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EU enlargement and the internal geography of countries

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This paper focuses on the relation between economic integration and the location of economic activity in a country. We extend a new economic geography model in which trade liberalization affects both the agglomeration and dispersion forces that shape the spatial equilibrium. We show that integration generally fosters spatial concentration in the region that has a pronounced advantage in terms of its access to international markets, unless competitive pressure from foreign firms is too high. Our results shed light on the optimal currency area debate concerning the enlarged European Union. *Journal of Comparative Economics* **32** (2) (2004) 265–279. TEAM, University of Paris I, CNRS, France; CREST, J360, 15 Bd Gabriel Péri, 92245 Malakoff cedex, France.

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1. Introduction

Issues concerning the viability of the enlarged European Union (EU) relate to production and income matters in addition to monetary concerns. The literature on optimal currency areas (OCA), initiated by Mundell (1961), indicates that the benefits from participating in a monetary union will outweigh the costs if the countries have high factor mobility and high openness to trade. In this paper, we shed light on the openness to

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trade criteria from the perspective of the new economic geography literature. Now that enlargement is underway, the impact of the integration process on the degree of trade openness of the accessing countries and thus on the intensity of their trade relations with the current EU member should be investigated. In addition to augmenting trade between two countries, economic integration has an impact on the spatial distribution of economic activity inside the country that opens to trade. In turn, this spatial reallocation process influences the intensity of trade flows between two countries and contributes to the OCA debate.

The relation between trade and the location of production inside countries has been studied explicitly in the new economic geography literature, which is based on Krugman (1991). In a two-country, three-region framework, Krugman and Livas Elizondo (1996) suggest that a decrease in international transaction costs between two countries may cause dispersion of economic activity inside the home country. Conversely, Alonso-Villar (1999, 2001), Monfort and Nicolini (2000), and Paluzie (2001) show that trade liberalization is more likely to enhance the agglomeration of economic activity inside the country opening to trade. Commenting on Krugman and Livas, Henderson (1996) introduces an additional element to the framework, by emphasizing that the impact of an increase in trade depends on the internal geography of the country.

In this paper, we develop a theoretical model containing two countries and three regions, i.e., two domestic regions and one foreign region, using the original new economic geography framework. We analyze the impact of trade liberalization on the internal geography of a domestic country in which both regions are equidistant from the border. In a model in which both the dispersion and agglomeration of economic activity are driven by endogenous elements, we observe that trade liberalization leads to the concentration of activity inside the domestic country. We generalize this model to investigate how the result is altered if a heterogeneous domestic country, in which both domestic regions do not have the same access to the foreign market, opens to trade. In this case, we show that trade liberalization is likely to favor the development of border regions. We also highlight the conditions under which industrial agglomeration occurs in regions offering the smallest access to foreign markets. Finally, using Romanian data, we estimate the reduced form of our motion law, to see if some agglomeration pattern takes place between 1991 and 1998. We expect that the consequences of the trade liberalization between the EU countries and the Central and Eastern European countries (CEECs) will either shift economic activity towards the Western border or reinforce localization in the inner remote regions.

2. The model

Following Paluzie (2001), we consider a framework consisting of a domestic country that has two regions, denoted 1 and 2. The country opens to trade with an exogenous foreign country, denoted 0. We focus on the evolution of the economic geography inside the domestic country during the process of trade liberalization. The country has two sectors; one is a monopolistically competitive manufacturing sector that produces a differentiated good and represents all increasing-to-scale production activities in the economy. The other sector is the constant-returns-to-scale, perfectly competitive sector;

it produces a homogeneous good and represents the agricultural sector. Factors are specific to each sector. Agricultural and manufacturing goods are traded both interregionally and internationally.

The foreign country is totally exogenous; its labor force is immobile and consists of L_{A0} agricultural workers and L_0 manufacturing workers. In the domestic country, the regional supply of agricultural labor is fixed. The two domestic regions have L_{A1} and L_{A2} workers respectively; these workers are able to move. In the domestic manufacturing sector, only the total amount of manufacturing labor, denoted L, is fixed. The interregional distribution of industrial workers is endogenous; workers are mobile and migrate between the regions 1 and 2 depending on the interregional real wage difference. For the rest of the paper, we normalize the total number of industrial workers in the domestic country at $L = 1$ and denote the share of industrial workers in region 1 as λ.

The spatial framework is introduced as a transaction cost variable that represents the distance between cities and also barriers to trade. Following similar models, output produced in a region is sold by the firm at the mill-price and the entire transaction cost paid by the consumer. We use an iceberg-type transaction cost variable, which means that a fraction of the good melts during the journey, so that, when one unit is shipped at price p, only $1/T$ actually arrives at its destination. Therefore, in order for one unit of a good to arrive, T units must be shipped, which increases the price of the unit received to pT. Trade in the industrial good incurs transaction costs, which differ across regions; T_{12} is the internal transaction cost, which applies to interregional domestic trade so that $T_{12} = T_{21}$. The external transaction costs applying to each domestic region's trade with the foreign country are denoted T_{01} and T_{02} respectively. We assume that trade in the agricultural good is costless, both interregionally and internationally, so that its price is equal everywhere, i.e., $p_{A1} = p_{A2} = p_{A0}$. The agricultural good is produced under perfect competition and we choose technical coefficients equal to 1. As a result, $p_A = w_A$ in each region. Finally, we use the agricultural good as a numéraire therefore, w_A is equal to one in each region.

Each consumer has the same Cobb–Douglas utility function given by

$$U = M^{\mu} A^{1-\mu}, \quad \text{with} \quad 0 < \mu < 1. \tag{1}$$

In Eq. (1), M is a composite index of the consumption of the manufactured good and A is the consumption of the agricultural good. The share of expenditures on manufactured goods is μ and the share on agricultural goods is $1 - \mu$. The composite index M is characterized by the following CES function:

$$M = \left[\sum_{i=1}^{n} c_i^{(\sigma-1)/\sigma} \right]^{\sigma/(\sigma-1)}. \tag{2}$$

In (2), c_i represents the consumption of a variety i of the manufactured good and σ is the elasticity of substitution between two varieties, with $\sigma > 1$. Given income Y, each consumer maximizes his utility under a budget constraint given by $Y = p_A A + \sum_{i=1}^{n} c_i p_i$. Hence, the following demand function represents demand from consumers of region s for

the output of a producer i located in region r:

$$c_{i,rs} = \frac{p_{irs}^{-\sigma}}{\sum_{r=0}^{R}\sum_{i=1}^{n_r}(p_{irs})^{1-\sigma}}\mu Y_s, \quad r,s = 0,1,2. \tag{3}$$

Equation (3) consists of R regions, each of which produces n_r varieties of the manufacturing good. The iceberg transport technology indicates that the price of each variety i produced in r and sold in s is equal to $p_r T_{rs}$.[1] T_{rs} is a general expression that represents either T_{12}, T_{01} or T_{02}. We assume that $T_{rr} = 1$ and, until Section 4, that $T_{01} = T_{02} > T_{12}$. Using (2) and (3), we derive the following industrial price index for each region s:

$$G_s = \left[\sum_{r=0}^{R} n_r (p_r T_{rs})^{1-\sigma}\right]^{1/(1-\sigma)}. \tag{4}$$

Individual demand (3) can be written as

$$c_{rs} = \frac{(p_r T_{rs})^{-\sigma}}{G_s^{1-\sigma}}\mu Y_s, \quad r,s = 0,1,2. \tag{5}$$

Following Dixit and Stiglitz (1977), manufactured goods are produced in a monopolistically competitive industry. For each producer, the production function is expressed in terms of manufacturing labor and given by $l = \alpha + \beta q$, where l is total cost in terms of labor of producing q varieties. Total cost consists of a fixed cost α and a marginal cost β per additional unit produced. Each producer maximizes profits so that we obtain constant mark-up equations given by

$$p_r = \left(\frac{\sigma}{\sigma - 1}\right) w_r \beta, \tag{6}$$

where p_r is the price of a variety produced in region r and w_r is the manufacturing wage in that region. The equilibrium output of a firm producing in region r is derived from the free entry condition to be:

$$q_r^* = \frac{\alpha(\sigma - 1)}{\beta}. \tag{7}$$

Labor market equilibrium in each region allows us to compute the equilibrium number of firms equal to

$$n_r = \frac{L_r}{\alpha\sigma}, \tag{8}$$

where L_r is the total number of manufacturing workers in region r.

To fully determine the short-term equilibrium, we derive the value of w_r that satisfies Eqs. (5)–(8) and the equilibrium condition on the goods' market for a given distribution of labor between regions 1 and 2. Hence, the manufacturing wage equation for each region r

[1] Due to symmetry, we omit the variety index for each region.

is given by

$$w_r = \frac{1}{\beta}\left(\frac{\sigma-1}{\sigma}\right)\left[\frac{\mu\beta}{\alpha(\sigma-1)}\left(\sum_{j=0}^{R} Y_j G_j^{\sigma-1} T_{jr}^{1-\sigma}\right)\right]^{1/\sigma}, \tag{9}$$

where $Y_r = w_r L_r + w_{Ar} L_{Ar}$ and $w_{Ar} = 1$. Equation (9) is a typical wage equation in new economic geography models (Fujita et al., 1999). This equation indicates that the larger is the number of consumers and the lower is the number of competitors in regions with low transaction costs to r, the higher is the nominal wage that a firm producing in r can pay. Indeed, the nominal wage in region r tends to be higher if incomes in other regions with low transaction costs to r are high. Conversely, the wage tends to be lower if other regions with low transaction costs to r contain a large number of firms because the region's industrial price index, denoted $G_j^{\sigma-1}$, may be regarded as an index of concentration.

We are now able to characterize fully the equilibrium variables in our two-country, three-region framework, for a given spatial distribution of workers. Regional incomes are given by

$$Y_1 = w_1\lambda + L_{A1}, \tag{10}$$

$$Y_2 = w_2(1-\lambda) + L_{A2}, \tag{11}$$

$$Y_0 = w_0 L_0 + L_{A0}. \tag{12}$$

Nominal wages are determined of the following system of equations, where G and Y are substituted for as functions of wages using (4), (6), (8) and $Y_r = w_r L_r + L_{Ar} w_{Ar}$:[2]

$$w_1 = \frac{1}{\beta}\left(\frac{\sigma-1}{\sigma}\right)\left[\frac{\mu\beta}{\alpha(\sigma-1)}\left(Y_0 G_0^{\sigma-1} T_0^{1-\sigma} + Y_1 G_1^{\sigma-1} + Y_2 G_2^{\sigma-1} T_{12}^{1-\sigma}\right)\right]^{1/\sigma}, \tag{13}$$

$$w_2 = \frac{1}{\beta}\left(\frac{\sigma-1}{\sigma}\right)\left[\frac{\mu\beta}{\alpha(\sigma-1)}\left(Y_0 G_0^{\sigma-1} T_0^{1-\sigma} + Y_1 G_1^{\sigma-1} T_{12}^{1-\sigma} + Y_2 G_2^{\sigma-1}\right)\right]^{1/\sigma}, \tag{14}$$

$$w_0 = \frac{1}{\beta}\left(\frac{\sigma-1}{\sigma}\right)\left[\frac{\mu\beta}{\alpha(\sigma-1)}\left(Y_0 G_0^{\sigma-1} + Y_1 G_1^{\sigma-1} T_0^{1-\sigma} + Y_2 G_2^{\sigma-1} T_0^{1-\sigma}\right)\right]^{1/\sigma}. \tag{15}$$

Thus, the industrial price indices are given by

$$G_1 = \left(\frac{\sigma\beta}{\sigma-1}\right)\left(\frac{1}{\alpha\sigma}\right)^{1/(1-\sigma)} \times \left[L_0(w_0 T_0)^{1-\sigma} + \lambda w_1^{1-\sigma} + (1-\lambda)(w_2 T_{12})^{1-\sigma}\right]^{1/(1-\sigma)}, \tag{16}$$

$$G_2 = \left(\frac{\sigma\beta}{\sigma-1}\right)\left(\frac{1}{\alpha\sigma}\right)^{1/(1-\sigma)}$$

[2] The uniqueness of the solution is difficult to demonstrate with more than one equation and we ignore it for the moment. The procedure used for solving numerically for w_1 and w_2 is explained in Crozet and Koenig Soubeyran (2004).

$$\times \left[L_0(w_0T_0)^{1-\sigma} + \lambda(w_1T_{12})^{1-\sigma} + (1-\lambda)w_2^{1-\sigma}\right]^{1/(1-\sigma)}, \tag{17}$$

$$G_0 = \left(\frac{\sigma\beta}{\sigma-1}\right)\left(\frac{1}{\alpha\sigma}\right)^{1/(1-\sigma)}$$
$$\times \left[L_0w_0^{1-\sigma} + \lambda(w_1T_0)^{1-\sigma} + (1-\lambda)(w_2T_0)^{1-\sigma}\right]^{1/(1-\sigma)}. \tag{18}$$

Finally, we derive the real wage of each domestic region, which consists of the nominal wage deflated by the price index, i.e., $\omega_1 = w_1/G_1^{\mu}$ and $\omega_2 = w_2/G_2^{\mu}$.

From above, if $\lambda = 1/2$ and $L_{A1} = L_{A2}$, $\omega_1 = \omega_2$. Hence, if the industrial workforce is distributed equally between the domestic regions, real wages are equalized and there is no incentive for workers to move. Suppose one worker from region 2 is reallocated to region 1. A real wage differential results and may either induce more people to move or lower the real wage in the destination region. In the latter case, the equal distribution of workers will be a stable equilibrium. We assume that industrial workers move between the two regions according to the following migration dynamics:

$$\frac{\mathrm{d}\lambda}{\mathrm{d}t} = \omega_1 - \omega_2. \tag{19}$$

To study the relationship between the real wage differential and the fraction of industrial workers living in region 1, we identify the spatial equilibria of the model, i.e., the distributions of workers for which no worker may obtain a higher real wage by changing location. These equilibrium distributions consist of the values of λ for which either $(\omega_1 - \omega_2) = 0$ and $\lambda \in [0, 1]$ or $(\omega_1 - \omega_2) \geqslant 0$ and $\lambda = 1$ or $(\omega_1 - \omega_2) \leqslant 0$ and $\lambda = 0$. As is typical in new economic geography models, $(\omega_1 - \omega_2)$ is not a simple function of λ. Hence, we are unable to determine the actual values of the parameters in the spatial equilibria. In the next section, we use numerical simulations to investigate the shape of the real wage differential function.

The evolution of the real wage differential $(\omega_1 - \omega_2)$ and the equilibrium spatial distribution inside the domestic country depend on the interaction of the agglomeration and dispersion forces appearing of the above equations. On the one hand, agglomeration forces arise from the interests of firms and consumers to locate in the same region due to cost and demand externalities. In Eqs. (13) and (14), the demand externality indicates that a large number of consumers in a region results in high local expenditures that allow firms to pay higher wages so that the region attracts more firms. In Eqs. (16)–(18), the cost externality indicates that a large number of firms results in many locally produced varieties so that the price index is lower and more consumers are attracted to the region. On the other hand, the dispersion force arises from intense competition on good and factor markets if industrial activity is concentrated in one region. Equations (13) and (14) indicate that the nominal wage of a region diminishes with an increase in competition so that firms relocate to the remote market in order to benefit from less intense competition in that region. The final equilibrium configuration depends on the parameters of the models, specifically on the level of interregional and international transaction costs. In the next section, we consider economic integration between the domestic country and a foreign country by considering decreases in T_{01} and T_{02}. We focus on the impact of the presence of a foreign country on the internal geography of the domestic country.

3. Trade liberalization and border regions

We specify a functional form for T_{rs} that represents all transaction costs, including a cost related to distance, and an ad-valorem tariff for international trade. We assume that transaction costs are an increasing function of distance so that $T_{12} = d_{12}^{\delta}$, $T_{01} = (1 + \mathit{tariff})d_{01}^{\delta}$ and $T_{02} = (1 + \mathit{tariff})d_{02}^{\delta}$ with $\delta > 0$. We consider the effect of lowering the international transaction cost on the spatial distribution of activity for a homogeneous country in which the two domestic regions have the same access to foreign markets, so that $d_{01} = d_{02} = d_0$. Hence, T_{01} and T_{02} are equal to T_0. For a given value of T_0, we solve numerically for the values of w_1 and w_2 over a range of values of $\lambda \in [0, 1]$.[3] Then we substitute the obtained w_1 and w_2 into $(\omega_1 - \omega_2)$. In Fig. 1, we plot this result of our simulation for three different values of *tariff*.

To interpret Fig. 1, we start from this situation in which workers are distributed symmetrically among regions, i.e., $\lambda = 0.5$. This configuration will be a stable equilibrium only if the real wage difference becomes negative for a marginal increase in λ so that

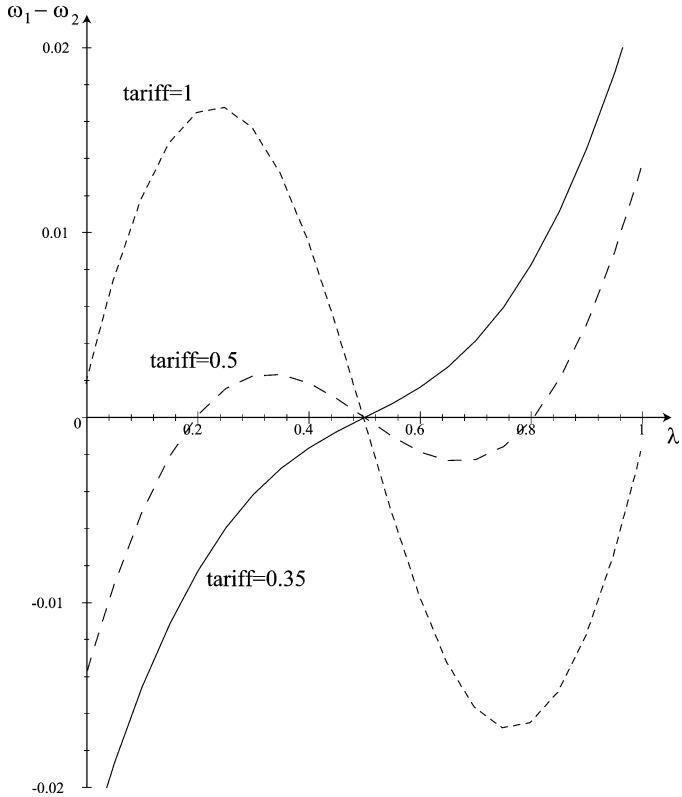

Fig. 1. Real wage differences for three different external transaction costs.

[3] The values of the other parameters are $\sigma = 4$, $\beta = 3/4$, $\mu = 0.4$, $\alpha = 1/4$, $d_{12} = 3$, $\delta = 0.8$, and $L_0/L = 50$.

migration will bring the distribution of workers back to the symmetrical configuration. The situation in which the domestic country is closest to autarky is illustrated by the dotted curve, which is drawn for $d_0 = 4$ and $tariff = 1$, corresponding to a 100% ad-valorem tariff. For this level of transaction costs, the symmetric equilibrium, i.e., $\lambda = 0.5$, is the only stable equilibrium.[4] The dashed curve illustrates the situation when the economy opens slightly with $tariff = 0.5$. There are now five equilibria, of which three are stable and two are unstable. While the symmetric equilibrium is still stable, the agglomerated configuration in either region, i.e., $\lambda = 0$ or $\lambda = 1$ is also stable. Finally, as trade barriers are decreased further, the slope of the curve becomes positive throughout. If $tariff = 0.35$, which corresponds to an ad-valorem tariff of 35%, the only stable outcomes are the two agglomerated configurations. Hence, according to our simulations, economic integration is most likely to result in a spatially concentrated domestic industrial sector.

A decrease in the external transaction cost allows two additional elements, i.e., foreign demand and foreign supply to impact the domestic economy. On the one hand, access to a large exterior market lowers the incentive for domestic firms to locate near domestic consumers, because they represent a smaller share of sales. Thus, the domestic demand externality is weakened by the presence of foreign demand. In essence, income from the foreign country becomes a more important part of total demand in Eqs. (13) and (14). For similar reasons, the domestic cost externality is weakened by the presence of foreign supply. Foreign firms now represent a much more important share of total supply to domestic consumers. Basically, the presence of foreign firms now constitutes the main impetus to drive the price indices down in Eqs. (16)–(18). On the other hand, trade liberalization affects competition within the domestic country. Competition exerted by foreign firms on the domestic market is large compared to competition of domestic firms. Therefore, the presence of foreign supply reduces the need for domestic firms to locate away from domestic competitors and, thus, lowers the need to disperse economic activity. Although foreign demand and foreign supply decrease both the agglomeration and the dispersion forces, our simulations show that economic integration has more effect on the dispersion force. As a result, the domestic economy becomes concentrated in only one location.

By allowing the two external transaction costs to differ, we assume that one of the domestic regions, i.e., region 2, has better access to the foreign market. Following Hotelling (1929), we adopt a simplified representation of space in which country 0 and region 1 are located at both extremes of a segment. Region 2 is located between country 0 and region 1; it is the border region. Thus, $T_{01} = (1 + tariff)d_{01}^{\delta}$ and $T_{02} = (1 + tariff)d_{02}^{\delta}$, with $d_{01} = d_{02} + d_{12}$. To understand how the economic geography of the country evolves with trade openness, we use numerical simulations to determine the shape of the interregional real wage difference as a function of the workers distribution λ.

Theoretically, the forces impacting on the domestic economy are modified because the country now contains two heterogeneous regions. First, as observed above, foreign demand lowers the domestic agglomeration force. However, an additional effect arises

[4] Figure 1 is drawn assuming a value of T_{12} for which industry is dispersed in autarky. We obtain similar results for lower values of T_{12}.

because domestic firms may now choose to locate closer to the foreign market in region 2. Thus, one potential effect of trade liberalization is to pull domestic firms towards the border so that they benefit from the access to foreign demand. Second, foreign supply lowers the domestic dispersion force. Again an additional effect arises due to the heterogeneity of the regions. Region 1, which is at the end of the segment, allows firms to locate as far away as possible from foreign competitors. Hence, trade liberalization may push domestic firms towards the remote regions to protect themselves from foreign competition.

Figure 2, which is similar to Fig. 1, illustrates the impact of these forces depending on the degree of trade liberalization. As in Fig. 1, the symmetric distribution of workers is a stable equilibrium for high values of *tariff*. As tariffs decrease, the slope of the curve becomes positive throughout so that only agglomerated configurations are stable equilibria. However, the curves are no longer symmetric at $\lambda = 0.5$. The push effect towards the interior region shifts the dotted curve to the right. When the domestic economy is relatively

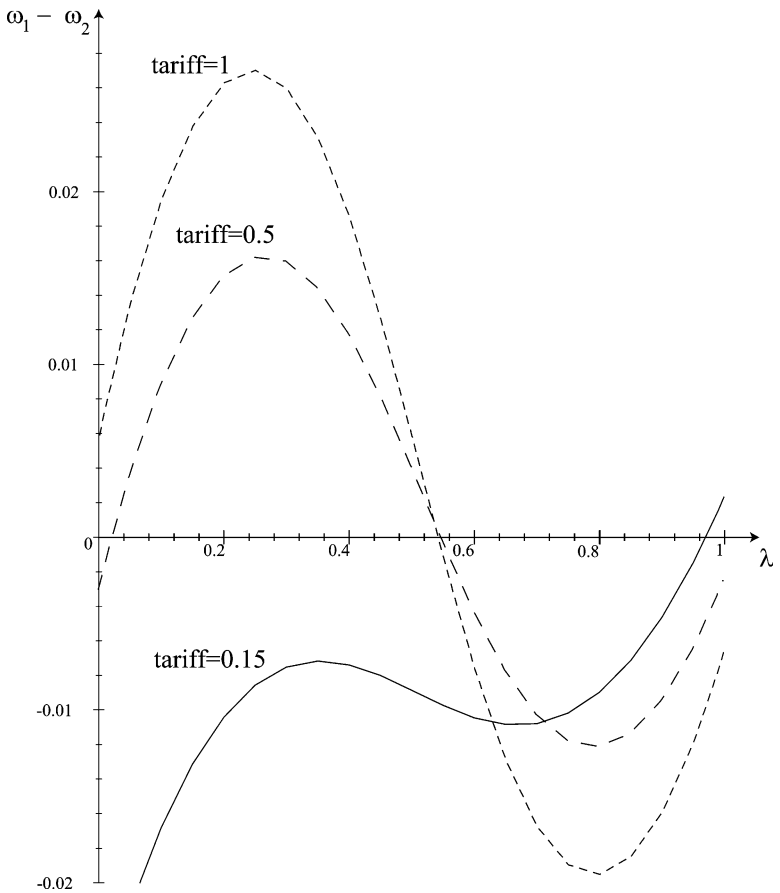

Fig. 2. Real wage difference when the two regions have different external transaction costs.

closed, the increase in the degree of competition driven by foreign supply dominates the pull effect. Economic activities are dispersed but there is an asymmetry leading to the location of more than 50% of the industries in region 1. The pull effect to the border region shifts the solid curve to the right. When tariffs are low, the increase of demand from the foreign country dominates the competition effect driven by foreign firms so that the country's economic activity is attracted to the border region. Agglomeration is the only stable equilibrium but it more likely to occur in the region closest to the foreign market. Figure 2 shows that concentration in region 1 may only occur if the initial distribution of activity strongly favors region 1, i.e., if λ lies between the intersection of the dark curve with the x axis and $\lambda = 1$.

The main result of modifying the model is to show that trade liberalization creates two effects, namely, a pull-effect towards border regions and a push-effect towards interior regions. The strengths of these phenomena will depend on various aspects of the model; large foreign demand for the domestic product will increase the pull of the domestic industrial sector towards low-cost access border regions. Conversely, significant export activity of foreign firms will encourage the development of better protected internal regions. These theoretical results have important consequences for countries meeting the criteria of an optimal currency area.

The existing literature emphasizes that the enlargement process should decrease trade costs between current EU members and the CEECs through the removals of trade barriers and the stabilization of the exchange rate. By increasing the intensity of trade, these policies are likely to generate higher business cycle synchronization and make enlargement of the European and Monetary Union feasible (Frankel and Rose, 1998). However, our model highlights on another consequence of the enlargement. Our results predict that a decrease in trade costs may influence the spatial dynamics within each of the CEECs, which will affect each country's trade with the rest of the EU. A country in which industrial activity is agglomerated in the remote region generates less trade with the foreign market than one in which economic activity is localized near the foreign country. In our model, the pattern of trade is related closely to a gravity-type effect. The basic gravity equation states that exports from remote regions are less than exports from border regions if the regions are of equal economic size. Hence, an accessing country is likely to trade more with the Western countries if its domestic economy is agglomerated in the border region rather than in a remote region.

Depending on the balance between these forces, spatial dynamics may influence positively or negatively the intensity of trade and thus the relevance of monetary integration. If the pattern of industrialization inside a country opening to trade with the EU exhibits localization towards inner and remote regions, this country it is less likely to meet the criteria of an optimal currency area. Conversely, if industrial development is concentrated in regions that are close to the foreign markets, trade will be higher and the country is more likely to be able to meet the criteria. In the next section, we apply our theoretical model to the UE integration process using Romania as an example. According to our theoretical results, the process of trade liberalization that began in the 1990s is likely to have some impact on the distribution of economic activity within each of the accessing countries. Our model shows that firms are likely to move to regions in which demand is higher and that workers will migrate to regions that pay higher real wages.

4. The implications of EU enlargement for Romania

Maurel and Cheikbossian (1998) claim that a rapid reorientation of trade has taken place in the CEECs since the dismantling of the COMECON in 1991. For Romania, Fig. 3 portrays imports from and exports to Western European countries as a percentage of GDP for the period 1988 to 1999.[5] Since, Romanian imports increased over the entire period, the weight of Western European goods in Romanian consumption rose significantly during the 1990s. In addition, exports to Western Europe increased as a percentage of GDP, indicating Romania's commercial relations with the EU.

Romania is an interesting country in which to study spatial reallocations due to trade liberalization because its economic activity was concentrated mostly in Eastern regions.[6] According to our theoretical framework, spatial configuration in Romania resembles the case of agglomeration in the remote region. Hence, higher urbanization growth rates in border regions would indicate more intensive trade relations between Romania and the EU.

Our purpose is to study whether migration flows inside Romania shed light on the pattern of reallocation of economic activity inside the country. In the theoretical model, workers move from region i to region j if the real wage difference is positive, i.e., $\omega_j > \omega_i$,

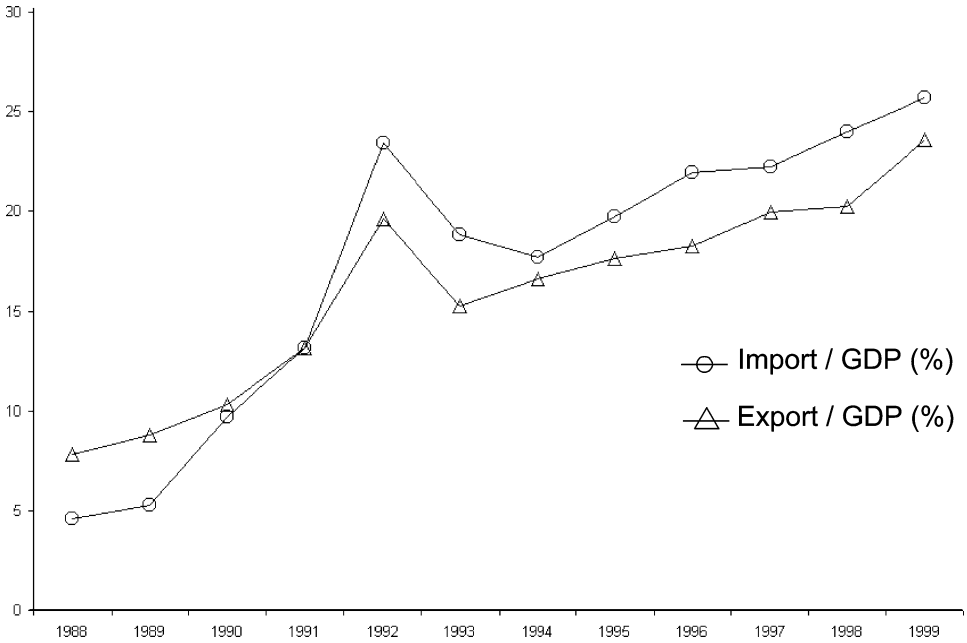

Fig. 3. Romania's trade with Western Europe.

[5] The trade data come from the CHELEM–CEPII database.

[6] The Bucharest region accounted for 10.3% of the total population in 1991 and 17% of urban population. In 1998, these percentages declined to 9.0 and 16.3%, respectively.

which supports industrial development in region j. From Section 2, the real wage depends on the nominal wage and the industrial price index. In Eq. (4), the price index of a region is the sum of market sizes in all regions, weighted by the transaction costs from all regions to this region. Since geographical distance is a natural proxy for transaction costs, this index resembles the region's market potential, which is the measure of access to markets used in the new economic geography literature. Harris (1954) uses the distance-weighted sum of all other regions' GDPs to measure market potential as

$$MP_r = \sum_{j=1}^{N} \frac{GDP_j}{d_{rj}}. \tag{20}$$

This measure of market potential will be used as a main explanatory variable in our regressions. We use data on regional population, which is divided between rural and urban population, to calculate regional urban balances. We express the share of urban population of a region, denoted s_r^u, as the ratio of urban to total population. Population data are provided by the Romanian Statistical Office. Romanian regions correspond to the *Eurostat* classification at the NUTS3 level,[7] which divides the country into 41 entities with Bucharest and its suburbs as one region.

Our dependent variable is the annual growth rate of the share of urban population defined as the difference of the logarithms. We expect urban growth rates to be higher in regions with higher market potential regions. The explanatory variables are the nominal wage and the market potential of a region. We compute the market potential of each Romanian region from Eq. (20). We use regional data for the EU countries at the NUTS2 level, national data for the CEECs at the NUTS1 level and regional data for Romanian regions at the NUTS3 level. GDP data come from the Eurostat Regio database. Distances are provided by an electronic road atlas that computes the length of the quickest journey by road between two cities. Hence, this measure takes account of the quality of road infrastructure.

To investigate whether Romanian industrial reallocations are driven mostly by access to EU markets, we consider the separate influences of EU markets, of all CEE markets without Romania, and of Romanian markets following the approach in Redding and Venables (2004). We estimate the following equation for 41 Romanian regions from 1991 to 1997 period:

$$\ln\left(\frac{s_{i,t}^u}{s_{i,t-1}^u}\right) = \alpha_1 \ln MP_{i,t} + \alpha_2 \ln w_{i,t} + \alpha_3 \ln u_{i,t} + \alpha_4 \ln S_{i,t-1}^u + \alpha_5\, sea + \alpha_6 Buchar + \varepsilon_{i,t}. \tag{21}$$

In Eq. (21), $s_{i,t}^u$ in region i at time t, is the share of urban population, $MP_{i,t}$ is the market potential, $w_{i,t}$ is the regional nominal wage, and $u_{i,t}$ is the regional unemployment rate. *Buchar* and *sea* are two dummies that are equal to 1 for Bucharest district and maritime regions, respectively.

[7] NUTS (nomenclature of territorial units for statistics) is a nomenclature providing a hierarchical structure of sub-national regions covering all European territory.

Because of the small sample size, we use instrumental variables for the lagged level of urbanization. This variable is instrumented by the lagged agricultural employment share, and dummies for maritime regions, Western border regions, Bucharest, and the year 1993.[8] Estimations are done using fixed effects on the time dimension to take account of heterogeneity in urbanization patterns arising from particular years. Thus, our coefficients reflect heterogeneity only in the degree of regional urbanization due to spatial characteristics. In Table 1, each column presents estimation results using different definitions of market potential. Lagged urban rates have a negative impact on urbanization growth, which suggests a catching-up process between low urbanized and high urbanized regions. As expected, high nominal wages favor urban growth in all specifications. However, the unemployment rate is never significant.

The coefficient on total market potential in column (1) of Table 1 is positive and significative, which confirms our theoretical predictions. Moreover, proximity to the coast has a significant positive effect, which emphasizes the importance of access to markets in determining the location of economic activity.

Table 1
Urban growth in Romania 1993 to 1997: Two-stage least squares estimation with fixed effects

Model	(1)	(2)	(3)	(4)
log *MP*	0.0111***			
	(0.003)			
log *MP* (Romania)		0.0004		
		(0.002)		
log *MP* (EU)			0.0107***	
			(0.003)	
log *MP* (CEECs)				0.0049***
				(0.018)
log Wage	0.0137***	0.0110***	0.0136***	0.0138***
	(0.004)	(0.004)	(0.004)	(0.004)
log Unempl. rate	0.0008	−0.0004	0.0007	0.0004
	(0.014)	(0.001)	(0.001)	(0.001)
log Lag urban rate	−0.0129***	−0.0104***	−0.0128***	−0.0123***
	(0.003)	(0.002)	(0.002)	(0.002)
sea	0.0053***	0.0029*	0.0052***	0.0044**
	(0.002)	(0.002)	(0.002)	(0.002)
Bucharest	0.0040**	0.0015	0.0044**	0.0039**
	(0.002)	(0.002)	(0.002)	(0.002)
No. obs.	205	205	205	205
R^2	0.4125	0.4276	0.4116	0.4040

Notes. The dependent variable is annual growth rate of share of urban population. Robust standard errors are in parentheses.

* Significant at the 10% level.
** Idem., 5%.
*** Idem., 1%.

[8] Our data cover the period from 1991 to 1997; however, we have no data for the year 1992. Hence, the first lags for the year 1993 correspond to 1991 data.

The results in column (2) of Table 1 also show that access to the Romanian market has no significant influence on urban growth. Hence, the share of total market potential in Romania is less important in driving industrial reallocations than is access to CEE markets and to EU markets, as columns (3) and (4) demonstrate. Therefore, the impact of trade liberalization on Romanian economic geography is likely to augment the intensity of trade between Romania and the EU.

5. Conclusion

In this paper, we extend the analysis of the relation between trade liberalization and the location of production inside countries in two ways. First, we generalize a simple extension of the model in Krugman (1991) to a two-country, three-region framework. If both agglomeration and dispersion forces are endogenous, we show that trade liberalization fosters spatial concentration using simulations of the model. Second, we consider a spatially heterogeneous country having both a border region and a remote region. Our simulations indicate that trade liberalization favors the development of the border region if competition pressure from international markets is not too intense. Using evidence from Romania, we find urbanization patterns that support this result. Hence, we conclude that reagglomeration dynamics within Romania will encourage more trade integration with EU countries.

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