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Regional Specialisation and Location of Industrial Activity in Accession Countries*

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Abstract

Central and East European economies have experienced since 1990 an increasing integration with the European Union via trade and foreign direct investments. The spatial implications of this process have not been in depth investigated. Have patterns of regional specialisation changed in the period 1990-1999? Has relocation of manufacturing activity taken place? What are the determinants of regional specialisation and industrial concentration patterns? This paper identifies and explains the effects of economic integration on patterns of regional specialisation and location of industrial activity in Bulgaria, Estonia, Hungary, Romania and Slovenia. On the basis of an extensive database we find evidence of regional relocation of industries, leading to higher average regional specialisation in Bulgaria and Romania and lower average regional specialisation in Estonia. In Hungary and Slovenia the average regional specialisation remains unchanged. We also find support for the new trade theory prediction of relocation of industries near the core, which, in the countries under analysis, has shifted from the country capital to the regions bordering EU.

Keywords: Regional specialisation, Location of industrial activity, Accession countries

JEL classification: F15, R11, R12

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1. Introduction

The emerging economies in the accession countries will most likely exhibit a high degree of spatial economic dynamics in the years to come, especially if they are increasingly exposed to market forces. The question is of course whether various regions or industries in these countries have anticipated this transformation, and are already showing the first signs of a shift in their spatial-economic base. Thus, we may wonder whether industries may demonstrate a different pattern of regional localisation, or alternatively, whether specific regions are able to attract new industries. This would mean of course a drastic change in location patterns of industries, reflected in changes in the spatial concentration of sectors or firms and in the regional concentration of various industries. The available theoretical frameworks on regional growth and innovation are not always conclusive, nor are individual country reports from the accession countries. Therefore, it is important to develop a solid statistical framework supported by a wealth of empirical findings through which the transition path of regions in accession countries can be traced and explored.

Have patterns of regional specialisation changed in the period 1990-1999? Has relocation of manufacturing activity taken place? What are the determinants of regional specialisation and industrial concentration patterns?

The aim of this paper is to identify, explain and compare patterns of regional specialisation and location of industrial activity in five accession countries, viz. Bulgaria, Estonia, Hungary, Romania and Slovenia.

This paper is the first to bring evidence about patterns of regional specialisation and concentration of industrial activity in accession countries. Our research results suggest that in the five accession countries included in this study regional relocation of industries has taken place leading to increasing regional specialisation in Bulgaria and Romania and decreasing regional specialisation in Estonia. Regional specialisation has not changed in Hungary and Slovenia. We also find support for the new trade theory prediction of relocation of industries near the core, which, in the countries under analysis, has shifted from the country capital to the regions bordering EU.

The remainder of this paper is organized as follows. Section 2 discusses the theoretical framework and existing empirical evidence on regional specialisation and geographical concentration of industries. Section 3 gives an overview of the data set and

measures used for our analysis. Section 4 analyses patterns of regional specialisation in the five accession countries while Section 5 discusses the geographic concentration of manufacturing in the same countries. Section 6 presents the results of our econometric analysis on determinants of regional specialisation and industrial concentration patterns. Section 7 concludes.

2. Theory and empirical evidence

2.1 Theoretical Framework

The impact of economic integration on regional specialisation and location of industrial activity has been analysed using three theoretical approaches[1]. While offering different explanations of patterns of specialisation, all three theoretical models predict increasing specialisation as a result of trade liberalization (economic integration). Conventional (neo-classical) trade theory explains patterns of regional specialisation on the basis of differences in productivity (technology) or endowments across regions while new trade theory and more recently new economic geography models underline increasing returns in production, agglomeration economies and cumulative processes as explanations for concentration of activities in particular regions.

Neo-classical trade theory has explained specialisation patterns through differences in relative production costs termed "comparative advantages" resulting from differences in productivity (technology) (Ricardo, 1817) or endowments (Heckscher, 1919, Ohlin, 1933) between countries and regions. The main features of these models are: perfect competition, homogeneous products and constant returns to scale. The neo-classical theory predicts that trade liberalization (economic integration) will result in production re-location and increasing specialization according to comparative advantages. The consequent changes in demands for factors of productions will tend to equalize factor prices across countries and regions. The neo-classical trade models can explain a substantial proportion of inter-industry specialization. While relevant, comparative advantage is however not sufficient as the only explanation of specialisation. In reality, different production structures are found in similar regions and the bulk of trade takes place among countries with similar factor endowments and production technologies. Most of trade between industrialised countries takes the form of intra-industry trade, that is an exchange of differentiated goods that fall into the same product category.

During the 1980s, new trade theory models have been developed to supplement conventional theories or to some extent even to replace them to explain the phenomenon of intra-industry trade (Krugman, 1979, 1980, 1981; Helpman and Krugman, 1985, Krugman and Venables, 1990). The main ingredients of these models are increasing returns to scale, product differentiation and imperfect (monopolistic) competition. The new trade models predict that both inter- and intra- industry trade will occur. Firms with increasing returns to scale will tend to concentrate their production in a few locations. Thus large regions or more generally, regions with good market access will be particularly attractive for production locations and will become net exporters of products produced by these firms. Economic integration (reduction of trade barriers) allows underlying geographical advantage to play a greater role. On the other hand, if trade barriers and transport costs become trivially small, then differences in these costs become unimportant. It is suggested (Krugman and Venables, 1990) that the balance between these forces resolves itself in an inverse U-shaped relationship, indicating that geographical advantage will be greatest at some intermediate level of trade costs. Thus, in moving from very high trade barriers to "intermediate" ones, the theory predicts that activity will be drawn into regions with good market access (into the "centre" at the expense of "periphery"). As integration proceeds, the process becomes reversed: as trade costs become small, so firms are less willing to pay the higher central wages, and industry will re-locate to peripheral regions where production factors costs are more favourable.

The prediction of new trade theory regarding the distribution of economic activity between the core and periphery is relevant in the case of the accession of Central and East European countries to the European Union. The current economic integration situation could be seen as one with "intermediate trade costs". A further integration could result in re-location of manufacturing towards these countries due to factor cots considerations. (Hallet, 1998).

The "new economic geography" models assume that geographical advantage is endogenous and suggest that regional specialisation may be the result of the spatial pattern of agglomeration of economic activities (Krugman, 1991a, 1991b). Krugman's analysis focuses on a model similar to the two sector-two region model of Krugman and Venables (1990), but in this case each sector (agriculture and manufacturing) uses a specific factor of production and only the factor specific to manufacturing (industrial workers) is mobile between regions. The two regions are identical in their initial factor

endowments. Relocating firms and workers from one region to the other trigger agglomeration. As a consequence of firm relocation, due to the monopolistic competition the variety of goods available in the receiving region increase. As labour demand rises in the receiving region, wages increase which in turn attract workers following the manufacturing firm. Thus this initial relocation will produce cumulative effects, causing both firms and workers to relocate from the "donor" region to the receiving region. With no barriers to the movement of firms or manufacturing workers (like in the Krugman,1991b model), a bleak scenario could be imagined: the manufacturing sector in the "donor" region would collapse and manufacturing would concentrate in the "receiving" region. This scenario could develop gradually following the lowering of trade costs. Initially when trade costs are high we are in a situation where manufacturing is evenly split between regions (each region produces for its own local market). If trade costs are sufficiently low, demand linkages outweigh the trade costs of servicing a non-local market. The place where agglomeration happens, could be a result of a historical accident: one small change in the share of manufacturing in a region may next set off a chain reaction. This simple model would seem to have dramatic implications for European integration. In this case, regions with an initial scale advantage in a particular sector would see their advantage reinforced in those sectors.

These models could be generalised to ones where firms have "supply-side linkages": manufacturing firms benefit from locating in a region where they have access to suppliers providing a range of specialised inputs (Krugman and Venables, 1995, Venables, 1996). In this case, one would expect European integration to simply bring about massive concentration and specialisation in sectors where supply-side and demand-side linkages are important. However, the simple agglomeration result seems unrealistic in a European context where inter-EU country mobility is extremely low and even intra-EU country mobility is less than perfect (Eichengreen, 1993, Obstfeld and Peri, 1998). Krugman (1991b) and Venables (1994) note that the European geographical pattern of economic activity differs from that in the US: there tends to be less concentration of manufacturing activities, and more inequality across regions in terms of per capita income. The agglomeration effects might still be powerful, as long as there is sufficient labour mobility within EU countries. In this case, we could observe agglomeration effects emerging around border regions: by locating closer to border regions, firms might be able to exploit supply-side linkages with firms in other EU countries whilst still attracting their own national work force without increasing labour

demand and setting off a large increase in labour costs. There is evidence that agglomeration does take place within individual regions of EU countries (see Gretschmann, 1998, for evidence on Germany), generating "growth poles" around important transport nodes.

2.2 Empirical Evidence

Compared to the theoretical literature, empirical analysis of the impact of economic integration on regional specialisation and geographic concentration of industries is still at an early stage. The most interesting studies have focused on the US and the European Union (EU).

Krugman (1991a) compares four regions in the US with four large countries in the EU and shows that geographic concentration of manufacturing is higher in the US than in Europe. The most concentrated industries are the textiles industries, while high technology sectors are less concentrated. Ellison and Glaeser (1997) analyse the geographic concentration of US manufacturing industries. Using a model which controls for industry characteristics they find that almost all industries seem to be localised. Many industries are, however, only slightly concentrated and some of most concentrated industries are related to natural advantages.

A rigorous and complete assessment of the locational forces identified by the new trade models is provided by the work of Hanson on US-Mexican integration. He finds support for the hypothesis that agglomeration is associated with increasing returns, and shows that integration with the US has shifted Mexican industry away from Mexico City and towards states with good access to the US market. This is reflected in the falling importance of distance from the capital and the rising importance of distance from the border in explaining interregional wage differentials (Hanson, 1997a, 1997b, 1998). A similar movement towards the border states can be observed in the US. Hanson (1996) finds that integration not only has shifted industry towards border cities both in the US and in Mexico, but also that it has made demand and cost linkages more important determinants of industrial location: employment has grown more in those regions that have larger agglomerations of industries with buyer/supplier relationships.

With respect to Europe, Brülhart (1996) and Brülhart and Torstensson (1996) study the evolution of industrial specialisation patterns in 11 EU countries (all except Luxembourg and the more recent member states, Austria, Finland, and Sweden) between 1980 and 1990. They find support for some of the main implications of theoretical models. More recently, Fischer and Nijkamp (1999) examine spatial-economic implications of the European integration. First, Brülhart (1996) finds that

between 1980 and 1990 14 of the 18 industries considered have become more geographically concentrated in Europe (as measured by Gini coefficients). Second, sectors characterised by large economies of scale have shown larger increases in concentration. Finally, Brülhart and Torstensson (1996) find some support for the U-shaped relationship between the degree of regional integration and spatial agglomeration predicted by the models when labour mobility is low: activities with larger scale economies were more concentrated in regions close to the geographical core of the EU during the early stages of European integration, while concentration in the core has fallen in the 1980s.

Using production data in current prices for 27 manufacturing industries, Amiti (1997) finds that there was a significant increase of specialisation between 1968 and 1990 in Belgium, Denmark, Germany, Greece, Italy, and the Netherlands; no significant change in Portugal; a significant fall in specialisation in France, Spain and the UK. There was a significant increase in specialisation between 1980 and 1990 in all countries. With more disaggregated data (65 industries) the increase in specialisation is more pronounced: the average increase is 2 percent for all countries except Italy compared to 1 percent in the case with 27 manufacturing industries. Other evidence of increasing specialisation in EU countries in the 1980s is provided by Hine (1990) and Greenway and Hine (1991). Sapir (1996) finds that specialisation did not increase in EU countries from 1977 to 1992 using an Herfindahl index with export data. This is an indicator of "absolute specialisation", since it measures how different the distribution of exports shares is from a uniform distribution.

More recent studies confirm the increasing specialization trends in EU Member States. Although using different data and measurement techniques, Aiginger et al. (1999) and Midelfart-Knarvik et al. (2000) find increasing specialisation during the 1980s and 1990s in a majority of EU countries.

At the front of geographic concentration of industries, Amiti (1997) finds that 17 out of 27 industries experienced an increase in geographical concentration with an average increase of 3 per cent per year in leather products, transport equipment and textiles. Only six industries experienced a fall in concentration, with paper and paper products and "other chemicals" showing particularly marked increases in dispersion. Brülhart (1998) and Brülhart and Torstensson (1996) also find evidence that the geographical concentration of most industries rose during the 1980s in a sample of 11 EU countries using employment data for 18 manufacturing industries. Brülhart and Torstensson (1996) investigate the location of more concentrated industries. They compare industry Gini coefficients with industry centrality indices proposed by Keeble et al. (1986) which suggested an industry bias towards central EU countries. Using employment data for 11 countries, disaggregated for 18 industries, which were

supplemented with regional data for nine of the EU countries and seven of the industries, they find a positive correlation between Gini coefficients and centrality indices. Similar results were found by Brülhart (1998). Brülhart and Torstensson (1996) find a positive correlation between scale economies and industry bias towards the central EU in both 1980 and 1990. Brülhart (1998) also finds that industries such as chemicals and motor vehicles which are highly concentrated and located in central EU countries are subject to significant scale economies. Midelfart-Knartvik et al. (2000) find that many industries have experienced significant changes in their location across EU Member States during the period 1970-1997. Slow growing and unskilled labour intensive industries have become more concentrated usually in peripheral low wage countries. During the same period, a number of medium and high technology industries have become more dispersed. A number of recent papers look at the effects of trade policy on agglomeration (Brülhart and Torstensson (1996), Martin and Ottaviano (1996), Ottaviano (1996), Puga and Venables (1997) and Walz (1997). From a policy perspective, Trionfetti (1997) looks at the consequences for industrial location of different procurement policies. A common idea in these papers is that the design of trade agreements and of infrastructure networks shapes the location advantage in terms of access to world markets. This is applied by Puga (2001) to discuss the implications of the new economic geography for European regional policy.

With respect to accession countries, existing evidence based on trade statistics suggests that these countries tend to specialise in labour and resource-intensive sectors following an inter-industry trade pattern (Landesmann, 1995). Despite the dominance of the inter-industry (Heckscher-Ohlin) type of trade, intra-industry trade has also increased, more evident for the Czech Republic and Hungary (Landesmann, 1995, Dobrinsky, 1995). This increase however, may be associated with the intensification of outward processing traffic. Most of the research on regional issues in transition economies has focused on patterns of disparities with the aim to identify policy needs at the regional level (for instance Spiridonova 1995, 1999 - for Bulgaria, Nemes-Nagy, 1994, 1998 - for Hungary, Constantin, 1997 - for Romania). It has been claimed that the processes of internationalisation and structural change in transition economies tend to favour metropolitan and western regions, as well as regions with a strong industrial base (Petrakos, 1996). In addition, at a macro-geographical level the process of transition will increase disparities at the European level, by favouring countries near the East-West frontier (Petrakos, 1999). Increasing core-periphery differences in Estonia are documented in Raagmaa (1996). Regional determinants of new private firms in Romania have been investigated in Traistaru (1999). Using the approach of the "new economic geography", Altomonte and Resmini (1999) investigated the role of foreign direct investment in shaping regional specialisation in accession countries.

Yet to date, there is no comprehensive study on the impact of the economic integration with the European Union on regional specialisation and location of industrial activity in accession countries.

3. Data and Measurement

In this paper we analyse patterns of regional specialisation and concentration of manufacturing and their determinants using regional manufacturing employment data and other variables at NUTS III level for Bulgaria, Estonia, Hungary, Romania and Slovenia. The employment data and the other regional variables are part of a specially created data set named REGSTAT[2]. Apart from employment other variables at the regional level used in our analysis include: geographic and demographic variables, average earnings (wages), Gross Domestic Product (GDP), measures of infrastructure, research and development (R&D) and public expenditures.

The maximum period covered is 1990-1999. In most cases, data have been collected from national statistical offices. In the case of Estonia, employment data at a regional level have been estimated using labour force surveys. In Slovenia, employment data at regional level have been estimated using the information provided in the balance sheets of companies with more than ten employees.

Regional specialisation and geographic concentration of industries are defined in relation to production structures[3]. Regional specialisation is defined as the distribution of the shares of an industry *i* in total manufacturing in a specific region *j* compared to a reference situation. A region *j* is said to be specialized in a specific industry *i* if this industry has a high share in the manufacturing employment of region *j*. The manufacturing structure of a region *j* is "highly specialised", if a small number of industries have a large combined share in the total manufacturing of region *j*.

Geographic concentration measures the distribution of the shares of regions in a specific industry *i*. A specific industry *i* is said to be "concentrated", if a large part of the production is carried out in a small number of regions.

Specialisation and concentration may be assessed using absolute and relative measures. There are several indicators proposed in the existing literature each offering certain advantages as well as shortcomings. For our analysis we have selected a relative measure (a dissimilarity index derived from the index proposed by Krugman, 1991).

Box 1.1 Indicators of regional specialisation and geographic concentration of industries[4]

E = employment
s = shares
i = industry (sector, branch)
j = region

s_{ij}^{S} = the share of employment in industry i in region j in total employment of region j
s_{ij}^{C} = the share of employment in industry i in region j in country employment of industry i
s_i = the share of country employment in industry i in total country employment
s_j = the share of total employment in region j in country employment

$$s_{ij}^{S} = \frac{Eij}{Ej} = \frac{Eij}{\sum_i Eij} \qquad s_{ij}^{C} = \frac{Eij}{Ei} = \frac{Eij}{\sum_j Eij}$$

$$s_i = \frac{Ei}{E} = \frac{\sum_j Eij}{\sum_i \sum_j Eij} \qquad s_j = \frac{Ej}{E} = \frac{\sum_i Eij}{\sum_i \sum_j Eij}$$

The dissimilarity index

Specialisation measure

$$DSR_j = \sum_i \left| s_{ij}^{S} - s_i \right|$$

Concentration measure

$$DCR_i = \sum_j | s_{ij}^{C} - s_j |$$

4. Regional Specialisation

The average level of regional specialisation may be different in each of the countries under analysis. Furthermore, in each country we may find regions with a high degree of specialisation as well as low specialised regions. It is not completely clear, however, whether a high level of specialisation is positive or negative for the economic development of regions. Addressing this problem, we subdivided the regions according to the level of specialisation in highly and low specialised regions. We clustered as regions with a low degree of specialisation the ones in which the specialisation index was below 0.35 for 60% of the period, while we clustered as highly specialised regions the ones in which the specialisation index was higher than 0.75 for 60% of the period examined[5]. 14.2 percent of regions fell in the cluster of highly specialised regions, while 15.1 percent fell in the cluster of low specialised ones. All levels of specialisation were

computed with respect to the national average, independently of the other countries' situation. A list of regions belonging to these groups may be found in Table 1 (see Annex).

The common characteristic of highly specialised regions is that GDP was usually above the national average, while wages were around the national average. Unemployment was above the national average and seemed to increase. The number of telephone lines and of cars was below, with the exception of Bulgaria, in which the number of cars was above the average, and decreasing. We may conclude that the economic indicators of the highly specialised regions were sometimes worse than the national average. The level of specialisation of regions belonging to this group was between 1.35 and 1.60 of the national average.

In regions with a low level of specialisation the GDP seemed to be slightly lower than the national average. The only exceptions were Estonian regions in which GDP seemed to be above the national average. Wages were usually above the national average and increasing, unemployment was usually below, although sometimes increasing. The number of cars and telephone lines was usually above the national average but decreasing, with the exception of Hungarian regions, in which cars and telephones were below the average and converging with the rest of the country. The level of specialisation of regions belonging to the group was around 0.60 – 0.70 of the national average. We may therefore conclude that low specialised regions seemed to have a better economic position/performance than higher specialised ones.

Although the general level of specialisation in the countries under analysis is quite low with respect to EU or US standards, the recent economic changes that are affecting these countries are probably yielding industries relocation toward an increasing in regional specialisation. In order to verify whether regional specialisation – expressed by means of the dissimilarity index – is increasing or decreasing in the countries under analysis, we estimated a trend model. Since we believe there is substantial heterogeneity among the five countries considered, the trend model has been estimated separately for each country using regional data at NUTS III level. The results of the fixed effect estimators for our regional panels are shown in Table 2 (see Annex). The table shows that on average regional specialisation in the '90s was increasing in Bulgaria and Romania, and decreasing in Estonia. The beta coefficient turned out to be not significantly different from zero at the national level for Hungarian and Slovenian regions. Specialisation seems to have increased more inside Bulgaria than inside

Romania. However, since the dependent variable was computed separately for each country, some caution is necessary in cross-country comparisons.

It may be argued that the trend models presented in Table 2 are still too aggregate and may therefore hide specific regional behaviours. Since we may expect the industry reallocation to yield increasing specialisation in some regions and decreasing specialisation in some others, the use of the common beta coefficient may seem to be a strong restriction. Regional trends suggest that specialisation was significantly increasing in 26.4 percent of all regions, significantly decreasing in 14.2 percent of the regions, and was not significantly different from zero in the remaining 58.5 percent of the regions.

We found no evidence of a clear relationship between the geographical location of a region (e.g., proximity with the EU market) and the changes in its level of specialisation: in all groups (increasing, decreasing and stable specialisation) we may find internal regions, regions bordering EU, accession countries, as well as regions bordering extra-EU. The chi-squared statistics never rejected the hypothesis of independence between the "increasing/decreasing specialisation" and the "internal/border regions" way of clustering regions.

However, some similarities among regions may be found if we subdivide regions according to their specialisation path in three clusters: regions experiencing increasing specialisation, regions experiencing decreasing specialisation, and regions showing no evident increasing or decreasing path. Regions belonging to these groups are listed in the Table 3 (see Annex).

We found that all regions belonging to the first group – increasing specialisation – had a level of specialisation that was below the national average [6] at the beginning of the period. The evidence seemed therefore in favour of a convergence in the level of specialisation of regions belonging to the same country. At the end of the period the average specialisation of the regions belonging to this group was slightly higher than the national average in Bulgaria, Hungary and Romania, while it was still below the national average in Estonia and Slovenia. Concerning the other economic indicators, GDP – per capita and per employee – seems to have decreased from slightly above to slightly below the national average in Bulgaria and Hungary, while it was above the average and still increasing in Estonia. We had insufficient information to analyse the path of GDP in Romania and Slovenia. The number of cars and of telephone lines per capita may be interpreted as a proxy for the level of wealth. The path of these variables

is very similar to the path of GDP: it is decreasing with respect to the national average in Bulgaria and Hungary, while it is increasing in Estonia and Romania. Finally, in Bulgaria, in these regions, wages were above the national average and unemployment was below; none of them seemed to increase or decrease (with respect to the national average). In Hungary, instead, unemployment was above the average and seemed to increase with respect to the national average.

The regions belonging to the second group – decreasing specialisation – may be subdivided in two sub-clusters: in Hungary and Estonia specialisation was slightly above the national average at the beginning of the period, and fell below it at the end of the period of observation. The evidence, therefore, seems in favour of a convergence of the level in specialisation in Hungarian and Estonian regions. In Bulgaria, Romania and Slovenia, instead, regions experiencing a de-specialising process were already less specialised than the national average. Therefore, the evidence for these countries seems to be in favour of an increasing divergence of the internal level of specialisation. Furthermore, also regions experiencing decreasing specialisation, with the only exception of Hungarian regions, seemed to experience a decline in GDP with respect to the national average. Concerning the level of wealth, the number of telephone lines was either stable or decreasing, but always above the national average. The number of cars showed a more heterogeneous pattern: it was stable and above the average in Bulgaria and Hungary, increasing from below the average in Estonia, and decreasing from above the average in Romania. Finally, wages were increasing in Hungary, Romania and Slovenia, while they were stable in Bulgaria and decreasing with respect to the national average in Estonia. Unemployment was more or less stable in all countries with the only exception of Estonia, in which it was decreasing.

The third group of regions – in which specialisation was not significantly increasing or decreasing – may be considered as a residual group, in which we may observe contradictory paths of the variables of interest. Inside this group we may have regions in which specialisation seemed to follow a random walk as well as regions in which specialisation was clearly increasing in the first period and decreasing in the second period, or vice versa. Due to the limited time period for which the data are available, we were not able to better analyse this third "residual" group. However, we found that on average regions belonging to this groups were slightly more specialised than the indicator observed at a national level. Concerning the other variables of interest, as expected, we found no similarity among the five countries.

Finally, the increasing integration between accession countries and the EU may have decreased the importance of internal regions in favour of regions bordering EU and other accession countries, which probably were less favoured in the past. In order to validate this hypothesis we tried to compare the behaviour of internal regions, regions bordering EU, regions bordering other accession countries, and regions bordering other extra-EU countries, according to the Eurostat (1999) definition.

Before clustering the regions we divided the value of each variable (cars per capita, wages and so on) by the national average obtaining a number higher than 1 if the region were above the national average and lower than one if the region were below it. After clustering the regions we computed the average and standard deviation of the above-mentioned indicators separately for each group. The main advantage of this approach consists in the fact that the national average, which we used as benchmark, remained stable and equal to one across time and countries. The results summarised in Tables 4A – 4E (see Annex) were obtained by comparing the averages computed inside each group with the averages computed at a national level. To get some insights on the path of each variable, we have reported the value of the indicators at the beginning and at the end of the period.

Table 4A shows that Bulgarian regions bordering EU and extra-EU countries were the most specialised ones, while internal regions and regions bordering other accession countries were less specialised than the national average. Specialisation seemed to increase in all regions, with the exception of regions bordering other accession countries. Concerning the other economic indicators, it appeared that internal regions had the worst performance, since they seemed to loose their initial advantage in favour of the other groups of regions. Regions bordering EU, instead, seemed to recover after starting from a more disadvantaged position, although at the end of the period they were still below the national average for many indicators. In summary, the evidence was for convergence in GDP, the number of cars and telephone lines per capita, and for divergence in wages and unemployment indicators at a national level.

Table 4B shows the indicators for Estonia. Estonian regions bordering EU were in a more advantaged position with respect to regions bordering other accession countries at the beginning of the period. GDP, the number of telephone lines per capita, and wages were above the national average for regions bordering EU; all these indicators were below the national average in regions bordering other accession countries. Although regions bordering EU are on average less specialised than regions bordering other

accession countries, the difference between the two groups seem to reduce. Because of the limited size of the country and of its small number of regions in Estonia there are no internal regions and no borders with extra-EU countries.

Table 4C shows convergence of specialisation levels among Romanian regions: there seemed to be convergence among group of regions, and divergence inside the groups of internal regions and regions bordering accession countries. Concerning the other economic indicators, internal regions seemed to perform better than the average at the beginning of the period, although they were loosing their initial advantage. Regions bordering extra-EU countries, instead, started from a more disadvantaged position and seemed to improve their position.

Table 4D shows that Hungarian internal regions were less specialised than the national average and seemed to have economic indicators that were better than the national average. On the other side, regions bordering accession countries were more specialised than the average and seemed to have economic indicators that were worse than the national average.

Table 4E, finally, shows that in Slovenia, regions bordering EU were on average less specialised than the national average. Furthermore, they had the worst position in terms of wages (lower than the average) and unemployment (higher than the average). Slovenian data showed divergence in all groups and with respect to all variables.

In summary, our findings seem to be in favour of the idea that highly specialised regions have an economic performance which is slightly worse than the one of low specialised regions. However, although the available data set covers only a limited time period, there seem to be convergence in the levels of regional specialisation in Hungary and Estonia. In Bulgaria, Romania and Slovenia, we found only partial convergence since some of the low specialised regions are decreasing their specialisation level and are therefore diverging from the rest of the country. Given the limited availability of observations over time it is still not clear whether an increase in the level of specialisation yield to an improvement of the economic performance of regions. Finally, the comparison between regions bordering EU with regions not bordering EU seem to confirm the idea of an economic convergence of regions inside each country, with the only exception of Slovenia, in which the data seem to show divergence.

5 Geographic Concentration of Manufacturing

In order to get more insights into the characteristics of industries in relation to their level of concentration we grouped them according to their level of scale economies, their level of technology, and their level of wages. The definition of high-medium-low technology level, and of high-medium-low wages level is based on OECD (1994); the definition of high-medium-low level scale economies is based on Pratten (1988). The manufacturing classification is according to the EUROSTAT NACE Rev1 for Estonia, Romania, and Slovenia. Employment data have been collected according to national classifications in Hungary and Bulgaria. For these two latter cases aggregations have been made to bring these classifications as close as possible to the NACE classification. This caveat however applies only to Hungary and Bulgaria.

On the basis of Pratten's (1988) classification we found that industries with low economies of scale had a level of concentration which was stable and very close to the national average in Bulgaria and Romania. In Estonia these sectors were less concentrated than the national average, while they were slightly more concentrated than the national average in Hungary and Slovenia. Slovenian industries belonging to this group were also experiencing a decrease in their level of concentration. The industries with medium economies of scale were below the national average in Bulgaria, Hungary and Slovenia, while they were slightly above the average in Estonia and Romania. In all cases the level of concentration of these industries seemed to be stable or slightly increasing. Finally, the industries with high economies of scale were much more concentrated than the average in all countries with the only exception of Romania, in which these industries were around the national average. Concentration in these industries seemed to slightly decrease, with the exception of Slovenia, in which is seemed to increase. In Romania all industries seemed to have the same level of concentration (around the national average), while the differences among groups of industries were much more evident for the other countries.

On the basis of OECD's (1994) classification of industries in high-medium-low tech we found that industries defined as high tech were usually less concentrated than the national average in all countries, although their level of concentration seemed to increase. The industries defined as medium tech seem to be more concentrated than the average, and stable or slightly decreasing in Bulgaria, Estonia and Hungary. In Romania and Slovenia these industries were as concentrated as the national average, and their

level of concentration was stable (in Romania) or increasing (Slovenia). Finally, the high tech industries were less concentrated than the national average in Bulgaria, Hungary and Slovenia. Their level of concentration seemed to be stable or to increase (Bulgaria). In Estonia and Romania these industries were more concentrated than the national average. They seemed to become even more concentrated in Estonia, while their level of concentration seemed to be stable or slightly decreasing in Romania.

On the basis of OECD's (1994) classification of industries in high-medium-low level of wages we found that industries with the lowest level of wages were also the more dispersed ones. Their level of concentration seemed to be stable or slightly increasing. On the other hand, the industries with the highest level of wages were more concentrated than the national average, and their level of concentration seemed to be stable or slightly decreasing. Concluding, the evidence seemed to be in favour of the convergence hypothesis. The medium wages industries had a level of concentration which was not far from the national average. Their concentration seemed to increase in Hungary, to decrease in Bulgaria and to remain stable in the other countries.

A problem of this analysis is that the period in which the data is available is quite short: it comprises ten years for Bulgaria and Estonia, nine years for Romania, eight for Hungary and only four for Slovenia. When the time period is short, the increasing or decreasing industry concentration path may be caused – or hidden – by the regional business cycle. Our results may therefore be (in-)validated on the basis of an extended data set.

Given the heterogeneity of the five countries analysed, the findings of the previous analysis are quite difficult to summarise. At a more aggregate level, the increasing economic integration with the EU may yield industries to increase their level of concentration.

Furthermore, analogously to the statistical procedure in the previous section in the context of regional specialisation, we tried to verify, by means of a trend model, whether industry concentration was increasing or decreasing in the countries under analysis. The model has been computed separately for each country, using a fixed effect panel estimation method. The results shown in Table 5 (see Annex) indicate that concentration did not increase or decrease significantly in these countries, with the exception of Bulgaria, in which concentration seemed to increase.

Since for the majority of sectors there seem to be no significant changes in the level of concentration, the analysis of industries depending on their level of scale economies,

level of technology or level of wages did not offer clear results. However, although some small differences between the countries still exist, the data seem to confirm that in all five countries the level of concentration is increasing (and decreasing) in the same kind of sectors.

6 Determinants of Regional Specialisation and Industrial Concentration Patterns

As pointed out in Midelfart-Knarvik et al., 2000, regional specialisation and industrial concentration patterns are determined by the interaction of regional and industry characteristics. The reason for evaluating the interaction between regional and industry characteristics lies in the fact that firms evaluate differently the same kind of production factors (Fujita et al., 1999). Industries will try to locate as close as possible to the place where their most important inputs are available, and will therefore be over represented in that location. Industries for which the same production factor is less important will instead be underrepresented.

To uncover determinants of manufacturing location and explain regional manufacturing production structures differentials in the five accession countries we estimate a model similar to Midelfart-Knarvik's et al. (2000). We analyse changes in regional specialisation and industry location by regressing the log share of industry i in region j (s_{ij}^S) on regional and industry characteristics, after controlling for the size of regions by means of the log share of population living in region j (pop_j) and of the log total manufacturing located in region j (man_j), using the following specification:

$$ln\,(s_{ij}^S) = \alpha\, ln\,(pop_j) + \beta\, ln\,(man_j) + \Sigma_k\, \beta\,[k]\,(y[k]_j - \gamma\,[k])\,(z[k]^i - \kappa\,[k]) \quad (1)$$

where $y[k]_j$ is the level of the k^{th} region characteristic in the j^{th} region and $z[k]^i$ is the level of the k^{th} industry characteristic of industry i. As is clear in (3), the k^{th} region characteristic is matched with the k^{th} industry characteristic. Finally, α, β, $\beta\,[k]$, $\gamma\,[k]$, and $\kappa\,[k]$ are the coefficients to be estimated. Following Krugman (1991) we computed the share of industry i in region j (s_{ij}^S) using employment data.

The first two variables appearing in the RHS ($ln\,(pop_j)$ and $ln\,(man_j)$) should capture the regional size effects and are therefore needed to correct for disparity in regional sizes. The remaining terms should capture the interaction between regional and industry characteristics. Details on the regional and industry characteristics are shown in Table 6.

The market potential (MP) characteristic – which has been interacted with the level of scale economies (SE) – may be interpreted as an indicator of proximity to markets. We computed two market potential indicators: the first one (MP1) intends to compare regions inside the same country in the context of a closed economy, while with the second indicator (MP2) we try to get some insights into the consequences of increasing relationship between each country and the EU. It is plausible that the association agreement with the EU has led to a reduction of transport cost toward the EU by reducing trade barriers, while transport costs within the country remained probably unchanged. This had probably led to a comparative advantage of regions bordering EU with respect to central regions, which had a comparative advantage before the EU accession agreements. The MP2 variable will then try to verify whether the increasing integration with the EU led to a reallocation of activity (industries) from central to peripheral regions bordering the EU. We did not introduce both variables (MP1 and MP2) in the same model, because we wanted to keep the two hypotheses (close versus open economy) separated.

The labour abundance (LA) and the research and development (RD) characteristics try to identify the relative regional abundance of these different input factors. The RD characteristic is then alternatively interacted with the technology level (TL) and with the importance of R&D inputs in each industry (RO), while the labour abundance (LA) characteristic is interacted with the importance of the labour as production factor (LI).

The two industry characteristics associated to the R&D regional characteristic – research orientation (RO) and technology level (TL) – may in principle seem very similar. However, the industries listed as RO are not the same industries listed as TL. Furthermore, their significance level did not change when we tried to set aside one of them in our estimations.

After having defined the regional and the industry characteristics, we interacted them in the way shown by Table 7 (see Annex).

The interaction variables MP1SE and MP2SE should be interpreted on the basis of the idea that industries with higher economies of scale may tend to concentrate in relatively central locations (Krugman, 1980; Midelfart-Knarvik et al., 2000). Since we expect the central location to be identified as the country capital in the early ‘90s and with the EU market in the most recent years, we expect the MP1SE and MP2SE variables to capture these changes.

The interaction variables RDRO, RDTL and LALI should be interpreted on the basis of the idea that industries that highly evaluate some production factors (R&D for research-oriented firms and firms with a high technology level; labour abundance for labour intensive firms) tend to locate near those market areas in which these production factors are abundant.

After this short illustration of the variables introduced in our estimations, we may now briefly discuss some estimation issues. First of all, since the data collected in the different countries are quite heterogeneous, we estimated equation (1) separately for each country using OLS with White's heteroskedasticity consistent standard errors. The main findings are shortly summarised in Table 8 (see Annex). More detailed results may be provided on request of the authors.

Contrary to Midelfart-Knarvik et al. (2000), for various reasons we estimated our models on level data instead of computing a 4-years moving average. The first reason for this choice is the limited time period covered by our data set. Secondly, we compare regions instead of countries: it is plausible that regional differences in business cycle are lower than differences that may be observed among countries. Finally, this approach may enable us to better identify structural breaks that may occur in our data set (e.g. we may be better able to distinguish between trends before and after certain EU agreements).

As shown in Table 8 the first two independent variables of the model (*ln(pop)* and *ln(man)*), capturing the effect of different sizes in the regions analysed, are either not significant or significantly higher than zero. The only exceptions here are Estonian results in which the coefficients seem to be significantly negative[7].

Concerning the regional characteristics, we found that the market potential variables – MP1 and MP2, that are an increasing function of the wage level – have either negative or not significant coefficients, meaning that the industry share (s_{ij}^S) is lower in these regions where wages are higher. This finding is consistent with the hypothesis that in general industries tend to locate in regions where wages are lower[8]. On the other hand, the MP1 and MP2 variables are also a decreasing function of distances with the core of the market. The negative sign imply that the industry share (s_{ij}^S) is lower in regions that are located near the core. A reason for this unexpected result may be due to a higher level of wages in regions located near the core. Further analyses are then needed in order to discriminate the kind of industries. If wages are higher near the core, then

maybe high-tech industries may locate in these areas, while labour intensive industry may locate in more peripheral regions, where labour costs are lower.

The labour abundance (LA) regional characteristic has negative coefficients for Hungary; this result may have a double interpretation. First, Hungarian regions may in general be not labour intensive and may therefore attach a low value to the labour as productivity factor. Second, labour may be abundant in every Hungarian region and therefore the relative abundance of this production factor may not influence the choice of location is not an issue for Hungarian industries. Further analyses are then needed in order to confirm these hypotheses. In Estonia the LA coefficient is instead significantly positive, meaning that labour intensive industries tend to locate in regions where labour is relatively abundant. Finally, the confusing result for Romania, in which the coefficient of LA is negative for two years when we use MP1 and positive for one year when we use MP2, may be related to the way in which the MP regional characteristic has been computed.

Concerning the industry characteristics, Table 8 shows that the coefficient of the scale economies (SE) variable is positive for Hungary but negative for Bulgaria, Estonia and Romania. The negative coefficient for SE may be related to our rough classification of industries in three levels of scale economies. Alternatively, the negative coefficient may be due to the post-communist transition, which has probably led to a general reduction of the size of single industries with a consequent inability of profiting of scale economies. The sign of the "research oriented" (RO) coefficient is positive in Bulgaria and negative in Slovenia. The technology level (TL) coefficient is instead either not significant or positive, although its significance level seems to reduce. Finally, the labour intensity (LI) coefficient is in general not significant.

Concerning the interaction variables, we found that the coefficients of the market potential variables are either positive or not significant. While in Hungary and Romania both MP1SE and MP2SE seem to be significantly higher than zero, in Bulgaria and Slovenia only MP1SE is significantly positive. In Estonia the only coefficient which seems to be positive is MP2SE. Only in Hungary the significance level of MP1SE and MP2SE seem to change: both coefficients indeed seem to increase their significance. Theory predicts that market forces induce industries with high returns to scale to locate near the core, and that these forces are stronger at intermediate levels of transport costs. Although, as mentioned above, some more research is needed to better identify the variables identifying the market potential of regions, the fact that these forces are not

weakening in the countries and in the period of our analysis supports the idea that the transport costs are still at an intermediate level.

The coefficients of the interaction variables RDRO and RDTL have been estimated only for Bulgaria and Slovenia. While in Bulgaria both coefficients seem to be not significantly different from zero, in Slovenia RDRO becomes significantly positive and RDTL becomes (slightly) significantly negative in the last year (1997). The positive coefficient points out the importance of the supply of researchers in determining the location of research oriented (RDRO) industries, is more relevant than for high technology (RDTL) industries. Finally, the coefficient of the interaction variable LALI is either zero (Bulgaria) or positive (Hungary, Romania and, to a lesser extent, Estonia). In Hungary and Romania the coefficient is increasing its significance level in the last periods of observation. We may interpret this finding as supportive for the idea of country specialisation in more labour intensive industries.

A final remark is in order now. Location shifts take place very slowly and a long time series of data is usually necessary in order to appreciate real changes in industrial relocation and regional specialisation. Unfortunately, given the "young" age of the five accession countries and their data sets, more research is still needed to be able to really appreciate the changes in relocation that their "transition" is implying.

7. Concluding Remarks

Central and East European economies have experienced since 1990 an increasing economic integration with the EU via trade and foreign direct investments. The spatial implications of this process have so far only scarcely been investigated. In this paper we investigated regional specialisation and industry concentration patterns in Bulgaria, Estonia, Hungary, Romania and Slovenia.

The main findings suggest an increasing specialisation in almost all countries analysed. Our analysis reveals that highly specialised regions may perform slightly worse than lowly specialised regions. Furthermore, although the available data set covers only a limited time period, we found some evidence in favour of – general or partial – convergence in the level of regional specialisation inside almost all countries analysed, though it is not clear whether an increase in the level of specialisation yield to an improvement of the economic performance of regions. Comparison between regions bordering and not bordering EU seem to confirm the idea of economic convergence of

regions inside each country, with the only exception of Slovenia, in which the data seem to show divergence.

For the majority of industries there seem to be no significant changes in the level of concentration however, although some small differences between the countries still exist, the data seem to confirm that the level of concentration is increasing (and decreasing) in the same sectors in all five countries analysed.

Our findings seem to confirm that multiple forces drive patterns of regional specialisation and industry concentration. A regression analysis involving regional and industry characteristics, as well as interaction among them, has also been carried out. Although the latter analysis would require further research our preliminary findings seem to support the prediction that industries seem to locate where productivity factors are abundant and/or costs are low. Finally, there seem to be evidence in favour of a relocation of industries near the core, which, in the countries under analysis, is recently shifting from the country capital to the regions bordering the EU.

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[1] Recent surveys of theoretical literature include: Amiti (1998a), Venables (1998), Brülhart (1998), Aiginger et al. (1999), Hallet (2001), Puga (2001).

[2] This data set has been generated in the framework of the PHARE ACE project P98-1117-R.

[3] Overviews of different measurements for specialisation and geographic concentration of industries include Ellison and Glaeser (1997), Aiginger et al. (1999), Devereux et al. (1999) and Hallet (2000).

[4] The indicators used in this paper to analyse regional specialisation and concentration of industries are defined similar to Aiginger, K. et al. (1999). The dissimilarity index is a modified version of the index proposed in Krugman (1991b).

[5] The dissimilarity index used to calculate the specialisation level may assume values between zero and two. However, in all regions, with some exception for Slovenia, the index is below the value of one. However, we believe that these thresholds, although quite restrictive (the proportion of regions in the two groups is quite low) enable us to find similarity among highly specialised regions on the one side and low specialised regions on the other side.

[6] Since in Bulgaria, Hungary and Romania the economic activity of the county capital is extremely high with respect to all other regions, in these countries we calculated the national average setting next to the country capital.

[7] This puzzling result for Estonia, predicting that regions with higher share of employment in manufacturing have also lower shares of the relative industries, is probably be due to some inconsistencies present in our data set.

[8] The lower level of wages of accession countries – with respect to other EU countries – may represent a comparative advantage especially for labour intensive industries.

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Annex

Table 1: Regions with high or low specialisation

Highly Specialised				
Bulgaria	**Estonia**	**Hungary**	**Romania**	**Slovenia**
Vidin			Botosani	Pomurska
Pernik			Galati	Koroška
Razgrad			Dambovita	Zasavska
			Ialomita	Spodnejposavska
			Valcea	Notranjsko-kraška
			Caras-Severin	
			Harghita	
Low Specialised				
Bulgaria	**Estonia**	**Hungary**	**Romania**	**Slovenia**
Veliko Tarnovo	Northern Estonia	Pest	Iasi	Podravska regija
Vtratza		Gyõr-Moson-Sopron	Mun. Bucuresti	
Montana		Somogy		
Plovdiv		Hajdú-Bihar		
Russe		Jász-Nagykun-Szolnok		
Sofia region				

Table 2: Trend model for regional specialisation

	Bulgaria	Estonia	Hungary	Romania	Slovenia
Year	0.0068 ***	-0.0073 **	-0.0019	0.0074 ***	-0.0023
	(0.0011)	(0.0033)	(0.0019)	(0.0012)	(0.0061)
Intercept	0.4488 ***	0.4756 ***	0.4638 ***	0.5405 ***	0.7050 ***
	(0.0067)	(0.0202)	(0.0132)	(0.0077)	(0.0462)
Number of observations	280	50	160	369	48
R-sq: within	0.1383	0.1029	0.0074	0.1086	0.0039

* significant at 10%; ** significant at 5%; *** significant at 1%
standard errors in parentheses

Table 3: Regions experiencing increasing or decreasing specialisation

Increasing Specialisation				
Bulgaria	**Estonia**	**Hungary**	**Romania**	**Slovenia**
Veliko Tarnovo	Northern Estonia	Tolna	Vaslui	
Dobrich		Hajdú-Bihar	Constanta	
Kustendil			Galati	
Pazardjik			Vrancea	
Plovdiv			Arges	
Razgrad			Calarasi	
Russe			Teleorman	
Sliven			Dolj	
Smolyan			Olt	
Stara Zagora			Valcea	
			Timis	
			Bihor	
			Salaj	
			Harghita	
			Mures	
Decreasing Specialisation				
Bulgaria	**Estonia**	**Hungary**	**Romania**	**Slovenia**
Gabrovo	Central Estonia	Budapest	Iasi	Dolenjska
Pleven	North-Eastern Estonia	Gyõr-Moson-Sopron	Mun. Bucuresti	Gorenjska
		Vas		
		Somogy		
		Nógrád		
		Jász-Nagykun-Szolnok		
		Békés		

Table 4A: Bulgarian variables divided by their national average, at the beginning and at the end of the period[1]

	Type of region:	Overall	Borders EU	Borders AC	Internal	Border EX
	Number of regions:	28	3	6	14	5
Dissimilarity Index	Mean	0.982 – 0.989	1.204 – 1.284	0.855 – 0.786	0.929 – 0.940	1.150 – 1.192
over national average	Std. Dev.	0.294 – 0.326	0.042 – 0.215	0.336 – 0.315	0.279 – 0.286	0.285 – 0.345
GDP per capita	Mean	1.027 – 1.001	0.949 – 0.960	0.978 – 1.003	1.041 – 0.985	1.093 – 1.067
over national average	Std. Dev.	0.120 – 0.072	0.078 – 0.012	0.083 – 0.043	0.094 – 0.059	0.208 – 0.117
GDP per worker	Mean	1.001 – 0.997	0.961 – 0.960	0.978 – 1.033	0.999 – 0.964	1.058 – 1.071
over national average	Std. Dev.	0.102 – 0.070	0.096 – 0.060	0.059 – 0.047	0.070 – 0.045	0.198 – 0.092
Cars per capita	Mean	1.031 – 0.999	0.796 – 0.796	0.923 – 0.920	1.099 – 1.051	1.110 – 1.070
over national average	Std. Dev.	0.216 – 0.184	0.116 – 0.037	0.124 – 0.127	0.238 – 0.201	0.149 – 0.144
Telephone lines per capita	Mean	1.029 – 1.010	0.763 – 0.797	1.033 – 0.980	1.132 – 1.089	0.892 – 0.953
over national average	Std. Dev.	0.224 – 0.187	0.248 – 0.223	0.123 – 0.074	0.220 – 0.187	0.130 – 0.172
Wages	Mean	1.019 – 1.010	0.995 – 0.893	0.996 – 0.991	1.023 – 1.024	1.049 – 1.064
over national average	Std. Dev.	0.052 – 0.136	0.016 – 0.034	0.031 – 0.165	0.050 – 0.122	0.080 – 0.163
Unemployment	Mean	0.939 – 1.001	1.321 – 1.023	0.972 – 1.241	0.847 – 0.967	0.927 – 0.838
over national average	Std. Dev.	0.233 – 0.325	0.041 – 0.315	0.119 – 0.179	0.194 – 0.376	0.289 – 0.197

[1] The first figure refers to the first year in which the variable is available, while the second figure refers to the last year in which the variable is available. Since not all variables are available for the same period, not all indicators in Tables 2A, 2B, 2C 2D and 2E refer to the same period. We should therefore use cautions in comparing the first and the last value of the different variables.

EU means European Union
AC means Accession Countries
EX means Extra-European Countries

Table 4B: Estonian variables divided by their national average, at the beginning and at the end of the period

	Type of region:	Overall	Borders EU	Borders AC	Internal	Border EX
	Number of regions:	5	3	2	0	0
Dissimilarity Index	Mean	1.000 – 1.000	0.942 – 0.988	1.087 – 1.018		
over national average	Std. Dev.	0.293 – 0.166	0.371 – 0.232	0.204 – 0.043		
GDP per capita	Mean	1.000 – 1.000	1.147 – 1.175	0.779 – 0.738		
over national average	Std. Dev.	0.457 – 0.543	0.578 – 0.686	0.059 – 0.090		
GDP per worker	Mean	1.000 – 1.000	1.101 – 1.122	0.849 – 0.817		
over national average	Std. Dev.	0.341 – 0.436	0.439 – 0.562	0.063 – 0.126		
Cars per capita	Mean	1.000 – 1.000	0.950 – 0.984	1.075 – 1.023		
over national average	Std. Dev.	0.158 – 0.078	0.193 – 0.106	0.081 – 0.018		
Telephone lines per capita	Mean	1.000 – 1.000	1.059 – 1.055	0.911 – 0.917		
over national average	Std. Dev.	0.126 – 0.183	0.112 – 0.233	0.111 – 0.042		
Wages	Mean	1.000 – 1.000	1.080 – 1.063	0.880 – 0.905		
over national average	Std. Dev.	0.165 – 0.217	0.172 – 0.280	0.040 – 0.012		
Unemployment	Mean	1.000 – 1.000	0.942 – 1.054	1.086 – 0.919		
over national average	Std. Dev.	0.356 – 0.269	0.490 – 0.359	0.044 – 0.097		

Table 4C: Romanian variables divided by their national average, at the beginning and at the end of the period

	Type of region:	Overall	Borders EU	Borders AC	Internal	Border EX
	Number of regions:	41	0	11	23	7
Dissimilarity Index	Mean	0.993 – 0.987		0.878 – 0.956	1.015 – 0.992	1.099 – 1.018
over national average	Std. Dev.	0.263 – 0.248		0.145 – 0.178	0.259 – 0.272	0.376 – 0.283
Cars per capita	Mean	1.027 – 1.016		1.067 – 1.114	1.098 – 1.055	0.730 – 0.736
over national average	Std. Dev.	0.354 – 0.378		0.272 – 0.489	0.368 – 0.313	0.298 – 0.286
Telephone lines per capita	Mean	1.050 – 1.032		1.031 – 0.961	1.109 – 1.094	0.887 – 0.943
over national average	Std. Dev.	0.408 – 0.329		0.287 – 0.301	0.491 – 0.367	0.210 – 0.206
Wages	Mean	1.001 – 1.011		0.983 – 1.020	1.018 – 1.023	0.974 – 0.956
over national average	Std. Dev.	0.100 – 0.128		0.065 – 0.108	0.112 – 0.142	0.110 – 0.110
Unemployment	Mean	0.987 – 0.986		0.861 – 0.754	0.942 – 1.056	1.333 – 1.123
over national average	Std. Dev.	0.399 – 0.292		0.296 – 0.166	0.420 – 0.287	0.308 – 0.284

Table 4D: Hungarian variables divided by their national average, at the beginning and at the end of the period

	Type of region:	Overall	Borders EU	Borders AC	Internal	Border EX
	Number of regions:	20	2	7	8	3
Dissimilarity Index	Mean	0.992 – 0.986	0.920 – 0.774	1.023 – 1.124	0.977 – 0.991	1.008 – 0.795
over national average	Std. Dev.	0.249 – 0.279	0.403 – 0.278	0.240 – 0.138	0.271 – 0.368	0.263 – 0.061
GDP per capita	Mean	1.058 – 1.065	1.248 – 1.453	0.968 – 0.921	1.126 – 1.159	0.962 – 0.890
over national average	Std. Dev.	0.299 – 0.374	0.009 – 0.026	0.149 – 0.164	0.442 – 0.519	0.052 – 0.070
GDP per worker	Mean	1.016 – 0.996	1.029 – 1.089	0.973 – 0.947	1.064 – 1.040	0.981 – 0.933
over national average	Std. Dev.	0.144 – 0.150	0.034 – 0.033	0.071 – 0.051	0.215 – 0.221	0.041 – 0.068
Cars per capita	Mean	1.016 – 1.021	1.071 – 1.130	0.914 – 0.929	1.043 – 1.051	1.145 – 1.084
over national average	Std. Dev.	0.156 – 0.164	0.025 – 0.023	0.166 – 0.154	0.151 – 0.194	0.034 – 0.045
Telephone lines per capita	Mean	1.150 – 1.030	1.350 – 1.098	0.963 – 0.945	1.249 – 1.092	1.187 – 1.019
over national average	Std. Dev.	0.743 – 0.164	0.175 – 0.049	0.352 – 0.123	1.145 – 0.215	0.254 – 0.047
Wages	Mean	1.022 – 1.028	0.990 – 1.078	1.000 – 0.976	1.069 – 1.093	0.968 – 0.944
over national average	Std. Dev.	0.110 – 0.147	0.035 – 0.065	0.050 – 0.061	0.159 – 0.207	0.036 – 0.052
Unemployment	Mean	0.952 – 0.966	0.395 – 0.543	1.055 – 1.155	0.990 – 0.882	0.980 – 1.032
over national average	Std. Dev.	0.527 – 0.346	0.134 – 0.124	0.549 – 0.342	0.618 – 0.351	0.192 – 0.089

Table 4E: Slovenian variables divided by their national average, at the beginning and at the end of the period

	Type of region:	Overall	Borders EU	Borders AC	Internal	Border EX
	Number of regions:	12	7	0	1	4
Dissimilarity Index	Mean	0.994 – 1.000	0.882 – 0.890		1.437 – 1.486	1.079 – 1.072
over national average	Std. Dev.	0.368 – 0.409	0.299 – 0.391		---	0.464 – 0.439
Wages	Mean	1.000 – 1.000	0.982 – 0.978		1.033 – 1.003	1.023 – 1.037
over national average	Std. Dev.	0.077 – 0.097	0.038 – 0.064		---	0.130 – 0.152
Unemployment	Mean	1.000 – 1.000	1.009 – 0.990		1.256 – 1.364	0.920 – 0.926
over national average	Std. Dev.	0.274 – 0.304	0.321 – 0.346		---	0.198 – 0.217

Table 5: Trend model for industry concentration

	Bulgaria	Estonia	Hungary	Romania	Slovenia
Year	0.0092 ***	0.0037	-0.0003	0.0015	-0.0011
	(0.0014)	(0.0037)	(0.0275)	(0.0017)	(0.0061)
Intercept	0.4945 ***	0.4481 ***	0.4690 ***	0.6342 ***	0.6367 ***
	(0.0090)	(0.023)	(0.0189)	(0.0111)	(0.0465)
Number of observations	120	130	64	108	48
R-sq: within	0.2773	0.0083	0.0002	0.0077	0.0010

* significant at 10%; ** significant at 5%; *** significant at 1%; standard errors in parentheses

Table 6: Regional and Industry characteristics

Variable name	Description
	Regional characteristics
Market Potential (MP1)	Average regional wages (deflated at national level) divided by the distances from country capital (in km; to avoid complications the distance of the country capital with itself is supposed to be 1 km)
Market Potential (MP2)	Average wages (deflated at a national level) divided by a proxy of the distance from EU markets (1 if the region borders EU, 2 if the region does not border EU)
R&D (RD)	R&D personnel divided by the number of persons employed for Bulgaria and Hungary; R&D expenditures divided by the value added in manufacturing for Slovenia; no information is available for Estonia and Romania
Labour Abundance (LA)	Sum of employment and unemployment, divided by the population in working age (15-65 years)
	Industry characteristics[2]
Scale economies (SE)	1 = low, 2 = medium, 3 = high (definition by Pratten, 1988)
Research Oriented (RO)	1 = almost none of the industries of the sector is defined as research oriented; 2 = some industries of the sector are defined as research oriented; 3 = almost all industries of the sector are defined as research oriented (definition by OECD, 1994)
Technology Level (TL)	1 = Low technology; 2 = Medium technology; 3 = high technology (definition by OECD, 1994)
Labour Intensity (LI)	Labour Intensity dummy (definition by OECD, 1994)

[2] Since the available classification of industries is quite aggregated we were sometimes forced to 'average' the qualitative characteristics proposed by Pratten (1988) and by the OECD (1994).

Table 7: Interaction variables

	Variable name	Regional characteristic	Industry characteristics
J=1	MP1SE	MP1 Market Potential (distances with country capital)	SE Scale economies
J=2	MP2SE	MP2 Market Potential (distances with EU markets)	SE Scale economies
J=3	RD1RO		RO Research oriented
J=4	RD2TL	RD1 RD2 = RD R&D personnel or expenses	TL Technology level
J=5	LALI	LA labour abundance	LI Labour intensity

Table 8: Summary of the estimations' findings

		Bulgaria		**Estonia**		**Hungary**		**Romania**		**Slovenia**	
	lnpop	0	0	0	pos.	pos.	pos.	pos.	0	pos.	pos.
	lnman	pos.	pos.	neg.	pos.$^{+}$	0	0	pos.	pos.	0	0
Regional characteristics	MP1	0	/	neg.	/	neg.	/	neg.	/	neg.	/
	MP2	/	0	/	neg.	/	neg.	/	neg.	/	0
	RD	0	0	/	/	/	/	/	/	0	0
	LA	0	0	pos.	pos.	neg.	neg.	neg.	pos.	/	/
Industry characteristics	SE	neg.	0	0	neg.	pos.	0	neg.	neg.	0	0
	RO	pos.	pos.	/	/	/	/	/	/	neg.	neg.
	LI	0	0	0	0	0	0	0	0	/	/
	TL	pos.	pos.	/	/	/	/	/	/	pos.	pos.
Interaction variables	MP1SE	pos.	/	0	/	pos.	/	pos.	/	pos.	/
	MP2SE	/	0	/	pos.	/	pos.	/	pos.	/	0
	RDRO	0	0	/	/	/	/	/	/	pos.	pos.
	LALI	0	0	pos.	pos.	pos.	pos.	pos.	pos.	/	/
	RDTL	0	0	/	/	/	/	/	/	neg.	neg.

(pos.) the estimated coefficient is positive; (neg.) the estimated coefficient is negative
(/) the variable was not available (or was not used) for the model estimation;
(0) the variable was never significant
(+) the variable was significantly negative in the first period and significantly positive in the last period