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Michael Pflüger

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# **ECONOMIC INTEGRATION, WAGE POLICIES AND SOCIAL POLICIES**

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## **Abstract**

This paper sets up a two country monopolistic competition model with intra-industry trade to study the effects of an exogenous differential in wage and social policies on the location of industry. Two model scenarios are considered. In the traditional one with physical capital, such a differential induces a relocation effect which increases with the level of trade integration. The ‘new economic geography’ world assumes mobile entrepreneurs which can relocate thus bringing agglomeration forces into play. The most significant difference between this world and the traditional one is that, at high levels of trade integration, where one country has emerged as the core and the other as the periphery, the core may have more generous social policies and higher wages than the periphery without inducing a relocation of firms. The scope to have higher wage is constrained, however, and related to the level of trade integration in a bell-shaped way.

JEL-Classification: F12, F15, F16, F21, F22, R12

Keywords: Integration, wages, industry location, agglomeration, monopolistic competition

## 1. Introduction

The labour market implications of economic integration, both on a regional level (e.g. in the European Union) and on a global level, have conquered a central place in the public debate in industrialised countries in recent years (see e.g. Rodrik 1997). Fears are widespread that the intensified competition associated with the process of integration severely constrains (union) wages and social policies. Some argue that a levelling of wages and welfare systems, if not a ‘race to the bottom’, is inevitable. In analysing these fears, economists have studied a variety of channels through which increased product market integration affects labour markets (see Andersen et al. 2000 for a recent survey). The present paper extends these considerations by studying the relocation incentives of firms in a model of monopolistic competition with firm and capital mobility. The central contribution of this paper is to show that unions and governments in an agglomerative core have scope to choose higher wages and more generous welfare policies than their counterparts in the periphery without inducing a relocation of industry. This result is based on the exploitation of the agglomeration rent accruing to mobile entrepreneurial capital owners. The result provides a rationale for the empirical finding of pronounced differences in wages and social policies even in well-integrated regions such as the European Union. Another contribution of this paper is to provide a unifying framework both for the public view of a large-scale exit of firms as well as for the idea of a relocation shelter deriving from an initial agglomeration.

A key to most of the results in the previous literature is that the integration of product markets affects the elasticity of labour demand and so the trade unions’ wage mark-up. Several channels imply that the elasticity of labour demand increases with product market integration so that the wage mark-up is reduced.<sup>1</sup> Other channels reverse this conclusion.<sup>2</sup> Moreover, the integration of product market has effects on institutions (e.g. the tax system), productivity and technical progress which, in turn, influence wages in diverse ways. Empirically, a tendency for wage convergence and an increasing sensitivity of domestic to foreign wages has been found,

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<sup>1</sup> This may be due to a removal of trade and FDI barriers which allows firms to move to areas where production costs are low (e.g. Driffill and Van der Ploeg 1995) or due to the fact that lower export costs shift the sectoral composition of an economy towards the traded goods sector which is affected by foreign (wage) competition (e.g. Andersen et al. 2000, Huizinga 1993).

<sup>2</sup> One line of argument concerns the degree of centralization in wage formation which may decrease (pro-competitive response) or increase (international cooperation of unions) in the face of product market integration and which in itself is related to wages in a non-monotonous way (e.g. Driffill and Van der Ploeg 1993, 1995; Danthine and Hunt 1994). Building on a model of reciprocal international trade in homogeneous goods, Naylor (1998) provides another argument which exemplifies that reductions in trade costs lead to higher wages.

notably in the EU (Andersen et al. 2000). However, differences in wage levels and social policies among integrating countries are still sizeable and there is no empirical support for the ‘race to the bottom’ hypothesis. This seems to justify the conclusion that there is still a role for domestic wage and social policies.

The focus of this paper is on the mobility of capital and firms and notably on the incentives of industry to relocate between regions in the process of economic integration. The question posed in this paper is thus related but slightly different from the one tackled in the previous literature. In fact, in order to focus on the relocation incentives of firms, the desire of unions to adjust their wages, is deliberately disallowed for in the present analysis. In the theoretical model used below this is achieved by postulating a rigid union wage which is tied up with the tax-benefit system. Moreover, in contrast to the previous literature, the present paper draws on the ‘new economic geography’.<sup>3</sup> The theoretical analysis is built around a simple model of monopolistic competition with firm and capital mobility which has the virtue that it is analytically tractable and yields closed-form solutions. There are two initially identical countries which are connected through intra-industry trade and firm and capital mobility. The analysis starts with the assumption that firms and capital are mobile internationally but their entrepreneurial owners are not. Hence, all rents from capital invested abroad are repatriated. The proportionate industry relocation effect associated with a union wage push in one of the two countries is then derived analytically. It is shown that this effect increases with the level of economic integration as measured by trade costs. This confirms the ‘traditional view’ which underlies the public’s fears and some of the results in the previous literature. By assuming that entrepreneurial owners of capital are mobile internationally, the agglomerative forces stressed in the new economic geography are then brought into play in the model. When, initially, the two countries are identical and the industry is split evenly, or when there is only a partial agglomeration of industry, a wage push in one country is shown to have a similar (strong) relocation effect as expressed in the ‘traditional view’. However, a new economic geography perspective suggests another possibility, too. Suppose that, for some reason, one country has historically emerged as the core, i.e. is the host of all industry. Then, an ‘agglomeration rent’ accrues to the mobile factor. This rent is the focus of recent public finance analyses which show that it can be taxed directly by governments by means of capital taxes.<sup>4</sup> A central element of the present analysis is to link this insight to the debate about the

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<sup>3</sup> See Fujita et al. (1999) and Neary (2001) for recent expositions and assessments.

<sup>4</sup> See Andersson and Forslid 1999, Baldwin and Krugman 2000, Kind et al. 2000 and Ludema and Wooton 2000.

labour market effects of product market integration. In particular, it is shown that the immobile unionised labour force is able to extract this rent indirectly. Indeed, unions in the core can have higher wages – and governments in the core can choose more generous welfare policies - than their counterparts in the periphery. More specifically, I derive the maximum international union wage differential that can be maintained at each stage of product market integration (i.e. at each level of trade costs) without inducing an exit of industry. This relationship is bell-shaped and achieves its peak at an intermediate stage of product market integration. Hence, this result provides a rationale for the persistence of sizeable differences in wage levels and social policies even in regions which are well-integrated. Moreover, this result implies that, international integration notwithstanding, there is some national autonomy in wage and social policies when historical agglomeration advantages are taken into account.

The paper is organised as follows. The monopolistic competition model which underlies the analysis is introduced in Section 2. Section 3 studies the incentive of entrepreneurs to relocate their firms and capital when traditional mobility assumptions are met. Section 4 turns to the new economic geography perspective. The discussion in section 5 sets the results into a wider perspective and puts the model's assumptions under closer scrutiny. Section 6 concludes.

## 2. The Model

### 2.1. Basic structure

I consider a trade and geography version of the Spence-Dixit-Stiglitz model of monopolistic competition (Spence 1976, Dixit and Stiglitz 1977, Krugman 1980, 1991) which obtains its analytical ease by the imposition of two assumptions. First, by assuming that one unit of capital is needed to run a firm as in Flam and Helpman (1987), the model becomes analytical tractable even in a geography context (Forslid 1999). Second, a significant further simplification is obtained by assuming that consumers' upper-tier utility is quasi-linear so that all income effects are channelled to the competitive outside sector (as e.g. in Driffill and Van der Ploeg 1995, Martin and Rogers 1995 and Pflüger 2001, 2003).<sup>5</sup>

The world is composed of two countries, home and foreign (denoted by an asterisk \*) which are assumed to have identical preferences, technology, factor endowments and trade costs but possibly different benefit-tax systems. There are three factors of production, non-unionised

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<sup>5</sup> Ottaviano and Thisse (1998) provide another analytically solvable model which assumes a quadratic utility function.

labour ( $L$ ), unionised labour ( $H$ ) and entrepreneurial capital ( $K$ ), and two sectors, manufacturing ( $X$ ) and an outside sector ( $A$ ). Non-unionised labour is intersectorally mobile at the national level but immobile at the international level. Unionised labour is internationally immobile and either employed in the manufacturing sector or unemployed. Capital is assumed to be internationally mobile throughout. However, its entrepreneurial owners are so only in the geography version of the model (section 4). This introduces the agglomerative forces which are the hallmark of the ‘new economic geography’. The outside good is homogeneous, traded without costs and produced perfectly competitively under constant returns with non-unionised labour only. This good is the numéraire and assumed to be produced in both countries after trade. The monopolistically competitive  $X$  sector employs all three factors to produce differentiated goods with a linear cost function. The two types of labour are variable inputs. Entrepreneurial capital enters only the fixed cost. One unit of it is needed to produce at all. Trade in  $X$  is inhibited by iceberg costs. Whereas the compensation of non-unionised labour and of entrepreneurial capital are determined on competitive markets, unionised labour’s wage is rigid and related to the benefit-tax system.

## 2.2. Utility and demand

There are  $L + H + K$  households, each of whom supplies one unit of non-unionised or unionised labour and entrepreneurial capital, respectively. Their compensation and income before taxes are denoted by  $W_L$ ,  $W_H$  and  $R$ , respectively. Those parts of unionised labour which do not find a job are eligible for a per-capita unemployment benefit,  $B$ . Each household's preferences are characterised by a quasi-linear upper-tier utility as in Dixit (1990):

$$U = \alpha \ln C_X + C_A, \quad C_X = \left( \int_0^N x_i^{\frac{\sigma-1}{\sigma}} + \int_N^{N^*} x_j^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}, \quad \alpha > 0, \sigma > 1 \quad (1)$$

where  $C_X$  is the manufacturing aggregate as in Dixit and Stiglitz (1977),  $C_A$  is the consumption of the outside good,  $x_i$  ( $x_j$ ) is the quantity consumed of a domestic variety  $i$  (foreign variety  $j$ ),  $N$  and  $N^*$  are the number of varieties produced in home and foreign and  $\sigma$  is the elasticity of substitution between manufacturing varieties. The budget constraint is given by

$$PC_X + C_A = Y, \quad P = \left[ NP_i^{1-\sigma} + N^* (\tau P_j)^{1-\sigma} \right]^{\frac{1}{1-\sigma}}, \quad \tau > 1 \quad (2)$$



where  $Y$  denotes a household's income,  $P$  is the perfect CES-price index,  $P_i$  ( $P_j$ ) is the price set by a domestic (foreign) firm. Iceberg transport costs are formalised by the constant  $\tau$  and imply that only  $1/\tau$  of a unit of a foreign variety arrives for consumption. The consumer price of an imported variety is given by  $\tau P_j$ . Utility maximisation yields the demand functions and indirect utility,  $V$ , as expressed in the following:

$$C_X = \alpha P^{-1}, \quad C_A = Y - \alpha, \quad x_i = \alpha P_i^{-\sigma} P^{\sigma-1}, \quad x_j = \alpha (\tau P_j)^{-\sigma} P^{\sigma-1} \quad (3)$$

$$V = -\alpha \ln P + Y + [\alpha (\ln \alpha - 1)] \quad (4)$$

### 2.3. Production

The production function of the outside good is  $X_A = L_A$  where  $X_A$  and  $L_A$  denote output and the input of non-unionised labour, respectively. Perfect competition ensures that this good is priced at marginal (and also average) cost. Since this good is the numéraire, the wage rate of non-unionised labour is unity,  $W_L = 1$ .

Each product type is supplied by a single firm  $i$  which incurs fixed costs  $R$  due to the requirement of one unit of entrepreneurial capital in order to be able to produce at all. Production then takes place according to the Cobb-Douglas function  $X_i = l_i^\beta h_i^{1-\beta}$  where  $X_i$  denotes the firm's production level and  $l_i$  and  $h_i$  its inputs of non-unionised and unionised labour, respectively. Marginal costs are given by  $c \equiv \beta^{-\beta} (1-\beta)^{\beta-1} W_H^{1-\beta}$ . The share of variable costs attributable to non-unionised labour (unionised labour) is given by  $\beta$  ( $1-\beta$ ). The firm's conditional input demand for non-unionised labour and unionised labour is given by  $l_i = \beta c X_i$  and  $h_i = (1-\beta) W_H^{-1} c X_i$ , respectively. Let the producer prices charged to domestic (foreign) households be denoted  $P_i$  ( $P_i^*$ ). Noting that part of demand is indirect, caused by transport losses, and denoting the demand of a foreign household by  $x_i^*$ , profits of the representative firm in the home region,  $\Pi_i$ , are given by:

$$\Pi_i = (P_i - c)(L + H + K)x_i + (P_i^* - c)(L^* + H^* + K^*)x_i^* - R \quad (5)$$

With the Chamberlinian large group assumption, profit maximising prices on both markets are constant mark-ups on marginal costs (which are increasing in union wages)

$$P_i = P_i^* = c\sigma/(\sigma - 1) \quad (6)$$

The compensation of human capital adjusts so as to ensure zero profit equilibrium. Using the market clearing condition,  $X_i = (L + H + K)x_i + (L^* + H^* + K^*)\alpha_i^*$  for domestic variety  $i$ , the following relationship between firm scale  $X_i$  and fixed costs  $R$  is obtained:

$$X_i = R(\sigma - 1)/c \quad (7)$$

#### 2.4. Wages

The compensation of both non-unionised labour and of entrepreneurial capital is determined on competitive markets as just described. In contrast, the compensation of unionised labour,  $W_H$ , is rigid and determined by purely exogenous parameters of the tax-benefit system<sup>6</sup>

$$W_H = \frac{1 - t_B}{1 - t_W} \frac{B}{v} \quad (8)$$

where  $t_W$  denotes the proportional tax rate on wage incomes of unionised and non-unionised labour and  $t_B$  denotes the proportional tax rate on unemployment benefits. The parameter  $v$  is constant and provides a measure for the net replacement ratio (i.e.  $v = [(1 - t_B)B]/[(1 - t_W)W_H]$ ). Eq. (8) captures in a simple way that wages are tied up with social policies, the constancy of the net replacement ratio being reasonable in the longer-run (e.g. Nickell and Layard 1999, Layard et al. 1991). It follows immediately from (8) that, ceteris paribus, the union wage is higher, the higher the benefit level and the wage tax and the lower the tax on unemployment benefits. The level of unemployment is given by  $H - Nh_i$  where the number of firms equals the capital stock installed domestically. Government budget balance,  $(H - Nh_i)(1 - t_B)B = t_W(W_L L + W_H h_i N)$ , commands that the outlays for the unemployed are financed by the taxes on wage incomes and benefits.

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<sup>6</sup> Eq. (8) can be given simple microfoundations by assuming that unions choose wages so as to maximise a Stone-Geary utility function,  $h(\cdot)[W_H(1 - t_W) - B(1 - t_B)]^\gamma$  (e.g. Booth 1995) and by noting that the wage elasticity of labour demand is given by  $-\partial \ln h(\cdot)/\partial \ln W_H = \beta + \sigma(1 - \beta)$  with Cobb-Douglas technologies and a constant price elasticity of demand for each variety given by  $\sigma$ . The constant parameter in (8) is then given by  $v \equiv [\beta + \sigma(1 - \beta) - \gamma]/[\beta + \sigma(1 - \beta)]$ . Thanks to Eric Toulemonde for pointing out to me this way to arrive at (8).

### 3. Revisiting the ‘traditional view’

Suppose that the two countries which share identical preferences, technology, factor endowments and trade costs but possibly have different benefit-tax systems engage in free trade and allow entrepreneurial capital to move freely across borders. However, assume that the entrepreneurial owners of capital are immobile internationally, as traditionally assumed. All rents from capital invested abroad are therefore repatriated. The international equilibrium under these mobility assumptions is determined by the conditions that capital rents are equalised internationally,  $R = R^*$ , that there is capital market clearing internationally,  $N + N^* = 2K$ , and that product markets clear and profits of domestic and foreign firms vanish in long-run equilibrium as stated in the following two conditions:<sup>7</sup>

$$\sigma R = \frac{\alpha(L + H + K)}{N + \phi^* N^*} + \frac{\phi \alpha(L^* + H^* + K^*)}{\phi N + N^*} \quad \sigma R^* = \frac{\phi^* \alpha(L + H + K)}{N + \phi^* N^*} + \frac{\alpha(L^* + H^* + K^*)}{\phi N + N^*} \quad (9)$$

$$\text{where} \quad \phi \equiv [\tau(W_H / W_H^*)^{1-\beta}]^{1-\sigma} \quad \phi^* \equiv [\tau(W_H^* / W_H)^{1-\beta}]^{1-\sigma}$$

Solving these conditions yields:

$$N = \frac{K[1 - 2\phi^* + \phi\phi^*]}{(1-\phi)(1-\phi^*)} \quad N^* = \frac{K[1 - 2\phi + \phi\phi^*]}{(1-\phi)(1-\phi^*)} \quad R = \alpha L / \sigma K \quad (10)$$

The output level of firms can then be derived from (7) and all other endogenous variables follow immediately. If the regions are equal with respect to their tax-benefit systems and, hence, if regional union wages are equal, then it follows immediately that  $\phi = \phi^*$  and from (10),  $N = N^* = K$ . Each region has half of the entrepreneurial capital and firms, accordingly.

Suppose now that unions in one region demand a higher wage, say because higher unemployment benefits are granted which in turn are financed by an increase in wage taxes. This wage policy will clearly have an effect on the location of firms. Around the symmetric-identical equilibrium this relocation effect can be derived from (10) as:

$$\frac{\partial N / N}{\partial W_H / W_H} = 2(1-\sigma)(1-\beta) \frac{\tau^{1-\sigma}}{(1-\tau^{1-\sigma})^2} < 0 \quad (11)$$

<sup>7</sup> To arrive at these conditions one has to impose the zero profit condition on (5), and to use (2), (3), (6) and the expression for marginal costs together with their foreign counterparts.

The size of this relocation effect increases with the cost share of unionised labour in variable costs,  $(1 - \beta)$ , and with the inverse of the elasticity of substitution,  $1/\sigma$ , which is an indicator for the returns to scale in zero profit equilibrium in this type of model<sup>8</sup> More importantly, the relocation effect is negatively related to the level of trade costs,  $\tau$ . The lower these are, the stronger the movement of firms out of this region and into the other for any given proportionate increase in union wages. The relocation effect goes to infinity as trade costs vanish ( $\tau \rightarrow 1$ ). Hence, in a world where firms produce with increasing returns to scale and where capital and firms are mobile, a union wage push in one region has a strong effect on industry location. Note in particular, that this effect increases with the level of economic integration as proxied by trade costs. This result underlies the ‘traditional view’ which stipulates that countries will necessarily have to stick to identical (or, at least, similar) wage and social policies or they will experience a massive relocation of firms.

#### 4. The new economic geography view

##### 4.1. Mobile entrepreneurs

Suppose now, in contrast to the previous section, that the entrepreneurial owners of capital are mobile internationally, too. When entrepreneurs move across borders along with their capital, their capital rents (incomes) will no longer be repatriated but accrue to the region where the entrepreneurs locate. This opens up agglomerative forces of the new economic geography.

To study the incentive of entrepreneurs to move across borders, it is necessary to derive and compare their indirect utility levels associated with living in one or the other country for a given short-run allocation of the world-wide capital stock. By symmetry,  $N = K$  and  $N^* = K^*$ , in the short-run. Equations (9) can therefore be reformulated to read:

$$\sigma R = \frac{\alpha(L + H + K)}{K + \phi^* K^*} + \frac{\phi \alpha(L^* + H^* + K^*)}{\phi K + K^*} \quad \sigma R^* = \frac{\phi^* \alpha(L + H + K)}{K + \phi^* K^*} + \frac{\alpha(L^* + H^* + K^*)}{\phi K + K^*} \quad (12)$$

Because of the quasi-linear upper tier utility function, the compensation for entrepreneurial capital in home and foreign,  $R$  and  $R^*$ , in such a short-run equilibrium can directly be read

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<sup>8</sup> As Neary (2001: 548) notes, it is a quirk of the Dixit-Stiglitz model that a standard measure of the degree of returns to scale, the ratio of average costs to marginal costs, depends on the elasticity of substitution. To see this, note that prices equal average costs in zero profit equilibrium and prices are constant markups on marginal costs according to (7). Hence, the ratio of average to marginal costs is given by  $\sigma/(\sigma - 1)$ . See also Helpman and Krugman (1985, Chapt. 7) on this.

of (12). In the long run, entrepreneurs move to the country where they obtain the higher level of indirect utility. The utility differential,  $V - V^* = \alpha \ln(P^*/P) + (R - R^*)$ , can be derived analytically for general trade costs in this model. If it is assumed that countries are identical except for union wages and benefit-tax systems and if all endowments are normalised to unity,  $L = L^* = H = H^* = K = K^* = 1$ , this utility differential reads

$$V - V^* = \frac{\alpha}{1 - \sigma} \left\{ \ln \tau^{1 - \sigma} + \ln \left[ \frac{\lambda + (1 - \lambda)/\phi}{\lambda + (1 - \lambda)\phi^*} \right] \right\} + \frac{\alpha}{\sigma} \left\{ \frac{(1 + \lambda)(1 - \phi^*)}{\lambda + (1 - \lambda)\phi^*} - \frac{(2 - \lambda)(1 - \phi)}{(1 - \lambda) + \lambda\phi} \right\} \quad (13)$$

where  $\lambda \equiv K/(K + K^*)$  denotes the share of the world-wide capital stock located in home. A long-run equilibrium in which both regions produce differentiated goods is given when  $V - V^* = 0$ . When regions are identical in all respects,  $\lambda = 1/2$  is such an equilibrium. However, this symmetric equilibrium is not necessarily stable because the model contains two agglomerative forces, a supply linkage and a demand linkage. The supply linkage arises because the country with the higher share of entrepreneurial capital has a larger manufacturing sector and therefore a lower price index. This is captured in the first term in (13). There is a demand linkage because increasing the share of entrepreneurial capital in one country induces an increase in income and, hence, in market size. This raises the profitability of firms in this country as expressed in  $(R - R^*)$  and thus attracts even more entrepreneurial capital. The demand linkage is captured in the second term in (13). However, shifting firms from the foreign to the domestic economy increases competition among firms for given expenditures on domestic products while lowering competition in the foreign market, thereby reducing the profitability of the domestic market in relation to the foreign market. This local competition effect is a deglomerative force. Trade costs affect the balance between the two types of forces. When they are large enough, they render the symmetric equilibrium stable. However, when trade costs are continuously reduced, the symmetric equilibrium becomes unstable. Then two stable and increasingly asymmetric equilibria emerge in which a larger part (and, finally, all) of the differentiated goods industry is located in one or the other country. Asymmetric equilibria emerge at trade costs  $\tau_b = [(\sigma - 2)/(5\sigma - 4)]^{1/(1 - \sigma)}$ . The level of trade costs  $\tau_f$  at which full specialisation arises is implicitly given by the condition  $\ln \tau_f = [2\tau_f^{1 - \sigma} + \tau_f^{-(1 - \sigma)} - 3]$ . Hence, the model exhibits a smooth 'supercritical pitchfork

bifurcation'.<sup>9</sup> This is illustrated in Fig. 1 which graphs the equilibrium shares of capital in each country against the level of trade costs.

[Fig. 1 about here]

Figure 1 illustrates that an analysis of a domestic wage hike, starting from an international union wage differential of unity, can be performed for three initial situations, a symmetric equilibrium, an equilibrium with partial agglomeration and an equilibrium with full agglomeration. Start with a symmetric equilibrium. A domestic wage hike which raises the international union wage differential above unity leads to a relocation of firms to the foreign country. The same result holds true for an initial equilibrium with partial agglomeration of firms. These results can be established analytically by imposing the condition  $V - V^* = 0$  on (13) and then by deriving  $\partial \ln \lambda / \partial \ln W_H < 0$  through implicit differentiation.<sup>10</sup> In this sense, the 'traditional view' is confirmed in this 'new economic geography' setting.

#### 4.2. A core advantage

Suppose now, however, that for some reason an agglomeration process has already occurred historically and that the whole increasing returns to scale industry is located in, say, the home country. Then, an 'agglomeration rent' accrues to the internationally mobile entrepreneurs in the core. For the present model, this 'agglomeration rent' can be calculated by taking the effect of the international union wage differential  $W_H / W_H^* \equiv \psi$  on  $\phi$  and  $\phi^*$  into account, and by using  $\lambda = 1$  in (13):

$$V - V^* = \frac{\alpha}{1 - \sigma} \ln \tau^{1 - \sigma} + \frac{\alpha}{\sigma} \left\{ 2 \left( 1 - \tau^{1 - \sigma} \psi^{-(1 - \beta)(1 - \sigma)} \right) - \frac{1 - \tau^{1 - \sigma} \psi^{(1 - \beta)(1 - \sigma)}}{\tau^{1 - \sigma} \psi^{(1 - \beta)(1 - \sigma)}} \right\} \quad (14)$$

Intuitively, the size of this agglomeration rent is positively related to  $\alpha$ , the income fraction devoted to differentiated goods (see eq. (3)), to  $\beta$ , the share of variable costs attributable to

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<sup>9</sup> The standard core-periphery model of Krugman (1991) exposed in great detail in Fujita et al (1999), in contrast, exhibits a chaotic 'subcritical pitchfork bifurcation', i.e. at a certain level of trade costs (the so-called sustain point) two stable fully agglomerative equilibria emerge in addition to the initially stable symmetric equilibrium. At a still lower level of trade costs (the so-called break point) the symmetric equilibrium becomes unstable. The different bifurcation pattern in the present model derives from the fact that the logarithmic quasi-linear utility function eliminates income effects from the manufacturing sector and thereby weakens the demand linkage as compared to the Cobb-Douglas upper tier utility used in the standard core periphery model. A detailed discussion of this difference is provided in Pflüger (2003). See Fujita et al. (1999) for an accessible introduction to bifurcations and Grandmont (1988) for a technical treatment.

<sup>10</sup> The analytical expression is rather unwieldy and for that reason not reported here.

non-unionised labour and to  $1/\sigma$ , the degree of returns to scale in the differentiated goods industry. The relationship between the agglomeration rent and trade costs is bell-shaped. The agglomeration rent is zero at the border value of trade costs at which the agglomeration in one country switches from partial to full (e.g. to  $\lambda = 1$ ). This rent is zero, too, when trade costs vanish ( $\tau = 1$ ) and location does not matter anymore. At some intermediate trade costs, the agglomeration rent is highest. Crucially, (14) shows that the agglomeration rent is related to the international union wage differential,  $\psi$ . This suggests that unions and governments which are located in the core can exploit the agglomeration rent and therefore choose higher benefits, taxes and wages than their counterparts in the periphery. This scope is limited by the condition that the utility differential  $V - V^*$  in (14) be non-negative. Imposing this condition yields a closed-form solution for the maximum international union wage differential  $\psi^M(\tau)$  which can be maintained without having to fear an exit of industry:<sup>11</sup>

$$\psi^M(\tau) = \left[ \frac{1 + 2\tau^{2(1-\sigma)}}{\tau^{1-\sigma}(3 + \sigma \ln \tau)} \right]^{\frac{1}{(1-\sigma)(1-\beta)}} \quad (15)$$

The maximum wage differential is increasing in the degree of returns to scale,  $1/\sigma$ , and in non-unionised labour's share of variable costs,  $\beta$ . Figure 2 plots the maximum union wage differential against the level of trade costs. As this graph reveals, the differential is bell-shaped. This suggests that, in the process of economic integration, the ability of unions in the core to charge a higher wage than unions in the periphery first rises, then reaches a peak and finally dissolves when trade costs are nil. The level of trade costs at which the maximum wage differential itself reaches a maximum is implicitly determined by the condition  $\tau^{2(1-\sigma)} = [(1-\sigma)(3 + \sigma \ln \tau) + \sigma] / 2[(1-\sigma)(3 + \sigma \ln \tau) - \sigma]$ . Intuitively, the bell-shaped relationship between trade costs and the wage differential reflects the behaviour of the agglomeration rent which constrains the core union's ability to achieve higher wages.

[Fig. 2 about here]

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<sup>11</sup> The migration rule used in this paper is based on the assumption that entrepreneurs are myopic, i.e. have static assumptions and thus base their migration decision on the current indirect utility differential. Hence, no individual entrepreneur would have an incentive to move to the periphery with the wage differential specified in (15). However, this situation offers a profit opportunity for large forward looking agents (similar as in Henderson's analysis of urban systems (e.g. Fujita et al. Chapt. 2)). By recurring to the assumption of myopic agents and (unmodelled) transaction costs the present analysis precludes that the entrepreneurs are able to coordinate on such a joint move to the other country. I am grateful to a referee for making me aware of this point.

With parameter values of  $\beta = 0.5$  and  $\sigma = 6$ , unions in the core can maintain a maximum wage premium of 10% (at integration level  $\tau = 1.14$ ) vis-à-vis unions in the periphery. When economies of scale are as strong as assumed in Baldwin and Krugman's (2000) baseline scenario ( $\sigma = 2.5$ ), this maximum premium rises to 55% (at  $\tau = 1.66$ ).

This analysis suggests that all international integration notwithstanding, there is some national autonomy in wage and social policies when historical agglomeration advantages are taken into account.<sup>12</sup> Hence, this paper provides an explanation for the persistence of sizeable differences in wage levels and social policies even in regions which are well-integrated. Trade costs in this model can be thought of as comprising both artificial trade barriers, such as tariffs or product standards, and natural barriers, such as transport costs or cultural differences. Even though artificial barriers could possibly be eliminated altogether between integrating countries, some natural barriers will, all past and future transport cost revolutions notwithstanding, surely remain. A complete levelling of wage and social policies in an integrating world in which countries start with different initial conditions is therefore unlikely.

Even if the focus of the paper is on wage and social policies, what can be said about unemployment? In the periphery, all unionised labour is unemployed. In the core, unemployment is given by  $H - Nh_i$  where  $N = K + K^*$  and where the demand for labour of the representative domestic firm is accordingly given by  $h_i = \alpha(1 - \beta)(\sigma - 1)(2 + 1/\tau)/\sigma W_H$ .<sup>13</sup> In a process of economic integration, this demand is governed by two forces: trade costs  $\tau$  are falling which per se increases the demand for unionised labour by increasing foreign demand (through (3)) whereas  $W_H$  first increases and then decreases according to (15) and so first reduces and then increases the demand for unionised labour. Hence, initially the two forces are counteracting. When the peak of the wage differential in Fig. 2 is reached they jointly contribute to an increase in demand for unionised labour and hence a reduction of unemployment in the core.

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<sup>12</sup> A similar result is derived by Munch (1999) in an international Cournot model of the Brander-Krugman-type.

<sup>13</sup> This derivation uses the market clearing condition  $X_i = (L + H + K + K^*)x_i + (L^* + H^*)x_i^*$  and (2), (3), (6) and the normalisation of all endowments to unity to determine the production level,  $X_i$ , given marginal cost. Applying the conditional demand for unionised labour as stated in section 2.3 gives the result above.



## 5. Discussion

According to this analysis the most significant difference between a world which takes the existence of agglomeration forces into account and a world which does not is that the former allows for some national autonomy in wage and social policies. This result requires that the manufacturing sector has agglomerated in one country, or, to put it differently, that the periphery is completely deindustrialised. Accordingly, all unionised labour in the periphery is unemployed, clearly an extreme case. This is a consequence of the parsimonious specification of the model, however. The following discussion sets this result in a wider perspective and puts some assumptions under closer scrutiny.

The complete deindustrialisation of the periphery results from the assumption of only two production sectors and, in a sense, it parallels the familiar result of extreme specialisation in the simple two-good Ricardo model. As in extensions of that model (e.g. Bhagwati et al. 1998), it would be natural to allow for many manufacturing sectors. In the geography context this is done by Venables (1999) and Fujita et al (1999, Chapt. 16). In these works it is shown that with such extensions the emergence of industrial clusters can be explained, i.e. countries then specialise on a selection of manufacturing sectors and the distribution of sectors between countries need not be equal (i.e. need not necessarily be half and half). If we consider such a multi-sector world, and think of entrepreneurial capital as being sector-specific and of unions being sectoral ones too, our result would suggest that there can be cross-country wage differentials in particular sectors. The country which, in a process of economic integration, obtains the larger share of manufacturing sectors then ends up with the higher average union wage.

With respect to unemployment, it should be noted that underlying the analysis is a presumption that the supply of unionised labour is always larger than the (aggregate) demand for labour at the various levels of trade costs and associated wage rates. If this assumption, a simplification to avoid the issue of rationing, was not met, the rigidity of wages, could not be maintained and one would have to face the fact that the wage would be bid up from the labour demand side. This would create difficult interactions with the main analysis. However, there is a simple alternative to exclude rationing. This alternative is to follow Driffil and van der Ploeg (1995) and to assume that unemployed union members can work in the constant returns outside sector at the wage  $W_L = 1$  prevailing there. Such a model would dispose of the tax-benefit system in (8) – and so place the focus on wage policies only – but assume instead that

union wages are simple mark-ups on this outside option. This would leave the remaining analysis intact. In such a model there would be no unemployment since the  $H - Nh_i$  unionised workers not employed in the manufacturing sector could resort to a job in the outside sector. However, they would clearly experience a welfare loss by being forced to work for a lower wage. Finally, note that the issue of unemployment would be a much less severe one (notably for the periphery) in a multi-sector extension of the present model as suggested above.

A final concern is trade costs. The model assumes that the outside-good can be traded without cost whereas iceberg costs have to be incurred in cross border trade of differentiated goods. This may not seem to be an innocuous assumption because, for a similar model, Davis (1998) has shown that the introduction of such costs for the good produced under constant return to scale eliminates the market size effect on which the demand linkage in geography models is based (e.g. Neary 2001). However, as shown by Fujita et al. (1999 Chapt. 7.4), when the output in the constant returns sector is differentiated across countries, the market size effect and hence the demand linkage is re-established even with trade costs in the constant returns sector. In light of this result, the assumption of no trade costs in the outside-good can be defended as simply being a convenient modelling short-cut.

## 6. Conclusions

In this paper, a simple model of monopolistic competition with mobile capital and firms is set up as an integrative theoretical framework for two views in the debate about the viability of nationally independent wage and social policies. The dominant view in the public debate holds that those countries which maintain higher union wages and more generous welfare systems than others (all other factors equal) experience an increasing exit of firms as product market integration proceeds. This view is at odds with empirical findings which show that sizeable differences remain even in regions which have achieved high levels of integration. This paper points to one theoretical rationale for this finding. Agglomeration advantages which have built up in the past allow unions in the core to have higher wages than unions in the periphery. The scope to have higher wages is constrained, however, and related to the level of trade costs in a bell-shaped way.

In order to work out this argument in the possibly simplest way, this paper has used the Flam-Helpman (1987) specification of the model of monopolistic competition and has followed the Krugman (1991) factor mobility tradition to model agglomerative forces. Due to these

assumptions, simple closed-form solutions could be provided for all results. The arguments of this paper could alternatively have been presented in a model following the tradition established by Venables (1996) and Krugman and Venables (1995). They provide a new economic geography model where the agglomerative forces are due to the proximity of an intermediate goods industry to a final goods industry. However, this alternative framework would have made it necessary to rely on numerical solutions.

There are several avenues for future work some of which were already spelled out in the previous section. Relaxing the assumption of an exogenously determined wage, is arguably the most important one. This would allow to address the competitive choice of wage and social policies in the core and the periphery.

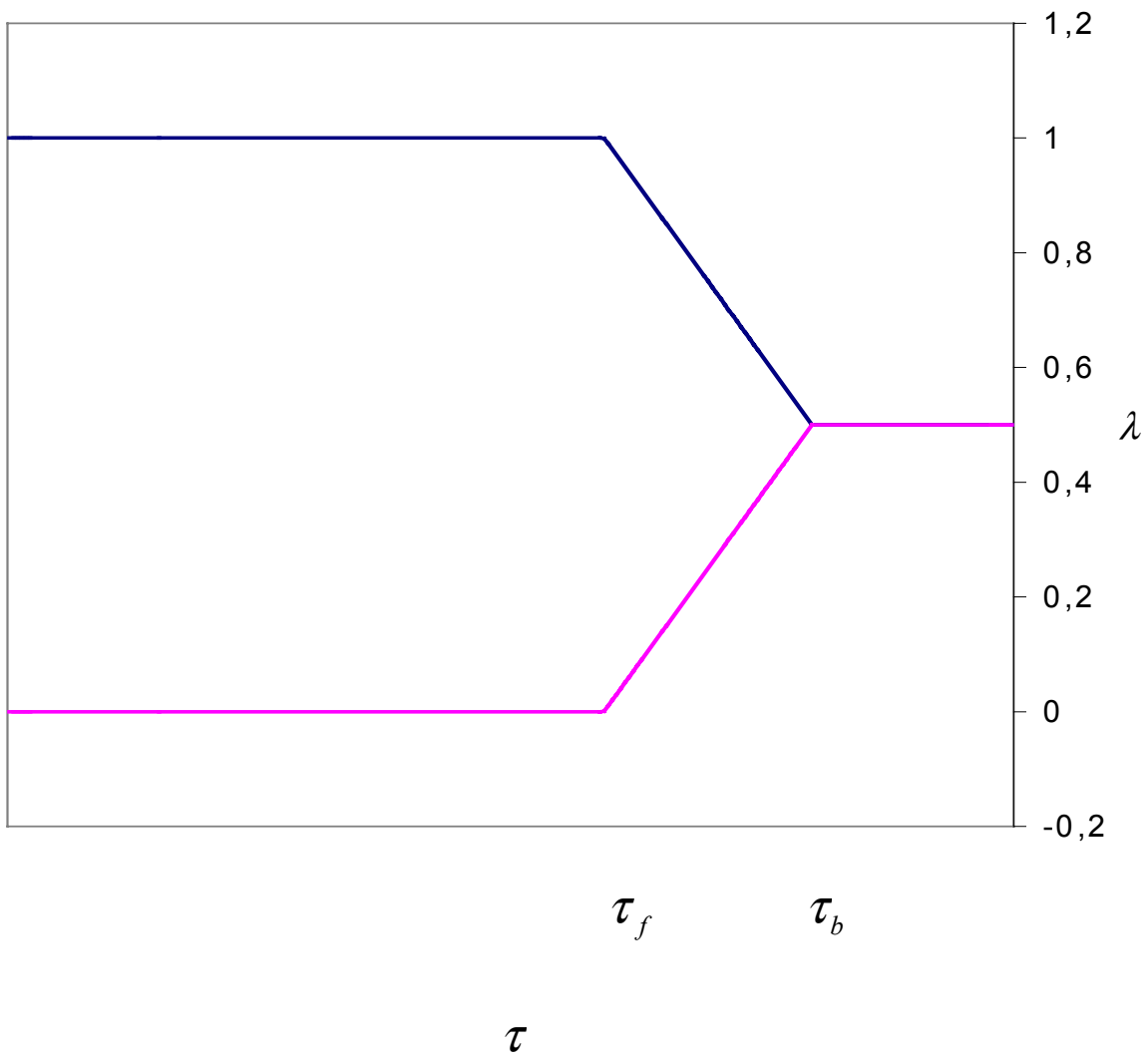
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**Fig. 1. Bifurcation diagram**

**Fig. 2. Maximum international union wage differential and trade costs**