Chapter 7

The Impact of Enlargement on the Internal Geography of Accession Countries

Annex

Abstract

Against the background of a new economic geography model, we analyze the internal spatial wage and employment structures of the Czech Republic, Hungary, Poland, Slovenia and Slovakia, using regional data for 1996-2000. Matching data for the existing EU member states provide a benchmark for comparison. The model predicts wage gradients and specialization patterns that are smoothly related to regions' relative market access. As an alternative, we formulate a "Comecon hypothesis", according to which wages and sectoral location are not systematically related to market access except for discrete concentrations in capital regions. Our estimations confirm the relevance of market access for regional wages and employment specialization. In the Central European countries, we also find considerable support the "Comecon hypothesis". Accession countries' internal wage structures and service employment in the late 1990s were still excessively concentrated on their capital regions. In line with the theory, our results therefore suggest a future increase in relative wages and employment shares of Central Europe's provincial regions, favoring particularly those that are proximate to the large markets of existing EU members.

1 Introduction

After the overthrow of their socialist regimes in 1989-90, most Central and Eastern European countries (CEECs) have rapidly adopted market-based economic systems and redirected the focus of their political and economic relations towards the European Union. In this process, the economies of these countries have been profoundly transformed, and the accession to the EU of nine CEECs in 2004 is likely to trigger further adjustments. One of the main benefits of the 2004 enlargement will be to boost economic activity, both in accession countries and in incumbent member states. Lower barriers to trade will yield gains that are well understood by economists and estimated to be significant (see e.g. Baldwin *et al.*, 1997).

Although the potential for aggregate economic gains through closer economic integration in Europe is undisputed, economists also acknowledge that integration transforms the internal structures of national economies, which can have important distributional consequences. One dimension of integration-induced restructuring concerns geography. How does European integration impact on the spatial distribution of activities, prices and incomes across regions? This question has been the object of a thriving research area in recent years.

It is somewhat surprising, given the vibrancy of the research field and the importance of the issue, that relatively little analysis has been conducted on the transforming economic geographies of accession countries.[1] For the academic researcher, these countries present an interesting "laboratory case", due to their legacy of centrally planned economic structures and rapid trade reorientation towards the EU. Is the old spatial organization of those economies unravelling and giving way to a different geographic distribution of activities, shaped by market forces? If so, what is the nature of these forces, and what new spatial equilibrium is likely to emerge? These questions are of evident interest to policy makers too, particularly in the context of designing appropriate regional policies.

We provide an analysis of the internal economic geographies of Central European accession countries, drawing on regional data for wages and sectoral employment in the Czech Republic, Hungary, Poland, Slovenia and Slovakia. Specifically, we estimate spatial wage and employment gradients inside those countries based on a new economic geography (NEG) model. The model features two countries and three regions, and we simulate EU enlargement by tracking the impact of a decrease in trade costs between the two countries on the location of economic activity among the two regions inside the "home" country. The model yields locational predictions that depend on a range of parameters, such as the mobility of production factors, the intensity of scale economies and the relative size of regions and countries. The principal determinant of industrial location and wages, however, is market access. The better a region's access to large markets (and pools of suppliers), the higher its wages and the greater its locational attractiveness for mobile trade-oriented sectors. Depending on the precise model used, access to markets will yield either high factor prices, large production, or a mix of both. The wage and output effects of market access are a typical feature of the NEG that sets these models apart from most neoclassical location theory. It makes the NEG approach eminently suitable as a theoretical framework for the analysis of locational changes in integrating economies with similar endowments.

As an alternative to the market-driven spatial structure described by the model, we formulate a "Comecon hypothesis", based on the idea that the artifice of central planning created economic geographies whose only regularity was a concentration of certain sectors and high wages in the capital region.

Our estimations based on data for the accession countries support both the new economic geography prediction and the "Comecon hypothesis". When we compare internal wage and employment gradients of accession countries with those of existing EU members, we find that accession countries are marked by significantly stronger concentrations of wages and of employment in both market services and public service sectors in their capital regions. One might therefore conjecture that market forces will in time attenuate those countries' economic concentration in capital regions and favor a dispersion of activities and an increase of relative wages in provincial regions - particularly in those that are located close to the core EU markets.

The paper is organised as follows. In section 2, we present the theoretical model that underpins our empirical approach and derive the estimable equations. Section 3 documents the trade integration of Central European countries with the EU that has already taken place, using a measure of "trade freeness" that is derived from the theory. Our estimations of wage and employment gradients in accession countries and in the full sample of 21 European countries are given in Section 4. Section 5 concludes.

[1]Prior studies of regional location patterns in CEECs are Resmini (2003) and Traistaru *et al.* (2003). These pioneer studies are largely exploratory and relatively limited in terms of data coverage.

2 Theory

The NEG provides a well suited framework for a formal analysis of the internal geography of countries that open their markets towards the outside world. In this section, we sketch the salient features of a three-region NEG model and derive the fundamental equations that underlie our empirical analysis. For a more complete exposition of the underlying model, we provide more details in Appendix A.

2.1 The model

NEG models, initially developed by Krugman (1991), Venables (1996) and Krugman and Venables (1995), rely on four essential ingredients to explain the spatial configuration of economic activity. First, production is subject to increasing returns to scale at the firm level. Second, the goods produced by different firms are "differentiated", i.e. imperfect substitutes. Third, firms are symmetric and sufficiently numerous to accommodate monopolistically competitive equilibria. Fourth, trade costs inhibit trade between locations and thereby give economic relevance to otherwise featureless geographic space.

The standard NEG setting features two locations, and the analysis focuses on the allocation of production and factor rewards in the increasing-returns sector at different levels of trade costs between those regions. Our purpose is slightly different: we seek to study the effects of a change in trade costs between two locations (a central European country and the EU) on the internal geography of one of the locations (thus on the allocation of activity inside an acceding country). Several authors have examined the effects of trade liberalisation in three- and four -region NEG settings that are amenable to the study of this issue. These include Krugman and Livas (1996), Monfort and Nicolini (2000), Paluzie (2001), Alonso-Villar (2001), Behrens (2003), and Crozet and Koenig-Soubeyran (2003). We summarise the latter analysis, which extends Krugman's (1991) model to a two-country three-region framework, in Appendix A of this paper.

An essential feature of these models is that market access acts as the principal determinant of the spatial structure of employment and factor prices. Market access is an increasing function of a location's own market size and of the size of other markets, and a decreasing function of the trade costs that separates the home location from all other locations. Changes in market access trigger locational forces, which, adopting to Head and Mayer's (2004) terminology, we call the price version and the quantity version of the market access effect. The price version can be illustrated as follows.

Suppose a typical NEG framework with multiple locations, a unique production factor in the differentiated sector, industrial labor, and zero mobility of firms and labor. The profit function of a representative firm in a differentiated sector and located in region i is:

$$\Pi_i = p_i x_i - w_i(F_i + cx_i) \tag{1}$$

To produce x_i units of the differentiated good, which it sells at price p_i, the firm uses F units of labor as a fixed input, and cx_i units as a variable input. Labor is paid a wage w_i. Each firm maximizes its profit by behaving as a monopolist for its own variety of the differentiated good. The first order profit-maximizing condition combined with the large-group assumption of monopolistic competition allow the derivation of the pricing rule, $p_i = \frac{c\sigma}{\sigma-1}$, where σ stands for the elasticity of substitution among goods from the competing symmetric firms. When incorporated in the profit equation, this gives:

$$\Pi_i = w_i \left(\frac{x_i c}{\sigma - 1} - F \right) \tag{2}$$

At the monopolistic equilibrium, profits are zero. This condition allows to derive the equilibrium quantity produced by each firm: $x_i^* = F(\sigma - 1)/c$. The equilibrium on the market for a variety of the industrial good is:

$$p_i x_i^* = \sum_j p_i^{1-\sigma} \ \Phi_{ij} \ P_j^{\sigma-1} \mu Y_j \tag{3}$$

where x_i^* is the equilibrium output of a representative firm in i, Y_j is the total income of region j, and μ is the share of expenditure that consumers allocate to the differentiated sector. P_j is the price index of the differentiated sector (see Appendix A for more details). Following Baldwin *et al.* (2003), trade costs are expressed as $\tau_{ij}^{1-\sigma} \equiv \Phi_{ij}$, which is comprised between 0 and 1 and is a measure of the degree of *trade freeness* between pairs of regions. At $\Phi_{ij} = 0$ there is no trade, and $\Phi_{ij} = 1$ means free trade. Φ rises in τ, the ad-valorem 'iceberg' cost of shipping goods between regions, and in σ, which can be interpreted as an inverse measure of product differentiation.

A normalization on output allows us to choose units such that $c = (\sigma - 1)/\sigma$. It follows that $p_i = w_i$ and $x_i^* = F\sigma$. Incorporating the pricing rule, the equilibrium quantity, and the equilibrium on the industrial labor market, equation (3) becomes:

$$w_i = \left[\frac{\mu}{F\sigma} \sum_j \Phi_{ij} P_j^{\sigma-1} Y_j \right]^{1/\sigma} \tag{4}$$

We can see that the wage in each region is a function of the size of the demand to which it has access, Y_j, the level of trade costs Φ_{ij}, and the price index, which can be understood as an inverse measure of the degree of competition. The price version of the market access effect is the impact that the access to markets of a region, also called its market potential, has on factor prices. Hence, through equation (4) it appears that central regions will pay higher wages, in order to compensate for the advantage in profitability. Central regions are large (have high Y_i), and/or they have good access (high Φs), to large partner regions (high $Y_j, j \neq i$).

The quantity version of the market-access effect arises in a similar type of model. Some models assume a single factor of production that is shared by two sectors, one of which is perfectly competitive and freely traded. In this case, the perfectly competitive sector pins down wages, and the industrial wage cannot increase in order to adjust for an increase in profitability of one of the region. Adjustment occurs through factor movements, either across sectors or across regions. Regions with better market access will host a (disproportionately) larger differentiated sector. When the ratio of a region's share of production in a sector and that region's share of demand (weighted by trade costs) is larger than one, one speaks of a 'Home Market Effect'.[2]

2.2 The estimable equations

The wage equation expressed in (4) shows that, in equilibrium, the nominal wage of a region depends on three main terms which form the complete expression of a region's market access. Such a comprehensive form of the wage equation has been empirically estimated in two related approaches. Hanson (1998) estimates a structural wage equation inside the United States, confirming a positive relationship between wages at the county level and market access. Redding and Venables (2000) analyze the impact of international market access on the GDP per capita in a sample of 101 countries. They find evidence of the importance of the geography of access to markets and to sources of supply in explaining cross-country variations in per-capita income.

[2]It is worth underlining that, by saying this, we extrapolate the results of a three/multi region model from a two region model. Indeed, the price and quantity aspects of the market access effect have, to our best knowledge, only been derived in a two region model - see Krugman (1980) for the price version and Helpman and Krugman (1985) for the quantity version.

Our approach will be based on a reduced-form estimation of the market access effect described by the wage equation. Equation (4) states that the wage of a region i depends on the size of the demand available in each accessible market, multiplied by the intensity of competition in each of these markets, and weighted by the accessibility of each market. In our estimations, we focus on τ_{ij} as the essential characteristic that distinguishes regions' market access. The ideal empirical counterpart of τ_{ij} would be, for each region of interest, a measure of the level of trade costs with all existing outside potential markets as well as internally. We simplify this task by choosing, as in Hanson (1996) and Hanson (1997), the access of each considered region to its principal markets, approximated by geographic distance.

Which are these principal markets in the case of the Central European accession countries? Before the dismantling of the Soviet bloc, those countries' trade was mainly focused on intra-Comecon (Council for Mutual Economic Cooperation) relationships. The main commercial outlets for domestic production were the national market, the other eastern countries and the Soviet Union. However, market forces had a very minor role in shaping wages and location patterns compared to the importance of central planning. The explanatory power of market-based economic models, such as those of the NEG, regarding those countries' internal economic geographies prior to their conversion to market systems in the 1990s is therefore likely to be limited. It is clear, however, that centrally planned economies tend to be strongly centred on the capital region. We therefore formulate a "Comecon hypothesis" as the reference point for our analysis: under central planning, nominal wages as well as employment shares of sectors that are closely linked to the central authorities are significantly higher in the capital regions but they are otherwise unrelated to market access. In other words, our Comecon hypothesis implies a discrete jump in wages and employment shares between the capital region and the provinces and no systematic patterns among the provinces.

According to the NEG prediction embodied in (4), wages should rise smoothly in market access. We model market access in terms of regions' distances (i) from their relative national capitals and (ii) from the EU, whose economic center of gravity we take to be Brussels. Continuous gradients of wages and/or employment shares relative to regions' market access are a general prediction of NEG models that we take as the alternative to our "Comecon hypothesis". We thus specify the following reduced-form expression for region i's relative wage:

$$\frac{w_i}{w_{\text{capital}}} = f\left(\Phi_{i\text{capital}}, \Phi_{i\text{EU}}, \text{other market access variables}\right) \tag{5}$$

where w_i is the regional nominal wage, w_{capital} is the wage in the capital, and $\Phi_{i\text{capital}}$ and $\Phi_{i\text{EU}}$ are the trade costs between i and, respectively, the EU and the national capital. We use distance to represent trade freeness, hence accessibility to each of the markets, and we specify a log-linear relation between the variables. Our first estimable equation is:

$$\ln\left(\frac{w_i}{w_{\text{capital}}}\right) = \beta_0 + \beta_1 \ln(d_{i\text{capital}}) + \beta_2 \ln(d_{i\text{EU}}) + \vec{\beta}\vec{X}_i + \varepsilon_i, \tag{6}$$

where $\vec{X}$ is a vector of other variables that determine market access, and ε_i is an error term that consists of a country effect, a year effect and a white noise component. Based on the NEG model, we expect the estimated β_1 and β_2 to be negative.[3] The Comecon hypothesis, in turn, implies a significantly positive β_0 and insignificant β_1 and β_2.

Our second estimable equation focuses on the quantity version of the market access effect. As emphasized in section (2.1), in this variant of NEG models, the adjustment variable is the number of firms. Hence, regions with relatively good access to the main markets will have the

[3]Note that in estimating a single equation for average wages across sectors - a choice necessitated by data constraints - we imply the assumption that labor is intersectorally mobile.

relative high share of employment in differentiated sectors. We write the following reduced-form expression, which holds for regional relative employment inside an accession country:

$$\frac{l_{s_i}}{\mathrm{pop}_i} = g_s(\Phi_{i\mathrm{capital}}, \Phi_{i\mathrm{EU}}, \text{other market access variables}) \quad (7)$$

l_{s_i} is employment in sector s and region i, and pop_i is the region's population. The right-hand side variables have been defined in (5). As for equation (6), we specify a log-linear relation between our variables and use distance to represent the trade costs. Our second estimable equation is

$$\ln\left(\frac{l_{s_i}}{\mathrm{pop}_i}\right) = \alpha_{s_0} + \alpha_{s_1}\ln(d_{i\mathrm{capital}}) + \alpha_{s_2}\ln(d_{i\mathrm{EU}}) + \vec{\alpha}_s\vec{X}_i + \epsilon_{s_i}, \quad (8)$$

where we make the same assumptions on the structure of ε_i.

3 The evolution of access to markets and bilateral trade between the EU and the CEECs

3.1 The new geography of access to markets

An interesting issue before analyzing spatial employment and wage patterns in accession countries is to observe how bilateral trade between EU members and the CEECs reacted to the gradual process of economic integration during the 1990s.

We use a general, multi-country version of the monopolistic competition trade model presented above. We focus on the trade costs parameter between countries i and j, Φ_{ij}, and we thus drop the distinction between domestic regions.

The expenditure of country j on imports of a representative variety of country i's good is given by:

$$p_{ij}c_{ij} = \frac{p_{ij}^{1-\sigma}}{\sum_k n_k p_{kj}^{1-\sigma}}\mu_j Y_j \quad (9)$$

where $\mu_j Y_j$ is the total expenditure of j on industrial goods, and $P_j^{1-\sigma} = \sum_k n_k p_{kj}^{1-\sigma}$ is the industrial price index. p_{ij} is the final price paid by consumers, comprising the mill price and the trade cost, $p_{ij}^{1-\sigma} = p_i^{1-\sigma}\Phi_{ij}$. Total exports of the n_i firms of country i to country j are thus:

$$m_{ij} = n_i p_{ij} c_{ij} = n_i p_i^{1-\sigma}\Phi_{ij}P_j^{\sigma-1}\mu_j Y_j \quad (10)$$

Equation (10) shows that exports from i to j depend on the size of each of the trading markets and on the level of trade costs between these two markets. Φ_{ij} represents all the frictions that inhibit bilateral trade between i and j. At $\Phi_{ij} = 0$, there is no bilateral trade, and $\Phi_{ij} = 1$ represents perfectly free trade.

Over the course of accession countries' economic transformation, trade barriers with the EU have been progressively lowered. The evolution and the scale of the frictions to trade between the EU and the CEECs can be quantified using the method proposed by Head and Ries (2001). Starting from equation (10) they derive an expression of Φ_{ij} that can be estimated empirically with trade and production data.

The first step involves dividing country j's imports from i by its imports from itself (m_{ij} by m_{jj}). This eliminates the $\mu_j Y_j P_j^{\sigma-1}$ that are common to the importer. We then multiply this expression by the corresponding ratio for country i, in order to obtain:

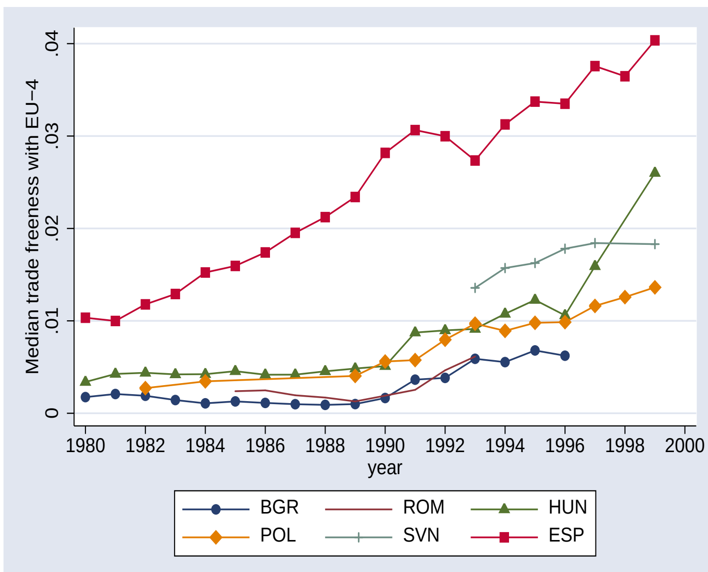
$$\frac{m_{ij}m_{ji}}{m_{jj}m_{ii}} = \frac{\Phi_{ij}\Phi_{ji}}{\Phi_{jj}\Phi_{ii}} \quad (11)$$

Two more assumptions are needed to derive the final expression. First, trade inside countries is assumed to be frictionless, thus $\Phi_{ii} = \Phi_{jj} = 1$. Second, trade barriers between countries are set to be symmetric, i.e. $\Phi_{ij} = \Phi_{ji}$. The expression for the measure of trade freeness (or equivalently the inverse measure of trade barriers) between countries i and j is:[4]

$$\hat{\Phi}_{ij} = \sqrt{\frac{m_{ij} m_{ji}}{m_{jj} m_{ii}}} \tag{12}$$

We calculate measures of trade freeness for different pairs of countries of the EU and the CEECs, using aggregate manufacturing trade flows. Imports of a country from itself are calculated as the value of manufacturing production minus the value of manufacturing exports. Production and trade data are taken from the database constructed and made available by the World Bank. This database has been augmented for recent years by the CEPII.[5]

Figure 1: Median $\hat{\Phi}_{ij}$ with EU-4



The first of the three figures depicts the evolution of the median trade freeness of some of the candidate countries with respect to four EU members (France, Germany, Italy, United-Kingdom, henceforth EU-4). We also report estimated trade freeness between Spain and these countries as a point of comparison. Due to a lack of data, the Czech Republic and Slovakia are not represented in any of these figures. Figure 1 illustrates two interesting features. First, the level of trade costs between the EU-4 and the candidate countries appears to be remarkably similar among eastern countries, and follows an consistent trend: whereas trade costs remain relatively constant during the 1980s, an obvious upward trend in the degree of trade freeness with the EU-4 is discernible post-1990 for the CEECs. This increase in trade integration coincides with the implementation of Europe Agreements between the EU and the candidate countries, aiming to liberalize trade progressively. The comparison between the trend followed respectively by the candidate countries and Spain leads us to the second interesting feature of Figure 1. We can see that trade between Spain and the EU-4 has become almost continuously freer over the entire

[4]The measure of trade freeness differs from conventional measures of trade openness in the sense that the former does not depend on the size of countries.

[5]The resulting dataset has been kindly provided by Soledad Zignago.

period. By 1999, our last sample year, Spain-EU trade freeness was noticeably higher than for the candidate countries. This is important to note, considering that, as the next figure will illustrate, trade integration between Spain and the other EU members is still relatively modest compared to that of France, Germany or the United-Kingdom. This shows that, while trade integration between the current and the future EU members has already progressed considerably, the CEECs continue to be less economically integrated with the existing EU than its incumbent members.

Figure 2: Intra EU $\hat{\Phi}_{ij}$

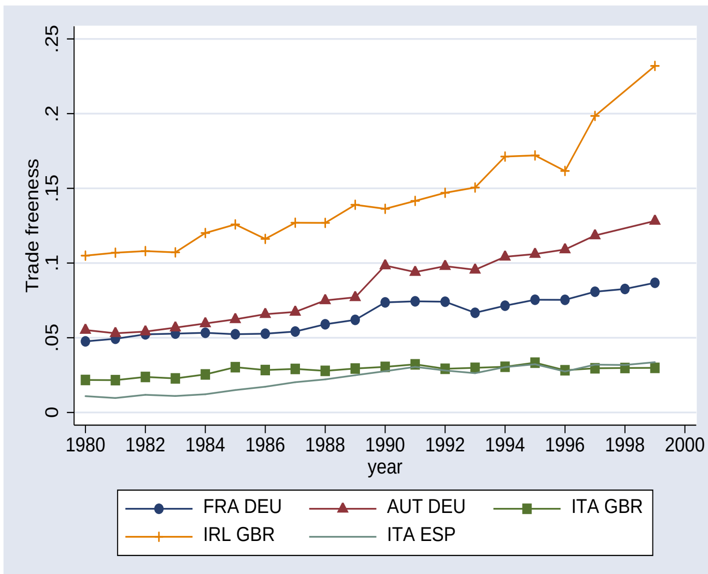


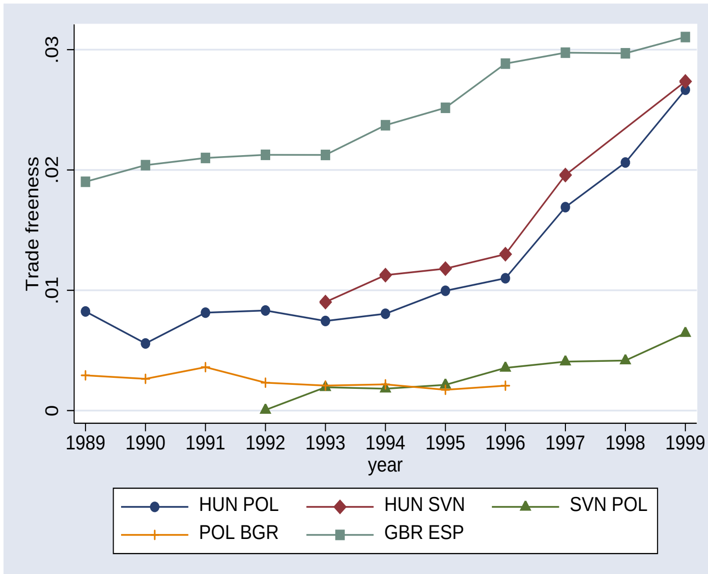
Figure 2 represents trade freeness among pairs of EU members. Although all country combinations are not shown here, we underline different levels for intra-EU trade freeness. The highest $\hat{\Phi}$s (thus the highest level of trade integration) are to be found either among pairs of large countries, which lie in the EU core (France-Germany, UK-Germany), or among country pairs with strong cultural or linguistic ties (Austria-Germany, Ireland-UK). Other country pairs, separated by larger physical or cultural distances, show lower levels of trade freeness.

Finally, Figure 3 describes the evolution of trade freeness between pairs of candidate countries. We focus here on the changes that have taken place since 1989. We can see that the level of trade freeness among candidate countries is low compared to to that of Spain and the UK, which is included in the graph as a point of comparison. Yet, here too we observe an increasing tendency of trade freeness, which could be related to the implementation of the Central European Free Trade Agreement (CEFTA) among four of the candidate countries (Hungary, Poland, the Czech Republic and Slovakia; Slovenia, Romania and Bulgaria joined respectively in 1995, 1997 and 1998).

3.2 The reorientation of trade

Comparing $\hat{\Phi}$s of different country pairs confirms an increase in trade integration between the EU and the CEECs. This finding leads to asking about the evolution of trade volumes following trade liberalization: How rapidly did trade volumes adapt to the changes in trade freeness? We examine this issue by calculating trade potentials. While trade freeness measures allowed an evaluation of the extent to which bilateral trade between countries had increased with respect to their sizes, the calculation of trade potentials indicate whether bilateral trade between these

Figure 3: ESP-GBR and Intra CEECs $\hat{\Phi}_{ij}$



countries has reached the 'normal' level defined by a reference group (in our case the OECD countries).

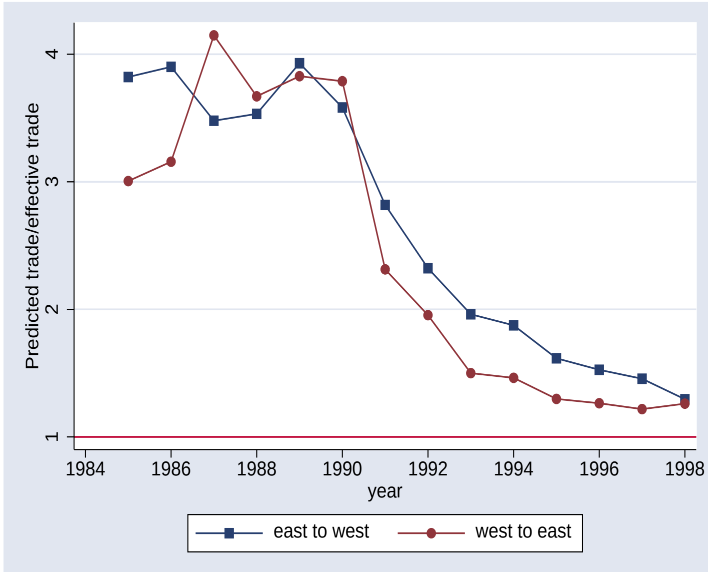
Trade potentials are computed as follows. Using a gravity model, we derive predictions concerning the volume of trade between the EU and the candidate countries over several years. This predicted or potential trade can then be compared to observed trade flows in order to evaluate the level and the evolution of the predicted over effective trade ratio. Bearing in mind the increasing trend followed by trade freeness between the EU and the candidate countries documented in the previous section, we compute ratios of predicted to effective trade between the two groups of countries for several years, in order to see how trade reacted to the apparent lowering of trade costs.

Several papers have previously analyzed trade potentials between the EU and the CEECs (Wang and Winters, 1991; Baldwin, 1994; Nilsson, 2000; Brülhart and Kelly, 1999). Baldwin (1994) uses 1989 data. He finds potential for bilateral trade in both directions. According to his results, EU's exports to the CEECs should have been approximately multiplied by two in 1989, while candidate countries' exports to the EU in the same year were supposed to be between 1.2 times higher in the case of Romania, 5.2 for Bulgaria and 2.1 for Poland. Nilsson (2000) updates simulations of predicted trade between the EU and the candidate countries, using data averaged for 1995 and 1996. He shows that the ratio of the EU's predicted to actual exports to the candidate countries has shrunk to 1.1, indicating that EU's exports are only slightly lower than potential exports. Concerning candidate countries' exports to the EU, Nilsson finds a ratio of potential to actual exports below unity, indicating that the candidate countries had already reached and exceeded their trade potential by 1995-1996.

The first step in calculating trade potentials consists in estimating a gravity equation for a reference sample of OECD countries, which we consider having 'normal' trade relations. The estimated coefficients are given in Appendix D. We use these coefficient estimates to simulate trade levels between EU members and CEECs. Because of the unavailability of data covering the entire period, we restrict our two groups of countries to seven countries in the case of the EU (Denmark, France, Germany, Ireland, Italy, the Netherlands, UK) and four candidate countries (Bulgaria, Hungary, Poland and Romania).

Figure (4) reports our calculated trade potentials over the period 1985-1998. Two interesting

Figure 4: Evolution of trade potentials, EU-7 and CEECs-4



points emerge. First, the ratios of predicted to effective trade are consistent with the ratios found by Badwin (1994) and Nilsson (2000). In 1989, the export potential between the EU and the candidate countries lies between 3 and 4 times the actual exports, which is a little higher than what Baldwin (1994) finds for the EU-15. In 1995, our figure indicates a trade potential between 1 and 2, which corresponds with Nilsson's (2000) results. The second salient feature concerns the evolution of these trade potentials. Indeed, figure (4) shows that the ratios of predicted to effective exports both of the EU and of the candidate countries, have been steadily decreasing since 1990. Over the same period, the geography of access to markets changed considerably for the CEECs, with Western markets replacing Eastern ones as the main source of trading partners. This evolution underlines how reactive trade structures are to the location of demand and supply capacities as trade freeness increases.

4 Wage and Employment Gradients

As Section 3 has shown, trade patterns of the CEECs have clearly followed the evolution of access to markets over the 1990s. We now explore to what extent regional wages and employment patterns inside Central European countries already reflected the new geography of market access in the second half of that decade.

4.1 The geography of wages and employment in Central European accession countries

4.1.1 Wages

In this section we study the impact of market access on regional wages and employment patterns in the Czech Republic, Hungary, Poland, Slovenia and Slovakia, using annual data for 1996-2000 (see Appendix C for further details). We estimate equations (6) and (8) as reduced forms of the NEG model. All estimated standard errors are based on White-corrected variance-covariance matrices, since most of our regression models are clearly heteroskedastic (mainly due to different disturbance variances across countries).

Table 1: Regional wage gradients in CEECs, panel

	Dependent Variable: $\ln(w_i/w_{\text{CAP}})$		
Model :	(1)	(2)	(3)
ln dist. to Capital	-0.109	-0.034	-0.041
	(-10.69)	(-4.46)	(-5.35)
ln dist. to Brussels	-0.009	-0.097	-0.021
	(-0.18)	(-3.10)	(-0.56)
capital		0.287	0.282
		(12.51)	(13.33)
land border with EU, N, CH			0.027
			(3.52)
land border with CEEC			0.006
			(0.64)
access to sea			0.069
			(3.22)
ctrdum	Yes	Yes	Yes
yrdum	Yes	Yes	Yes
N	248	248	248
R^2	0.677	0.824	0.838

Note: t-statistics in parentheses

Table 1 reports our results for the wage equation (6). The first column reports the simplest specification that includes merely the two distance terms.[6] The results suggest that wages fall off with distance from national capitals but not with distance from the EU.

This model, however, is overly parsimonious. According to our "Comecon hypothesis", wages in centrally planned economies are higher in the capital region, but there is no compelling reason for expecting wages to fall off smoothly across provincial regions as they become more remote with respect to the capital. Hence, the second specification includes a dummy variable for capital regions, to allow for the possibility of a discontinuous relationship between wages and distance to the capital.[7] Our results reported in the second column of Table 1 show that wage gradients are indeed discontinuous: being a capital region raises relative nominal wages by 29 percent, *ceteris paribus*. However, distance from the capital matters also in the provinces. In provincial regions, relative wages fall by 0.3 percent for every 10 percent increase in distance from the capital. It also turns out in this second regression model that proximity to the EU had a statistically significantly positive impact on regional wages in our sample countries already in the late 1990s, a mere half-decade after those countries' economic reorientation. A 10 percent increase in distance from Brussels was associated with 0.3 percent fall in relative regional wages.

Our final specification of the wage equation, reported in column 3 of Table (1), includes additional variables intended to represent market access: (i) a dummy for regions that share a land border with an EU country, in order to represent potentially discontinuous wage gradients also with respect to access to EU markets; (ii) a dummy for regions that share a land border with

[6] We use great circle distances from the largest town in each region.

[7] The inclusion of this dummy variable has the further advantage of reducing the estimations' sensitivity to the way we model intra-regional distance in the capital regions. We model these distances as $d_{i_i} = 0.67 sqrt(area/\pi)$. The underlying assumption is that intra-regional economic geographies can be approximated by a disk where all firms are located at the center and consumers are spread uniformly over the area.

Table 2: Regional wage gradients in CEECs, by country

	Dependent Variable: $\ln(w_i/w_{\text{CAP}})$				
Model :	(A)	(B)	(C)	(D)	(E)
ln dist. to Capital	-0.043	-0.075	0.048	0.016	-0.004
	(-2.74)	(-6.47)	(1.59)	(0.97)	(-0.19)
capital	0.295	0.240	0.439	0.214	0.340
	(6.82)	(6.19)	(18.00)	(15.88)	(17.01)
ln dist. to Brussels	0.218	-0.256	-0.105	-0.775	0.118
	(3.91)	(-3.55)	(-1.42)	(-2.97)	(0.47)
land border with EU, N, CH	0.038	0.057	-0.062	-0.016	0.058
	(4.43)	(2.86)	(-3.12)	(-1.12)	(3.11)
land border with CEEC	-0.025	-0.005	0.024	-0.040	0.000
	(-1.35)	(-0.30)	(1.50)	(-2.23)	(0.0)
access to sea	0.000	0.000	0.020	0.098	0.000
	(0.0)	(0.0)	(1.21)	(5.74)	(0.0)
ctrdum	Yes	Yes	Yes	Yes	Yes
yrdum	Yes	Yes	Yes	Yes	Yes
N	56	80	32	48	32
R^2	0.904	0.79	0.937	0.833	0.886

Note: t-statistics in parentheses
Model A: Czech Republic, Model B: Hungary, Model C: Poland
Model D: Slovenia, Model E: Slovakia

another accession country,[8] representing the potential importance of those markets; and (*iii*) a dummy for coastal regions, representing facilitated market access for goods transported by sea. We find that wage gradients relative to the EU are in fact entirely a phenomenon of higher relative wages in border regions (+ 2.7 percent, *ceteris paribus*), as distance to Brussels has no statistically significant effect on wages in non-border regions. Bordering another accession country, however, has no significant impact on wages, while sea access is associated with a 6.9 percent higher relative wage level.

In Table 2, we show results of our full model, estimated separately for each of the five accession countries in our sample. The most striking result is the consistent wage advantage of capital regions. The estimated effect ranges from 21 percent (Slovenia) to 44 percent (Poland) and is statistically significant throughout.[9]

The wage effect of access to the EU market is more varied across sample countries. Proximity to the EU market has the strongest wage-boosting impact in Hungary, where relative wages are statistically significantly higher in border regions and fall off significantly with distance in non-border regions. Evidence of a wage boost through proximity is also found for Slovenia, where distant regions have significantly lower wages, and Slovakia, where border regions have significantly higher wages. The results are ambiguous for Poland, where we estimate a negative wage premium for border regions, and the Czech Republic, where distance from the EU seems

[8] For the construction of this dummy variable, we considered as accession countries our five sample countries plus Romania and Lithuania.

[9] The estimated magnitudes of these effects are affected by the way one models intra-regional distances in the capital regions. If our formula overestimates effective internal distances, the coefficient on the capital dummy will also be overestimated. We have experimented with smaller estimated intra-regional distances and found that the estimated capital-region effects remained very strong.

to raise relative wages.

What we retain from the analysis of regional wage gradients in accession countries is that the nominal wage bonus of capital regions is highly significant in both economic and statistical terms. This is consistent with our "Comecon hypothesis". We also find some wage-boosting effects of market access to the EU, but these effects are statistically and economically less significant, and they apply less consistently across sample countries.

4.1.2 Sectoral Employment

Using regional employment data for nine sectors covering the full spectrum of economic activities, we have estimated equation (8). Our additional market access dummy variables for capital regions, EU border regions, accession-country border regions and coastal regions are included. The estimation results are reported in Table 3.

Table 3: Regional employment gradients in CEECs, by sector

	Dependent Variable: $\ln(l_i/\text{pop}_i)$							
Model :	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)
ln dist. to capital	0.451	0.012	0.062	0.007	0.026	-0.028	0.115	0.069
	(5.94)	(0.33)	(1.89)	(0.23)	(0.44)	(-0.42)	(3.27)	(3.49)
capital	-0.781	-0.281	0.644	0.890	0.973	1.555	1.513	0.663
	(-2.85)	(-2.96)	(9.15)	(12.76)	(6.42)	(8.52)	(17.76)	(9.59)
ln dist. to Brussels	-0.488	-0.896	-0.685	-0.168	-0.301	0.411	-0.414	0.126
	(-1.24)	(-5.30)	(-3.35)	(-0.93)	(-1.08)	(0.99)	(-1.93)	(1.45)
land border with EU, N, CH	0.006	-0.027	0.001	0.065	0.128	0.175	0.185	0.066
	(0.04)	(-0.73)	(0.03)	(1.59)	(1.98)	(2.09)	(4.12)	(3.50)
land border with CEEC	-0.237	0.056	0.050	0.074	0.013	-0.095	-0.016	-0.048
	(-3.09)	(1.48)	(1.08)	(1.70)	(0.20)	(-1.15)	(-0.37)	(-2.67)
access to sea	-0.135	-0.381	0.029	0.227	0.643	0.287	0.357	0.055
	(-0.79)	(-4.19)	(0.45)	(2.91)	(3.78)	(2.00)	(2.99)	(1.81)
ctrdum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
yrdum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	240	240	240	240	240	240	240	240
R^2	0.65	0.597	0.722	0.78	0.575	0.722	0.737	0.667

Note: t-statistics in parentheses
Model F: Agriculture, Model G: Manufacturing, Model H: Construction
Model I: Distribution, Model J: Transport and Communication
Model K: Banking and Insurance, Model L: Other market services
Model M: Non-market services

Since we are regressing employment shares in regional population, simple adding-up constraints make it impossible for the coefficients on any of the dummy variables to have the same sign across sectors. For example, unless the provinces suffered from massive unemployment, it is impossible to find all sectors as being relatively concentrated in the capital regions. Indeed, it comes as no surprise that the share agricultural employment is 78 percent smaller in capital regions than elsewhere and increases by 4.5 percent with every 10 percent increase in distance from the capital.

Given the standard labelling of the differentiated sectors in NEG models as "manufacturing", it might be less expected that manufacturing too accounts for a significantly smaller employment share in capital regions than in the provinces (-28 percent). Furthermore, manufacturing is not significantly larger in regions bordering the EU and is actually significantly smaller than elsewhere in coastal regions (-38 percent). The regional distribution of manufacturing employment does, however, conform with the NEG prediction in so far as it rises continuously with proximity to the EU: every 10 percent increase in distance from Brussels appears to reduce the share of manufacturing employment by 9 percent. This is an effect that is very strong both economically and statistically, and it suggests that manufacturing activities in accession countries is already oriented very strongly towards the EU market.

Interestingly, our market-access model of employment shares has greatest explanatory power in tertiary sectors. Distribution (which comprises both wholesale and retail trades) stands out with the highest R-square and estimated coefficients suggesting that employment in the distribution sector is significantly concentrated in capital regions, border regions and coastal regions. According to our findings, therefore, distribution appears as the sector most affected by market access considerations.[10]

4.2 A comparison with EU members

We have estimated wage and employment gradients in Central European accession countries, and we found confirmation that market access matters for wages and sectoral employment. Our results are at least partly consistent with both a central-planning explanation, which implies a discrete advantage for the capital region, and a market-based NEG model, which implies continuous wage and employment gradients on distance from economic centers. This is informative in itself, but it raises the question as to which force is likely to dominate in the foreseeable future. Specifically, are the intra-country economic geographies inherited from the central-planning period likely to persist, or are market forces pushing towards a spatial reorganization of Central European economies? Note that modern location theory offers little guidance on such practical questions, since NEG models typically feature multiple locally stable equilibria (see Appendix A). If the world is indeed marked by strong locational discontinuities, unchanging economic geographies in accession countries could well be consistent with NEG models. Spatial stability would simply imply that the increase in market access to the EU has been insufficient to dislodge the spatial equilibrium inherited from the days of Comecon.

There are two analytical approaches to this issue. One is to track the evolution of spatial patterns in Central European countries over time since their transition in the early 1990s, and to extrapolate. We prefer a second approach, which is both less dependent on assumptions about timing and unaffected by the fact that the time dimension of our data panel is relatively short (5 years). This second approach consists in comparing wage and employment gradients of accession countries directly with those observed in existing EU member countries. Specifically, we re-estimate equations (6) and (8) in a sample consisting of the five accession countries plus a comparison group of 16 EU and EFTA countries.[11] By interacting market access variables with a dummy variable that identifies the five accession countries, we can estimate to what extent the internal geographies of accession economies differ from those of established member countries. If we assume, quite plausibly, that the existing EU economies are closer to their long-run spatial equilibrium than the economies of accession countries, we can interpret any significant effects on the interaction variables as an (inverse) indicator of impending spatial changes in accession countries.

4.2.1 Wages

Our estimations reported in Table 4 replicate those of Table 1 but this time drawing on the full sample of 21 countries and estimating coefficients for the accession countries *relative* to

[10] Country-by-country regressions of the employment equation are reported in Appendix D.

[11] Our reference group includes Norway and Switzerland, which, albeit not full members of the EU, are mature market economies that have enjoyed preferential access to EU markets for decades.

those of established member states. For the EU reference sample, we find statistically significant continuous wage gradients in all three specifications, and no additional wage bonus in capital regions.[12] The statistically significant coefficients on interaction terms confirm that the geography of wages is very different in accession countries, where wages are discretely higher in capital regions but otherwise not significantly related to distance from the capital. The implied conjecture is that market forces will smooth out wage gradients in accession countries. Nominal wages will still be relatively high in capital regions, but the difference particularly compared to proximate regions will erode.

Table 4: Regional wage gradients in CEECs, CEEC vs EU

	Dependent Variable: $\ln(w_i/\overline{w}_{\text{ctr}})$		
Model :	(P)	(Q)	(R)
ln dist. to capital	-0.071	-0.065	-0.086
	(-7.58)	(-5.07)	(-6.60)
ln dist. to cap × CEEC	-0.037	0.032	0.047
	(-2.71)	(2.14)	(3.15)
ln dist. to Brussels	0.085	0.081	0.097
	(3.33)	(2.89)	(3.62)
ln dist. to Bru. × CEEC	-0.094	-0.178	-0.079
	(-1.71)	(-4.29)	(-1.73)
CEEC	0.791	1.030	0.297
	(2.20)	(3.92)	(1.01)
capital		0.030	0.022
		(0.69)	(0.53)
capital × CEEC		0.257	0.261
		(5.23)	(5.66)
land border with EU,N,CH			0.071
			(5.64)
CEEC × land border with EU,N,CH			-0.040
			(-2.73)
land border with CEEC			-0.018
			(-1.75)
access to sea			0.076
			(6.96)
ctrdum	Yes	Yes	Yes
yrdum	Yes	Yes	Yes
N	1520	1520	1520
R^2	0.123	0.138	0.176

Note: t-statistics in parentheses

What about border regions? The results reported in column (3) of Table 4 show that border regions of existing member countries pay relatively higher nominal wages, and that the corresponding effect in accession countries is significantly weaker. We can thus project an increasing tendency of relative nominal wages in border regions of accession countries.

[12] Capital regions in the reference sample are defined as economic centers of gravity. These coincide with political capitals in all cases bar Germany (Köln-Bonn) and Italy (Milan).

4.2.2 Sectoral Employment

In Table 5, we show the results of our sectoral employment regressions for the full sample of 21 countries. Very strong positive effects on the interaction term with the dummy for capital regions is found in the construction sector and in all service sectors. This is clear evidence of an excessively centralized legacy of central planning. In so far as existing EU countries are a valid benchmark, accession countries are due a significant dispersion of employment in these sectors away from their capital regions.

Table 5: Regional employment gradients by sector, CEEC vs EU

	Dependent Variable: $\ln(l_i/\text{pop}_i)$							
Model :	(S)	(T)	(U)	(V)	(W)	(X)	(Y)	(Z)
ln dist. to capital	0.202	0.049	-0.006	-0.026	-0.028	-0.050	-0.032	0.018
	(6.51)	(2.83)	(-0.60)	(-2.40)	(-2.52)	(-3.86)	(-2.93)	(1.77)
ln dist. to cap × CEEC	0.215	-0.070	0.072	0.055	0.089	0.031	0.1 66	0.050
	(2.72)	(-1.66)	(2.13)	(1.60)	(1.53)	(0.43)	(4.57)	(2.30)
capital	-1.014	-0.070	-0.080	0.369	0.363	0.297	0.357	0.267
	(-9.82)	(-1.35)	(-2.76)	(12.68)	(12.39)	(9.47)	(12.56)	(7.19)
capital × CEEC	0.219	-0.225	0.726	0.532	0.631	1.265	1.167	0.397
	(0.76)	(-1.92)	(9.55)	(6.72)	(4.19)	(7.05)	(12.91)	(5.09)
ln dist. to Brussels	0.130	-0.30	0.035	-0.069	-0.072	-0.085	-0.076	0.031
	(2.49)	(-7.89)	(1.87)	(-3.77)	(-3.79)	(-3.97)	(-4.12)	(1.00)
ln dist. to Bru. × CEEC	-0.859	-0.841	-0.743	0.011	-0.241	0.421	-0. 340	0.049
	(-2.27)	(-5.10)	(-3.79)	(0.07)	(-1.00)	(1.07)	(-1.76)	(0.57)
land border with EU,N,CH	0.000	0.036	-0.067	0.001	0.007	0.028	0. 013	0.005
	(-0.01)	(1.48)	(-4.07)	(0.05)	(0.52)	(1.80)	(1.00)	(0.42)
CEEC × land border with EU,N,CH	-0.038	-0.107	0.070	0.091	0.155	0.152	0.192	0.058
	(-0.27)	(-2.46)	(1.49)	(2.24)	(2.36)	(1.88)	(4.11)	(2.60)
land border with CEEC	-0.060	0.236	0.052	-0.022	-0.060	-0.084	-0.059	-0.026
	(-0.76)	(8.07)	(1.56)	(-0.85)	(-1.72)	(-1.84)	(-2.38)	(-1.71)
access to sea	0.050	-0.203	-0.064	0.030	0.041	0.019	0.030	- 0.003
	(1.12)	(-9.46)	(-5.16)	(2.38)	(2.67)	(1.21)	(2.20)	(-0.34)
CEEC	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
ctrdum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
yrdum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1656	1656	1656	1656	1656	1656	1656	1656
R^2	0.61	0.433	0.688	0.812	0.72	0.869	0.876	0.884

Note: t-statistics in parentheses
Model S: Agriculture, Model T: Manufacturing and energy, Model U: Construction
Model V: Distribution, Model W: Transport and Communication
Model X: Banking and Insurance, Model Y: Other market services
Model Z: Non-market services

Access do the EU market, however, seems to play a minor role for those sectors. Our results in fact suggest that accession countries' construction and services jobs are already more strongly represented in EU border regions, and distance gradients relative to Brussels are no weaker, than is the case in incumbent member states.

Exactly the reverse pattern holds for manufacturing employment. Manufacturing jobs in accession countries seem to be relatively under-represented in capital regions as well as in EU border regions. Again, we can interpret these findings as evidence of a legacy from central planning, under which manufacturing plants were often located on the basis of purely political considerations. Our analysis therefore suggests a tendency for increasing agglomeration of manufacturing activities near the capital regions of accession countries and near the border with the EU.

4.3 Is it really market access?

Our study has so far implicitly assumed either that all regions are identical except for their differential market access or that other relevant features of regions are uncorrelated with our market access variables. This assumption underlies practically all NEG models. Indeed it is by formalizing spatial concentration forces in such a uniform world that these models become so valuable. Unfortunately, this assumption is empirically implausible, particularly when applied to the scale of half a continent. Regions differ in natural and man-made endowments and technologies, and these differences may well to some extent correlate with our market access variables. It is, however, beyond the scope of this (and probably any) study to collect a full set of endowment and technology controls for all the regions in our sample.

Table 6: Regressing region dummies on market access variables

	Dependent Variable: Regdummy								
Model :	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
dcap	-0.117	-0.108	0.192	0.078	0.000	-0.004	0.004	0.002	0.079
	(-14.13)	(-2.36)	(10.30)	(3.82)	(-0.02)	(-0.21)	(0.17)	(0.12)	(7.98)
ln dist. to Cap & CEEC	0.071	0.053	0.044	0.034	0.217	0.242	0.3 29	0.376	0.088
	(4.23)	(0.58)	(1.18)	(0.83)	(7.90)	(6.63)	(7.28)	(10.60)	(4.40)
Capital	-0.030	-1.084	0.223	-0.069	0.357	0.376	0.361	0.380	0.361
	(-1.06)	(-7.04)	(3.52)	(-1.01)	(7.74)	(6.12)	(4.76)	(6.37)	(1 0.79)
Capital & CEEC	0.213	-0.699	0.060	0.802	0.827	1.023	1.885	1.398	0.514
	(4.56)	(-2.72)	(0.57)	(7.01)	(10.78)	(10.00)	(14.92)	(14.08)	(9.23)
ln dist. to Brussels	0.084	0.548	-0.180	-0.158	-0.163	-0.170	-0.188	-0.167	-0.048
	(10.93)	(13.04)	(-10.45)	(-8.41)	(-12.94)	(-10.12)	(-9.06)	(-10.28)	(- 5.27)
ln dist. to Bru. & CEEC	0.239	1.545	-0.153	-0.589	-1.870	-1.719	-3. 239	-1.926	-1.160
	(3.80)	(4.46)	(-1.07)	(-3.81)	(-18.07)	(-12.47)	(-1.00)	(-14.39)	(-1 5.45)
Land border with EU,N,CH	0.067	0.331	0.058	-0.109	-0.072	-0.052	-0. 034	-0.055	0.056
	(5.58)	(4.99)	(2.13)	(-3.66)	(-3.65)	(-1.97)	(-1.05)	(-2.16)	(3.87)
Land border with EU,N,CH & CEEC	0.027	-0.343	-0.127	0.322	0.065	0.334	0.112	0.255	-0.009
	(0.97)	(-2.24)	(-2.01)	(4.71)	(1.43)	(5.46)	(1.49)	(4.30)	(- 0.28)
Land border with CEEC	0.009	-0.023	0.093	-0.122	-0.004	-0.073	-0.009	-0.081	-0.008
	(0.52)	(-0.25)	(2.49)	(-2.99)	(-0.16)	(-2.00)	(-0.19)	(-2.28)	(- 0.40)
Access to sea	0.042	0.289	-0.383	-0.207	-0.007	0.030	-0.006	- 0.011	-0.066
	(3.53)	(4.39)	(-14.16)	(-7.02)	(-0.34)	(1.14)	(-0.18)	(-0.44)	(- 4.65)
CEEC	-2.186	-10.024	0.568	3.538	11.714	10.253	20.178	11.231	7.433
	(-5.14)	(-4.29)	(0.59)	(3.39)	(16.76)	(11.00)	(17.52)	(12.41)	(1 4.65)
N	1921	1921	1921	1921	1921	1921	1921	1921	1921
R^2	0.216	0.266	0.264	0.175	0.386	0.372	0.425	0.364	0.333

Note: t-statistics in parentheses

Model 1: wage equation, Model 2: employment (Agriculture)

Model 3: employment (Manufacturing and energy), Model 4: employment (Construction)

Model 5: employment (Distribution), Model 6: employment (Transport and communication)

Model 7: employment (Banking and Insurance), Model 8: employment (Other market services)

Model 9: employment (Non-mkt services)

As an alternative to estimating a full model that includes region-specific features other than market access, we estimate the extent to which total regional differences in wages and sectoral employment shares can be explained by differences in those regions' market access. Specifically, we re-estimate our wage and employment equations, substituting the market access variables by regional dummies. In a second step, we regress estimated coefficients for the regional dummies on our market access variables. The R-square of this second equation is taken as a gauge of the power of market access in explaining regional differences in wages and sectoral employment shares.[13]

The results are reported in Table (6) for the wage equation and the eight employment equations. The R-squares range from 0.18 to 0.43. Market access variables therefore explain up to 43 percent of the variance in regional fixed effects, which suggests that they are a significant explanatory factor in the spatial patterns of wages and sectoral employment.

As an aside, we note that the highest R-squares are found in employment regressions for tertiary sectors (Banking and insurance, and Distribution), which confirms that the significance of geographic market access extends well beyond the manufacturing sector.

5 Conclusion

We have drawn on a multi-region new economic geography model to study the internal economic geographies of five Central European accession countries (Czech Republic, Hungary, Poland, Slovenia and Slovakia). According to the theory, the external trade liberalization represented by progressing integration into the EU market will have significant location effects in those countries, by strengthening agglomeration forces. Depending on the mobility of labor and firms across regions and sectors, this will translate into regional relocations of sectors and/or into changes in the spatial structure of average wages.

As an alternative to this market-based scenario, we have formulated a "Comecon hypothesis", according to which the spatial structure of economic activity is not systematically related to regions' market access, except for a strong concentration of activity and high wages in the capital region.

Our estimations yield strong support for the ongoing relevance of the Comecon hypothesis in Central European countries. Wages are discretely higher in capital regions, and service employment (in the private as well as in the public sector) is strongly concentrated on those regions. The comparison with the current EU countries shows that these concentrations are significantly stronger in the accession countries than in the incumbent member states. We therefore conjecture that the extreme centralization of wages and service sectors in Central European capital cities is likely to erode and give way to smoother gradients driven by market access, as predicted by the theory and confirmed in the regressions for existing EU members. The exception to this result is manufacturing, which, compared to the EU, is relatively underrepresented in CEEC capital and border regions. Finally, both the theory and some of our comparative estimations suggest that accession countries' regions nearest the border to the current EU stand to gain most in terms of relative wages and sectoral employment growth.

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[13]Perfect multicollinearity of course makes it impossible to include regional fixed effects in the wage and employment regressions together with our region specific and time invariant market access variables. See also Hanson (1997).

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A A two country - three region NEG model

We present here a general version of a two country - three region NEG model in which the foreign country is exogenous. It is a adaptation by Crozet and Koenig-Soubeyran (2003) of the original Krugman (1991) framework to a three regions setting.

The model is a general equilibrium model. It contains three regions: region 0 is assimilated to the foreign country and will be exogenous in our model. Regions 1 et 2 are part of the domestic country. The economy contains two factors of production, specific to each sector, and two sectors, manufacturing (X) and agriculture (A). Agricultural workers are immobile and equally distributed in the domestic country: $L_A = L_{A1} + L_{A2}$. The country is also endowed with L manufacturing workers, which are interregionally mobile: $L = L_1 + L_2$. The foreign country is fully exogenous: it contains L_{A0} agricultural workers and L_0 industrial workers. Both countries have identical preferences and technology. The agricultural sector operates in a perfectly competitive framework under constant returns to scale, and produces a homogeneous good, which is traded between the two countries at no cost. The manufacturing sector is produced under increasing returns to scale, and employs manufacturing workers both as a fixed cost and as a variable cost: Production of each variety requires F units of manufacturing workers as a fixed cost, and L_{Xi} units as a variable input, with $L_{Xi} = cX_i$. The differentiated good is traded between the three regions; its trade supports an iceberg-type transaction cost.

A.1 Consumers

Each consumer has the following utility function:

$$U = C_X^{\mu} + C_A^{1-\mu}, \quad \text{with} \quad C_X = \left[\sum_0^N c_i^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}} \tag{13}$$

in which $0 < \mu < 1$ and $\sigma > 1$. μ and $(1-\mu)$ are respectively the shares of expenditure that are allocated to the industrial and to the agricultural good. σ is the elasticity of substitution between varieties. C_X is an aggregate of the manufacturing varieties and C_A is the consumption of the agricultural good. Consumers maximize utility under the budget constraint $Y = \sum_i x_i p_i + C_A p_A$. The following expression represents the amount of a variety produced in i that is demanded by region j (all varieties produced in the same region are symmetric):

$$x_{ij} = \frac{p_{ij}^{-\sigma}}{P_j^{1-\sigma}} \mu_j Y_j \tag{14}$$

where

$$P_j \equiv \left[\sum_i n_i (p_i \tau_{ij})^{1-\sigma}\right]^{\frac{1}{1-\sigma}} \tag{15}$$

is the industrial price index in region j. n_i is the number of firms in i. p_{ij} is the final price paid by consumers. It contains the mill price, p_i, which is multiplied by the ad-valorem trade cost, τ_{ij}: $p_{ij} = p_i \tau_{ij}$.

A.2 Producers

The profit function of a representative firm located in i is:

$$\Pi_i = p_i x_i - w_i(F + cx_i) \tag{16}$$

w_i is the wage of the industrial workers in i, c is the marginal cost, in terms of labor, per additional quantity produced, and x_i is the quantity produced by the firm in equilibrium.

Each firm maximizes its profit by behaving as a monopolist on its own variety of the differentiated good. The first order condition coupled with the "Chamberlinian large group assumption" allow to derive the following pricing rule:

$$p_i = \frac{c\sigma}{\sigma - 1} w_i \tag{17}$$

The price of each firm is thus constant and does not depend on production.

Replacing the price equation in the profit equation, we obtain:

$$\Pi_i = w_i \left(\frac{x_i c}{\sigma - 1} - F_i \right) \tag{18}$$

A.3 Short-run equilibrium

In the short-run, demand is exogenously distributed. For a given distribution of industrial workers among regions 1 and 2, the condition for equilibrium is that the firms' profits be equal to zero in each location so that no firm has interest in moving to the other location. Firms adjust immediately to profits differentials. The zero-profit condition allows to derive the equilibrium quantity produced by a representative firm:

$$x_i^* = \frac{F(\sigma - 1)}{c} \tag{19}$$

The agricultural production function in region i is $L_{Ai} = a_i x_{Ai}$. Our first normalization consists in setting the coefficient equal to one: $a_i = 1$. Perfect competition implies a price equal to the marginal cost, thus $p_{Ai} = w_{Ai} a_i = w_{Ai}$. We choose the agricultural good as the numéraire, therefore $w_{Ai} = 1 = p_{Ai}$. Finally, the good is traded without cost; its price is thus equalized in the three regions.

The income in a region j is then:

$$Y_j = L_{Aj} + L_j w_j \tag{20}$$

Equilibrium in the market for industrial workers

L_i is the number of industrial workers and n_i is the number of firms in region i; Equilibrium in the market for industrial workers in region i states that:

$$n_i l_i = n_i(F + cx_i) = L_i$$

Using (19), we get:

$$n_i = \frac{L_i}{F\sigma} \tag{21}$$

Equilibrium in the market for the industrial good

We can derive the expression that equalizes supply and demand for region i industrial good:

$$p_i x_i^* = \mu p_i^{1-\sigma} \sum_j \Phi_{ij} P_j^{\sigma-1} Y_j \tag{22}$$

Following Baldwin et al. (2003), the trade costs parameter is expressed as $\tau_{ij}^{1-\sigma} \equiv \Phi_{ij}$, which is comprised between 0 and 1 and is a measure of the degree of trade freeness between two countries or regions. At $\Phi_{ij} = 0$ there is no trade and $\Phi_{ij} = 1$ means free trade.

We normalize the measurement of output, by choosing units such that $c = (\sigma - 1)/\sigma$. It follows that $p_i = w_i$ and $x_i^* = F\sigma$. Incorporating the normalization and rearranging, equation (22) becomes:

$$w_i = \left[\frac{\mu}{F\sigma} \sum_j \Phi_{ij} P_j^{\sigma-1} Y_j \right]^{1/\sigma} \tag{23}$$

Equation (23), or the wage equation, is central in NEG models. It allows to obtain the remuneration of industrial workers in each region for a given distribution of the industrial workforce. Once nominal wages are determined through (15), (20), (21) and (23), equilibrium values for the endogenous variables of the model can be obtained: p_i, n_i, Y_i.

However, as in the standard Krugman (1991) setting, this model can not be solved analytically because of the non linearity of equation (22). The solution consists in solving for the nominal wage using numerical procedures, as explained in the next section.

Our third normalization concerns the number of industrial workers in the domestic country: we set it equal to 1: $L = L_1 + L_2 = 1$. In our three region setting, expressions for nominal wage are:

$$w_1 = \left[\frac{\mu}{F\sigma} \left(Y_0 P_0^{\sigma-1} \Phi_0 + Y_1 P_1^{\sigma-1} + Y_2 P_2^{\sigma-1} \Phi_{12} \right) \right]^{1/\sigma} \tag{24}$$

$$w_2 = \left[\frac{\mu}{F\sigma} \left(Y_0 P_0^{\sigma-1} \Phi_0 + Y_1 P_1^{\sigma-1} \Phi_{12} + Y_2 P_2^{\sigma-1} \right) \right]^{1/\sigma} \tag{25}$$

$$w_0 = \left[\frac{\mu}{F\sigma} \left(Y_0 P_0^{\sigma-1} + Y_1 P_1^{\sigma-1} \Phi_0 + Y_2 P_2^{\sigma-1} \Phi_0 \right) \right]^{1/\sigma} \tag{26}$$

From (15), price indices in each regions are:

$$P_1 = \left[\frac{1}{F\sigma} \left(L_0 w_0^{1-\sigma} \Phi_0 + \lambda w_1^{1-\sigma} + (1-\lambda) w_2^{1-\sigma} \Phi_{12} \right) \right]^{1/1-\sigma} \tag{27}$$

$$P_2 = \left[\frac{1}{F\sigma} \left(L_0 w_0^{1-\sigma} \Phi_0 + \lambda w_1^{1-\sigma} \Phi_{12} + (1-\lambda) w_2^{1-\sigma} \right) \right]^{1/1-\sigma} \tag{28}$$

$$P_0 = \left[\frac{1}{F\sigma} \left(L_0 w_0^{1-\sigma} + \lambda w_1^{1-\sigma} \Phi_0 + (1-\lambda) w_2^{1-\sigma} \Phi_0 \right) \right]^{1/1-\sigma} \tag{29}$$

The wage equation is a central element of the model. In the short-run, the nominal wage represents the adjustment variable through which firms' profits remain equal to zero in both domestic locations. The region which contains the largest number of consumer, or which is more profitable because of its better access to foreign markets, will adjust by paying higher nominal wages[14], this conclusion holds because or our extrapolating the results of the three region model from the classical two region model, in which the price and quantity aspects of the market access effects have been derived (Krugman (1980), Helpman and Krugman (1985)). This price version of the market size effect is the focus of our empirical analysis.

Let us further emphasize that the wage and price index equations convey the typical agglomeration and dispersion forces that are essential to obtain NEG results.

On the one side, as stated above, equations (24) to (26) signal that firms will be attracted to the location that contains the largest number of consumers, because the largest market represents a higher profitability. This feature is called the "backward linkage" or the demand externality. The other relation that forms the second part of the potential *cumulative causation*

[14] As emphasized in section 2.1

is embedded in equations (27) to (29). These equations show that the more there are firms in a location, the lower is its price index. Thus, human capital owners will tend to migrate towards the location the offers the lowest price index, i.e. that contains the largest number of firms. This is the "forward linkage", or the cost externality.

On the other side, our model incorporates a dispersion force that will tend to attract firms in the location that contains the lowest number of consumers. The dispersion force is contained in the price index equations (equations (27) to (29). Indeed, the larger is the number of firms in a region, the lower is its price index, which can be seen as an index of the degree of competition.

In the next section, we will abandon the assumption of immobility of human capital owners and let them migrate between the two domestic regions according to the indirect utility differential.

A.4 Long-run equilibrium

Indeed, in the long run manufacturing workers are mobile between domestic regions. They migrate towards the regions with the highest real wage. The real wage of each domestic region is the nominal wage deflated by the price index:

$$\omega_1 = \frac{w_1}{P_1^{\mu}} \tag{30}$$

$$\omega_2 = \frac{w_2}{P_2^{\mu}} \tag{31}$$

One can see that if $\lambda = 1/2$ (and if $L_{A1} = L_{A2}$), $\omega_1 = \omega_2$: when the industrial workforce is equally distributed between domestic regions, the real wages are equalized and there is no incentive for workers to move. But what happens if we move one worker from region 2 to region 1? This move will create a real wage differential that may either incite more people to move, or on the contrary it may lower the real wage in the destination region, in which case the equally distributed configuration would be a stable equilibrium.

We want to study the relationship between the real wage differential and the fraction of industrial workers living in region 1. We want to identify the spatial equilibria of the model, thus the distributions of workers for which no worker may get a higher real wage by changing location. The equilibrium distributions of the workforce thus consist of the values of $(\lambda, 1-\lambda)$ for which either $\omega_1 - \omega_2 = 0$ and $\lambda \in (0,1)$, or $\omega_1 - \omega_2 \geq 0$ and $\lambda = 1$, or $\omega_1 - \omega_2 \leq 0$ and $\lambda = 0$.

Unfortunately, as typically in new economic geography models based on the original Krugman (1991) framework, $\omega_1 - \omega_2$ is not a simple function of λ: we are unable to tell precisely for what values of the parameters of the model the spatial equilibria are reached. In the next section we will thus use numerical simulations in order to look at the shape of the real wage differential function.

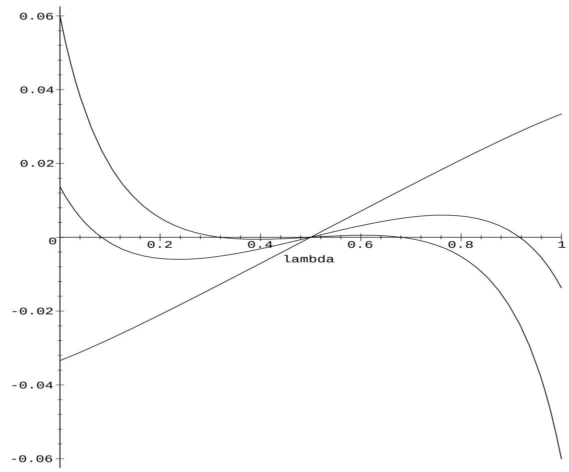
The evolution of the real wage differential $\omega_1 - \omega_2$ and the equilibrium spatial distribution inside the domestic country depend on the interaction of agglomeration and dispersion forces appearing in the equations we derived above.

Which equilibrium configuration is finally reached depends on the parameters of the models, and specifically on the level of interregional and international trade costs. In the next section we will consider an economic integration between the domestic and the foreign country, illustrated through an increase of Φ_0. We will focus on determining how the presence of a foreign country impacts the internal geography of the domestic country.

A.5 Trade Liberalization

This section considers the effect of lowering the international transaction cost on the spatial distribution of activity, in the case of a homogeneous country: the two domestic regions have the same access to foreign markets (Φ_0 is the same for both domestic regions). We explain how

Figure 5: Real wage differential for three values of ϕ_0



we draw the real wage differential curves. For a given value[15] of Φ_0, we numerically solve w_1 and w_2 for a range of values of $\lambda \in (0, 1)$. We then substitute the obtained w_1 and w_2 into $\omega_1 - \omega_2$ in order to plot one of the above curves. As shown in figure (5), this is done for three different values of Φ_0.

Let us analyze figure (5) by starting where workers are symmetrically distributed among regions: $\lambda = 0.5$. This configuration is an equilibrium, but it will only be stable if, for a marginal increase in λ, the real wage difference becomes negative. The migration of workers will then 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, drawn for $\Phi_0 = 0.004$ (the ad-valorem equivalent is $\tau_0 = 2.1$, which means that only $1/2.1 = 0.47$ of the shipped quantity arrives at the final destination, corresponding to a transaction cost of 53 %). For this level of transaction costs, the dispersed configuration is the only stable equilibrium[16]. The dashed curve illustrates the situation when the economy opens slightly. There are now five equilibria, of which three are stable, and two unstable. While the symmetric equilibrium is still stable, the agglomerated configuration (in either region) has become stable as well. Finally, the more trade barriers are decreased, the more the curve turns upwards; when it comes to cross the x axis with a positive slope (the level $\Phi_0 = 0.03$ corresponds to a transaction cost of 40 %), the only stable outcome are the two agglomerated configurations. We thus highlight this interesting result: according to our simulations, an economic integration is most likely to lead the domestic industrial sector to be spatially concentrated.

[15]The values of the other parameters are: $\sigma = 6$, $\beta = 4/5$, $\mu = 0.4$, $\alpha = 0.4/5$, $T_{12} = 1.75$, $L_0/L = 10$.

[16]Figure (5) is drawn for a value of Φ_{12} for which industry is dispersed in autarky ($\Phi_{12} = 0$). Similar results are obtained for lower values of Φ_{12}, but they are not showed here. The results are not as visible because the economy is already agglomerated.

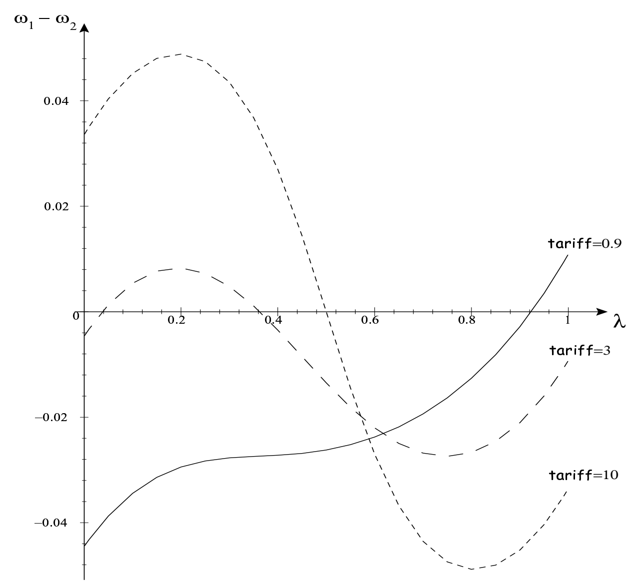
The forces at stake

What mechanisms explain this outcome? The decrease of the external transaction cost allows two additional elements to impact on the domestic economy: foreign demand and foreign supply. On the one side, having an access to a large exterior market lowers the incentive for domestic firms to locate near domestic consumers, which represent a smaller share of their sales. Thus the domestic demand externality is weakened by the presence of the foreign demand (in equations (24) and (25), income from the foreign country becomes a more important part of total demand). For similar reasons, the domestic cost externality is weakened by the presence of the foreign supply: the foreign firms now represent a much more important share of the total supply available to domestic consumers (in equations (27) and (28), the presence of the foreign firms now constitutes the main elements that drives the price indices down).
On the other side, trade liberalization also affects the competition effects within the domestic country. The competition exerted by foreign firms on the domestic market is large compared to the competition of other domestic firms. Therefore, the presence of the foreign supply lowers the need for domestic firms to locate far from domestic competitors, and thus lowers the need to disperse economic activity (in equations (27) and (28), as stated before, the presence of foreign firms lowers both price indices, which then diminish w_1 and w_2).

It finally appears that while foreign demand and foreign supply decrease both the agglomeration and the dispersion forces, the simulations show that in the end, a strong economic integration has more effect on the dispersion force: as a result the domestic economy becomes concentrated in only one location.

A.6 Border regions

Figure 6: Real wage difference when the two regions have different external transaction costs



We now ask the same question, but in a slightly different framework: by letting the two external transaction costs differ, we suppose that one of the domestic cities has a better access to the foreign market (region 2 for example). We specify a functional form for τ_{ij}. τ_{ij} represents all the transaction costs and consists of a cost related to distance and, for international trade, an ad-valorem tariff. In this section we also adopt a specific and simplified representation of space *à la* Hotelling in which country 0 and region 1 are located at both extremes. Region 2 is the border region. The segment thus has a length equal to d_{01}, and the distance between 1 and 2 is $d_{01}-d_{02}$. We assume that transaction costs are a linear function of distance: $\tau_{12} = 1+(d_{01}-d_{02})$ and $\tau_{01} = (1 + \text{tariff})d_{01}$.

In order to understand how the economic geography of the country evolves with trade openness, as in section (A.5) we use numerical simulations to display 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 since the country now contains two heterogeneous regions. Two changes are noticeable: first, as observed in section (A.5), foreign demand lowers the domestic agglomeration force. However, an additional effect appears, because domestic firms may now choose to locate in the location closest to the foreign market, which is region 2. We thus highlight one of the potential effects of trade liberalization, which is to *pull* domestic firms towards the border in order for them to benefit from the best access to foreign demand. Then, foreign supply lowers the domestic dispersion force. There is also an additional effect due to the heterogeneity of the regions: region 1, at the end of the segment, allows firms to locate as far as possible from the foreign competitors. Hence, trade liberalization may *push* domestic firms towards the remote regions, as a reaction of protection against the large foreign competition.

Figure (6), which is drawn in a similar way as figure (5), illustrates the impact of these forces according to the degree of trade liberalization. As observed in section (A.5), the symmetric distribution of workers is a stable equilibrium for low values of Φ_0. When Φ_0 increases, the curve comes to cross the x axis with a positive slope, meaning that only agglomerated configurations are stable equilibria. However, the curves are not symmetric anymore with respect to the value $\lambda = 0.5$. The push effect of firms towards the interior region is to be seen through the shift of the dotted curve to the right: when the domestic economy is still relatively closed, the increase of 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 of firms to the border region is illustrated by the shift of the dark curve to the right. When Φ_0 is high, the increase of demand emanating from the foreign country dominates the competition effect driven by foreign firms, and the country's economic activity is attracted to the border region. The agglomeration is the only stable equilibrium, but it has more chances to occur in the closest region to the foreign market. Figure (6) shows that the concentration of the industry will only occur in region 1 if the latter contains more than 80 % of the industrial activity of the country.

The main outcome arising in this section helps to modulate our previous results. The model shows that trade liberalization may foster two effects: a pull-effect towards border regions and a push-effect inside remote regions. The strength of these phenomena will be shaped by the various elements of the model: a large foreign demand for domestic product will increase the pull of the domestic industrial sector towards low-cost access regions. Conversely, a large amount of foreign firms exporting to the domestic market may favor the development of better protected internal regions.

B Data appendix for trade potentials

The first step in calculating trade potentials consists in estimating a gravity relation on the reference sample, which in our case contains the OECD countries. Data on bilateral trade comes from the World Bank Trade and Production database. Table (7) shows the estimation coefficients.

Table 7: Coefficient of the gravity estimations used for calculating trade potentials

Year	Constant	ln (gdp) exporter	ln (gdp) importer	Distance
1985	-7.456348	.7467666	.797172	-1.1054
1986	-7.955073	.7543431	.7791241	-1.036233
1987	-7.864255	.7310896	.7763425	-.9882122
1988	-7.780969	.7274196	.7855822	-1.021775
1989	-7.361966	.7181974	.7758338	-1.021413
1990	-7.356963	.7211061	.7647031	-1.015694
1991	-9.349811	.7706099	.7971912	-.9628118
1992	-9.354696	.7627021	.8005233	-.9580373
1993	-9.341378	.7590637	.7880122	-.9174621
1994	-9.629128	.7677888	.7910713	-.9046019
1995	-10.31963	.7880366	.8065055	-.9121171
1996	-10.51896	.8023613	.7982305	-.9020121
1997	-10.11245	.8038037	.7892268	-.9250775
1998	-9.77052	.8095613	.7648662	-.9197291

C Data appendix for the regional data

The data used in section (4) was made available by the WIIW in Vienna. The original database contains information on population, employment, and wage (among others), for the five accession countries that we examine in this section. Regional data is available at the NUTS 3 level[17] for the Czech Republic, Hungary, Slovakia, Slovenia, and at the NUTS 2 level for Poland. The sectoral disaggregation corresponds to the Statistical Classification of Economic Activities in the European Community, rev. 1, at the lower level of disaggregation.

D Employment gradients by sector and country

[17] *Nomenclature of Territorial Units for Statistics*, Eurostat

Table 8: Regional employment gradients in CEECs (Agriculture)

	Dependent Variable: $\ln(l_i/\text{pop}_i)$				
Model :	(1)	(2)	(3)	(4)	(5)
ln dist. to capital	-0.158	0.30	0.129	0.712	-0.733
	(-0.86)	(4.97)	(0.32)	(3.02)	(-11.81)
Capital	-3.756	-1.719	-0.177	0.508	-1.948
	(-8.79)	(-9.17)	(-0.46)	(0.86)	(-41.87)
ln dist. to Brussels	1.629	-0.091	-1.141	0.538	3.831
	(1.85)	(-0.17)	(-1.14)	(0.15)	(4.85)
land border with EU,N,CH	-0.194	0.252	-0.102	-0.044	-0.259
	(-1.25)	(2.57)	(-0.34)	(-0.10)	(-6.39)
land border with CEEC	-0.559	-0.410	-0.229	0.446	0.000
	(-3.21)	(-5.45)	(-0.98)	(1.51)	(0.0)
access to sea	0.000	0.000	0.333	-0.476	0.000
	(0.0)	(0.0)	(1.56)	(-5.30)	(0.0)
Yrdum	Yes	Yes	Yes	Yes	Yes
N	56	80	32	48	24
R^2	0.811	0.788	0.442	0.217	0.905

Note: t-statistics in parentheses.
Model 1: Czech Republic, Model 2: Hungary
Model 3: Poland, Model 4: Slovenia, Model 5: Slovakia

Table 9: Regional employment gradients in CEECs (Manufacturing)

	Dependent Variable: $\ln(l_i/\text{pop}_i)$				
Model :	(1)	(2)	(3)	(4)	(5)
ln dist. to capital	0.101	-0.004	-0.137	-0.199	0.362
	(2.27)	(-0.06)	(-1.02)	(-3.30)	(2.31)
Capital	-0.573	-0.064	0.056	-0.553	0.107
	(-6.13)	(-0.28)	(0.52)	(-7.55)	(0.92)
ln dist. to Brussels	-0.793	-1.612	-1.698	0.005	-4.188
	(-3.81)	(-5.70)	(-3.76)	(0.01)	(-3.61)
land border with EU,N,CH	-0.117	0.327	-0.392	-0.002	0.059
	(-2.42)	(5.42)	(-3.32)	(-0.03)	(0.52)
land border with CEEC	0.109	-0.056	0.159	-0.022	0.000
	(2.66)	(-1.13)	(1.67)	(-0.24)	(0.0)
access to sea	0.000	0.000	-0.046	-0.603	0.000
	(0.0)	(0.0)	(-1.03)	(-12.23)	(0.0)
Yrdum	Yes	Yes	Yes	Yes	Yes
N	56	80	32	48	24
R^2	0.859	0.566	0.593	0.738	0.703

Note: t-statistics in parentheses.
Model 1: Czech Republic, Model 2: Hungary
Model 3: Poland, Model 4: Slovenia, Model 5: Slovakia

Table 10: Regional employment gradients in CEECs (Construction)

	Dependent Variable: $\ln(l_i/\text{pop}_i)$				
Model :	(1)	(2)	(3)	(4)	(5)
ln dist. to capital	0.074	0.136	0.192	-0.041	0.330
	(1.06)	(3.10)	(1.78)	(-0.40)	(3.26)
capital	0.626	0.974	0.654	0.329	0.977
	(3.92)	(8.12)	(6.43)	(4.74)	(10.71)
ln dist. to Brussels	0.674	-2.005	-0.909	-2.947	-2.817
	(2.24)	(-5.81)	(-2.93)	(-1.81)	(-3.68)
land border with EU,N,CH	0.117	0.089	-0.394	-0.129	0.099
	(2.20)	(0.93)	(-3.39)	(-1.34)	(1.23)
land border with CEEC	-0.151	-0.015	0.115	0.148	0.000
	(-2.21)	(-0.27)	(1.30)	(1.13)	(0.0)
access to sea	0.000	0.000	-0.015	0.155	0.000
	(0.0)	(0.0)	(-0.28)	(1.35)	(0.0)
Yrdum	Yes	Yes	Yes	Yes	Yes
N	56	80	32	48	24
R^2	0.717	0.696	0.638	0.355	0.864

Note: t-statistics in parentheses.
Model 1: Czech Republic, Model 2: Hungary
Model 3: Poland, Model 4: Slovenia, Model 5: Slovakia

Table 11: Regional employment gradients in CEECs (Distribution)

	Dependent Variable: $\ln(l_i/\text{pop}_i)$				
Model :	(1)	(2)	(3)	(4)	(5)
ln dist. to capital	0.058	-0.004	0.190	-0.098	0.157
	(1.05)	(-0.09)	(1.80)	(-1.91)	(1.81)
capital	1.136	1.061	0.889	0.903	0.909
	(8.25)	(6.49)	(11.64)	(26.00)	(10.00)
ln dist. to Brussels	-0.264	-0.077	-0.665	2.257	-2.041
	(-1.11)	(-0.22)	(-1.61)	(2.91)	(-2.80)
land border with EU,N,CH	0.053	0.224	-0.276	0.303	-0.099
	(1.18)	(2.03)	(-2.12)	(7.38)	(-1.17)
land border with CEEC	0.174	0.047	-0.031	-0.277	0.000
	(3.66)	(0.90)	(-0.32)	(-5.70)	(0.0)
access to sea	0.000	0.000	-0.054	0.456	0.000
	(0.0)	(0.0)	(-0.93)	(8.69)	(0.0)
Yrdum	Yes	Yes	Yes	Yes	Yes
N	56	80	32	48	24
R^2	0.845	0.820	0.74	0.882	0.873

Note: t-statistics in parentheses.
Model 1: Czech Republic, Model 2: Hungary
Model 3: Poland, Model 4: Slovenia, Model 5: Slovakia

Table 12: Regional employment gradients in CEECs (Transport and Comm.)

	Dependent Variable: $\ln(l_i/\text{pop}_i)$				
Model :	(1)	(2)	(3)	(4)	(5)
ln dist. to capital	-0.050	0.232	0.226	-0.004	-0.053
	(-0.80)	(4.74)	(1.88)	(-0.04)	(-0.52)
capital	0.563	2.350	0.737	0.472	0.941
	(4.42)	(4.95)	(7.09)	(2.48)	(12.58)
ln dist. to Brussels	0.099	-1.194	-0.064	-4.951	1.653
	(0.40)	(-3.53)	(-0.20)	(-3.97)	(1.29)
land border with EU,N,CH	0.076	0.178	0.050	-0.013	-0.092
	(1.26)	(2.57)	(0.64)	(-0.09)	(-1.38)
land border with CEEC	-0.032	0.079	-0.077	-0.160	0.000
	(-0.39)	(1.70)	(-1.17)	(-1.10)	(0.0)
access to sea	0.000	0.000	0.103	1.118	0.000
	(0.0)	(0.0)	(1.35)	(14.54)	(0.0)
Yrdum	Yes	Yes	Yes	Yes	Yes
N	56	80	32	48	24
R^2	0.622	0.85	0.724	0.698	0.664

Note: t-statistics in parentheses.
Model 1: Czech Republic, Model 2: Hungary
Model 3: Poland, Model 4: Slovenia, Model 5: Slovakia

Table 13: Regional employment gradients in CEECs (Banking and Insurance)

	Dependent Variable: $\ln(l_i/\text{pop}_i)$				
Model :	(1)	(2)	(3)	(4)	(5)
ln dist. to capital	-0.015	0.032	-0.185	0.238	0.079
	(-0.22)	(0.37)	(-1.33)	(4.72)	(1.31)
capital	1.810	2.360	0.982	1.072	1.950
	(10.92)	(4.16)	(7.23)	(20.73)	(31.09)
ln dist. to Brussels	-0.421	0.815	-0.486	-2.063	0.125
	(-1.24)	(0.93)	(-1.65)	(-2.64)	(0.18)
Land border with EU,N,CH	0.179	0.240	0.105	-0.040	-0.063
	(3.53)	(1.06)	(1.07)	(-0.78)	(-1.30)
Land border with CEEC	0.248	-0.205	0.040	-0.158	0.000
	(4.04)	(-2.69)	(0.61)	(-1.97)	(0.0)
Access to sea	0.000	0.000	0.065	0.451	0.000
	(0.0)	(0.0)	(0.73)	(8.55)	(0.0)
Yrdum	Yes	Yes	Yes	Yes	Yes
N	56	80	32	48	24
R^2	0.932	0.872	0.898	0.822	0.953

Note: t-statistics in parentheses.
Model 1: Czech Republic, Model 2: Hungary
Model 3: Poland, Model 4: Slovenia, Model 5: Slovakia

Table 14: Regional employment gradients in CEECs (Other market services)

	Dependent Variable: $\ln(l_i/\text{pop}_i)$				
Model :	(1)	(2)	(3)	(4)	(5)
ln dist. to capital	0.055	0.235	-0.154	0.097	-0.246
	(1.11)	(5.49)	(-0.98)	(0.92)	(-6.66)
Capital	1.775	1.963	1.170	1.413	1.169
	(15.08)	(13.46)	(8.92)	(14.32)	(21.54)
ln dist. to Brussels	0.171	-2.012	-1.809	-0.048	2.570
	(0.81)	(-7.08)	(-3.48)	(-0.03)	(4.20)
Land border with EU,N,CH	0.324	-0.037	-0.20	0.395	-0.159
	(6.60)	(-0.44)	(-1.21)	(3.94)	(-3.98)
Land border with CEEC	0.131	-0.066	0.290	-0.596	0.000
	(1.91)	(-1.29)	(2.34)	(-5.59)	(0.0)
Access to sea	0.000	0.000	0.191	0.633	0.000
	(0.0)	(0.0)	(2.34)	(6.85)	(0.0)
Yrdum	Yes	Yes	Yes	Yes	Yes
N	56	80	32	48	24
R^2	0.933	0.797	0.779	0.839	0.942

Note: t-statistics in parentheses.
Model 1: Czech Republic, Model 2: Hungary
Model 3: Poland, Model 4: Slovenia, Model 5: Slovakia

Table 15: Regional employment gradients in CEECs (Non-market services)

	Dependent Variable: $\ln(l_i/\text{pop}_i)$				
Model :	(1)	(2)	(3)	(4)	(5)
ln dist. to capital	0.153	0.186	-0.018	0.138	0.070
	(7.47)	(10.13)	(-0.49)	(6.30)	(2.66)
capital	0.765	1.391	0.123	0.619	0.593
	(19.19)	(29.43)	(4.26)	(10.07)	(33.03)
ln dist. to Brussels	-0.705	0.121	0.206	-0.307	0.212
	(-5.96)	(1.40)	(2.57)	(-0.55)	(0.72)
land border with EU,N,CH	0.022	-0.006	0.110	0.021	0.074
	(0.79)	(-0.23)	(5.83)	(0.41)	(4.87)
land border with CEEC	0.066	-0.027	0.002	-0.192	0.000
	(2.54)	(-1.95)	(0.08)	(-4.71)	(0.0)
access to sea	0.000	0.000	-0.004	0.107	0.000
	(0.0)	(0.0)	(-0.16)	(3.64)	(0.0)
Yrdum	Yes	Yes	Yes	Yes	Yes
N	56	80	32	48	24
R^2	0.839	0.950	0.707	0.73	0.894

Note: t-statistics in parentheses.
Model 1: Czech Republic, Model 2: Hungary
Model 3: Poland, Model 4: Slovenia, Model 5: Slovakia