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Interregional Income Redistribution and Convergence in a Model with Perfect Capital Mobility and Unionized Labor Markets

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Abstract

The model presents a general equilibrium dynamic model of an economy consisting of many regions. Capital is perfectly mobile and labor is immobile across regions. Wages are determined by local unions. There is training on the job and strategic complementarity between investment in physical capital by firms and investment in becoming "trainable" by workers. Structurally similar regional economies preserve forever their differences in per capita output and employment rate, if the workers' non-labor income is equalized across regions by interregional income redistribution operated via central budget. Regional decentralization of income redistribution allows convergence in per capita output and employment rate.

Keywords: growth, on-the-job training, skilled labor, strategic complementarity, fiscal transfers

JEL Code: J24, J51, J64, O41, R11

1. Introduction

The value added of the general equilibrium dynamic model presented in this paper consists in combining unemployment theory and growth theory in order to improve understanding of the relevant mechanisms through which disparities in per capita output and employment rates may persist across regions. In particular, the focus is on the role that interregional fiscal transfers may play in the process of convergence in levels across regions. In this regard, the paper can contribute to clarify the long-term implications of those programs that redistribute income across regions or across countries of a union (or across states of a union) via central budgets. Therefore, the conclusions of the paper can be relevant for the debate on the merits of fiscal federalism and on the degrees of centralization of redistribution both at the national and at the supernational level.

The paper is strongly motivated by the recent experience of continental Europe. In the last two decades, indeed, differences in GDP per capita between European regions have appeared to be quite persistent. Typically, regions with lower level of GDP per capita tend to be those having the higher rate of unemployment, and regions which had the lowest unemployment rates at the beginning of the 1980s still tend to have the lowest rates at the end of the 1990s (European Commission, 1999). However, in spite of long-lasting (and rising) differentials in regional unemployment rates, interregional migration flows have

declined and then remained very low in the last two decades[1]: in contrast to the USA, where migration flows are important to accommodate region-specific shocks (see Blanchard and Katz, 1992),[2] the adjustment pattern in countries like Italy and Germany seem to involve larger and more persistent changes in labor-market participation (see Obstfeld and Peri, 1998).[3] As a result, it is often the case that depressed areas exhibit lower rates of labor force participation and wages do not seem to be particularly sensitive to local labor market imbalances.

It is often argued that generous transfers and (relatively) uniform social benefits tend to disproportionally depress work incentives for residents in poorer areas (e.g., Bertola, 2001), raising their reservation wages, discouraging their labor-market participation and lowering their propensity to migrate. Consistently with this view, a strand of literature emphasizes that region policies and long-lasting inflows of public resources to less developed regions "do not appear to enhance the capacity of these regions, and hence offer no prospect that future transfers will no longer be needed. Instead, they simply redistribute income. If income distribution is a key concern, such transfers will therefore be needed in perpetuity" (Boldrin and Canova, 2001, p. 211). This is because they "facilitate postponement of any necessary adjustment in labour force and relative prices" (Obstfeld and Peri, 1998, p. 242). Hence, "the sharp distinction. . . between the redistribution and stabilization functions of fiscal transfers, while conceptually valid, is overdrawn in practice" (Obstfeld and Peri, 1998, p. 209). In brief, "open-ended transfers. . . are not a mode of regional adjustment to permanent shocks. Instead they finance regional *non-adjustment* indefinitely" (Obstfeld and Peri, 1998, p. 211, italics in the original).

Since the present paper does not aim at studying the effects of a particular aspect of the welfare system, but the overall impact of all those public policies that directly or indirectly redistribute income across households located in different regions (or states), the model presented here assumes that the fiscal authorities collect a fixed proportion of total output and redistribute in equal amount to all the households. In this way, the paper allows to compare a framework in which a centralized authority collects taxes and makes transfers nationwide (or in the whole union) with a framework in which the transfers to the households living in a certain region (or state) can be financed only by taxing the economic activities located in that region (or state). The geographical level at which redistribution takes place matters for the convergence in per capita output and employment rate among regions (or states). In the model, indeed, capital is mobile and tends to flow into those regions (states) where an abundant supply of complementary factors (workers trained on the job and workers in possession of the basic knowledge that make them trainable on the job) is available at convenient wage levels. Poorer regions (states) are those which suffered in the past for the scarcity of good jobs in firms where newly hired workers can acquire skills. Therefore, they tend to be less endowed with skilled labor and to offer fewer opportunities for training on the job. As a consequence, the population living in these areas is less inclined to invest in the acquisition of that basic knowledge that is required for being employable (and trainable) by firms offering good jobs. Hence, in a context where labor is practically immobile across regions (states), the poorer regions (states) can exit from this "trap" if they succeed in attracting (physical) capital thanks to a cheaper labor cost. However, generous interregional transfers in support of households tend to equalize the wages across regions (states), thus

contributing to perpetuate initial differences in per capita GDP and employment rate. Indeed, in the absence of such interregional transfers, each region (state) could rely only on its own tax base, and poorer regions (states) could not afford to offer the same monetary transfers and welfare entitlements guaranteed by the richer regions (states) to their citizens. This is exactly the intuition underlying the main formal result of this paper, namely that convergence in per capita output and employment rate among structurally similar regions (states) characterized by different initial conditions can occur only in the absence of redistribution across regions (or states).

The paper is thus organized: Section 2 presents the model; Section 3 characterizes the equilibrium path of the economy; Section 4 shows that regional disparities become permanent when there is interregional redistribution; Section 5 shows that regional disparities may disappear in the long run when there is no interregional redistribution; Section 6 concludes.

2. The Model

The infinite-horizon economy under consideration consists of J regions, $J \geq 2$. All regions share the same structural and institutional features: they are assumed to have the same parameter values and modalities of wage determination.[4] Thus, the regions may differ only with respect to their initial conditions. In this economy, there are firms (that produce by renting physical capital), investors (that are the owners of the productive assets) and workers (that consume their entire income).

2.1. Population's Dynamics

Time is discrete, and individuals are finitely lived: they have a strictly positive and constant probability $\sigma (0 < \sigma < 1)$ of dying in each period t. Thus, the probability of dying in a certain period is assumed to be independent of the age of the individual; and it is also assumed that the mortality rate of each large group of individuals does not fluctuate stochastically even though each individual's lifespan is uncertain. This implies that at the end of t a constant fraction σ of individuals living in region j dies, while a new cohort is born at the beginning of the following period. Assuming that $\xi (0 < \xi < 1)$ is the birth rate, the workers' population P_{jt} evolves in each region according to

$$P_{jt+1} = P_{jt}(1 + \xi - \sigma), \quad P_{j0} \text{ given } \forall j. \tag{1}$$

2.2. The Firms

In each region, there is a continuum—of measure $n > 0$—of locations. In each location $i \in [0, n]$ there is a large number (normalized to be one) of identical firms. Locations differ with respect to the specific shock affecting them in each period. Indeed, in each period t the representative firm located in i produces some amount of Y_t, which is the unique good

produced in this economy (the numéraire of the system), according to the technology

$$Y_{jit} = x_{it} K_{jit}^{1-\alpha} (S_{jit} + \Omega A_{jit})^{\alpha}, \quad 0 < \alpha < 1, \quad 0 < \Omega < 1, \tag{2}$$

where x_{it} is a random variable taking a value in t which is specific to the i location, K_{jit} is the physical capital that the i firm borrowed at the beginning of t to carry out production, S_{jit} are the experienced workers (the "skilled workers") employed by the i firm in t, A_{jit} are the newly hired workers (the "apprentices") of the i firm in t. Note that the apprentices are less productive than the skilled workers ($\Omega < 1$), and that aggregate output in region j is given by $Y_{jt} = \int_0^n Y_{jit}\, di$.

The random variable x_{it} is assumed to be uniformly distributed on the interval $[0, n]$. Moreover, it is identically distributed across locations and periods, and independently distributed across periods. In each t, x_{it} takes a different value in each location, with x_{it} varying continuously across locations. This implies that the average value of x_{it} across locations is not a random variable and does not fluctuate in time, even though individual firms are uncertain about their local x_{it} (no aggregate uncertainty). Assuming that there is a tax on output, the period net profits π_{jit}^n (after taxes and net of the cost of capital) of the i firm are given by:

$$\pi_{jit}^n = \pi_{jit}^g - (r_t + \delta) K_{jit}, \quad 0 < \delta < 1, \tag{3}$$

where $\pi_{jit}^g = (1 - \tau) Y_{jit} - v_{jit} S_{jit} - e_{jit} A_{jit}$, $0 < \tau < 1$, are the firm's gross profits, τ is the (fixed) tax rate, v_{jit} is the real wage paid by the i firm to the skilled workers employed in t, e_{jit} is the entry wage paid by the i firm to the apprentices hired in t, δ is a capital depreciation parameter, and r_t is the (real) interest rate, i.e. the market rate at which firms borrowed capital at the beginning of t. Interest payment and reimbursement of principal are due at the end of t. The interest rate is unique because capital is perfectly mobile across regions and locations at the beginning of each t, while mobility is infinitely costly within the period: once borrowed and installed at the beginning of t, a firm's capital stock must remain fixed until the end of t.

2.3. The Investors

There is a large number (normalized to be one) of identical investors who are the firms' owners: for simplicity and without loss of generality, it is assumed that all investors are entitled to receive an equal share of the firms' net profits. Being the owners of the firms' productive assets, investors must decide in each t what fraction of their gross returns on wealth to spend on consumption rather than on buying productive assets to be lent at the beginning of $t + 1$ to firms. Hence, the problem of the representative investor amounts to deciding a contingency plan for consumption C_t^{in} and holding of productive assets K_{t+1} in order to maximize:

$$\sum_{t=0}^{\infty} \theta^t z\left(C_t^{\text{in}}\right), \quad \theta \equiv \gamma(1 - \sigma), \quad 0 < \gamma \leq 1, \tag{4}$$

subject to $K_{t+1} + C_t^{\text{in}} \leq (1 + r_t)K_t + \pi_t^n$, K_0 given, $\pi_t^n = \sum_{j=1}^{J} \int_0^n \pi_{jit}^n \, di$, where

$$z\left(C_t^{\text{in}}\right) = \begin{cases} \dfrac{\left(C_t^{\text{in}}\right)^{1-\zeta}}{1-\zeta} & \text{if } \zeta \geq 0, \zeta \neq 1 \\ \ln\left(C_t^{\text{in}}\right) & \text{if } \zeta = 1, \end{cases}$$

γ is a time-preference parameter and π_t^n are aggregate (net) profits. Expectations are rational, in the sense that they are consistent with the model and are formed by optimally processing the available information. Since there is uncertainty only at the local level, investors have perfect foresight on the behavior of aggregate variables. Moreover, it is immaterial where the investors are located, since there is a single market both for capital and for the only good produced in this J-regions economy (no transportation cost). Finally—for simplicity and without loss of generality—it is assumed that the wealth of someone who dies is inherited by some newly born individual (accidental bequests).

2.4. The Skilled Workers

Skilled workers have been trained on the job while working in a firm for at least one period, while apprentices are workers with no work experience in the formal economy, but who have been hired by a firm after having invested to acquire the required basic knowledge. In their lives, workers never lose the general skills that they have acquired on the job. Being general, the skills are perfectly transferable. It is also assumed that interregional labor mobility is infinitely costly. Thus, the skilled workforce evolves in each region according to

$$M_{jt+1} = (1-\sigma)(M_{jt} + A_{jt}), \quad M_{jt} = \int_0^n M_{jit} di, \quad M_{j0} \text{ given } \forall j,$$
$$A_{jt} = \int_0^n A_{jit} \, di, \tag{5}$$

where M_{jit} are the skilled workers of region j located in i during period t.

As in Blanchflower and Oswald (1994), workers choose location (within their region) ex ante (at the beginning of each t), while firms decide on labor input once uncertainty is resolved. As for capital, labor is perfectly mobile across locations (of the same region) at the beginning of each period t, while mobility across locations is infinitely costly within a period.[5]

Once located in i, a skilled worker has the following period expected utility:

$$u_{jit}^{sk} = E_t[p_{jit} u(w_{jt} + v_{jit}) + (1 - p_{jit}) u(\eta w_{jt})], \quad \eta > 1,$$
$$u(.) = \begin{cases} \dfrac{(.)^{1-\varphi}}{1-\varphi} & \text{if } \varphi \geq 0, \quad \varphi \neq 1 \\ \ln(.) & \text{if } \varphi = 1, \end{cases} \tag{6}$$

where E_t is an expectation operator conditional on the information available in t as the realization of x_{it} is not yet known, w_{jt} is the workers' non-labor income (namely the monetized value of the welfare entitlements and government transfers made to all workers of region j), and p_{jit} is the fraction of the skilled workforce located in i that is employed in t:

$$p_{jit} = \begin{cases} \dfrac{S_{jit}}{M_{jit}} & \text{if } S_{jit} \leq M_{jit} \\ 1 & \text{otherwise.} \end{cases} \tag{7}$$

Finally, $\eta > 1$ captures the fact that an unemployed worker can enjoy more leisure (and/or undertake some activity in the informal segment of the labor market).

At the beginning of each period, a skilled worker decides in what location to stay (within his/her region). Obviously, s/he locates where s/he can expect to enjoy the highest lifetime utility. Therefore, the discounted sequence of utilities that an optimizing skilled worker can expect (before the realization of x_{it}) to gain in the rest of his/her lifetime is given by

$$U^{sk}_{jt} = u^{sk}_{ji^*t} + \phi U^{sk}_{jt+1}, \quad \phi \equiv \beta(1-\sigma), \quad 0 < \beta < 1. \tag{8}$$

In (8), β is a time-preference parameter, and i^* is the location where a skilled worker living in region j can have the best prospects (a "best location")[6]: $u^{sk}_{ji^*t} \geq u^{sk}_{jit}\ \forall i$.

2.5. *The Trainable Workers*

An investment in human capital at the beginning of period t in order to become "trainable" (or "employable" in the formal segment of the labor market) yields a strictly positive probability of being employed by a firm only in that period, since the basic knowledge acquired by a person is dissipated if it is not used on the job. Moreover, possession of the basic knowledge required by the firms has no value in the informal economy. Hence, the investment made in order to participate in the formal labor market will be lost, if within one period, the worker does not find an entry job paid at least as his/her reservation wage: after having invested in human capital, a trainable worker will accept any job offer paying an entry wage larger than his/her reservation wage. Finally, also a trainable worker decides to stay in that location within his/her region where s/he can expect to enjoy the highest lifetime utility. Thus, the discounted sequence of utilities that an optimizing trainable worker can expect (before the realization of x_{it}) to gain in the rest of his/her lifetime is given by

$$U^{tr}_{jt} = E_t\left\{q_{ji^*t}\left[u(w_{jt} + e_{ji^*t}) + \phi U^{sk}_{jt+1}\right] + (1 - q_{ji^*t})\left[u(\eta w_{jt}) + \phi U^{\text{un}}_{jt+1}\right]\right\}. \tag{9}$$

In (9), U^{un}_{jt+1} is the discounted sequence of utilities that an optimizing unskilled worker still alive at the beginning of $t+1$ can expect to get in the rest of his/her lifetime, $u(w_{jt} + e_{jit}) \geq$ $\geq u(w_{jt} + e^{\min}_{jt}) = u(\eta w_{jt}) - \phi(U^{sk}_{jt+1} - U^{\text{un}}_{jt+1})$, where $e^{\min}_{jt}$ is the reservation wage, i^* is a best location for a trainable worker living in region j,[7] and q_{jit} is the fraction of the trainable

workforce located in i that is hired in period t:

$$q_{jit} = \begin{cases} \dfrac{A_{jit}}{L_{jit}} & \text{if } A_{jit} \leq L_{jit} \\ 1 & \text{otherwise,} \end{cases} \tag{10}$$

where L_{jit} is the trainable workforce located in i.

2.6. The Unskilled Workers

At the beginning of each t, an unskilled worker decides whether to incur the utility loss associated with participation in the formal labor market (i.e., with the acquisition of the basic knowledge required by the firms operating in the formal economy)[8] or to remain out of the formal labor market: an unskilled worker can be hired by a firm only if s/he becomes trainable. An unskilled worker who decides not to invest in human capital has the same lifetime prospects as a trainable worker who does not find an entry job after having incurred the utility loss entailed by this investment. Thus, an optimizing unskilled worker expects at the beginning of t to get the lifetime discounted sequence of utilities associated with the best available alternative:

$$U_{jt}^{\text{un}} = \max\left\{-h(c) + U_{jt}^{\text{tr}},\ u(\eta w_{jt}) + \phi U_{jt+1}^{\text{un}}\right\}, \quad h' > 0, \tag{11}$$

where $-h(\text{c})$, captures the disutility of acquiring the required basic knowledge (c is the monetized value of this disutility).

2.7. Wage Determination

An insider-outsider scenario is considered. In each location, the wages are determined by negotiations held at the beginning of every period between a local union unconcerned about the interests of workers with no work experience and the local employers' association. In this context, it is immaterial whether the unions are only concerned about the workers employed in the previous period, or about both the latter and those experienced workers who were laid off in previous periods. In fact, even if the wage setters do not care about the interests of the skilled workers on layoff, the latter put pressure on them, insofar as they are perfect substitutes and thereby reduce the job security of the employed.

The union operating in i negotiates the wage that all the firms of i pay to the employed skilled workers, while each individual firm takes its decisions on the demand for labor and capital in full autonomy. This negotiation also concerns the entry wage, which is established as the fixed fraction μ of the skilled workers' wage that firms must pay to the apprentices ($e_{jit} = \mu v_{jit}$). It is realistic to assume that the union does not allow the wage differential between skilled workers and apprentices fully to offset their productivity differential ($\Omega < \mu \leq 1$), so that any incentive for the firms to replace experienced workers with apprentices is suppressed.[9]

The bargaining process can be represented as if each union unilaterally sets the real wage in the awareness of its impact on the local firms' decisions. On the other hand, each union is

aware that the effects of its wage policy on the economy as a whole is negligible. Similarly, each single firm perceives that its decisions on labor and capital input cannot influence the wage setting process because their impact is insignificant relatively to the size of the local labor market. Since the real wage, once negotiated, remains fixed for a certain lapse of time (a "period"), it is reasonable to assume that the wage is set by the union before the realization of the random variable that is relevant for that period. Within this decentralized wage setting, in each t the local union operating in i must solve the following problem:

$$\max_{v_{jit}} \; u^{sk}_{jit} + \phi U^{sk}_{jt+1}. \tag{12}$$

In each period the union has full control only over the current wage, if we maintain that current union membership cannot commit the workers who will manage the union in the future to the pursuit of policies not optimal from their own temporal perspective. In other words, a wage policy is feasible only if it is time consistent. Hence, the union's problem can be decomposed into a sequence of similar problems that can be solved recursively.

2.8. Redistributive Policies

We consider two possible institutional setups for income redistribution.

In the first one, there is a centralized fiscal authority that collects taxes throughout the economy and provides the same welfare benefit for all workers (interregional redistribution):

$$w_{1t} = w_{2t} = \cdots = w_{Jt} = w_t = \frac{\tau \sum_{j=1}^{J} Y_{jt}}{\sum_{j=1}^{J} P_{jt}}. \tag{13a}$$

In the alternative scenario, in each region there is a fiscal authority collecting taxes within the region and providing the same welfare benefit for all workers living in that region (no interregional redistribution):

$$w_{jt} = \tau Y_{jt}/P_{jt}. \tag{13b}$$

2.9. A Summary of the Timing of Events

Summarizing, in each t we have a sequence of events in the following order: (i) a new cohort enters the economy; (ii) unskilled workers decide whether to invest in order to become trainable; (iii) firms borrow physical capital for carrying out production, the workers decide where to locate; (iv) unions set the wage; (v) idiosyncratic shocks occur; (vi) firms atomistically determine their demand for skilled workers and apprentices, production takes place, apprentices are trained on the job, taxes are collected and transfers payments are made; (vii) firms reimburse the principal and pay the interest on the capital borrowed at the beginning of the period, firms also pay the dividends to the shareholders, investors decide what fraction of their income to save, a fraction σ of each group of population dies at the end of the period.

3. Characterization of an Equilibrium Path

3.1. Equilibrium Conditions in the Markets for Product and Physical Capital

One can easily derive the conditions for equilibrium both in the product market and in the market for productive assets:

$$\sum_{j=1}^{J} Y_{jt} + (1-\delta)K_t = K_{t+1} + C_t^{\text{in}} + \sum_{j=1}^{J} C_{jt}^{w}, \tag{14a}$$

$$K_{t+1} = \sum_{j=1}^{J} \int_0^n K_{jit+1}\, di, \tag{14b}$$

where $C_{jt}^{w} = P_{jt} w_{jt} + \int_0^n (v_{jit} S_{jit} + e_{jit} A_{jit})\, di$ is the consumption of the workers living in j.

3.2. Firms' Optimality Condition for Capital Accumulation

Firms of i determine their demand for capital at the beginning of t by satisfying

$$E_t\left[\frac{\partial \pi^g(x_{it}, M_{jit}, k_{jit}, s_{jit}, v_{jit})}{\partial K_{jit}}\right] = r_t + \delta, \quad k_{jit} \equiv \frac{K_{jit}}{M_{jit}}, \quad s_{jit} \equiv \frac{L_{jit}}{M_{jit}}, \tag{15}$$

where $\pi^g(.)$ is the firms' (gross) profit function.[10]

This optimality condition defines k_{jit}, i.e. the physical capital/skilled labor ratio in i, as an implicit function of the trainable labor/skilled labor ratio of i, the wage and the interest rate:

$$f(k_{jit}, s_{jit}, v_{jit}) = r_t + \delta, \quad f_k < 0, \quad f_s > 0 \quad \text{and} \quad f_v < 0, \tag{16}$$

where $f(.) = \frac{(1-\alpha)v_{jit}^2\{(\mu/\Omega)^2[1-(1+\Omega s_{jit})^{2-\alpha}]-1\}}{2n\alpha(2-\alpha)(1-\tau)k_{jit}^{2-\alpha}} + \frac{(1-\alpha)(1-\tau)n}{2(1+\Omega s_{jit})^{-\alpha}k_{jit}^{\alpha}}$ [11] and v_{jit} is determined by the union operating in i according to the wage rule

$$v_{jit} = v(k_{jit}, w_{jt}), \quad v_k > 0, \quad v_w > 0.^{12} \tag{17}$$

Note that $f_k < 0$ and $f_s > 0$ together imply that—other things being equal—a larger supply of trainable labor boosts the demand for (physical) capital: an increase in L_{jit} makes less likely that in favorable circumstances (large realizations of x_{jt}) a shortage of trainable workers prevents the efficient utilization of the installed stock of capital. Furthermore, it is not surprising that—as it is implied by $f_k < 0$ and $f_v < 0$ together—a wage increase reduces capital demand: other things being equal, a higher labor cost depresses profitability. Similarly, it is plain that a higher capital stock raises the wage demand of the unions, since the job security of a skill worker is improved at any wage level by a higher (physical) capital/skilled labor ratio. Finally, $v_w > 0$ means that at any level of the (physical) capital/skilled labor ratio a higher non-labor income raises the skilled workers' wage. Together with the fact that a wage increase reduces capital demand by firms, the boosting impact on wages of a higher w_{jt} has relevant implications for the issue that is analyzed in this paper.

3.3. The Lifetime Well-Being of a Skilled Worker Along an Equilibrium Path

Using (17) and the expected utility function of a skilled worker $u^{sk}(.)$,[13] (8) becomes:

$$U_{jt}^{sk} = u^{sk}(v(k_{jt}, w_{jt}), k_{jt}, w_{jt}) + \phi U_{jt+1}^{sk}, \tag{18}$$

where the subscripts denoting the location are dropped. Indeed, an equilibrium pair ($\{s_{jt}\}_0^\infty$, $\{k_{jt}\}_0^\infty$) depends on structural parameters assumed to be equal across locations and on exogenously given trajectories of r_t and w_{jt}. Therefore, different locations belonging to the same region display equal physical capital/skilled labor and trainable labor/skilled labor ratios. Hence, local unions operating in the same region are induced to set the same wage in all locations of the region, and workers can be indifferent (ex ante) among locations belonging to the same region, expecting the same well-being everywhere.[14]

Moreover, along an equilibrium path, one has

$$U_{jt}^{\text{un}} = u(\eta w_{jt}) + \phi U_{jt+1}^{\text{un}}. \tag{19}$$

The equilibrium number of unskilled workers becoming trainable is such that an unskilled worker is indifferent between investing in basic knowledge or staying in the informal economy:

$$h(c) = q(v_{jt}, k_{jt}, s_{jt})\big[u(w_{jt} + \mu v_{jt}) - u(\eta w_{jt}) + \phi\big(U_{jt+1}^{sk} - U_{jt+1}^{\text{un}}\big)\big], \tag{20}$$

where $q(.)$ is the probability (before the realization of x_{it}) of being hired in t for a trainable worker[15]:

$$q(v_{jit}, k_{jit}, s_{jit}) = 1 - \frac{\mu v_{jit}\, k_{jit}^{\alpha-1}[(1+\Omega s_{jit})^{2-\alpha} - 1]}{n\alpha(1-\tau)(2-\alpha)\Omega^2 s_{jit}},$$
$$q_v < 0, \quad q_k > 0, \quad q_s < 0.^{16} \tag{21}$$

Note that $q(.)$ diminishes as there is a larger number of trainable workers, remaining constant both the size of the skilled workforce and the stock of capital.

Using (18) and (19), one can rewrite (20) as

$$\Psi(s_{jt+1}, k_{jt+1}, w_{jt+1}, s_{jt}, k_{jt}, w_{jt}) = 0, \tag{22}$$

where

$$\Psi(.) = \frac{h(c)}{\phi q(v(k_{jt}, w_{jt}), k_{jt}, s_{jt})} - \frac{h(c)}{q(v(k_{jt+1}, w_{jt+1}), k_{jt+1}, s_{jt+1})} + \frac{u(\eta w_{jt})}{\phi} -$$
$$- \frac{u(w_{jt} + \mu v(k_{jt}, w_{jt}))}{\phi} - u^{sk}(v(k_{jt+1}, w_{jt+1}), k_{jt+1}, w_{jt+1}) +$$
$$+ u(w_{jt+1} + \mu v(k_{jt+1}, w_{jt+1})).$$

3.4. Determination of the Equilibrium Interest Rate

One can determine the time profile of the interest rate by solving the problem of the investors. The investors' optimal plan must satisfy:

$$\left(\frac{C_{t+1}^{\text{in}}}{C_t^{\text{in}}}\right)^{\zeta} = \theta(1 + r_{t+1}), \tag{23a}$$

$$\lim_{t\to\infty} \theta^t K_t \left(C_t^{\text{in}}\right)^{-\zeta} = 0. \tag{23b}$$

Along an equilibrium trajectory, one has:

$$C_t^{\text{in}} = \sum_{j=1}^{J} M_{jt} C(w_{jt}, k_{jt}, s_{jt}, k_{jt+1}), \tag{24}$$

where

$$C(.) = \frac{[v(k_{jt}, w_{jt})]^2 k_{jt}^{\alpha-1}}{2\alpha(2-\alpha)n(1-\tau)}\left\{1 + \left(\frac{\mu}{\Omega}\right)^2 \left[(1 + \Omega s_{jt})^{2-\alpha} - 1\right]\right\} + \frac{k_{jt}^{1-\alpha} n(1-\tau)(1 + \Omega s_{jt})^{\alpha}}{2} -$$
$$- v(k_{jt}, w_{jt})(1 + \mu s_{jt}) + (1 - \delta)k_{jt} - (1 - \sigma)[1 + s_{jt} q(v(k_{jt}, w_{jt}), k_{jt}, s_{jt})]k_{jt+1}.$$

Moreover, along an equilibrium trajectory, the skilled workforce evolves according to

$$M_{jt+1} = M_{jt}\left(1 + \rho_{M_{jT}}\right), \quad \rho_{M_{jt}} \equiv \frac{M_{jt+1} - M_{jt}}{M_{jt}}, \quad M_{j0} \text{ given } \forall j, \tag{25}$$

where

$$\rho_{M_{jt}} = \rho(k_{jt}, w_{jt}, s_{jt}) = (1 - \sigma)[1 + s_{jt} q(v(k_{jt}, w_{jt}), k_{jt}, s_{jt})] - 1,$$
$$\rho_k > 0, \quad \rho_w < 0, \quad \rho_s > 0.$$

The fact that $\rho_k > 0$ [17] reflects the (direct) positive effect of a higher (physical) capital-skilled labor ratio on the fraction of the trainable workforce that is hired in t, which dominates the (indirect) negative effect that a higher k_{jt} has on $q(.)$ via its boosting impact on the union wage. It is exactly by raising the union wage that a higher non-labor income exerts a depressing effect on $q(.)$, thus lowering the growth rate of the skilled workforce. In contrast, $\rho_s > 0$ is the result of the positive effect that a larger supply of trainable labor has on the number of workers that are hired and trained on the job, which dominates the negative effect that a larger s_{jt} has on this number via its negative influence on $q(.)$. Finally, along an equilibrium trajectory, one has:

$$Y_{jt} = M_{jt}\left\{\frac{[\mu v(k_{jt}, w_{jt})]^2[1 - (1 + \Omega s_{jt})^{2-\alpha}] - [\Omega v(k_{jt}, w_{jt})]^2}{2n\alpha(1-\tau)^2(2-\alpha)\Omega^2 k_{jt}^{1-\alpha}} + \frac{n k_{jt}^{1-\alpha}(1 + \Omega s_{jt})^{\alpha}}{2}\right\}. \tag{26}$$

4. The Equilibrium Path with Interregional Redistribution

Considering that according to (13a) $w_{1t} = w_{2t} = \cdots = w_{Jt} = w_t$, one has $s_{1t} = s_{2t} = = \cdots = s_{Jt} = s_t$ and $k_{1t} = k_{2t} = \cdots = k_{Jt} = k_t \; \forall t$. Hence, one can use (26) to write (13a) as

$$w_t = \tau b_t \left\{ \frac{[\mu v(k_t, w_t)]^2[1 - (1 + \Omega s_t)^{2-\alpha}] - [\Omega v(k_t, w_t)]^2}{2n\alpha(1-\tau)^2(2-\alpha)\Omega^2 k_t^{1-\alpha}} + \frac{nk_t^{1-\alpha}(1+\Omega s_t)^{\alpha}}{2} \right\}, \tag{27}$$

where $b_t \equiv \frac{\sum_{j=1}^{J} M_{jt}}{\sum_{j=1}^{J} P_{jt}}$ is the skilled labor-workers' population ratio of the entire economy. Equation (27) allows to implicitly define w_t as a function of k_t, s_t and b_t:

$$w_t = w(k_t, s_t, b_t). \tag{28}$$

Moreover, the ratio b_t evolves according to

$$\chi(b_{t+1}, b_t, k_t, w_t, s_t) = b_{t+1} - b_t \frac{[1 + \rho(k_t, w_t, s_t)]}{(1 - \sigma + \xi)} = 0, \quad b_0 \text{ given}, \tag{29}$$

where $\rho(.)$ is given by (25).

Considering that $w_{1t} = w_{2t} = \cdots = w_{Jt} = w_t, s_{1t} = s_{2t} = \cdots = s_{Jt} = s_t$ and $k_{1t} = k_{2t} = \cdots = k_{Jt} = k_t \; \forall t$, one can use (24)–(25) to rewrite (23a) as

$$\frac{[1 + \rho(k_t, w_t, s_t)]^{\zeta}[C(w_{t+1}, k_{t+1}, s_{t+1}, k_{t+2})]^{\zeta}}{[C(w_t, k_t, s_t, k_{t+1})]^{\zeta}} = \theta(1 + r_t). \tag{30}$$

Given (16), (17) and (30), the condition for equilibrium in the capital market becomes

$$\begin{aligned} &\Phi(k_{t+2}, s_{t+1}, k_{t+1}, w_{t+1}, s_t, k_t, w_t) = \\ &\quad = f(k_{t+1}, s_{t+1}, v(k_{t+1}, w_{t+1})) + 1 - \delta - \\ &\qquad - \frac{[1 + \rho(k_t, w_t, s_t)]^{\zeta}[C(w_{t+1}, k_{t+1}, s_{t+1}, k_{t+2})]^{\zeta}}{\theta[C(w_t, k_t, s_t, k_{t+1})]^{\zeta}} = 0. \end{aligned} \tag{31}$$

One can use (28) to substitute for w_t in (22), (29) and (31), thus obtaining the system of difference equations in k_t, s_t and b_t that governs the general equilibrium path of the economy under fiscal centralism. Along this path, the following proposition holds:

Proposition 1. *In the presence of interregional redistribution* (*fiscal centralism*), *initial differentials across regions in per capita output and employment rates are preserved forever even if these regional economies are structurally similar* (*i.e.*, *even if they have the same parameter values*).

To verify that Proposition 1 holds, consider that along an equilibrium path the per capita output of region j is given by

$$\frac{Y_{jt}}{P_{jt}} = b_{jt}\left\{\frac{[v(k_t, w(k_t, s_t, b_t))]^2\left[\mu^2 - \mu^2(1+\Omega s_t)^{2-\alpha} - \Omega^2\right]}{2n\alpha(1-\tau)^2(2-\alpha)\Omega^2 k_t^{1-\alpha}} + \frac{n(1+\Omega s_t)^{\alpha}}{2k_t^{\alpha-1}}\right\} \quad (32a)$$

and the employment rate of region j is given by

$$\frac{S_{jt} + A_{jt}}{P_{jt}} = b_{jt}[p(v(k_t, w(k_t, s_t, b_t)), k_t) + s_t q(v(k_t, w(k_t, s_t, b_t)), k_t, s_t)], \quad (32b)$$

where $b_{jt} \equiv \frac{M_{jt}}{P_{jt}}$ is the skilled labor-workers' population ratio of j, $j = 1, 2, ..J$. This ratio evolves according to

$$b_{jt+1} = b_{jt}\frac{[1 + \rho(k_t, w(k_t, s_t, b_t), s_t)]}{(1-\sigma+\xi)}, \quad b_{j0} \text{ given } \forall j, \quad (33)$$

where k_t, s_t and b_t are governed by (22), (29) and (31). It is apparent that if $b_{j0} \neq b_{z0}$, then $b_{jt} \neq b_{zt}\,\forall t$, $j \neq z$, entailing non convergence across regions in per capita output and in employment rate.

Proposition 1 reflects the fact that the skilled labor-workers' population ratio grows at the same rate in all regions (or states). This is because the interregional transfers equalize the workers' non-labor income across the different areas, thus preventing the wages from being lower in the poorer areas. Therefore, the regions (or states) endowed with a smaller number of skilled workers are unable to attract that additional physical capital which would permit them to grow faster in skilled labor and in output per head than the richer regions (or states). Hence, interregional differentials in levels of per capita GDP and employment rates are perpetuated.

4.1. The Balanced Growth Path (BGP) in the Presence of Interregional Redistribution

Along a BGP, one must have $k_{t+1} = k_t = k$, $s_{t+1} = s_t = s$ and $b_{t+1} = b_t = b$ in (22), (29) and (31). It is apparent by inspecting (29) that this entails $1+\rho(k, w, s) = 1 - \sigma + \xi$. Hence, along a BGP, equation (31) reduces to $f(k, s, v(k, w(k, s, b))) + 1 - \delta = (1 - \sigma + \xi)^{\zeta}\theta^{-1}$. Thus, a steady-state triple (k, s, b) can be obtained by solving (22), (29) and (31) for $k_{t+1} = k_t = k$, $s_{t+1} = s_t = s$ and $b_{t+1} = b_t = b$. Note that $b_j/b_z = b_{j0}/b_{z0}$, $j \neq z$: since along the transition path the skilled labor-workers' population ratio grows at the same rate in each region (see (33)), at steady state the proportion between the skilled labor-workers' population ratios of any two regions is the same as it was initially. Finally, one can produce numerical examples showing that the system obtained by linearizing the difference equations governing the equilibrium path of the regional economies around its (unique) BGP exhibits saddle-path stability.[18]

5. The Equilibrium Path Without Interregional Redistribution

5.1. *The General Equilibrium Path Under Fiscal Decentralization*

Considering (13b) and (26), one has

$$w_{jt} = \tau b_{jt}\left\{\frac{[\mu v(k_{jt}, w_{jt})]^2\left[1-(1+\Omega s_{jt})^{2-\alpha}\right]-[\Omega v(k_{jt}, w_{jt})]^2}{2n\alpha(1-\tau)^2(2-\alpha)\Omega^2 k_{jt}^{1-\alpha}}+\right.$$
$$\left.+\frac{nk_{jt}^{1-\alpha}(1+\Omega s_{jt})^{\alpha}}{2}\right\}. \tag{34}$$

Equation (34) allows to implicitly define w_{jt} as a function of k_{jt}, s_{jt} and b_{jt}:

$$w_{jt} = w(k_{jt}, s_{jt}, b_{jt}). \tag{35}$$

Moreover, the ratio b_{jt} evolves according to

$$\chi(b_{jt+1}, b_{jt}, k_{jt}, w_{jt}, s_{jt}) = b_{jt+1} - b_{jt}\frac{[1+\rho(k_{jt}, w_{jt}, s_{jt})]}{(1-\sigma+\xi)} = 0, \quad b_{j0} \text{ given } \forall j, \tag{36}$$

where $\rho(.)$ is given by (25).

One can use (24)–(26) to rewrite (23a) as

$$\frac{\left\{\sum_{j=1}^{J}[1+\rho(k_{jt}, w_{jt}, s_{jt})]M_{jt}C(w_{jt+1}, k_{jt+1}, s_{jt+1}, k_{jt+2})\right\}^{\zeta}}{\left[\sum_{j=1}^{J}M_{jt}C(w_{jt}, k_{jt}, s_{jt}, k_{jt+1})\right]^{\zeta}} = \theta(1+r_t). \tag{37}$$

Given (16), (17) and (37), the condition for equilibrium in the capital market becomes

$$\Theta(k_{1t+2}, s_{1t+1}, k_{1t+1}, w_{1t+1}, s_{1t}, k_{1t}, w_{1t}, M_{1t}, k_{2t+2}, s_{2t+1}, k_{2t+1}, w_{2t+1}, s_{2t}, k_{2t},$$
$$w_{2t}, M_{2t}, \ldots, k_{Jt+2}, s_{Jt+1}, k_{Jt+1}, w_{Jt+1}, s_{Jt}, k_{Jt}, w_{Jt}, M_{Jt}) = 0, \tag{38}$$

where

$$\Theta(.) = f(k_{jt+1}, s_{jt+1}, v(k_{jt+1}, w_{jt+1})) + 1 - \delta$$
$$-\frac{\left\{\sum_{j=1}^{J}[1+\rho(k_{jt}, w_{jt}, s_{jt})]M_{jt}C(w_{jt+1}, k_{jt+1}, s_{jt+1}, k_{jt+2})\right\}^{\zeta}}{\theta\left[\sum_{j=1}^{J}M_{jt}C(w_{jt}, k_{jt}, s_{jt}, k_{jt+1})\right]^{\zeta}}$$

and M_{jt} evolves according to (25).

One can use (35) to substitute for w_{jt} in (22), (25), (36) and (38), thus obtaining the system of difference equations in k_{jt}, s_{jt}, b_{jt} and M_{jt} that governs the general equilibrium path.

5.2. *The Balanced Growth Path (BGP) Under Fiscal Decentralization*

Along a BGP, one must have again $k_{jt+1} = k_{jt} = k_j$, $s_{jt+1} = s_{jt} = s_j$ and $b_{jt+1} = b_{jt} = b_j$ in (22), (25), (36) and (38). It is apparent by inspecting (36) that this entails $1+\rho(k_j, w_j, s_j) =$

$= 1 - \sigma + \xi$. Hence, along a BGP, equation (38) reduces to $f(k_j, s_j, v(k_j, w(k_j, s_j, b_j))) + +1 - \delta = (1 - \sigma + \xi)^{\zeta}\theta^{-1}$ and equation (25) can be rewritten as $M_{jt+1} = M_{jt}(1 - \sigma + \xi)$. Therefore, a steady-state triple (k_j, s_j, b_j) can be obtained by solving (22), (36) and (38) for $k_{jt+1} = k_{jt} = k_j$, $s_{jt+1} = s_{jt} = s_j$ and $b_{jt+1} = b_{jt} = b_j$. Thus, the following proposition holds:

Proposition 2. *In the absence of interregional redistribution* (*fiscal decentralization*), *structurally similar regions are characterized by the same steady-state levels of per capita output and employment rate.*

To verify that Proposition 2 holds, consider that along a BGP the per capita output of region j is

$$\frac{Y_{jt}}{P_{jt}} = b_{Jt}\left\{\frac{[v(k_t, w(k_t, s_t, b_t))]^2\left[\mu^2 - \mu^2(1 + \Omega s_t)^{2-\alpha} - \Omega^2\right]}{2n\alpha(1-\tau)^2(2-\alpha)\Omega^2 k_t^{1-\alpha}} + \frac{n(1+\Omega s_t)^{\alpha}}{2k_t^{\alpha-1}}\right\}, \tag{39a}$$

and the employment rate of region j is

$$\frac{S_{jt} + A_{jt}}{P_{jt}} = b_j[p(v(k_j, w(k_j, s_j, b_j)), k_j) + s_j q(v(k_j, w(k_j, s_j, b_j)), k_j, s_j)]. \tag{39b}$$

Noting that the steady-state levels of per capita output and employment rate in region j depend only on the steady-state triple (k_j, s_j, b_j), which in its turn depends only on the parameter values (that are assumed to be equal across regions), it is apparent that Proposition 2 holds. In other words, Proposition 2 states that structural similar regions (or states)—whose independent fiscal authorities set the same tax rate—share the same steady-state levels of per capita GDP and employment rate. The reason is that—under fiscal decentralization—the workers' non-labor income adjusts to the conditions prevailing in the region (state) where the workers are located, thus allowing regions (states) with different initial levels of per capita GDP and employment rate to display the same long-run equilibrium levels of per capita output and employment rate.

Moreover, it is worth to note that if there is more than one steady-state triple (k_j, s_j, b_j) satisfying (22), (36) and (38) for $k_{jt+1} = k_{jt} = k_j$, $s_{jt+1} = s_{jt} = s_j$ and $b_{jt+1} = b_{jt} = b_j$, then along a BGP structurally similar regions may exhibit different per capita output and employment rate. Conversely, the existence of a unique (k_j, s_j, b_j) implies that along a BGP structurally similar regions must necessarily exhibit the same per capita output and employment rate. Considering parameter values that rule out the possibility of multiple (k_j, s_j, b_j), one can produce numerical examples showing that the system obtained by linearizing the difference equations governing the equilibrium path of the regional economies around its (unique) BGP exhibits saddle-path stability.[19] Hence, for these parameter values the following proposition holds:

Proposition 3. *Without interregional redistribution* (*fiscal decentralization*), *structurally similar regions whose initial per capita output and employment rate are not too far away from their steady-state values converge to the same per capita output and employment rate.*

This proposition is a consequence of the fact that along a BGP structurally similar regions have the same per capita output and employment rate, together with the fact that in a neighborhood of the BGP the linear approximation of the system governing the equilibrium path of the economy is saddle-path stable. Intuitively, once the non-labor income of the workers adjusts to the specific conditions of the region where they are living, one can be certain—at least when the initial conditions of two regions are not too different—that market forces will equalize over time their per capita GDP and employment rate. Therefore, it emerges a policy dilemma: one option amounts to not equalizing immediately the differences in workers' income across the regions (or the states) of a country (or an union) through public transfers, thus relying on market forces for a long-term equalization in per capita GDP, employment rate and workers' income; the alternative option consists in equalizing immediately these differences, but at the cost of preventing market forces from operating.

6. Conclusions

This paper shows that a system of centralized income redistribution can perpetuate the differentials in output per capita and employment rate across regions. This is because redistributive programs providing equal transfer payments and welfare entitlements to households living in areas that differ in GDP per head and productivity levels tend to equalize the non-labor income (the "outside option") of the workers, thus influencing the process of wage determination. Indeed, in the presence of interregional redistribution, the wages cannot fully reflect the differences in per capita productivity among the different areas, even if the wage-setting process is decentralized. In this respect, an implication of the paper is that decentralized wage determination is not sufficient to insure convergence in per capita output and employment rate across regions.[20] It would be also possible to show that even with competitive labor markets the combination of labor immobility and centralized income redistribution prevents the interregional differentials to vanish in time.[21] Especially for Europe, where it is not realistic to expect a resumption of significant interregional labor flows, this conclusion may support the argument that both at national levels and at the level of the EU there is a trade off between social policies aimed at providing all citizens with the same basic entitlements and the elimination of regional disparities in GDP per head and employment rate. This has implications for the discussion on the possible introduction of an European fiscal authority, since it helps assessing the long-run effects that such an authority may have on interregional (and inter-country) differentials by operating fiscal transfers within the EU.[22]

Dealing with the long-run effects of fiscal transfers and welfare entitlements determining the non-labor income of workers living in areas characterized by different levels of GDP per capita and employment rates, this paper gives a simplified treatment of the tax system and neglects the politico-economic process that influence taxation and redistribution. Indeed, in the model the tax rate τ is given, and both in the case of centralized and decentralized redistribution it is assumed that in all regions (or states) within a country (or an union) the tax rate is set at the same level τ. This restriction is imposed in order to focus exclusively on the long-term implications of the geographical level (central versus local) at which income

redistribution occurs: even if the tax rate is the same everywhere, the tax base relatively to the size of the workers' population, namely per capita GDP, tends to differ across regions (states), thus making crucial whether the redistribution occurs at the local or at the central level. However, an extended model could remove this restriction by allowing the unique fiscal authority (in the case of centralized redistribution) to vary the tax rate across different regions (or states), or the many local authorities (in the case of decentralized redistribution) to set different tax rates. In this context, a credible specification of the authorities' objective would require a careful consideration of how the interests of different groups (investors, skilled workers, unskilled workers...) influence the public decision process and interact with the geographical dimension of the redistributive problem.

Notes

1. Since the mid 1970s labor flows across European regions have decreased rapidly, practically coming to a stop in the last decade. In contrast, gross capital flows have grown considerably during the same period. This is why the model presented here assumes perfect capital mobility and labor immobility across regions. Indeed, the experience of the last decades makes unrealistic to imagine that in Europe labor flows may play an important role in the face of territorial disparities.
2. Blanchard and Katz (1992) argue that the long-run effect of adverse shocks to regional employment is larger when the outflow of laid-off workers from a region hit by the adverse shock is rapid relative to the speed at which new firms locate there in response to falling wages.
3. Also Decressin and Fatás (1995) find that in Europe regional demand shocks induce large initial participation changes.
4. The model also limits its analysis to regions that are structurally similar, i.e. that share the same parameter values and differ only with respect to their initial levels of per capita income and employment rates. This is consistent with the viewpoint according to which it is "reasonable to look for convergence or divergence only among regions that are relatively similar to each other, if not in territorial size at least in the composition of their natural endowment, population, location, geographical structure, climate, access to natural resources, political regimes and so on" (Boldrin and Canova, 2001, p. 212).
5. This short-term immobility implies that in period t a worker located in i does not work at all in the formal economy if s/he is not employed in that period by a firm of i.
6. More than one location can share this status of best location.
7. $$E_t\left\{q_{ji^*t}[u(w_{jt}+e_{ji^*t})+\phi U^{sk}_{jt+1}]+(1-q_{ji^*t})[u(\eta w_{jt})+\phi U^{\text{un}}_{jt+1}\right\}\geq$$
$$\geq E_t\left\{q_{jit}[u(w_{jt}+e_{jit})+\phi U^{sk}_{jt+1}]+\ (1-q_{jit})[u(\eta w_{jt})+\phi U^{\text{un}}_{jt+1}]\right\}\ \forall i.$$
8. Alternatively, one may interpret this disutility as due to the direct and indirect costs of searching an entry job in the formal segment of the labor market.
9. Burdett and Smith (1995) emphasize that the key assumption for the existence of a low skill trap is that an employer's profit flow is greater when employing a skilled worker than when employing an unskilled worker. Indeed, the fact that firms lay off unskilled workers before skilled workers is difficult to reconcile with the contention that unskilled workers are more profitable.
10. For the derivation of $\pi^g(.)$ see Bonatti (2002) (Appendix).
11. It is assumed that the representative firm' problem has an internal solution: for given s_{jit} and v_{jit} there exists a value of k_{jit} satisfying equation (16) and such that
$$\frac{\mu v_{jit}(1+\Omega s_{jit})^{1-\alpha}}{(1-\tau)\alpha\Omega k_{jit}^{1-\alpha}}<n.$$

Intuitively, the existence of an internal solution implies that in each period and location a shortage of trainable labor may occur in the case of a very favorable realization of x_{jt} (see Bonatti, 2002, Appendix).

12. Proof is available on request.
13. For the derivation of $u^{sk}(.)$ see Bonatti (2002) (Appendix).
14. In other words, the equilibrium solution is symmetric across locations.
15. Note that $q(.)$ is also the equilibrium fraction of the trainable workforce that is hired in t.
16. The probability $q(.)$ can be computed by using the firms' demand function for trainable labor (see Bonatti, 2002, Appendix).
17. Proof is available on request.
18. Analysis of the conditions ensuring uniqueness and local stability of the BGP is available on request.
19. Analysis of the conditions ensuring uniqueness and local stability of the BGP is available on request.
20. Indeed, it is shown that decentralizing the wage-setting process at the local level is not sufficient to differentiate wages according to local labor-market conditions, if fiscal transfers and welfare entitlements equalize the outside option of workers living in areas characterized by different levels of GDP per capita and employment rates. Hence, on this issue, the conclusions of the paper support the position of those who argue that decentralized bargaining would not help very much unless the social system is reformed (e.g. Sinn and Westermann, 2001).
21. See Bonatti (1999). In other words—differently than in Perotti (2001)—the existence of noncompetitive labor markets is not essential in this model.
22. Under this respect, the argument against the introduction of an European fiscal system provided by this paper can be added to the point made by those arguing that the only benefit of such a system—namely to create cross-country insurance—has been reduced by the general increase in cross-country correlation which has taken place during the process of European integration (see Fatás, 1997).

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