To a great extent, the European Structural funds fit into this type of policy. They are granted to lagging regions, basically those with per capita income below the European average, and they finance a wide range of projects, including infrastructures, communication systems and other investment projects that could be considered inputs to other sectors. Some basic regression analysis using data on the Structural Funds for the period 1994-98 suggests that the objective 1 funds are positively correlated with regional employment and especially manufacturing employment, while the other programs don't seem to be correlated with employment.

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1 Introduction

Trade liberalization brings about a geographical reorganization of the economic activity. Often times trade liberalization leads to the concentration of certain activities in some areas (specialization) or even to the concentration of most of the activities (agglomeration). However, as the economy is in continuing evolution, the economic landscape might also change along the different stages of economic integration.[1] As in other examples of economic integration, The European Union has delivered important changes in the geographical distribution of the economic activity. The consequences of these changes on the national and regional disparities have been a permanent concern of the European public authorities, and they have also been an issue in the research agendas of many academics, from the growth literature to the so-called new economic geography.

The conclusions of the academic works can be classified into two opposite lines: the "convergence" and the "divergence" theories.[2] The convergence advocates argue that trade liberalization can increase factor productivity and income levels for all the participants. Relying on some growth regressions, they also claim that prior to the single market, there was already some convergence underway across the European regions. In contrast, the new economic geography theory predicts that the reduction in trade costs leads to the agglomeration of economic activity, even though the relationship might not be monotonic. The initial reduction in trade costs would make agglomeration forces stronger and thus would induce the concentration of economic activity in a few locations. However, after some critical value, the intensification of trade liberalization would result in factor prices differentials and congestion costs that would lead to the relocation of some activity to the deindustrialized areas.[3] That is, the relationship between trade integration and

[1] The history of U.S. manufacturing is an example of this. Kim (1995) shows how concentration and regional specialization in U.S. manufaturing has gone through different stages: it increased up to the interwar years, then flattened out and decreased in the second half of the XX century. A more recent example of geographical reorganization took place in Mexico as a consequence of the North-American Free Trade Agreement, with the relocalization of some industrial activity from Mexico city to the North of the country -Hanson (1998).

[2] This classification of the literature is due to Boldrin and Canova (2001).

[3] There are several agglomeration and dispersions forces. The classical Marshallian external economies (market size effects, thick labor markets and pure external economies such as information or technological spillovers) induce economic activity to concentrate on a few locations, whereas immobile factors, comparative advantage and congestions costs cause activity to disperse. In Krugman (1991) pioneer model, agglomeration obtains due to geographical differences on the demand level. Higher

agglomeration might display an inverse-U shape.

Although there is no consensus in the literature about the welfare consequences of agglomeration, the European authorities have advocated for a policy aimed at dispersing the economic activity, helping elevate the economic potential of all the players. The Structural Funds, the main instrument of the European regional policy, were established to ensure the economic and social cohesion within the EU. The entry in the EU of relatively poor countries such as Greece (1981) and Spain and Portugal (1986) was to aggravate the economic disparities among state members. As a consequence the Structural Funds went under reform in 1989, when they acquired budgetary significance for the first time. To the extent that the future members have per capita incomes considerably lower than the average, the enlargement of the EU in 2004 poses a new challenge to the European regional policy.

In this paper, we start by assuming that the objective of a supranational government is to disperse the economic activity and we ask what would be the appropriate policies to the task. We use a modified version of Venables (1996) model that incorporates public policy variables. We study the ability of various policies in reversing the agglomeration tendency that seems to follow trade integration. We find that standard policy instruments such as subsidies and public expenditure do not work, while we find a justification for redistributive interregional transfers devoted to upstream activities. Insofar as the Structural Funds are granted to poor regions and they are used to finance projects such as infrastructures, communications and energy systems that can be viewed as "inputs" to other sectors, they fit the category of redistributive interregional transfers devoted to upstream activities. Then we try to empirically assess the effects of these funds on the European regional employment for the period 1994-98.

The rest of the paper is organized as follows. In the next section we summarize some of the arguments that give support to the EU policy to pursue the dispersion of economic activity, and we review some of the literature on European public policies. Section 3 presents the model and shows the effects of trade liberalization in the absence of public intervention. Section 4 introduces the public sector and we explore the ability of different policies in preventing agglomeration. In section 5 we explain the basic workings of the Structural Funds. Section 6 presents some correlation and regression analysis and section 7 concludes.

demand in one location bids wages up and labor, which is assumed to be mobile, moves there. In contrast, Venables (1996) assumes labor is immobile. Instead, firms are the ones moving in response to demand and cost linakges.

2 Agglomeration and public policies

The empirical evidence available up to now yields mixed results on the effect of the EU integration on income convergence. While the dispersion in per capita income across countries decreased during the 1980s, the dispersion between regions increased.[4] Some papers argue that there exist different "convergence clubs" within the EU.[5] On the other hand, the 1980s witnessed an increase in the geographical concentration of overall manufacturing as well as a process of geographical productive specialization.[6] In a paper titled "What determines the economic geography of Europe?", Haaland and Torstensson (1999) find that concentration is positively correlated with the localization of expenditure (market size differentials) and this factor gained importance between 1985 and 1992. Input and output linkages have an effect as well. However, it is believed that the European Union has not exhausted its trade liberalization process, what suggests that Europe might still be on the ascending part of the (inverse) U-shaped relationship between trade integration and agglomeration.[7]

It is beyond the scope of this paper to analyze the welfare consequences of agglomeration and whether or not the public authorities should intervene. Yet we want to present some of the arguments in the existing literature that call for public intervention. Ottaviano and Thisse (2002) analyze the welfare implications of the concentration of activity following an economic integration process and find that agglomeration is socially desirable at high and low trade cots but undesirable at intermediate costs. Forslid et al. (2002) argue that welfare is positively associated with the location of the increasing returns manufacturing sector because the locations where activity tends to concentrate enjoy higher than average growth rates. Brulhart (1998) also points out to the divergence in regional growth that might take place as a consequence of agglomeration. Amiti (1998) provides a different argument to restrain agglomeration. The geographical concentration of economic activity increases the likelihood of asymmetrical shocks. Insofar as the adoption of the single currency makes it impossible to use the exchange rate instrument to adjust to the shocks, concentration and interregional disparities pose a problem to the viability of the EU.

But then, if the goal is to have a geographically balanced model

[4] Giannetti (2002), Canova and Marcet (1995). See also Puga (2002) for some review of empirical findings.

[5] Canova (1999), Quah (1996, 1997), Canova and Marcet (1995).

[6] Amiti (1998), Brulhart (1998), Brulhart and Torstensson (1996).

[7] Notwithstanding the elimination of tariffs, it is argued that there still remain border effects and nontariff barriers that undermine free trade.

of growth, what should be done? In other words, what would be the appropriate policies to prevent the agglomeration of economic activity? Murphy, Shleifer and Vishny (1989) discuss the Rosenstein-Rodan (1943) idea of the "big push" to move from a bad equilibrium to a good one. In an economy characterized by imperfect competition and increasing returns to scale, the government can promote and accelerate the industrialization process by coordinating investments across sectors. This would help create a sufficiently large market where increasing returns could be exploited. In the context of the EU policy, the papers addressing this issue have only focused on a few policies. Martin (1998, 1999) considers the investment in infrastructures. His analysis suggests that intrarregional infrastructures that improve transportation within poor regions are likely to promote an even distribution of activity, but they are also likely to be economically inefficient. In contrast, interregional infrastructures that improve the connection between poor and rich regions are more efficient but might result in a more unequal geographical distribution of activity across regions. Martin concludes that the current European policies might not be doing the job they were designed for and he suggests instead other policies, such as subsidies to innovation. Walz (1996) is also skeptical on the effectiveness of the actual European programs to bring the regions closer together. He argues that in fact they might be having the opposite effect: increasing the gap between the regions growth. Instead he defends an "infant-region" policy to ensure the technological maturity of the regions before they can join an economic union. Using Krugman (1991) model, Trionfetti (1997) considers the effect of general public expenditures and shows that, regardless of the level of transportation costs, public expenditure can practically always reach the level of concentration that the government might desire. In our model public expenditure by itself does not work, but we consider alternative policies, some of which do work.

3 The model

We use Venables (1996) model in its partial equilibrium version, as it is a useful theoretical framework to explain the phenomenon of concentration of industrial activity in the context of the European economic integration. In this section we summarize the assumptions and the characterization of the "laissez-faire" equilibria in the presence of trade barriers and when trade costs decrease. In the next section we will analyze how the equilibria might be altered by the intervention of the public sector.

The model is sketched in Figure 1. There are 2 regions or locations, 1 and 2. There is only one factor of production, labor, which is immobile between regions, and there are 3 production sectors:

- A perfectly competitive sector that produces a homogeneous tradable good, used as the numeraire.
- Two monopolistically competitive sectors vertically linked: an upstream industry, a, that provides intermediate goods for a downstream industry, b, that produces final goods. They produce a differentiated good, with every firm producing a different variety.

Firms in any industry might supply both locations. The goods that are produced in one location and sold in the other are subject to advalorem trade costs that are borne by the consumers. Using the CES aggregators over varieties, the demand for a particular variety is given by:

$$\begin{aligned} x_{ii}^k &= (p_i^k)^{-\varepsilon} \left(P_i^k\right)^{\varepsilon-1} e_i^k \\ x_{ij}^k &= (p_i^k t)^{-\varepsilon} \left(P_j^k\right)^{\varepsilon-1} e_j^k \end{aligned} \tag{1}$$

where $k = a, b$ denotes the industry, x_{ij} is the quantity of a particular variety produced in location i and sold in location j, t denotes the advalorem trade costs, p is the price of the particular variety, while P is the industry aggregate price, e_i is the level of expenditure in location i and ε is the elasticity of substitution among varieties, that is assumed to be the same across industries and locations.

The industry price indices at each location, P_1^k and P_2^k, are:

$$\begin{aligned} \left(P_1^k\right)^{1-\varepsilon} &= (p_1^k)^{1-\varepsilon} n_1^k + (p_2^k t)^{1-\varepsilon} n_2^k \\ \left(P_2^k\right)^{1-\varepsilon} &= (p_1^k t)^{1-\varepsilon} n_1^k + (p_2^k)^{1-\varepsilon} n_2^k \end{aligned} \tag{2}$$

where n_i^k denotes the number of firms in location i.

The profits of a firm in location i are given by:

$$\pi_i^k = \left(p_i^k - c_i^k\right)\left(x_{ii}^k + x_{ij}^k\right) - c_i^k f^k \tag{3}$$

where c_i^k is the marginal cost and $c_i^k f^k$ is the fixed cost.

In partial equilibrium, the wages and the expenditures on final goods are exogenous. Thus, the prices, the quantities and the number of firms are determined by (1), (2) and (3) together with:

1 The profit maximizing pricing rule of firms:

$$p_i^k(1 - \frac{1}{\varepsilon}) = c_i^k \tag{4}$$

The marginal cost, c_i^k, for the upstream sector is only the labor cost, while the cost for the downstream sector has two components: the cost of labor and the cost of the intermediate goods produced by the upstream sector. The downstream cost function is Cobb-Douglas, so the cost functions are:

$$\begin{aligned} c_i^a &= \omega_i \\ c_i^b &= (\omega_i)^{1-\mu}(P_i^a)^{\mu} \end{aligned} \tag{5}$$

where μ is the share of intermediate goods used by the downstream industry.

2 The free-entry or zero-profit condition:

$$x_{ii}^k + x_{ij}^k = f^k(\varepsilon - 1) \tag{6}$$

The geographical concentration of industrial activity is defined as the value of industrial output produced in location 2 relative to that of location 1:

$$v^k \equiv \frac{n_2^k p_2^k \left(x_{22}^k + x_{21}^k\right)}{n_1^k p_1^k \left(x_{11}^k + x_{12}^k\right)} \tag{7}$$

Two other useful variables to define are: the marginal cost of industry k in location 2 relative to that of location 1 (ρ^k) and the relative expenditure in industry k (η^k) :

$$\rho^k \equiv \frac{c_2^k}{c_1^k} = \frac{p_2^k}{p_1^k} \tag{8}$$

$$\eta^k \equiv \frac{e_2^k}{e_1^k} \tag{9}$$

After some algebraic manipulation, the variable v^k can be expressed as a function of relative costs, expenditure and trade costs:

$$v^k = \frac{\eta^k[\left(t^k\right)^{\varepsilon} - \left(\rho^k\right)^{\varepsilon}] - t^k[\left(\rho^k\right)^{\varepsilon} - \left(t^k\right)^{-\varepsilon}]}{[(t^k)^{\varepsilon} - (\rho^k)^{-\varepsilon}] - \eta^k t^k[(\rho^k)^{-\varepsilon} - (t^k)^{-\varepsilon}]} \equiv g^k\left(\rho^k, \eta^k, t^k\right) \tag{10}$$

v^k is negatively related to costs $\left(\rho^k\right)$ and positively related to expenditure $\left(\eta^k\right)$ with the elasticity greater than 1, what means that there is a positive "home market effect"-ceteris paribus, a large market attracts a larger than proportional share of production to that location. As to trade costs, if both locations have the same size and costs $(\eta = \rho = 1)$ the industry output is equally distributed across locations, regardless of trade costs. Otherwise, demand considerations dominate location decisions at high costs while cost differences are dominant at low trade costs.

3.1 Demand and cost linkages

In partial equilibrium wages and expenditures on final goods are considered exogenous. Relative costs for the upstream industry and relative expenditures for the downstream industry are:

$$\bar{\rho}^a = \bar{\omega} = \frac{w_2}{w_1} \tag{11}$$

$$\bar{\eta}^b = \frac{e_2^b}{e_1^b} \tag{12}$$

In contrast, the cost for the downstream firms and the expenditure for the upstream firms are endogenous. The cost for the downstream firms depends on the cost of labour but also on the cost of the inputs sold by the upstream firms. This is the cost linkage (ρ^b). The demand faced by the upstream sector is the derived demand coming from the downstream sector. This is the demand linkage (η^a).

The cost linkage is embodied in the expression of relative costs of industry b:

$$\rho^b = \frac{c_2^b}{c_1^b} = \bar{\omega}^{1-\mu}\left(\frac{P_2^a}{P_1^a}\right)^{\mu} \tag{13}$$

where μ is the share of intermediate goods used by the downstream industry.

Since the industry relative prices are a function of t^a, v^a and $\rho^a = \bar{\omega}$, we can rewrite ρ^b as a function of the following arguments:

$$\rho^b \equiv h\left(\bar{\omega}, v^a, t^a\right) \tag{14}$$

In words, sector b's relative costs depend -negatively- on the relative value of production of the upstream industry, v^a.

The demand linkage is given by the expression of relative expenditure for the upstream industry:

$$\eta^a = \frac{e_2^a}{e_1^a} = \frac{\mu n_2^b c_2^b(x_{22}^b + x_{21}^b + f^b)}{\mu n_1^b c_1^b(x_{11}^b + x_{12}^b + f^b)} = \frac{n_2^b p_2^b(x_{22}^b + x_{21}^b)}{n_1^b p_1^b(x_{11}^b + x_{12}^b)} \equiv v^b \tag{15}$$

Notice that the expenditure for the upstream industry located in i is given by the demand coming from the downstream industry of that location (first equality). The model assumes that the only source of demand for a's output is the demand coming from b. In particular, a fraction μ of the downstream industry cost is spent on upstream goods. By the zero profit condition, this relation equals the relative value of production of the downstream sector (second equality). In short, expression (15) says that industry a's relative expenditure is proportional to b's relative value of production.

Incorporating these linkages into the location variables, the equilibrium can be found by means of the two implicit equations:

$$v^a = g^a\left(\bar{\omega}, v^b, t^a\right) \tag{16a}$$

$$v^b = g^b\left(h\left(\bar{\omega}, v^a, t^a\right), \bar{\eta}^b, t^b\right) \tag{16b}$$

Both $g^a$and $g^b$are increasing functions on the arguments v^b and v^a respectively. These equations are sort of "reaction functions" whose intersection yields the equilibrium of the model.

3.2 Trade liberalization and equilibria

Figures 2 through 4 illustrate the effects of trade liberalization on the equilibria for the case of symmetric locations in terms of market size and factor prices, that is, for the value of the parameters $\bar{\omega} = 1$ and $\bar{\eta}^b = 1$.Transport costs are assumed to be equal across industries, $t^a = t^b = t$. The graphs, which are a reproduction of those in Venables (1996), are plotted using an elasticity of substitution among varieties $\varepsilon = 6$, a share of intermediate inputs of the upstream sector, $\mu = 0.5$, and trade costs equal to 1.45, 1.35 and 1.25 respectively.

As we observe in figure 2, when trade costs are high, there exists a unique disperse equilibrium, where output of both sectors a and b is evenly distributed across locations, $v^a = v^b = 1$.

As trade costs decrease, there is less of a need to locate near the final demand. In other words, the dispersion forces become weaker and the agglomeration forces (demand and cost linkages) bring about new equilibria where the activity is concentrated in either one of the locations. As figure 3 illustrates at intermediate trade costs there are 5 possible equilibria:

- A stable equilibrium where production is symmetrically dispersed between both locations (point S).
- Two stable equilibria where the activity of industry a is totally concentrated in one location and industry b is also strongly skewed towards that location, although not entirely concentrated. Point S' depicts the equilibrium at which $v^a = 0$ and $v^b = g^b\left(h\left(\bar{\omega}, 0, t^a\right), \bar{\eta}^b, t^b\right)$. However, agglomeration could obtain at either location. That is, the reciprocal of S' (with $\frac{1}{v^a} = 0$) is the other possible equilibrium.

- Two unstable asymmetric equilibria in between the other stable equilibria: point U and, as before, the reciprocal of U that one would obtain by interchanging the labels for location 1 and 2.

At low enough trade costs (see figure 4) the agglomeration forces completely dominate the dispersion forces, and there is an abrupt change in the equilibria. Three equilibria exist:

- A symmetrically dispersed equilibrium that is now unstable (point U).
- Two stable equilibria where production is completely concentrated in one location (point S and its reciprocal).

Venables (1996) analytical result is the following. Assume two symmetric locations, i.e., $\bar{\omega} = \bar{\eta}^b = 1$. For fixed values of μ and ε, if and only if $\mu > 0$ (that is, provided vertical linkages exist) and $\varepsilon > 1$, there exists a value of transport cost, t, at which the symmetrically dispersed equilibrium becomes unstable.

This critical value is higher, and thus, the region of agglomeration and multiple equilibria is larger:

- the lower is the elasticity of substitution between varieties, ε, and
- the greater the share of intermediates goods (μ) used in industry b, that is, the greater the cost linkage.

4 Public policy

When trade costs are low, the dispersed equilibrium becomes unstable because the centripetal forces, the demand and cost linkages, become more powerful than the centrifugal forces. Given trade costs $t^a = t^b = t$, the mathematical condition for an equilibrium $\left(v^a_{eq}, v^b_{eq}\right)$ to be stable is:

$$g^a_2\left(\bar{\omega}, v^b_{eq}, t\right) . \left[g^b_1\left(h\left(\bar{\omega}, v^a_{eq}, t\right), \bar{\eta}^b, t\right) .h_2\left(\bar{\omega}, v^a_{eq}, t\right)\right] < 1 \qquad (17)$$

The subscripts on the functions denote the partial derivative with respect to the numbered argument. The first term on the left-hand side is the demand linkage, while the second captures the strength of the cost linkage. Stability of the equilibrium requires the demand and cost linkages to lie within certain limits. In particular, it requires their combined effect to be less than 1. In terms of the $\left(v^a, v^b\right)$ plot, this means that the slope of the inverse of g^a at the equilibrium needs to be higher than that of g^b. If instead the dispersed equilibrium is unstable, at any small deviation from it the linkage effects result in a self-reinforcing force that takes the economy away from the dispersed equilibrium to a concentrated one. Finally, when (11) holds with equality we have the condition for the value of t below which the stable disperse equilibrium becomes unstable.

Obviously, the importance of the clustering forces, relative to the dispersion or centrifugal forces, depends on the value of the parameters ε and μ. Agglomeration forces are weaker -and thus the bifurcation level of t lower and the agglomeration region smaller- the larger the elasticity of substitution between varieties (ε) and the smaller the share of intermediate goods in the production of final goods (μ).

Now, for any given ε and μ, and assuming trade costs have fallen sufficiently so that the economy is at a concentrated equilibrium, can anything be done to alter the market equilibrium? That is, can the public authorities prevent the cumulative process that leads to agglomeration and turn the unstable dispersed equilibrium into a stable one? There are, in principle, several policy instruments at hand. Here we explore the following:

1 Production subsidies, such as labor subsidies and subsidies to the use of intermediate inputs.

2 Discriminatory public expenditure.

3 Discriminatory consumption taxes.

4 Redistributive interregional transfers.

The policies will also affect overall income and in many cases, like in the presence of taxes, this effect is likely to be negative. However, as we mentioned above, we assume that the objective of the public authorities is to achieve a somehow even distribution of economic activity across regions, even when this comes at the expense of some efficiency. Thus, the focus in the next subsections will be on relative income across locations, and not on total income.

4.1 Labor subsidies and subsidies to intermediate inputs

Let's assume that the industrial activity is concentrated in location 1 so the objective is to have some activity relocated at location 2. Given $t^a = t^b = t$, $\bar{\omega}$ and $\bar{\eta}^b$, suppose the public authorities at location 2 subsidize the cost of labor for the firms located there. They establish an advalorem subsidy that reduces the effective wage paid by firms in location 2 to $\delta.\omega_2$, where $0 < \delta < 1$.

The effect of such a subsidy is equivalent to that of a reduction in relative costs ρ^k. The new expressions for the relative costs in the upstream and downstream sectors are:

$$\rho^a_{sub} = \delta.\bar{\omega} \tag{11'}$$

$$\rho^b_{sub} = (\delta.\bar{\omega})^{1-\mu}\left(\frac{P^a_2}{P^a_1}\right)^{\mu} = (\delta.\bar{\omega})^{1-\mu}\left(\frac{1+t^{1-\varepsilon}.\left(\delta.\bar{\omega}\right)^{-\varepsilon}.v^a}{t^{1-\varepsilon}+\left(\delta.\bar{\omega}\right)^{-\varepsilon}.v^a}\right)^{\frac{\mu}{\varepsilon-1}} \tag{13'}$$

Notice that the relative cost for the downstream sector, expression (13'), is affected by the subsidy in two ways: directly through the use of labor whose price in location 2 is now subsidized, and through the relative prices of the intermediate inputs (the cost linkage) which are also cheaper in location 2 now.

Proposition 1 *: Starting from a core-periphery situation, that is, when the economic activity is concentrated in one location, labor subsidies can not turn an unstable dispersed equilibrium into a stable equilibrium.*

Proof. In the presence of a subsidy to the cost of labor in location 2, both the demand and the cost linkages become stronger, instead of weaker, and consequently the policy in unable to turn the unstable disperse equilibrium into a stable one. The demand linkage is stronger because the relative cost for the upstream sector is smaller with the subsidy than in the "laissez-faire" case ($\rho^a_{sub} = \delta.\bar{\omega} < \rho^a$) and we have:

$$\frac{\partial g^a_2\left(\rho^a, v^b, t\right)}{\partial \rho^a} < 0 \qquad \forall \rho^a, v^b, t, \varepsilon$$

By the chain rule, the derivative of the cost linkage with respect to the subsidy is:

$$\frac{\partial g^b_1\left(h\left(.\right), \bar{\eta}^b, t\right)}{\partial \rho^a} \cdot h_2\left(\rho^a, v^a, t\right) + g^b_1\left(h\left(.\right), \bar{\eta}^b, t\right) \cdot \frac{\partial h\left(\rho^a, v^a_{eq}, t\right)}{\partial \rho^a} < 0 \quad \forall \rho^a, v^b, t, \varepsilon, \mu$$

(See appendix for the expressions for the demand and cost linkages). ■

In the presence of high trade costs, labor subsidies work in the expected direction; that is, they push the equilibrium in favor of the location where labor is being subsidized. However, the subsidies can not overturn the demand and cost linkages and might even have a perverse effect on the unstable dispersed equilibrium when trade costs are low. Figure 5 plots this case for values of the parameters $\varepsilon = 6, \mu = 0.5, \bar{\omega} = \bar{\eta}^b = 1$ and $t = 1.25$ and a wage subsidy of 1% ($\delta = 0.99$). As we said, labor subsidies make both the demand and the cost linkages stronger and as the subsidy increases, there is a point after which the equilibrium suffers a qualitative change and shifts in favor of location 2. The function $g^b(.)$ lies above the inverse of $g^a(.)$ for any pair $\left(v^a, v^b\right)$, what means that the economy would tend to $\left(v^a, v^b\right) = (\infty, \infty)$. That is the case in Figure 6, where $\delta = 0.90$. In other words, the subsidies can shift the concentration of economic activity to one location at the expense of the other, but they do not prove effective if the goal is to disperse the economic activity.

If instead of labor it is the use of intermediate inputs produced in location 2 that is subsidized, the demand linkage is weakened but the overall effect on the equilibrium is essentially the same. Again, the cost linkage is strengthened because the subsidy makes the intermediate inputs bought in location 2 relatively cheaper. This effect outweighs the weakening of the demand linkage and thus, the condition for stability -expression (17)- is not achieved.

4.2 Public expenditure on final goods and discriminatory expenditure

Suppose that the public authorities decide to elevate the level of final expenditure in location 2 to promote industry there. The injection of public expenditure in the downstream sector is equivalent to an increase in the parameter $\bar{\eta}^b$ with all the equations remaining the same. In this case, both local and foreign firms can take advantage of this increased level of expenditure. The demand and cost linkages are not weakened and if anything, a high enough level of expenditure can shift the agglomeration equilibrium in favor of location 2, but a stable disperse equilibrium can not be achieved.

The other possibility is to specifically restrict some of the expenditure in location 2 to domestic producers as to benefit exclusively the local industry in this backward region. For example, the government could induce consumers to buy local varieties by imposing non-tariff barriers (NTBs), such as quantity requirements, on foreign varieties. This means that the foreign firms would only have access to a fraction $\alpha < 1$ of location 2 total expenditure. We might still keep the assumption of symmetric market size, $\bar{\eta}^b = \frac{e_2^k}{e_1^k} = 1$; the novelty is that e_2^k has now two components: a "tied" and a "free" component.

The profit functions for the firms, the pricing rule and the zero-profit condition -expressions (3), (4) and (6)- are not affected by this new element. The demand functions for varieties produced in location 1 are also the same. The only thing that changes is the demand function for varieties produced in location 1 that are sold in 2. The demand functions are

$$\begin{array}{ll} x_{11}^k = (p_1^k)^{-\varepsilon} \left(P_1^k\right)^{\varepsilon-1} e_1^k & x_{22}^k = (p_2^k)^{-\varepsilon} \left(P_2^k\right)^{\varepsilon-1} e_2^k \\ x_{12}^k = (p_1^k t)^{-\varepsilon} \left(P_2^k\right)^{\varepsilon-1} \alpha.e_2^k & x_{21}^k = (p_2^k t)^{-\varepsilon} \left(P_1^k\right)^{\varepsilon-1} e_1^k \end{array} \qquad (1\text{"})$$

The easiest way to have discriminatory expenditure in the model is to impose it on the expenditure devoted to the downstream sector that is considered exogenous.[8] So we will assume that only the downstream sector is affected by the "tied" component of expenditure, while the function g_a remains the same. The reaction function $g^b(.)$ becomes:

$$g^b\left(h(\bar{\omega}, v^a, t), \bar{\eta}^b, t, \alpha\right) = \frac{\bar{\eta}^b[t^\varepsilon - \alpha.h^\varepsilon] - t[h^\varepsilon - t^{-\varepsilon}]}{[t^\varepsilon - h^{-\varepsilon}] - \bar{\eta}^b t[h^{-\varepsilon} - \alpha.t^{-\varepsilon}]} \qquad (16\text{b"})$$

where

$$h(\bar{\omega}, v^a, t) = \bar{\omega}^{1-\mu}\left(\frac{P_2^a}{P_1^a}\right)^\mu$$

with both industry prices, P_1^a and P_2^a, being the same as in the "laissez-faire" case.

Proposition 2 *Discriminatory expenditure by itself or exogenous public expenditure in the downstream sector cannot turn the unstable dispersed equilibrium into a stable equilibrium and, in a neighborhood of the unstable equilibrium, they might have a perverse effect on the value of production of the location implementing the policy relative to the other location's production.*

Proof. The case of exogenous public expenditure in the downstream sector is equivalent to an increase in $\bar{\eta}^b$ in the benchmark model. It is trivial from the partial derivatives that the demand linkage is unaffected, and the cost linkage becomes stronger. The derivative of the cost linkage with respect to $\bar{\eta}^b$ is:

$$\frac{\partial g_1^b\left(h\left(.\right), \bar{\eta}^b, t\right)}{\partial \bar{\eta}^b} \cdot h_2\left(\rho^a, v^a, t\right) + g_1^b\left(h\left(.\right), \bar{\eta}^b, t\right) \cdot \frac{\partial h_2\left(\rho^a, v_{eq}^a, t\right)}{\partial \bar{\eta}^b}$$

We have:

$$\frac{\partial h_2\left(\rho^a, v_{eq}^a, t\right)}{\partial \bar{\eta}^b} = 0$$

[8] It is more difficult to do so for the upstream sector because its demand is the derived demand coming from the downstream sector.

but

$$\frac{\partial |g_1^b\left(h\left(.\right),\bar{\eta}^b,t\right)|}{\partial\bar{\eta}^b} > 0 \qquad \forall \rho^a, v_{eq}^a, t, \varepsilon, \mu$$

That is, the partial derivative $g_1^b\left(.\right)$ becomes more negative. Since $h_2\left(.\right)$ is also negative, we have that

$$\frac{\partial g_1^b\left(h\left(.\right),\bar{\eta}^b,t\right)}{\partial\bar{\eta}^b}\cdot h_2\left(\rho^a,v^a,t\right)+g_1^b\left(h\left(.\right),\bar{\eta}^b,t\right)\cdot\frac{\partial h\left(\rho^a,v_{eq}^a,t\right)}{\partial\bar{\eta}^b} > 0 \qquad \forall \rho^a, v^a, t, \varepsilon, \mu$$

The same applies to the discriminatory expenditure: the demand linkage is unaffected, while the cost linkage is reinforced. ■

The plot in Figure 7 is drawn for the same values of the parameters as in the previous plots and a proportion, $\alpha = 0.75$, of location 2 downstream expenditure available to foreign firms. As we observe this policy can not overturn the demand and cost linkages and has even a perverse effect on the unstable dispersed equilibrium.

4.3 Discriminatory consumption taxes

Given $t^a = t^b = t$, $\bar{\omega}$ and $\bar{\eta}^b$, we consider now the implementation of a consumption tax in location 2 that taxes foreign varieties heavier than local varieties.

All the relevant expressions for the firms, the profits functions (3), the pricing rule (4) and the zero-profit condition (6) remain the same and so do the demand functions in location 1. However, the tax changes the price for varieties consumed in location 2, that increases by $(1+\tau_2^k)$, with $\tau_2^k > 0$, for domestic varieties and by $(1+\tau_1^k)$, $\tau_1^k > 0$, for foreign varieties.[9] As with trade costs, we assume the consumption tax is paid by the consumer so that the demand functions are:

$$\begin{array}{ll} x_{11}^k = (p_1^k)^{-\varepsilon}\left(P_1^k\right)^{\varepsilon-1}e_1^k & x_{22}^k = \left(p_2^k\left(1+\tau_2^k\right)\right)^{-\varepsilon}\left(P_2^k\right)^{\varepsilon-1}e_2^k \\ x_{12}^k = \left(p_1^k t\left(1+\tau_1^k\right)\right)^{-\varepsilon}\left(P_2^k\right)^{\varepsilon-1}e_2^k & x_{21}^k = (p_2^k t)^{-\varepsilon}\left(P_1^k\right)^{\varepsilon-1}e_1^k \end{array} \qquad (1''')$$

The price index in location 1 remains the same while the price index in location 2 is now:

$$\left(P_2^k\right)^{1-\varepsilon} = \left(p_1^k t\left(1+\tau_1^k\right)\right)^{1-\varepsilon}n_1^k + \left(p_2^k\left(1+\tau_2^k\right)\right)^{1-\varepsilon}n_2^k \qquad (2''')$$

[9] The nonnegativity condition for the number of firms, n_1 and n_2, requires:

$$\frac{t}{1+\tau_2^a} > \frac{\rho^a}{1+\tau_1^a}$$

Working out expressions (1") through (6), the new expressions for (16a) and (16b) are:

$$v^a = \frac{v^b[(t/(1+\tau_2^a))^\varepsilon - (\bar{\omega}/(1+\tau_1^a))^\varepsilon] - t(1+\tau_1^a)^{1-\varepsilon}[\bar{\omega}^\varepsilon - t^{-\varepsilon}]}{(1+\tau_2^a)^{1-\varepsilon}[t^\varepsilon - \bar{\omega}^{-\varepsilon}] - v^b t[((1+\tau_2^a)\bar{\omega})^{-\varepsilon} - ((1+\tau_1^a)t)^{-\varepsilon}]} \tag{16a"'}$$

$$v^b = \frac{\bar{\eta}^b[(t/(1+\tau_2^b))^\varepsilon - (h_{tax}/(1+\tau_1^b))^\varepsilon] - t(1+\tau_1^b)[(h_{tax})^\varepsilon - t^{-\varepsilon}]}{(1+\tau_2^b)[t^\varepsilon - (h_{tax})^{-\varepsilon}] - \bar{\eta}^b t[((1+\tau_2^b)h_{tax})^{-\varepsilon} - \left((1+\tau_1^b)t\right)^{-\varepsilon}]} \tag{16b"'}$$

where

$$h_{tax}(\bar{\omega}, v^a, t, \tau_1, \tau_2) = \bar{\omega}^{1-\mu}\left(\frac{P_2^a}{P_1^a}\right)^\mu$$

and P_2^a is that defined above.

Proposition 3 *A discriminatory consumption tax -relatively higher for the other location's varieties- can alter the equilibrium in favor of the location that enacts the tax and for adequate values of the parameters this equilibrium will be stable.*

A discriminatory consumption tax works because it makes exports from location 1 (where there are no taxes) to location 2 (where the tax is enacted) more expensive. This encourages some firms to relocate to location 2 in order to avoid the tax differential. At the same time, if no tax was levied on local varieties at location 2, the demand linkage would become so strong that all the activity would tend to concentrate there, while location 1 would be served from (cheap) exports from location 2. To prevent this from happening, some tax on location 2 domestic varieties is needed as well. Like the trade costs, the tax acts as a centrifugal force that causes firms to locate near the markets they serve.

Table 1 provides some examples of discriminatory taxes and the corresponding equilibria for the following values of the parameters: $\varepsilon = 6$,

$\mu = 0.5$, $\bar{\omega} = \bar{\eta}^b = 1$ and $t = 1.25$.

Table 1: Equilibria in the presence of a consumption tax.

	$\boldsymbol{\tau}_2^a$	$\boldsymbol{\tau}_1^a$	$\boldsymbol{\tau}_2^b$	$\boldsymbol{\tau}_1^b$	$\left(v_{eq}^a, v_{eq}^b\right)$	**Stable/Unstable**
Ex. 1	0.125	0.25	0.125	0.25	$(0, 0)$	Stable
Ex. 2	0.125	0.375	0.125	0.375	$(2.62, 1.34)$ $(0.04, 0.17)$ $(0, 0)$	Stable Unstable Stable
Ex. 3	0.125	0.50	0.125	0.50	(∞, ∞)	Stable
Ex. 4	0	0.375	0	0.375	(∞, ∞)	Stable
Ex. 5	0.20	0.60	0.125	0.375	$(0.91, 0.71)$ $(0.24, 0.28)$ $(0, 0)$	Stable Unstable Stable
Ex. 6	0.30	0.90	0	0.25	$(0.81, 0.68)$ $(0.34, 0.36)$ $(0, 0)$	Stable Unstable Stable

The examples above illustrate some of the conditions that a discriminatory tax needs to meet in order to be effective in dispersing economic activity between the two locations:

- $\tau_2^k < \tau_1^k$ for $k = a, b$. That is, foreign varieties need to be taxed more heavily than local varieties, and the tax differential must lie within certain limits. If it is too low, production could still be concentrated in location 1 at the equilibrium (see examples 1 and 2). By contrast, if the differential between foreign and local varieties is too high, activity will be concentrated on the location enacting the discriminatory tax (example 3).

- A tax only on foreign varieties does not succeed in turning the unstable equilibrium into a stable one, but it just results in activity being concentrated in location 2 (example 4).

- Taxes in the upstream and downstream sectors need not be of the same magnitude. To some extent, taxes in one sector are substitutable for taxes in the other (see examples 5 and 6). However, taxing inputs seems more important because it affects the demand

and cost linkages. In fact, taxes on intermediate goods are needed in both locations (i.e., $0 < \tau_2^a < \tau_1^a$), while they are not required in the downstream sector (see example 6).

Figure 8 plots the equilibria in example 5. A discriminatory consumption tax in both sectors (slightly higher for the upstream sector) can yield a stable dispersed equilibrium. Notice that this plot is very similar to that of Figure 3, for intermediate trade costs.

4.4 Redistributive interregional transfers financed through consumption taxes

Discriminatory taxes give us an idea of how demand and cost linkages can be overturned to prevent activity from agglomerating in one location, but they are politically unfeasible in the context of trade liberalization. Instead, we propose a policy of redistributive interregional transfers financed through consumption taxes and devoted to the upstream sector. This policy is a good simplification of the European Structural Funds, the main instrument of the European regional policy. The Structural Funds are granted to lagging regions, basically those with per capita income below the European average and they finance a wide range of projects, including infrastructures, communication systems and other investment projects that to a great extent are channeled to the upstream sector.

The way this policy works is simple. Let's suppose both locations establish a consumption tax on final goods with the same tax rate, $\tau_2^b = \tau_1^b = \tau^b$. The receipts of this tax will be devoted to a leveraging transfer program channeled to the upstream sector of the poorest region. In particular the lagging location i would receive an expenditure amount, G_i^a, proportional to the difference between the fraction of total output it would produce was economic activity evenly distributed according to size and the actual fraction of output produced. The magnitude of this gap is given by the output shares of the production of final goods. By assumption our two locations have the same size and so if economic activity was evenly distributed across regions, each one would be producing half of the total output. Thus a location i would receive a transfer if:

$$\frac{1}{2} - \frac{n_i^b p_i^b (x_{ii}^b + x_{ij}^b)}{n_i^b p_i^b (x_{ii}^b + x_{ij}^b) + n_j^b p_j^b (x_{jj}^b + x_{ji}^b)} \equiv \gamma \geq 0 \tag{18}$$

where γ is the gap in final production. The amount of the transfer received would be:

$$G_i^a = 2 \cdot \gamma \cdot \tau^b \cdot \left[n_i^b p_i^b (x_{ii}^b + x_{ij}^b) + n_j^b p_j^b (x_{jj}^b + x_{ji}^b) \right] \tag{19}$$

This scheme is redistributive because it channels funds from the locations with higher level of economic activity (that consequently pay more in consumption taxes) to those below the average, and the recipient regions get more funds the larger is their gap with respect to the average. In the extreme, if all activity was concentrated in location j, the gap would equal 1/2 and thus location i would receive all the tax receipts. Likewise, if the share of output of location i was less than half but greater than zero, the region would not receive all the tax receipts but only a proportion of twice the gap.[10]

Expression (19) can be rewritten as follows:

$$G_i^a = \tau^b \cdot \left[n_j^b p_j^b (x_{jj}^b + x_{ji}^b) - n_i^b p_i^b (x_{ii}^b + x_{ij}^b)\right] \qquad (19')$$

Assuming $t^a = t^b = t$, $\bar{\omega}$ and $\bar{\eta}^b$, let's suppose once again that location 2 is the backward region. Relative expenditure for that location's upstream sector becomes:

$$\eta_{gov}^a = \frac{e_2^a + G_2^a}{e_1^a} = \left(\frac{\mu - \tau^b}{\mu}\right) \upsilon^b + \frac{\tau^b}{\mu} \qquad (20)$$

where the second equality follows from the fat that the demand of the upstream sector is the derived demand from the downstream sectors.[11]

All the prices for final goods are equally affected by the tax that has the same rate in both locations, while the relevant expression for the firms, the relative cost of the downstream sector $\left(\rho^b\right)$,the firms pricing rule and the zero-profit conditions remain the same as in the benchmark. Thus the expressions for $g^a\left(.\right)$ and $g^b\left(.\right)$ turn out to be the same as in (16a) and (16b), with the only difference that now $\eta^a = \eta_{gov}^a$.

Proposition 4 *: Starting from a core-periphery situation, redistributive interregional transfers devoted to the upstream sector of the backward region and financed through consumption taxes can turn an unstable equilibrium into a stable equilibrium and they can elevate the level of economic activity of the backward region.*

[10] Our model does not include any dynamics. However, in pratice the amount of government expenditure should be calculted according to past deviations from the average. Since our framework is a partial equilibrium one, we are not concerned about a balanced-budget either. We assume that the tax receipts that are not spent in this program are used for other purposes or even wasted away.

[11] That is:

$$e_i^a = \mu n_i^b p_i^b (x_{ii}^b + x_{ij}^b) \quad i = 1, 2$$

As we can see from (20), the key variable to achieve the desired dispersion equilibrium is the tax rate. At low tax rates, the dispersed equilibrium might still not be stable, but as the tax rate is increased it is possible to reach an evenly distribution of the economic activity. We present some examples in Table 2 and Figure 9 plots example 3.

Table 2: Equilibria in the presence of redistributive interregional transfers and consumption taxes

	τ^b	$\left(v^a_{eq}, v^b_{eq}\right)$	**Stable/Unstable**
Ex.1	0.1	$(1,1)$	Unstable
		$(0,0)$	Stable
Ex. 2	0.2	$(1,1)$	Stable
		$(2.05, 1.70)$	Unstable
Ex. 3	0.25	$(1,1)$	Stable
Ex. 4	0.3	$(1,1)$	Stable

The reason why this policy works is because it is capable of weakening the demand linkage sufficiently as to disperse economic activity. In effect, the consumption tax raises more funds in the more active regions, and by channeling those funds to the poorest region the program helps leveraging the demand level across regions so it partly counteracts the demand linkage. Since the gap system was formulated absent of time subscripts, the model does not yield any dynamic partial adjustment and the examples show the steady-state equilibria solutions which consist of equality of production across locations. Another point worth mentioning is that the taxes might have some distortionary effect across sectors, but not across locations. Therefore even if agents were looking forward, which in any case we do not assume here, this scheme would not cause a geographical relocation of firms ex-ante, but ex-post, as a consequence of the transfers to the upstream sector.

5 The European Structural funds

The Structural Funds (hereafter SF) are the main instrument of the European regional policy. It is their ultimate goal to help reduce the economic disparities among the European regions. Since their creation the funds have increased in importance. For the period 1975-1988, a total of 23 billions Euro were spent. They amounted to 68 billion in the first programming period 1989-1993. This number was more than doubled in the next programming period: 177 billion Euro during 1994-1999 while 213 billion Euro were budgeted for the last period (2000-2006). Figure

10 shows the evolution of the annual payments. This average hides important differences in the amounts received by each country. For example, by 1996 on average they represented a little more than 0.35% of the total EU GDP. However, Greece, Ireland and Spain received funds that amounted to 1.74, 1.58 and 1% of their GDP respectively, while for countries like the Netherlands, Belgium and France the Structural Funds only represented 0.067, 0.13 and 0.14 % of their GDP respectively.

Although the history of these funds goes back as far as the Treaty of Rome in 1957, they only became significant in budgetary terms in 1989 with the reform of the Structural Funds. The signature of the Single European Act (SEA) in 1986, that called for the completion of the internal market by 1992, was to have a significant impact on the economies of the member states. Moreover, the entry of Spain and Portugal in 1986 was also going to increase the disparities among the state members. All these reasons led the European Community to set new guidelines for the structural policy in 1987. The reform of the Structural Funds was taken up in practice in 1988 and the first year of implementation was 1989. The reform increased the budget allocated to the SF and pursued the concentration of efforts in a limited number of priorities such as the improvement of communications (primarily upgrade of basic infrastructures), assistance to industry, crafts and business services, tourism, development of agricultural resources and rural development, support of infrastructures for economic activities and development of human resources.

Similarly, the reform set the principle of multiannual programming. By the beginning of a programming period, the European Commission would decide on the budget of the Structural Funds for the next few years and the regions eligible to them. The first of these multiannual periods went from 1989 to 1993, the second one from 1994 to 1999 – the sub period analyzed here is 1994-98- and the last one has been the 2000-2006 program.

The Structural Funds cofinance development projects that respond to national priorities agreed upon between the member states and the European Commission. Any economic agent, a public body, a private company or even an association who wants to implement a project in an eligible region can apply for support. A managing authority, either the national or regional government, decides on the approval of the project. Only in the case of the Community Initiatives (that we do not deal with here) does the Community have full capacity to propose and decide on the project.

The are several types of SF depending on the nature of the projects they finance:

- ERDF (European Regional Development Fund). It concentrates mainly on productive investment, infrastructure and the development of small businesses. This is the most important program of European regional policy accounting for about 50% of the total funds. This is also the most interesting fund for our purpose in this study as it is aimed at promoting the industrial sector.

- ESF (European Social Fund). It concentrates on vocational training and recruitment aid.

- EAGGF (European Agriculture Guidance and Guarantee Fund). It assists the structural adjustment in agriculture.

- FIFG (Financial Instrument for Fisheries Guidance). It assists the structural adjustment in the fisheries sector.

In order to concentrate efforts on a few priorities, the reform of the Structural Funds set five priority objectives. With the entry of the two Nordic countries, Finland and Sweden, in 1995, a sixth objective was added to the list. The objectives for the periods 1989-93 and 1994-99 were the following:

- Objective 1: promote the development and structural adjustment of regions that are lagging behind.

- Objective 2: convert the regions or parts of regions seriously affected by industrial decline.

- Objective 3: combat long-term unemployment.

- Objective 4: facilitate the occupational integration of young people.

- Objective 5a: promote the adjustment of agricultural and fisheries sector.

- Objective 5b: promote the development and adjustment of rural areas.

- Objective 6: promote the development of the low populated regions.

Objectives 1, 2, 5b and 6 are geographically targeted at specific regions while the others are horizontal in coverage, that is, economic actors of any EU region might apply for them. At the beginning of the programming period, the European Commission (EC) sets the criteria for eligibility for the territorial objectives 1, 2, 5b and 6 and lists the regions or subregions that meet them. It also assigns them a specific budget for each of the programming years. These quantities are referred to as "commitments" in the EC budget. By the end of the year, the budget might or might not have been completely executed. In the empirical analysis, we use the quantities effectively used every year –the "payments"- and not the commitments. Since they are geographically linked to the territory, it is easier to track the regions receiving Objectives 1, 2, 5b and 6 funds than those recipients of Objectives 3, 4 and 5a. In the Reports of the Structural Funds, there is usually a portion of the payments classified as "multirregional". This proportion is considerably higher in the cases of Objectives 3, 4 and 5a. Since we are interested in the regional impact of the SF, it is crucial to know the exact recipient regions. Therefore we only focus on Objectives 1, 2, 5b and 6, which are also the most significant in magnitude. For the period 1994-98, Objectives 1, 2, 5b and 6 accounted for 80% of the total SF spending. Objective 1 was the most important; it represented 66% of the total SF executed. An additional reason to only consider these objectives is that, although they receive other type of funds as well, Objectives 1, 2, 5b and 6 are the only objectives financed by the ERDF and, as we pointed out, this is the fund we are mainly interested in.

The criteria applied to determine eligibility for the territorial objectives during the period studied, 1994-98, was the following:

Objective 1.

- NUTS2 regions whose per capita income of the last three years fell below 75% of the Community average;
- NUTS2 regions whose per capita GDP was close to the Community average but in which there were particular circumstances which led them to be included in Objective 1.

Objective 2. Areas smaller or equal to NUTS level 3 that met all the following conditions:

- an unemployment rate above the Community average for the last three years;
- a percentage of industrial employment higher than the Community average for any reference year after 1975;
- a decline in industrial employment with respect to the reference year.

A secondary criteria allows the extension to areas adjacent to Objective 1 or Objective 2, smaller areas meeting the main criteria, as well as other areas, in particular urban districts, which are facing the threat of severe worsening of unemployment, problems related to the regeneration of industrial sites and the impact of the restructuring of the fisheries sector.

Objective 5b. Rural areas not included under Objective 1 (NUTS3 or smaller) that meet at least two of the following three criteria:

- a high share of agricultural employment;
- a low level of agricultural income, measured as agricultural value-added per unit of labor;
- a low population density and/or a significant depopulation trend.

Eligibility was extended to other areas not covered by Objective 1 with a low level of development, provided they met one or more of the secondary criteria: remoteness, sensitivity to trends in the agricultural sector and the restructuring of the fisheries sector, the structure of agricultural holdings and the age of the agricultural working population, pressure on the environment, location in mountain areas, etc.

Objective 6. This objective was added in 1995 with the access of Finland and Sweden to the EU. The eligible regions need to be NUTS2 with a population density of eight inhabitants per km2 or less and some adjacent smaller areas with the same population density.

The regions cannot be eligible for more than one territorial objective. That is, if a region is eligible according to Objective 1, it cannot receive funds from the other territorial objectives as well. However, if the region is not Objective 1, then it can simultaneously be eligible for say objectives 2 and 5b as long as they do not coincide in the same geographical area.

6 Assessment of the Structural Funds: some regression analysis

In this section we use data on the Structural Funds from the second programming period (1994-98) to get an idea of what impact the Structural Funds might have had on the economic performance of the European regions. In particular we focus on the regional employment.[12] The main

[12] This choice is largely motivated by data availability. Regional European data is scarce and incomplete. Yet, there are relatively complete and long series for employment.

objective of this analysis is to check whether there is a strong correlation between the Structural Funds and the regions employment performance or this can be dismissed from the outset. That is, the results in this paper should not be interpreted as making a strong case for a causal relationship between the Structural Funds and the regional economic performance, but rather as a first "pass" to try disentangle what the effects must have been. A rigorous evaluation of the Structural Funds would require a more serious analysis than the simple analysis we present here. Two other points are also worth mentioning. We focus on the public expenditure side, the funds, but not on the cost of these policies. That is, it is not the purpose of this paper to study the distortionary effects that the taxes raised to finance the expenditure might have had. More importantly, we only consider the Structural Funds and not other policies, European or national, that might have also had an impact on regional performance. Insofar as these other policies interact with the Structural Funds, reinforcing or offsetting their effects, this omission might introduce a bias in our results.[13]

6.1 Data description

The data on the Structural Funds comes from the Annual Reports of the Structural Funds published by the European Commission. Most of the funds are broken down by region. Only a small part within each country, labeled “multirregional”, is not assigned to specific regions as they are devoted to projects that involve more than one region or the specific recipient region is not known. We imputed these amounts using the proportions of spending that were already territorialized.

The other economic variables used here (employment, GDP, productive structure and population) come from the *Regio* database of the European Office for Statistics (Eurostat). Eurostat created a geographical classification that divides the EU territory in units called NUTS (Nomenclature of Territorial Units for Statistics). There are 3 different levels of aggregation from the largest to the smallest unit: NUTS1, NUTS2 and NUTS3.[14] With the exceptions of Denmark and Greece, our sample uses the same territorial units as the Reports of the Structural Funds, which is the following: Denmark, Ireland and Luxembourg are treated as uniregional countries; NUTS1 for Belgium, Germany, the

[13] According to R. Martin (1998) the national policies do not necessarily go in line with the EU regional policy and might have some significant importance. However, we do not have adequate ways to control for these other policies.

[14] These units tend to coincide with the national administrative classifications. The current nomenclature divides the (pre-2004) 15 countries of the European Union into 78 NUTS1, 210 NUTS2 and 1093 NUTS3.

Netherlands, United Kingdom, Greece,[15] Austria and Finland; NUTS2 for France, Italy, Spain, Portugal and Sweden. In total, the panel consists of 120 regions in the 15 EU countries.[16]

6.2 Regression results

As a first exploration of the data, we run some long-difference regressions. The change in regional employment over some time horizon, total and manufacturing employment, is regressed on the sum of the Structural Funds received during that period. Table 3 presents the results. They show a positive long-run correlation between the Structural Funds and the change in employment. The coefficient is statistically significant in most cases, except for column 3 for the total employment regressions.

Next we consider a panel year-by-year model. We run two sets of regressions. In Tables 4 and 5, the log change in employment –total and manufacturing- is regressed on the Structural Funds and some other control variables. Different variations of a fixed effect model are estimated, with both regional and time fixed effects. The former are used to account for unobserved embodied in the error term.[17] The time fixed effects are used to control for the effect of business cycles or some other time trend in the data. We could better control for business cycles by using regional or EU GDP but we do not have data for these variables up to 1998. Most of the models are estimated using weighted least squares to cope with the heteroscedasticity problem using the regional populations as weights, and the standard errors are White-Huber corrected.

As we can see on Table 4, the Structural Funds objective 1, which is the most important in magnitude, appears positively correlated with the employment growth. The coefficients range between 0.014 and 0.035, whenever they are significant (columns 1 to 3). However, the coefficient fails to be statistically significant when both regional and year fixed effects are included (column 4). We try then with a more refined variable, to see if the Structural Funds are still significant for at least a specific group of regions. This new variable is an interaction term between the

[15] In the case of Greece, due to lack of data, we use the NUTS level 1, with two of them –Kentriki Ellada and Attiki- collapsed into one region.

[16] In particular, we have 3 regions for Belgium –corresponding to the Belgian administrative regions-, 1 for Denmark, 16 for Germany –the German Länder-, 3 for Greece, 18 for Spain –the Autonomous Communities-, 22 for France –the French regions-, 1 for Ireland, 20 for Italy –the Italian regions-, 1 for Luxembourg, 4 for the Netherlands, 7 for Portugal, 11 for the UK, 3 for Austria, 2 for Finland and 8 for Sweden. The complete list of the regions as well as some descriptive statistics are presented in the appendix.

[17] Although we do not report the results here, we also ran random effects but the Haussman test rejected this specification.

objective 1 and the share of the primary sector in the region's total value-added.[18] The ultimate goal of the Structural Funds is to help regions that are lagging behind. Thus, a priori we would expect the sign on the interaction term to be positive –that is, the Structural Funds should be more useful in promoting employment and activity in those regions with higher shares of the primary sector. The sign of this term is positive but in none of the regressions (columns 5 and 6) is significant. The coefficients on the other types of Structural Funds vary significantly in sign and magnitude and they are not significant in most of the cases.

Total employment might not be the most appropriate dependent variable to assess the effects of the Structural Funds though, because these funds are meant to help mainly the industrial sector. Moreover, manufacturing employment, and not total employment, seems also more consistent with the theoretical model in the background. Thus, in Table 5 we look at the growth in manufacturing employment. The results improve over the previous ones. Except for regressions 5 and 6 , the coefficients on objective 1 are significant and they tend to be considerably higher than those obtained for total employment. Objective 1 is statistically significant –at the 10% significance level- even when both regional and fixed effects are present (column 4). Likewise, the interaction terms in regression 5 and 6 result now significant and they have the expected positive sign, while the coefficients on the other objectives are still not significant in most cases and they vary in sign.

To get a better feeling for the relative impact of the Structural Funds on employment, we scale the Structural Funds by the regional GDP and population. The results are presented in Table 6 and 7 respectively. To avoid repeating all the regressions, we chose the model with regional fixed effects and no time effects. As in the previous tables, objective 1 is positive and statistically significant, while the others are generally not significant.[19] The bottom part of the tables shows the impact of the Structural Funds, whenever this is significant and if we take the results at face value, for those regions that do get some funds. On Table 6, for example, we see that the regions that receive objective 1 funds get on average 2.6% of their real GDP. This money would be having an impact in the annual growth rate of total employment of 1.5% and 3.27% in the growth rate of manufacturing employment.

[18] In the NACE classification this corresponds to the sector B01 "Agricultural, forestry and fishery products". The share used here has been calculated as the average over the period 1986-90 of the share of sector B01 value-added in the region's total value-added.

[19] The exception is objective 6 that, although significant, varies in sign across models.

7 Conclusions

The economic geography literature argues that trade integration tends to result in agglomeration of economic activity in a few core locations while others become deindustrialized, its population either unemployed or locked in traditional sectors. Although the normative analysis is not conclusive, the exarcerbation of regional inequalities has been a permanent concern of the EU authorities, and from early on they have pursued a regional policy of even distribution of economic activity. We do not enter the controversy whether the public authorities should intervene or not. Rather, we start assuming that the goal of the EU is to pursue the geographical dispersion of economic activity, and then we explore the different policies to best achieve this goal.

Building upon Venables (1996) model, we assume an initial core-periphery situation, where trade costs have fallen sufficiently so that a dispersed equilibrium, if it exists, is not stable. We introduce different public policy variables in the model and study their effects on the equilibria. More precisely, we consider the following policy instruments: production subsidies such as wage subsidies, consumption taxes, discriminatory expenditure and redistributive interregional transfers. Contrary to our intuition, we find that production subsidies and public expenditure alone cannot overturn the demand and cost linkages that lead to agglomeration and thus they are unable to turn a dispersed unstable equilibrium into a stable one. Discriminatory consumption taxes, on the other hand, can work provided certain conditions are met. Yet they are unfeasible given their discriminatory nature. We then consider redistributive interregional transfers combined with non-discriminatory consumption taxes. Both local and foreign goods are taxed at the same rate but poorer regions are granted transfers. If the transfers are mainly spent on projects in the upstream sector, this policy can deliver dispersed equilibria which are also stable. To a great extent, the European Structural Funds fit into this type of policy. They are granted to lagging regions, basically those with per capita income below the European average, and they finance a wide range of projects, including infrastructures, communication systems and other investment projects that could be considered inputs to other sectors. Some basic regression analysis using data on the Structural Funds for the period 1994-98 suggests that the Objective 1 Funds are positively correlated with regional employment and especially manufacturing employment, while the other programs don't seem to be correlated with employment in any significant way. Yet, the unavailability of regional data prevents us to control for some other important factors that might be at play and this constitutes a limitation of our empirical analysis.

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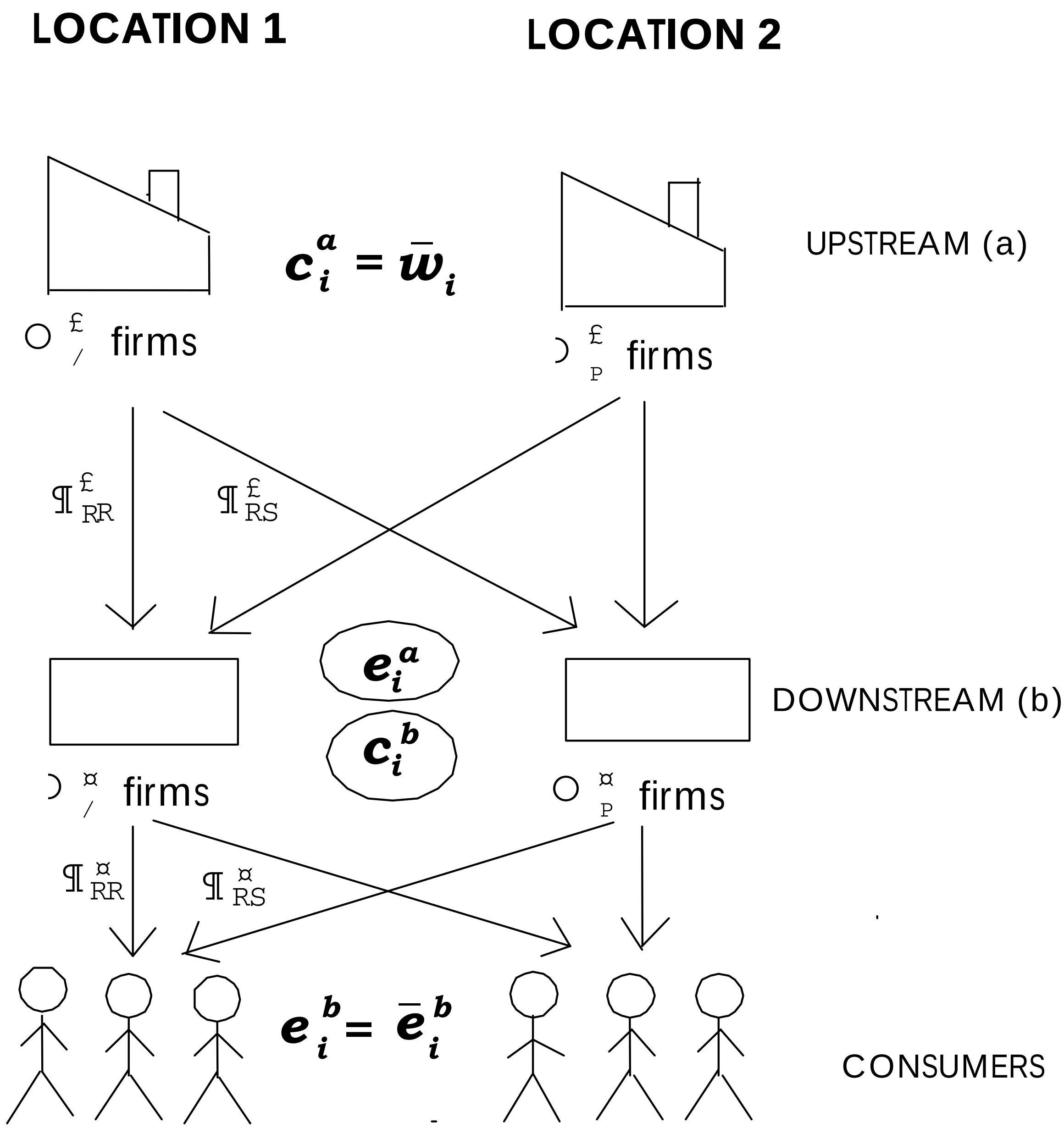

Figure 1: Sketch of the model

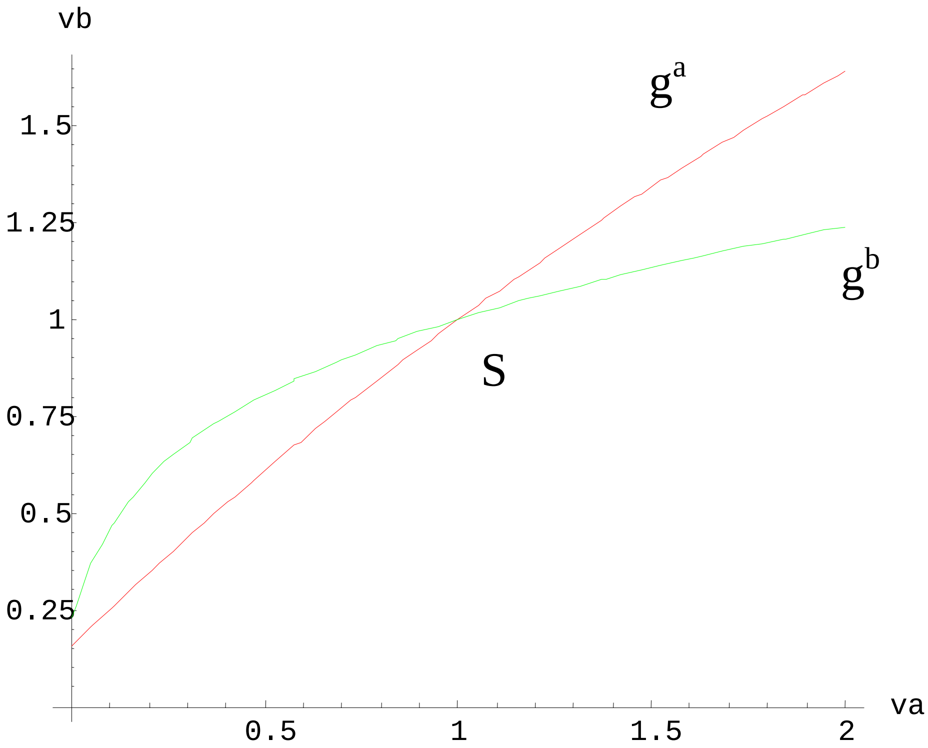

Figure 2: Equilibria with high trade costs

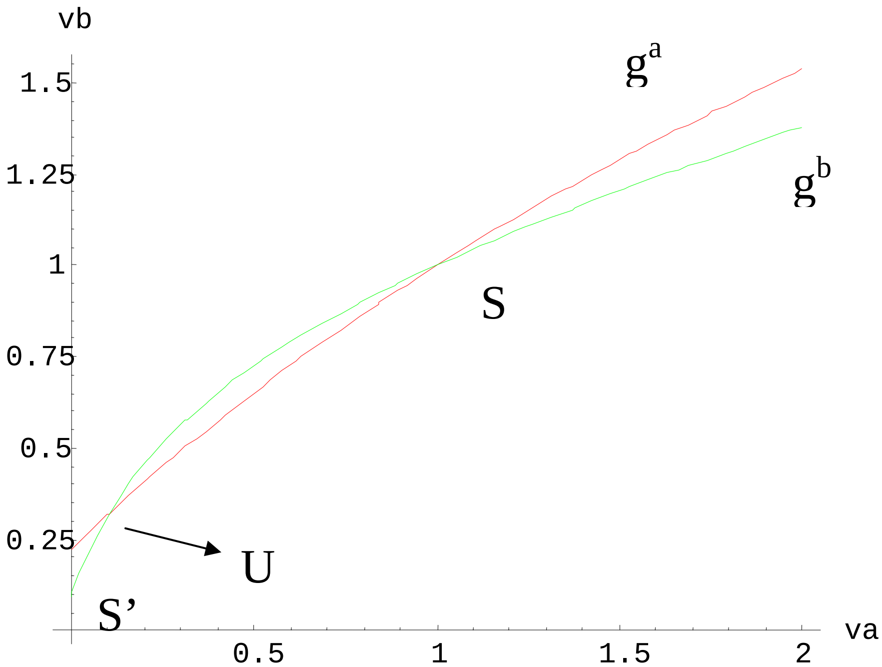

Figure 3: Equilibria with intermediate trade costs

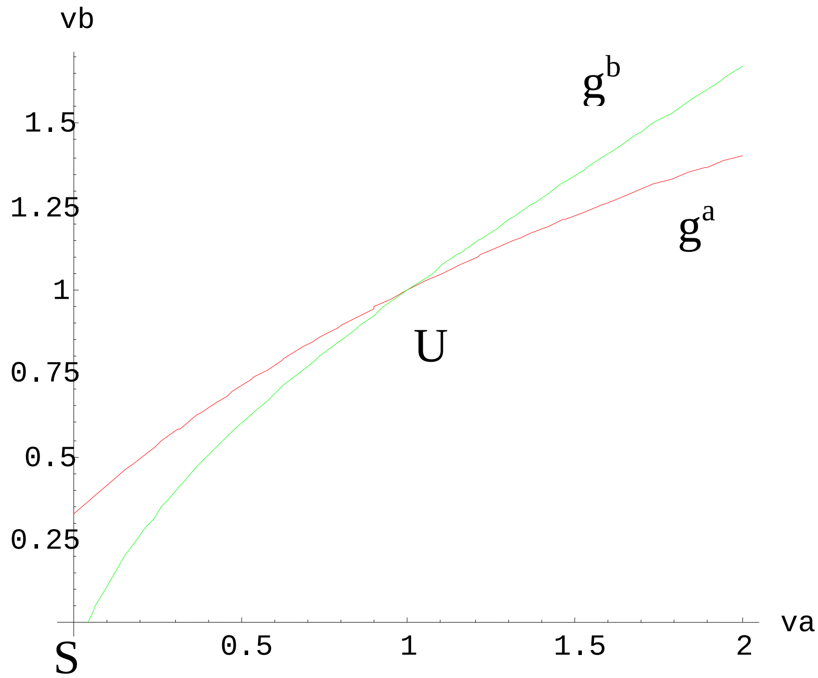

Figure 4: Equilibria with low trade costs

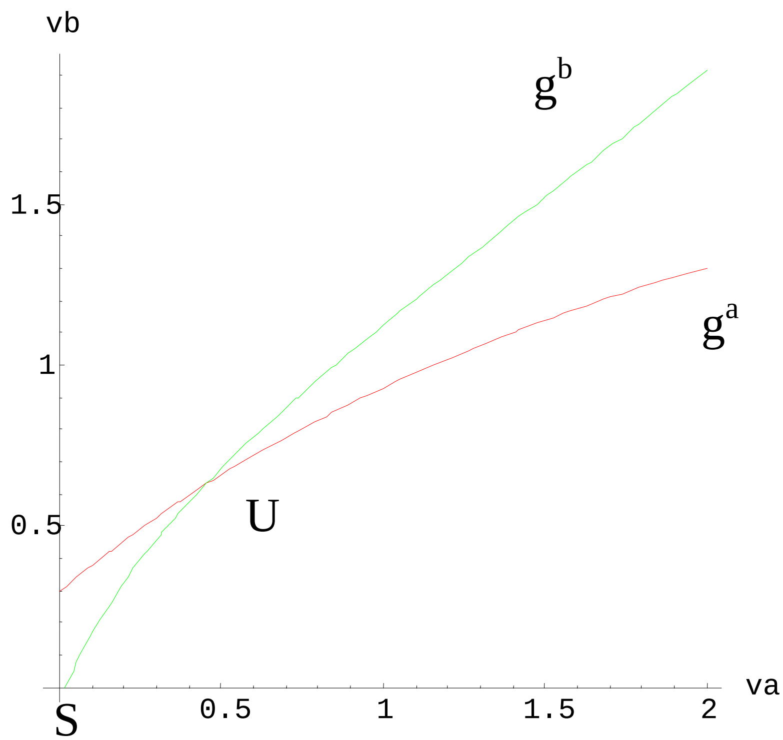

Figure 5: Effect of a small labor subsidy

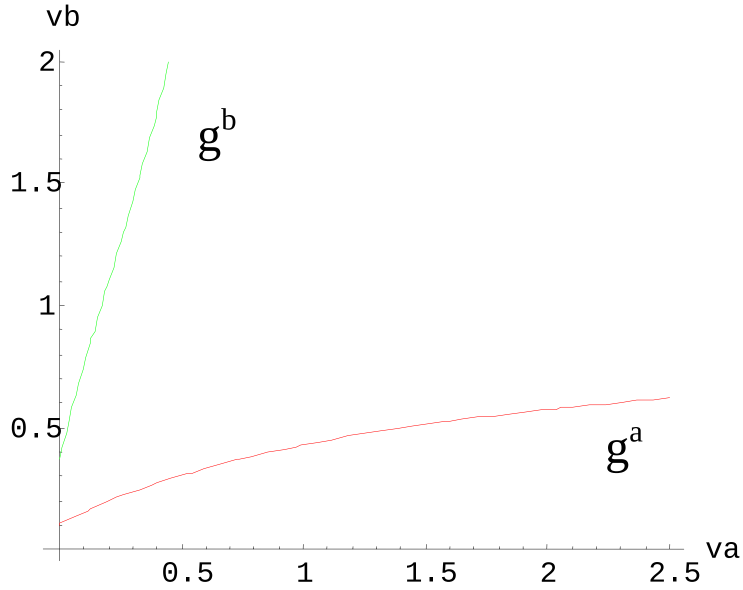

Figure 6: Effect of a high labor subsidy

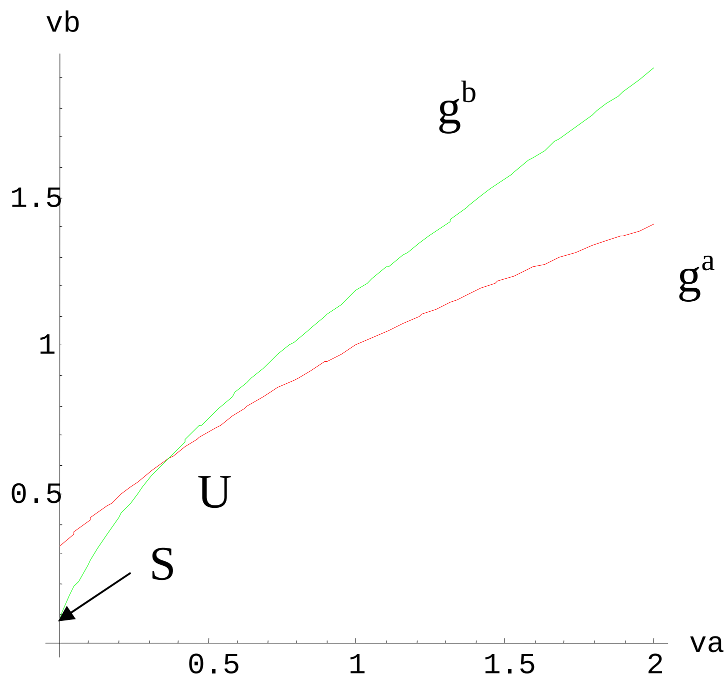

Figure 7: Effect of discriminatory expenditure

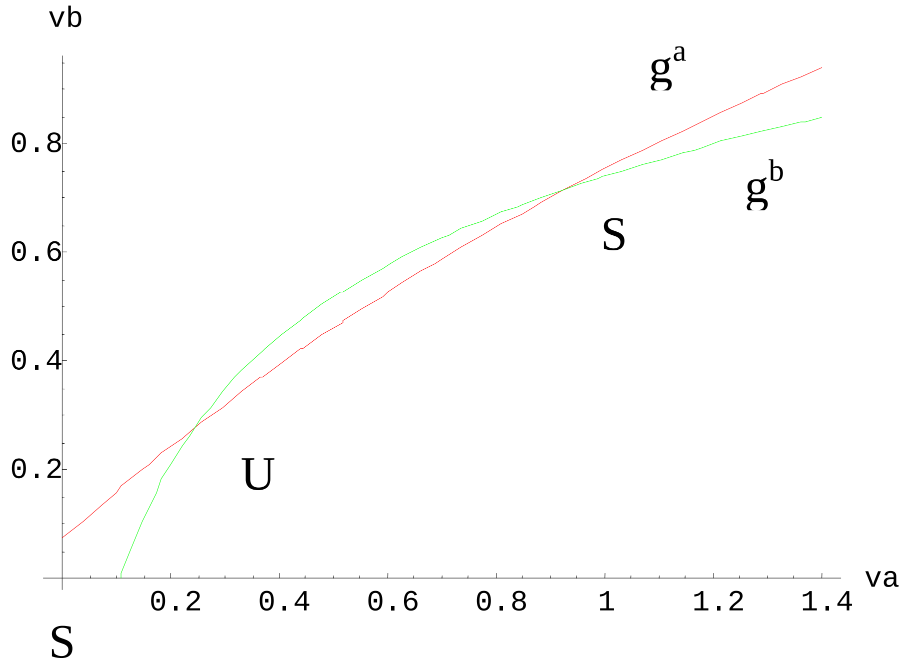

Figure 8: Effect of a discriminatory consumption tax

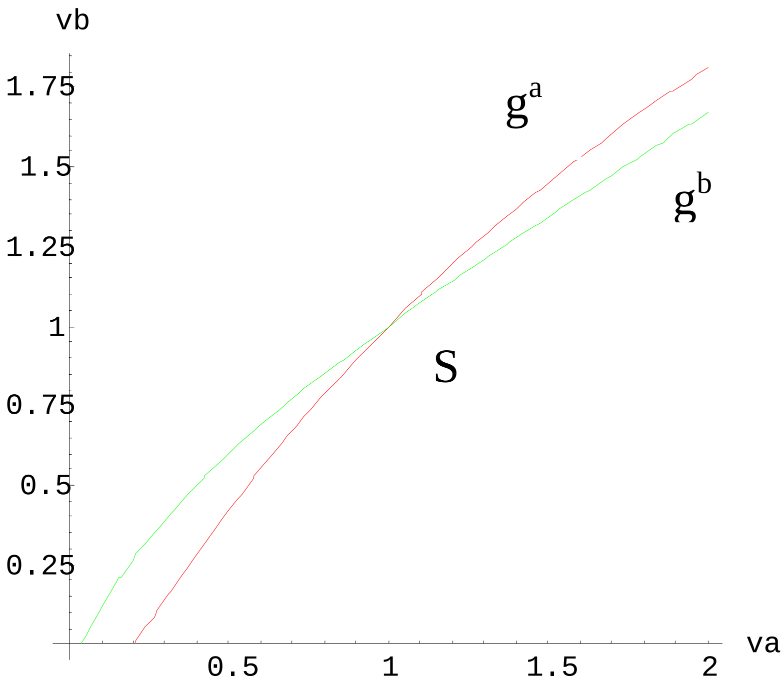

Figure 9: Effect of redistributive interregional transfers and a consumption tax

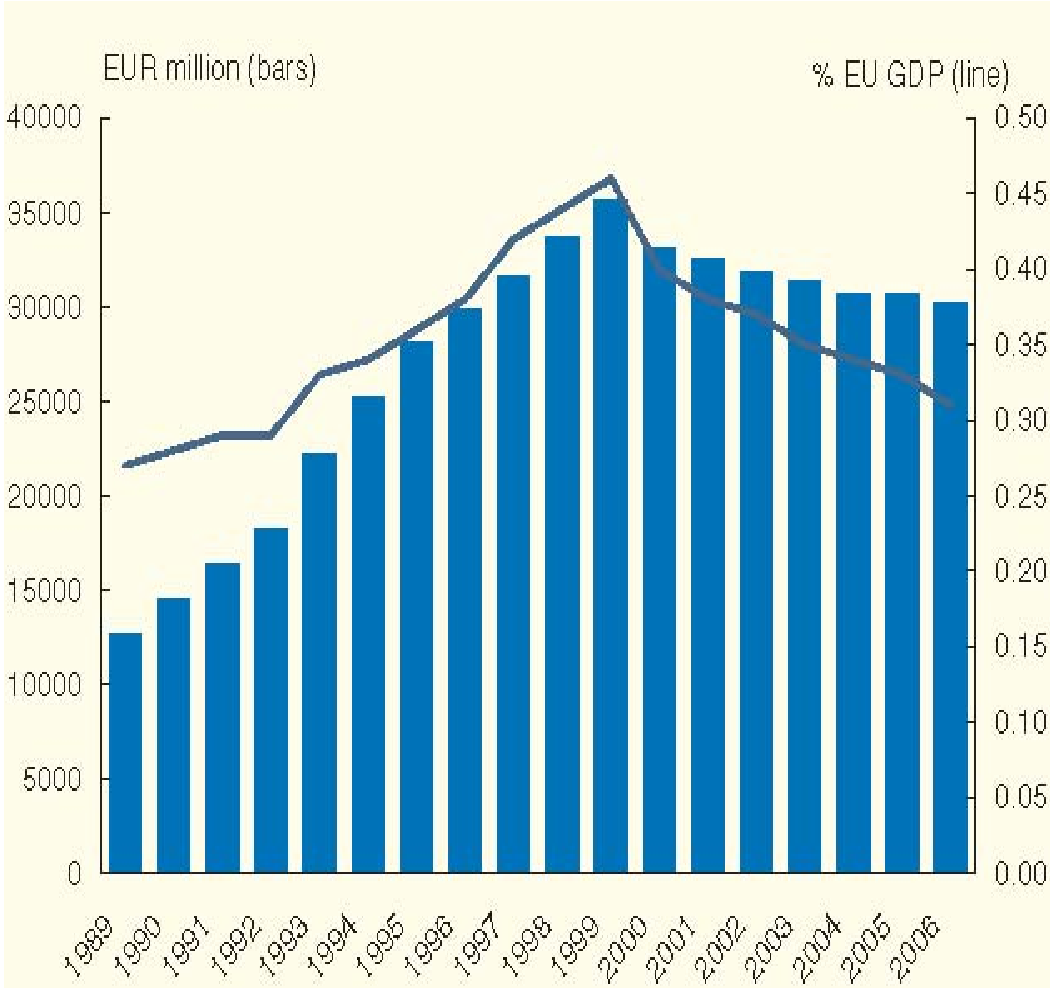

Figure 10: Evolution of the Structural Funds, 1988-2006

Source: European Commission site:
http://europa.eu.int/comm/regional_policy/sources/docoffic/official/repor_en.htm

Tables 3: Long-differences regressions for the change in employment.

Dependent variable: Change in log total employment between the years:

	94-98	94-99	89-99	(85-89)-(94-98)
Sum of objectives 1,2,5b and 6 over the years 1994-1998 (ECU billions)	0.018 (0.008)	0.027 (0.009)	0.019 (0.015)	0.044 (0.008)
Number of observations	100	100	95	68

Dependent variable: Change in log manufacturing employment between the years:

	94-98	94-99	89-99	(85-89)-(94-98)
Sum of objectives 1,2,5b and 6 over the years 1994-1998 (ECU billions)	0.038 (0.010)	0.054 (0.013)	0.065 (0.014)	0.074 (0.013)
Number of observations	100	100	95	68

Notes: WLS estimations using average population as weights. White-Huber robust standard errors in parenthesis. Units of the Structural Funds are billions of 1995 ECUs.

Table 4: Panel model for the change in total employment.

Dependent variable: Annual growth rate of total employment						
	(1)	(2)	(3)	(4)	(5)	(6)
Weighted least squares	No	Yes	Yes	Yes	Yes	Yes
Objective 1	0.035	0.020	0.014	0.0018	-0.018	-0.014
	(0.014)	(0.011)	(0.007)	(0.011)	(0.042)	(0.041)
Objective 2	0.034	0.005	-0.006	-0.058	-0.049	
	(0.045)	(0.026)	(0.028)	(0.026)	(0.026)	
Objective 5b	0.110	0.024	-0.153	-0.256	-0.267	
	(0.142)	(0.120)	(0.070)	(0.118)	(0.122)	
Objective 6	-39.58	-28.38	-0.076	-29.31	-29.29	
	(25.44)	(17.15)	(0.862)	(17.25)	(17.22)	
Interaction between obj. 1 and					0.239	0.243
sectoral composition					(0.466)	(0.454)
Fixed effects:						
By region	Yes	Yes	No	Yes	Yes	Yes
By year	No	No	Yes	Yes	Yes	Yes
Adjusted R^2	0.330	0.532	0.024	0.547	0.162	0.090
No. of observations	566	562	562	562	481	481

Notes: WLS estimations, except for model (1). Average population used as weights. White-Huber robust standard errors in parenthesis. Units of the Structural Funds are billions of 1995 ECUs.

Table 5: Panel model for the change in manufacturing employment.

Dependent variable: Annual growth rate of manufacturing employment						
	(1)	(2)	(3)	(4)	(5)	(6)
Weighted least squares	No	Yes	Yes	Yes	Yes	Yes
Objective 1	0.064 (0.035)	0.080 (0.032)	0.037 (0.013)	0.055 (0.033)	-0.114 (0.111)	-0.116 (0.112)
Objective 2	-0.046 (0.084)	-0.071 (0.066)	-0.115 (0.048)	-0.229 (0.070)	-0.220 (0.071)	
Objective 5b	0.370 (0.238)	0.241 (0.269)	-0.142 (0.122)	-0.148 (0.208)	-0.210 (0.200)	
Objective 6	-51.72 (33.50)	-35.08 (22.00)	-0.061 (1.07)	-35.92 (22.12)	-35.99 (22.10)	
Interaction between obj. 1 and sectoral composition					2.063 (1.061)	2.155 (1.064)
Fixed effects:						
By region	Yes	Yes	No	Yes	Yes	Yes
By year	No	No	Yes	Yes	Yes	Yes
Adjusted R^2	0.349	0.498	0.046	0.530	0.225	0.159
No. of observations	566	562	562	562	481	481

Notes: WLS estimations, except for model (1). Average population used as weights. White-Huber robust standard errors in parenthesis. Units of the Structural Funds are billions of 1995 ECUs.

Table 6: Panel models with Structural Funds scaled by real GDP.

	Annual growth rate of total empl.	*Annual growth rate of manuf. empl.*
Independent variables:	(1)	(2)
Lagged dependent var.		
Objective 1	0.574 *** (0.236)	1.247 ** (0.643)
Objective 2	1.672 (2.333)	-3.564 (5.107)
Objective 5b	3.490 (3.452)	10.424 (6.857)
Objective 6	-517.72 ** (289.44)	-676.71 * (368.41)
Fixed effects:		
By region	Yes	Yes
By year	No	No
R^2	0.557	0.522
No. of observations	562	562
Effect of the Structural Funds spent on average in the regions that receive some. (I.e.: average SF * coefficient)		
Objective 1 (ave=0.0262)	1.5 %	3.27 %
Objective 2 (ave=0.0006)		
Objective 5b (ave=0.0004)		
Objective 6 (ave=0.0007)	-36.24 %	-47 %

Notes: WLS estimations. Average population used as weights. White-Huber robust standard errors in parenthesis. (***) 1% significance level, (**) 5% significance level, (*) 10% significance level. Units of the Structural Funds are billions of 1995 ECUs.

Table 7: Panel models with Structural Funds scaled by regional population.

	Annual growth rate of total empl.	*Annual growth rate of manuf. empl.*
Independent variables:	(1)	(2)
Lagged dependent var.		
Objective 1	72.83 ***	133.72 *
	(28.64)	(76.39)
Objective 2	156.31	-183.60
	(188.89)	(359.92)
Objective 5b	203.36	717.53
	(250.77)	(479.11)
Objective 6	-25945.83 *	-33958.67 *
	(14450.16)	(18361.46)
Fixed effects:		
By region	Yes	Yes
By year	No	No
R^2	0.558	0.523
No. of observations	562	562
Effect of the Structural Funds spent on average in the regions that receive some. (I.e.: average SF * coefficient)		
Objective 1 (ave=0.000204)	1.48 %	2.73 %
Objective 2 (ave=0.000009)		
Objective 5b (ave=0.000006)		
Objective 6 (ave=0.000015)	-38.92 %	-50.94 %

Notes: WLS estimations. Average population used as weights. White-Huber robust standard errors in parenthesis. (***) 1% significance level, (**) 5% significance level, (*) 10% significance level. Units of the Structural Funds are billions of 1995 ECUs.

Appendix

(A.1) Expressions for $g^a\left(\bar{\rho}^a, \eta^a, t^a\right)$ and $g^b\left(h\left(.\right), \bar{\eta}^b, t^b\right)$.

$$g^a\left(\bar{\rho}^a, v^b, t\right) \equiv \frac{v^b[t^\varepsilon - (\bar{\rho}^a)^\varepsilon] - t[(\bar{\rho}^a)^\varepsilon - t^{-\varepsilon}]}{[t^\varepsilon - (\bar{\rho}^a)^{-\varepsilon}] - v^b t[(\bar{\rho}^a)^{-\varepsilon} - t^{-\varepsilon}]}$$

$$g^b\left(h(\bar{\rho}^a, v^a, t), \bar{\eta}^b, t^b\right) \equiv \frac{\bar{\eta}^b[t^\varepsilon - h^\varepsilon] - t[h^\varepsilon - t^{-\varepsilon}]}{[t^\varepsilon - h^{-\varepsilon}] - \bar{\eta}^b t[h^{-\varepsilon} - t^{-\varepsilon}]}$$

where

$$h\left(.\right) \equiv (\bar{\rho}^a)^{1-\mu}\left(\frac{1 + t^{1-\varepsilon}.\left(\bar{\rho}^a\right)^{-\varepsilon}.v^a}{t^{1-\varepsilon} + \left(\bar{\rho}^a\right)^{-\varepsilon}.v^a}\right)^{\frac{\mu}{\varepsilon-1}}$$

(A.2) Demand and cost linkages. The demand linkage is given by:

$$g_2^a\left(\bar{\rho}^a, v^b, t\right) = \frac{[t^\varepsilon - (\bar{\rho}^a)^\varepsilon].[t^\varepsilon - (\bar{\rho}^a)^{-\varepsilon}] - t^2.[(\bar{\rho}^a)^{-\varepsilon} - t^{-\varepsilon}].[(\bar{\rho}^a)^\varepsilon - t^{-\varepsilon}]}{\left[[t^\varepsilon - (\bar{\rho}^a)^{-\varepsilon}] - v^b t[(\bar{\rho}^a)^{-\varepsilon} - t^{-\varepsilon}]\right]^2}$$

and the cost linkage is given by:

$$g_1^b\left(h(\bar{\rho}^a, v^a, t), \bar{\eta}^b, t^b\right) \cdot h_2(\bar{\rho}^a, v^a, t)$$

where

$$\begin{aligned} g_1^b\left(.\right) = & -\varepsilon.\frac{\left(\bar{\eta}^b + t\right).h^{\varepsilon-1}.([t^\varepsilon - h^{-\varepsilon}] - \bar{\eta}^b t[h^{-\varepsilon} - t^{-\varepsilon}])}{([t^\varepsilon - h^{-\varepsilon}] - \bar{\eta}^b t[h^{-\varepsilon} - t^{-\varepsilon}])^2} - \\ & -\varepsilon.\frac{h^{-\varepsilon-1}.\left(1 + \bar{\eta}^b t\right).\left(\bar{\eta}^b.[t^\varepsilon - h^\varepsilon] - t.[h^\varepsilon - t^{-\varepsilon}]\right)}{([t^\varepsilon - h^{-\varepsilon}] - \bar{\eta}^b t[h^{-\varepsilon} - t^{-\varepsilon}])^2} \end{aligned}$$

$$h_2(.) = \frac{\mu}{\varepsilon - 1}\left(\bar{\rho}^a\right)^{1-\mu}.\left(\frac{1 + t^{1-\varepsilon}.\left(\bar{\rho}^a\right)^{-\varepsilon}.v^a}{t^{1-\varepsilon} + \left(\bar{\rho}^a\right)^{-\varepsilon}.v^a}\right)^{\frac{\mu-\varepsilon+1}{\varepsilon-1}}.\frac{\left(\bar{\rho}^a\right)^{-\varepsilon}.\left[t^{2(1-\varepsilon)} - 1\right]}{\left(t^{1-\varepsilon} + \left(\bar{\rho}^a\right)^{-\varepsilon}.v^a\right)^2}$$

Descriptive Statistics for the period 1994-98

REG	NAME	COUNTRY	POPULAT (Thousands)	PER CAPITA TOTAL STRUCT. FUNDS 1994-98: OBJ.1 (per capita ECUs)	OBJ.2 (per capita ECUs)	OBJ.5B (per capita ECUs)	OBJ.6 (per capita ECUs)	TOTEMPL (Thousands)	SHARE MANUF. EMPL. (%)	GROSS VALUE-ADDED: AGRSH (%)	MANSH (%)	PER CAPITA GDP (ECUs)
at1	Ostösterreich	at	3,392.6	26.03	5.19	17.46	0.00	1,548.5	27.3			24,418.5
at2	Südösterreich	at	1,767.4	0.00	19.15	45.85	0.00	755.0	31.5			17,313.3
at3	Westösterreich	at	2,890.6	0.00	5.62	27.40	0.00	1,328.3	33.4			20,868.4
be1	Région Bruxelles-capitale	be	950.6	0.00	0.00	0.41	0.00	325.2	15.7	0.02	13.76	30,625.3
be2	Vlaams Gewest	be	5,880.9	0.00	11.73	1.07	0.00	2,340.8	31.0	1.75	31.83	20,569.7
be3	Région Wallonne	be	3,315.9	109.87	25.42	5.13	0.00	1,139.2	25.1	1.87	26.25	15,891.3
de1	Baden-Württemberg	de	10,318.2	0.00	0.00	3.11	0.00	4,729.3	42.5	1.39	38.13	25,409.4
de2	Bayern	de	11,976.6	0.00	1.79	27.09	0.00	5,698.3	37.2	1.56	32.86	25,453.4
de3	Berlin	de	3,460.2	136.25	48.59	0.00	0.00	1,571.8	24.3			21,254.5
de4	Brandenburg	de	2,548.6	641.81	0.00	0.00	0.00	1,095.3	34.2			13,350.4
de5	Bremen	de	678.8	0.00	75.70	0.00	0.00	278.6	29.9	0.26	30.30	30,838.8
de6	Hamburg	de	1,705.6	0.00	0.00	0.00	0.00	776.7	23.4	0.33	19.36	39,281.9
de7	Hessen	de	6,002.7	0.00	4.64	8.11	0.00	2,649.7	33.1	0.76	26.54	30,198.4
de8	Mecklenburg-Vorpommern	de	1,824.7	743.93	0.00	0.00	0.00	779.5	30.2			12,331.1
de9	Niedersachsen	de	7,759.9	0.00	6.87	22.44	0.00	3,299.3	33.5	3.53	31.66	21,042.8
dea	Nordrhein-Westfalen	de	17,876.1	0.00	20.81	0.66	0.00	7,313.2	36.5	0.80	34.98	22,624.0
deb	Rheinland-Pfalz	de	3,974.3	0.00	8.10	13.06	0.00	1,701.5	36.5	1.92	34.93	19,650.2
dec	Saarland	de	1,083.5	0.00	55.81	11.68	0.00	415.7	35.1	0.38	36.06	21,698.8
ded	Sachsen	de	4,564.8	585.64	0.00	0.00	0.00	1,905.3	37.8			12,777.9
dee	Sachsen-Anhalt	de	2,740.0	639.42	0.00	0.00	0.00	1,128.3	35.0			12,363.2
def	Schleswig-Holstein	de	2,725.2	0.00	7.75	20.99	0.00	1,221.7	27.0	2.76	27.47	21,133.2
deg	Thüringen	de	2,504.5	589.44	0.00	0.00	0.00	1,077.1	36.7			12,249.8
dk	Denmark	dk	5,246.7	0.00	12.92	4.84	0.00	2,614.6	26.5	3.97	27.37	25,103.0
es11	Galicia	es	2,725.1	831.60	0.00	0.00	0.00	912.2	26.0	9.17	29.12	8,976.1
es12	Principado de Asturias	es	1,073.9	801.67	0.00	0.00	0.00	309.3	29.9	2.63	35.00	10,653.9
es13	Cantabria	es	526.6	997.10	0.00	0.00	0.00	158.2	31.3	4.48	30.28	11,009.9
es21	Pais Vasco	es	2,072.7	0.00	224.43	7.75	0.00	692.2	36.9	2.14	39.75	13,431.7
es22	Navarra	es	525.9	0.00	68.92	89.60	0.00	189.9	40.0	4.62	40.74	13,813.7
es23	La Rioja	es	260.6	0.00	61.13	87.80	0.00	86.9	40.7	8.11	33.78	12,964.6
es24	Aragón	es	1,181.2	0.00	46.74	182.02	0.00	407.1	33.5	5.42	32.03	12,790.2
es3	Comunidad de Madrid	es	5,011.9	0.00	30.50	5.52	0.00	1,684.7	26.1	0.23	24.84	14,274.5
es41	Castilla y León	es	2,512.7	770.78	0.00	0.00	0.00	771.9	28.9	8.51	32.94	10,708.2
es42	Castilla-la Mancha	es	1,690.3	907.58	0.00	0.00	0.00	496.8	33.8	11.00	31.00	9,478.4

Descriptive Statistics for the period 1994-98

REG	NAME	COUNTRY	POPULAT (Thousands)	PER CAPITA TOTAL STRUCT. FUNDS 1994-98: OBJ.1 (per capita ECUs)	OBJ.2 (per capita ECUs)	OBJ.5B (per capita ECUs)	OBJ.6 (per capita ECUs)	TOTEMPL (Thousands)	SHARE MANUF. EMPL. (%)	GROSS VALUE-ADDED: AGRSH (%)	MANSH (%)	PER CAPITA GDP (ECUs)
es43	Extremadura	es	1,073.8	1,202.64	0.00	0.00	0.00	278.0	23.6	9.14	25.99	7,857.3
es51	Cataluña	es	6,066.2	0.00	124.64	13.23	0.00	2,170.5	37.7	1.48	34.82	14,109.4
es52	Comunidad Valenciana	es	3,908.0	490.33	0.00	0.00	0.00	1,284.9	35.5	3.15	31.50	10,874.8
es53	Baleares	es	727.5	0.00	19.49	26.13	0.00	269.2	23.9	1.64	15.03	14,525.0
es61	Andalucia	es	7,111.9	633.78	0.00	0.00	0.00	1,814.9	22.6	8.62	22.93	8,316.6
es62	Murcia	es	1,080.9	562.55	0.00	0.00	0.00	336.5	28.8	7.11	27.60	9,828.3
es63	Ceuta y Melilla	es	132.4	1,041.85	0.00	0.00	0.00	35.5	9.1	0.62	8.93	9,874.9
es7	Canarias	es	1,556.1	815.36	0.00	0.00	0.00	491.3	18.2	3.11	15.93	10,941.4
fi1	Manner-Suomi	fi	5,089.4	0.00	16.65	17.02	48.94	2,042.4	27.4	5.92	33.33	18,066.4
fi2	Åland	fi	25.2	0.00	0.00	77.26	0.00	11.2	19.9	8.66	14.30	22,763.7
fr1	Île de France	fr	11,022.8	0.00	0.00	0.00	0.00	4,698.2	20.5	0.29	25.77	30,814.3
fr21	Champagne-Ardenne	fr	1,351.6	0.00	48.64	11.90	0.00	475.7	27.4	12.29	32.55	17,956.8
fr22	Picardie	fr	1,863.5	0.00	87.07	0.00	0.00	639.2	33.0	6.12	34.27	16,243.0
fr23	Haute-Normandie	fr	1,779.8	0.00	108.21	2.48	0.00	684.5	32.5	3.15	36.52	20,382.1
fr24	Centre	fr	2,440.8	0.00	13.03	16.30	0.00	939.4	31.3	5.91	33.24	17,613.6
fr25	Basse-Normandie	fr	1,416.9	0.00	41.10	47.94	0.00	479.7	28.7	6.22	32.23	17,083.0
fr26	Bourgogne	fr	1,622.6	0.00	24.65	41.05	0.00	614.0	30.3	6.72	30.50	17,319.4
fr3	Nord - Pas-de-Calais	fr	4,000.2	46.05	80.89	0.00	0.00	1,258.3	30.8	1.99	32.32	16,434.2
fr41	Lorraine	fr	2,307.7	0.00	50.85	25.13	0.00	841.7	31.9	2.92	34.52	17,035.8
fr42	Alsace	fr	1,698.3	0.00	16.47	14.28	0.00	683.8	36.3	3.08	37.17	20,320.9
fr43	Franche-Comté	fr	1,115.1	0.00	54.71	40.04	0.00	436.8	39.1	3.97	40.86	17,731.9
fr51	Pays de la Loire	fr	3,158.7	0.00	49.29	22.23	0.00	1,231.4	31.8	6.08	31.25	17,389.2
fr52	Bretagne	fr	2,864.1	0.00	31.65	44.43	0.00	1,114.0	25.7	7.51	25.73	16,373.4
fr53	Poitou-Charentes	fr	1,627.0	0.00	44.27	48.75	0.00	620.7	26.2	7.42	27.90	15,899.2
fr61	Aquitaine	fr	2,879.9	0.00	41.81	52.68	0.00	1,120.6	22.5	7.32	25.91	17,593.2
fr62	Midi-Pyrénées	fr	2,506.6	0.00	14.67	61.94	0.00	945.0	25.2	4.72	26.97	16,594.4
fr63	Limousin	fr	717.7	0.00	0.00	116.51	0.00	261.3	24.9	3.78	28.92	15,604.8
fr71	Rhône-Alpes	fr	5,605.4	0.00	14.38	15.18	0.00	2,298.6	30.9	2.47	35.43	19,289.7
fr72	Auvergne	fr	1,314.9	0.00	61.00	87.30	0.00	480.3	26.7	4.66	30.99	16,029.4
fr81	Languedoc-Roussillon	fr	2,246.0	0.00	33.10	31.38	0.00	734.5	19.0	6.37	21.16	15,082.9
fr82	Provence-Alpes-Côte d'Azur	fr	4,456.6	0.00	23.07	12.25	0.00	1,492.9	19.5	2.69	21.60	17,639.7
fr83	Corse	fr	259.4	502.27	0.00	0.00	0.00	59.4	15.7	2.75	21.75	15,722.9
gr1	Voreia Ellada	gr	3,377.9	907.63	0.00	0.00	0.00	1,275.2	23.6	22.05	28.79	8,229.0
gr2+3	Kentriki Ellada and	gr	6,076.9	585.50	0.00	0.00	0.00	2,207.0	23.8	10.41	25.75	8,729.1

Descriptive Statistics for the period 1994-98

REG	NAME	COUNTRY	POPULAT (Thousands)	PER CAPITA TOTAL STRUCT. FUNDS 1994-98: OBJ.1 (per capita ECUs)	OBJ.2 (per capita ECUs)	OBJ.5B (per capita ECUs)	OBJ.6 (per capita ECUs)	TOTEMPL (Thousands)	SHARE MANUF. EMPL. (%)	GROSS VALUE-ADDED: AGRSH (%)	MANSH (%)	PER CAPITA GDP (ECUs)
gr4	Attiki Nisia Aigaiou, Kriti	gr	1,008.3	1,382.01	0.00	0.00	0.00	376.9	16.5	23.53	14.13	8,839.8
ie	Ireland	ie	3,627.3	1,144.07	0.00	0.00	0.00	1,323.9	28.1	7.73	40.19	14,420.0
it11	Piemonte	it	4,295.8	0.00	34.33	5.81	0.00	1,690.9	40.5	2.79	35.87	17,492.3
it12	Valle d'Aosta	it	118.8	0.00	59.85	8.88	0.00	51.2	22.9	2.46	25.19	19,565.3
it13	Liguria	it	1,655.5	0.00	50.37	11.52	0.00	578.8	24.1	2.43	23.48	17,889.5
it2	Lombardia	it	8,936.8	0.00	3.15	1.04	0.00	3,677.6	42.0	1.83	37.78	19,732.9
it31	Trentino-Alto Adige	it	913.7	0.00	0.00	21.43	0.00	387.0	27.3	4.95	25.65	18,977.7
it32	Veneto	it	4,438.5	0.00	13.09	12.00	0.00	1,814.9	41.2	3.68	35.31	18,344.2
it33	Friuli-Venezia Giulia	it	1,188.8	0.00	24.52	11.75	0.00	463.2	34.0	2.78	28.02	18,717.0
it4	Emilia-Romagna	it	3,931.3	0.00	3.47	3.64	0.00	1,673.6	35.1	4.22	32.86	19,636.1
it51	Toscana	it	3,525.9	0.00	30.45	15.50	0.00	1,352.5	34.3	2.40	30.61	16,495.7
it52	Umbria	it	825.8	0.00	23.56	108.94	0.00	299.1	31.9	4.73	29.79	14,708.3
it53	Marche	it	1,444.2	0.00	14.90	32.64	0.00	563.1	39.3	3.94	31.92	15,739.7
it6	Lazio	it	5,208.1	0.00	6.73	5.16	0.00	1,817.1	20.0	1.81	18.32	16,997.4
it71	Abruzzo	it	1,270.2	458.11	0.00	0.00	0.00	443.7	32.4	4.88	29.58	13,438.7
it72	Molise	it	331.2	1,009.18	0.00	0.00	0.00	105.5	27.4	5.84	26.25	11,642.5
it8	Campania	it	5,759.9	139.82	0.00	0.00	0.00	1,512.3	23.4	3.82	20.35	9,949.1
it91	Puglia	it	4,080.4	287.78	0.00	0.00	0.00	1,148.0	25.3	7.67	21.53	10,701.3
it92	Basilicata	it	609.9	1,374.23	0.00	0.00	0.00	171.8	29.5	7.68	26.52	10,234.6
it93	Calabria	it	2,075.3	555.18	0.00	0.00	0.00	538.5	18.4	6.38	16.69	8,888.1
ita	Sicilia	it	5,082.3	269.80	0.00	0.00	0.00	1,291.3	19.5	6.13	19.84	9,972.5
itb	Sardegna	it	1,660.4	751.08	0.00	0.00	0.00	494.2	23.1	5.28	23.56	11,137.1
lu	Luxembourg	lu	412.5	0.00	23.51	6.44	0.00	165.7	24.0	2.20	34.90	32,311.3
nl1	Noord-Nederland	nl	1,627.9	0.00	39.27	24.34	0.00	650.4	25.9	4.42	37.66	18,590.1
nl2	Oost-Nederland	nl	3,201.6	30.39	33.06	2.05	0.00	1,371.2	26.3	4.18	26.96	16,826.3
nl3	West-Nederland	nl	7,243.7	0.00	0.00	0.77	0.00	3,178.6	18.2	2.78	20.45	20,755.5
nl4	Zuid-Nederland	nl	3,422.6	0.00	27.66	2.72	0.00	1,494.6	29.4	3.58	32.69	18,684.4
pt11	Norte	pt	3,531.9	537.30	0.00	0.00	0.00	1,603.9	42.7			7,159.5
pt12	Centro	pt	1,711.9	884.67	0.00	0.00	0.00	865.5	30.7			6,924.9
pt13	Lisboa e Vale do Tejo	pt	3,310.4	367.25	0.00	0.00	0.00	1,496.2	26.1			10,240.6
pt14	Alentejo	pt	523.9	1,549.72	0.00	0.00	0.00	205.2	24.6			6,792.8
pt15	Algarve	pt	345.5	1,009.74	0.00	0.00	0.00	146.1	17.7			8,105.7
pt2	Açores	pt	241.5	10,875.80	0.00	0.00	0.00	89.4	23.2			5,730.2
pt3	Madeira	pt	257.3	6,298.00	0.00	0.00	0.00	108.7	31.0			6,202.7
se01	Stockholm	se	1,724.3	0.00	0.00	0.00	0.00	818.5	16.9	0.21	18.88	25,119.2
se02	Östra	se	1,497.0	0.00	10.60	11.37	0.00	678.9	28.7	2.93	33.85	18,838.0

Descriptive Statistics for the period 1994-98

				PER CAPITA TOTAL STRUCT. FUNDS 1994-98						GROSS VALUE-ADDED		
REG	NAME	COUNTRY	POPULAT (Thousands)	OBJ.1 (per capita ECUs)	OBJ.2 (per capita ECUs)	OBJ.5B (per capita ECUs)	OBJ.6 (per capita ECUs)	TOTEMPL (Thousands)	SHARE MANUF. EMPL. (%)	AGRSH (%)	MANSH (%)	PER CAPITA GDP (ECUs)
se04	Mellansverige Sydsverige	se	1,260.7	0.00	9.10	0.00	0.00	496.8	26.9	2.15	30.97	19,115.1
se06	Norra Mellansverige	se	860.3	0.00	0.00	10.16	64.11	413.2	29.2	3.75	36.00	19,935.3
se07	Mellersta Norrland	se	393.1	0.00	34.56	0.00	64.07	321.2	27.3	4.62	31.31	20,621.3
se08	Övre Norrland	se	525.0	0.00	64.24	12.08	63.92	269.0	25.0	3.51	30.56	20,199.0
se09	Småland med öarna	se	802.5	0.00	0.00	20.14	0.00	176.3	23.1	3.99	37.01	20,203.0
se0a	Västsverige	se	1,756.9	0.00	10.03	11.84	0.00	234.7	23.7	1.87	32.90	19,947.9
ukc	North East	uk	2,604.2	0.00	127.64	6.73	0.00	1,057.0	31.1			12,681.9
ukd	North West (incl.Merseyside)	uk	6,894.5	63.40	46.27	0.00	0.00	2,949.3	29.4			13,607.3
uke	Yorkshire and The Humber	uk	4,984.2	0.00	60.12	0.00	0.00	2,207.0	30.3	1.94	36.66	13,570.1
ukf	East Midlands	uk	4,133.8	0.00	18.74	4.76	0.00	1,919.7	34.1	2.68	40.00	14,234.1
ukg	West Midlands	uk	5,312.9	0.00	72.84	2.41	0.00	2,366.3	34.7	1.94	38.95	13,944.5
ukh1	East Anglia	uk	2,132.3	0.00	0.00	9.80	0.00	1,003.5	27.9	5.05	30.39	14,904.2
ukj	South East	uk	18,335.9	0.00	4.96	0.00	0.00	8,621.1	21.2			17,128.4
ukk	South West	uk	4,835.0	0.00	8.56	22.57	0.00	2,232.5	25.3	3.22	29.56	14,163.4
ukl	Wales	uk	2,874.6	0.00	71.41	37.56	0.00	1,188.1	29.9	2.26	37.00	12,667.8
ukm	Scotland	uk	5,131.0	40.49	82.85	14.76	0.00	2,261.8	27.0	2.76	31.61	14,743.9
ukn	Northern Ireland	uk	1,648.5	467.64	0.00	0.00	0.00	634.8	26.0	4.28	28.79	12,229.8
	Total EU-15		371,546.4	156.66	20.63	9.91	0.98	149,987.4	29.9			17,419.8

Notes: 1) All amounts are in constant ECUs .
2) Agriculture and manufacturing refer to the NACE classifications b01 "Agricultural, forestry and fishery products" and b02 "Manufactured products" respectively.
3) Population, total and manufacturing employment are averages for the period 1994-98.
4) The shares of agriculture and manufacturing in total gross value-added are also averages over the period 1994-96, except for the figures in cursive that are averages over the period 1990-92.
5) The data on per capita GDP is the average over the period 1994-96 for both, the regions and the total EU-15.
6) The per capita Structural Funds for the EU-15 are calculated including all the regions, i.e., those who receive funds and those who do not receive them.
7) No data available for the cells in blank.

Regions eligible for Objectives 1, 2, 5b and 6 during 1994-99.

	OBJECTIVE 1	**OBJECTIVE 2**	**OBJECTIVE 5b**	**OBJECTIVE 6**
AUSTRIA	Burgenland (East Austria)	East Austria West Austria South Austria	East Austria West Austria South Austria	None
BELGIUM	Hainut (Wallonia)	Liège (Wallonia) Limburg (Flanders) Antwerpen (Flanders)	Namur (Wallonia) Luxembourg (Wallonia) West and East Vlaanderen (Flanders)	None
FINLAND	None	Continental Finland	Islands	Continental Finland
FRANCE	Ultramar departments Corsica Nord-Pas-de-Calais (partially)	All the country but the Ultramar departments, Corsica, Île-de-France and Limousin	All the country but Nord-Pas-de-Calais, Picardy and Île-de-France	None
GERMANY	Mecklenburg-Vorpommern Berlin Brandenburg Sachsen-Anhalt Thüringen Sachsen			None
GREECE	All the country	None	None	None
IRELAND	All the country	None	None	None
ITALY	Abruzzi Molise Campania Apulia Basilicata Calabria Sicily Sardinia	Rest of the country except for Trentino-Alto Adige	Rest of the country	None

Regions eligible for Objectives 1, 2, 5b and 6 during 1994-99.

	OBJECTIVE 1	**OBJECTIVE 2**	**OBJECTIVE 5b**	**OBJECTIVE 6**
LUXEMBOURG	None	All the country	All the country	None
NETHERLANDS	East Netherlands	North Netherlands South Netherlands	All the country	None
PORTUGAL	All the country	None	None	None
SPAIN	Galicia Asturias Cantabria Castilla-León Castilla-La Mancha Extremadura Valencia Murcia Andalucía Ceuta y Melilla Canarias	Cataluña Aragón Navarra Rioja País Vasco Madrid Baleares	Cataluña Aragón Navarra Rioja País Vasco Madrid Baleares	None
SWEDEN	None	Upper Norrland Central Norrland Northern Middle Sweden Eastern Middle Sweden West Sweden South Sweden	All the country	Upper Norrland Central Norrland Northern Middle Sweden
U.K.	Northern Ireland Merseyside (Northwest) Highlands and Enterprise area (Scotland)	North Yorkshire and Humberside North West East Midlands West Midlands Wales South East South West	North Yorkshire and Humberside North West East Midlands East Anglia West Midlands Wales South West	None