Determinants of Geographical Concentration Patterns in Central and Eastern European Countries

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The authors investigate the determinants of the location of industries in Central and Eastern European countries. Using output and employment data for thirteen manufacturing industries over the years 1993 to 2000, the authors find the concentration of industrial activity to have increased in these ten countries in contrast to the general trend prevailing in Western Europe in the same period. Further, the authors observe differences with respect to absolute and relative concentration as well as output and employment. In the analytical part, these developments are explained with factors derived from traditional trade theory (differences in endowments or technologies), new trade theory (expenditure patterns, scale economies) and new economic geography (backward and forward linkages, transport costs). Relative concentration is found to have been driven by differences in FDI levels, productivity differentials and expenditure patterns, absolute concentration to have been determined mainly by differences in human capital levels.

1 Introduction

The process of European integration has naturally raised concerns about the impact of integration on the location of industry. The substantial reduction of trade barriers and transport costs in Europe due to the single market program inside the EU-15 and following the Europe Agreements in the East-West European context increased the mobility of goods and factors of production, allowing factors to move to the locations where their returns are highest. Consequently, a higher degree of concentration of industrial activity inside Europe than ever before is to be expected.

Given the reorientation of Central and Eastern European countries' external relations towards Western Europe, which took place during their transition from centrally planned to market economies over the past decade, we would expect these countries to join into a European pattern of specialization according to comparative advantage. The purpose of this paper is to examine the changes in industrial specialization and concentration patterns in Central and Eastern European countries (CEECs) that took place during the transition period. We chose to confine our attention to the industrial sector, as this sector experienced a more radical opening up to international competitors through trade and investment flows than other sectors (e.g. agriculture).

A vast number of studies has been devoted to the research of patterns of industrial location and their developments in Europe (e.g. Amiti, 1999; Brühlhart, 1998; Haaland et al., 1999). Two things become immediately apparent when looking at this large and still growing body of literature: First, the literature focuses largely on the incumbent Member States of the European Union and does not include the new member countries in Central and Eastern Europe. Second, the results of individual studies are often inconclusive or even contradictory. The latter observation can be explained by two factors: On the one hand, there is still a lack of strong and comprehensive theoretical foundations for the empirical work that has been carried out in this area. Both traditional (mostly trade) theories and economic geography models may become inconclusive with respect to their predictions concerning specialization patterns as soon

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as the number of regions included in these models is greater than two.[3] On the other hand, developments seem to have been quite diverse over the past few decades, with alternating periods of increasing specialization or concentration and diversification. Consequently, different studies will arrive at different conclusions depending on the specific time period under consideration. Our aim here is not to improve on this point; rather, we aim to extend the coverage of the current literature to Central and Eastern European countries. In this paper, we want to give an overview of the determinants of the location of industry in this part of Europe and compare these developments with those in Western Europe as well as assess the likely impact of further integration on future developments.

The fall of the Iron Curtain implied the collapse of the Council for Mutual Economic Assistance (CMEA), which was formally dissolved in 1991. Under the CMEA system, industrial specialization patterns were more or less predetermined and sustained through the accordance of the central plans of all countries under Soviet hegemony. The rapid reorientation towards Western European trading partners that was observed immediately after 1991 resulted on the one hand from the strong interest in reducing economic dependence on the former Soviet Union and on the other hand from the desire to catch up with the economically far more advanced Western European countries (Richter, 1997, 2001). Given these motivations, it does not seem surprising that CEECs first engaged in contracts with partners in Western Europe and the European Union before cooperating with each other. Thus, the far-reaching bilateral Europe Agreements[4] between individual CEECs and each member of the European Union as well as the EU itself were signed in the first half of the 1990s and predate the Central European Free Trade Agreement (CEFTA), again on a bilateral basis. This makes clear that during the 1990s no integration process inside the CEECs could be observed. On the contrary, each country was pursuing a policy of integration with the Western world while being reluctant towards their former communist partners. As an example, roughly 90% of industrial goods have been freely tradable inside CEFTA since 1997. Moreover, since 1998 the CEECs' industrial exports to the EU have been free from tariffs.[5] Thus, the impact of integration on industry location in the Eastern European context has to be seen as bilateral East-West integration rather than as a regional Eastern European integration process.

During the preparation of enlargement, fears were raised that enhancing competition between individual countries would lead to an uneven distribution of production in the EU, where some industries, especially those offering a high potential for productivity growth, would concentrate in already prosperous central regions while others, usually labor-intensive industries, would move to more peripheral regions. Likewise, incumbent EU members were afraid of losing exactly those labor-intensive industries to the new Eastern members because of the wage differential. From a static trade theoretical point of view,

[3] *With only two regions, specialization in one country automatically implies less production of the same good in the other country. With more than two countries and many goods, however, the situation becomes much less tractable.*

[4] *The Europe Agreements are not restricted to economic issues and include political, financial and cultural cooperation as well as general regulations, the movement of workers and the like.*

[5] *The asymmetric nature of the Europe Agreements implied that EU exports to CEECs were tariffed up to 2000.*

such a pattern of specialization according to existing comparative advantages would also be optimal, as it implies the most efficient allocation of resources, thus maximizing total output.[6] However, in a dynamic setting where demand patterns as well as production processes and with them comparative advantages are subject to change, there is a risk that peripheral regions will eventually end up in a deadlock situation of slow growth and outdated production structures.

The aim of this paper is to shed some light on the empirical evidence about industrial relocation patterns in CEECs. The paper is organized as follows: Section 2 gives a short summary of the theoretical background. Section 3 describes the patterns of industrial specialization in the Central and Eastern European countries and compares these developments to those in the EU-15. Section 4 first explains how the variables that are used in the analytical part are derived. Next, industrial concentration inside the region is explained using a panel of 13 industries and 8 years. Finally, this section also looks at the factors that drive specialization inside individual industries, again using a panel data set of ten countries and eight years for each industry. Section 5 concludes.

2 Theoretical Background

The question of the concentration of industrial activities cannot be addressed without entering the field of trade theory. Geographically concentrated production structures imply that output will be traded between regions or countries in order to serve demand in all regions. Thus, a prerequisite for concentration patterns to emerge is that transport costs are not prohibitive and that trade takes place. Looking at various trade theories, a number of factors influencing patterns of specialization across countries or patterns of concentration across industries can be derived. Traditional trade theories assume constant returns to scale and perfect competition. When trade costs are not prohibitive, countries will specialize according to their comparative advantages. Relative differences in production costs thus drive specialization patterns. In a Ricardian model, comparative advantages stem from differences in labor productivity and are thus determined exogenously by technological differences. In a Heckscher-Ohlin model, relative cost differences arise from differences in the endowment structure between trading partners. Together with the relative intensity of each factor's use in the production of the respective good, they determine the pattern of specialization. In these models, technologies do not differ between countries. The ultimate determinants of specialization are again exogenous to the model and will not change unless production factors are mobile across international borders.

In contrast to traditional trade theories, new trade theory adopts entirely different assumptions, allowing for increasing returns to scale, preference for variety and imperfect competition (Krugman, 1980; Helpman, 1981; Ethier, 1982). Further, in addition to explaining specialization solely by supply-side factors, this strand of literature accords an important role to demand characteristics. The interaction of economies of scale together with home market effects (i.e. size, demand bias for a certain product) can lead to the evolution of distinct

[6] *The above argument disregards problems that may arise due to insufficient mobility and flexibility of workers and from external (congestion and pollution) effects resulting from transport, especially road transport.*

specialization patterns even for countries with identical endowment structures and identical technologies. Thus, this strand of literature can lead to predictions opposed to those of traditional trade theories. For instance, a demand bias in favor of a certain good will lead to net imports of this good according to traditional trade theories, whereas new trade theory would predict net exports, resulting from the home market effect together with scale economies.

Given their genuine focus on explaining the location of industry (inside national borders) rather than international trade, economic geography models further allow for factor mobility and put strong emphasis on transport (transaction) costs (Fujita et al., 1999). Ongoing economic integration, not only in Europe but worldwide, seems to assign an increasingly important empirical role to these assumptions. Again, endowments and technologies are identical across regions, while there are increasing returns to scale in production. Competition is imperfect due to a love of variety, and demand structures may differ across countries. Specialization is determined endogenously through the interaction of forward (i.e. larger input variety) and backward (i.e. larger markets) linkages in a process of cumulative causation. Agglomeration economies, stemming from self-reinforcing location decisions of firms, consumers and workers, can result in a core-periphery pattern, where weakly linked industries that are characterized by constant returns to scale and low transport costs move to the periphery while strongly linked, increasing returns-to-scale industries remain in the core. However, this specialization pattern will change along with changes in transport costs. The relationship between the level of transport costs and the concentration of production is nonlinear and depends on developments in relative factor prices. In general, concentration will be highest at intermediate levels of transport costs. Prohibitively high transport costs imply that each country produces both goods, while negligible transport costs raise the attractiveness of peripheral regions (due to the absence of congestion costs and low relative wages), which again implies a low level of concentration.

In the attempt to structure the above-outlined determinants of industrial concentration patterns, one may relate their importance to different stages of development. For a given economic activity, comparative advantages and factor endowments may play the most important role initially. The introduction of an entirely new product in itself implies a comparative advantage as long as no other country has the ability to produce it. Once production becomes standardized and common knowledge, it will move to the country which offers the best conditions for its production (i.e. an abundance of appropriate or relatively cheap production factors). Personal computers provide a good example of such a process. Initially, they were mainly produced in the U.S.A., where they had been developed. Due to favorable conditions in East Asia (skilled but cheap labor force), the production of personal computers moved to these countries.[7] For countries at more similar stages of development where differences in endowments or technologies no longer play an important role, new trade and economic geography models can offer explanations for the existence of distinct specialization patterns. Thus, it may be asserted that traditional factors play a stronger role in countries at an earlier stage of development than their

[7] *This is described in the product-cycle theory by Posner (1961).*

trading partners, whereas new trade theory and economic geography explain specialization patterns in countries at more advanced and equal stages of development.

3 Evolution of Geographical Concentration in Central and Eastern European Countries

3.1 Measuring Geographical Concentration

Our database contains data for ten CEECs (Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic and Slovenia) from 1993 to 2000. This period allows us to analyze the impact stemming from the transitional change and from the stronger trade integration of the CEECs with the European Union. Our starting point – 1993 – has the clear advantage that the data are not blurred by the transformational recession, which was largely over in most transition countries by 1993. We use data for output, employment, wages, exports and imports (total and to the EU), and FDI inward stocks for 13 manufacturing industries from the wiiw Industrial Database.[8] Industries are classified according to NACE, revision 1, subsections DA to DN.[9] All values are in euro, converted at current exchange rates. The database contains 1,040 observations across three dimensions: industries, countries and years. The measures of the degree of geographical concentration are based on output data at current prices[10] as well as on employment data.

Until the start of the transition process in the late 1980s, production and employment patterns in CEECs strongly deviated from those of Western European economies. In the late 1980s, they were basically dominated by the manufacturing sector in general and heavy industry in particular. Then, transition set in motion a process of catching-up of CEECs towards current EU Member States that triggered per capita income and structural convergence.

On a broader level, the sectoral allocation of production and labor resources among the three main sectors (agriculture, industry and services) has become more similar to the sectoral allocation prevailing in EU countries. Generally, in the CEECs the shares of value added and of employment in agriculture[11] and in the industry sector[12] declined, whereas the service sector gained importance. These fundamental structural changes can be traced – among other factors – to the stronger integration with the EU that has taken place. Intensified trade and an increased inflow of FDI have changed the competitive environment of the CEECs' firms and have modified the patterns of geographic concentration.

In the period under review, the structure of manufacturing changed broadly in the CEECs. In 1993, the three largest countries in terms of output – Poland,

[8] *wiiw Industrial Database Eastern Europe, July 2003.*

[9] *In some countries, the manufacturing of coke, refined petroleum products and nuclear fuel and manufacturing n.e.c. were not reported separately. Thus, we aggregated these industries in all countries.*

[10] *There are various other ways to measure the size of an industry (for instance employment or value-added data). Apart from the fact that value-added data are not available for all CEECs, production output data are less affected by structural shifts from outsourcing to other sectors than value-added data (Midelfart-Knarvik, 2002).*

[11] *Remarkable exceptions are Bulgaria and Romania, where the share of the labor force in agriculture has increased.*

[12] *The industry sector comprises the manufacturing industry, mining, water and electricity supply, and construction. Today, the contribution of the manufacturing sector to GDP in the CEECs is only slightly larger than the average in the current EU Member States.*

the Czech Republic and Romania – accounted for 67% of manufacturing production in the region. By 2000, Romania had fallen behind and Hungary had advanced to the third rank, with the share of the three largest countries having increased to 72%. Poland, Romania and the Czech Republic also ranked first to third in 1993 in terms of employment. At the time, 68% of all manufacturing employees of the region worked in these three countries; their share was virtually unchanged in 2000.

How has the degree of geographical concentration changed in Central and Eastern Europe? Let us first explain our measure of concentration in more detail. To start with, the issue of specialization versus concentration should be set out clearly. While the two concepts are strongly linked – both describe convergence or divergence of industrial structure in terms of output, employment, trade patterns and the like – they do not describe exactly the same developments. Specialization is measured across countries and relates to increasing differences in industrial structure between individual countries. Concentration is measured with respect to individual industries and refers to the question whether certain industries locate only in certain regions or countries contrary to a pattern where output is homogeneously dispersed across all countries. The two often coincide such that increasing specialization is observed together with increasing concentration. However, if countries differ in size, they need not coincide. If one country were twice the economic size of its trading partner, one industry could be completely concentrated in this country, while the country itself would remain unspecialized.

This leads us to our measure of concentration. In the literature on geographical concentration, a variety of approaches to measure the degree of concentration can be found. We decided to use a measure of concentration in accordance with Haaland et al. (1999), which is a modified form of the Hoover-Balassa index. Haaland et al. distinguish between absolute and relative concentration (or specialization) measures. Absolute concentration measures the spread of industrial activities across countries. An industry is said to be absolutely concentrated if its output is generated in only one or a few countries. Relative concentration measures the difference between an industry's spread of production and the average spread of production. Thus, an industry is relatively concentrated if its output is more concentrated than total manufacturing (or economy-wide) output in the area. Consequently, a high relative concentration implies also a high degree of country specialization. The above example of high concentration without specialization is only possible when using the concept of absolute concentration. Again, relative country size matters crucially. If all countries are of equal size, the two measures are identical. Analyzing both concentration indices, relative and absolute, has the advantage of providing a comprehensive picture of the localization of industries in the CEECs. While the measure of relative concentration allows us to draw conclusions on the ongoing specialization process in CEECs, absolute concentration can be seen as being important in a broader pan-European perspective.

The absolute concentration index (CIP_i^A) is defined as:

$$CIP_i^A = \sqrt{\frac{1}{c}\sum_j \left(\frac{X_{ij}}{\sum_j X_{ij}}\right)^2}.$$

The value of production is denoted by X_{ij},[13] the indices i refer to industries and j to countries. Total industrial production in the CEECs is depicted by $\sum_j X_{ij}$, and the share of production in industry i carried out in country j by $\frac{X_{ij}}{\sum_j X_{ij}}$. The term c indicates the number of countries in our sample.

The relative concentration index CIP_i^R adjusts for country size and is defined as:

$$CIP_i^R = \sqrt{\frac{1}{c}\sum_j \left(\frac{X_{ij}}{\sum_j X_{ij}} - \frac{\sum_i X_{ij}}{\sum_i \sum_j X_{ij}}\right)^2},$$

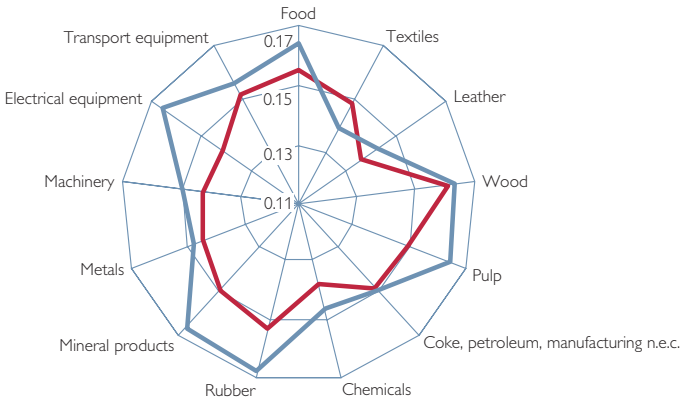
where $\frac{\sum_i X_{ij}}{\sum_i \sum_j X_{ij}}$ reflects country j's share in total manufacturing production of all ten countries.

3.2 The Evolution of Concentration Based on Output Data

Comparing the beginning and the end of our time series (1993 and 2000), we observe an increase of absolute concentration in terms of production in all industries, except for the textile industry (see chart 1). However, the intensity of changes varies strongly across industries.

Chart 1

Evolution of Absolute Concentration (Production) in the CEECs



Source: wiiw, OeNB.

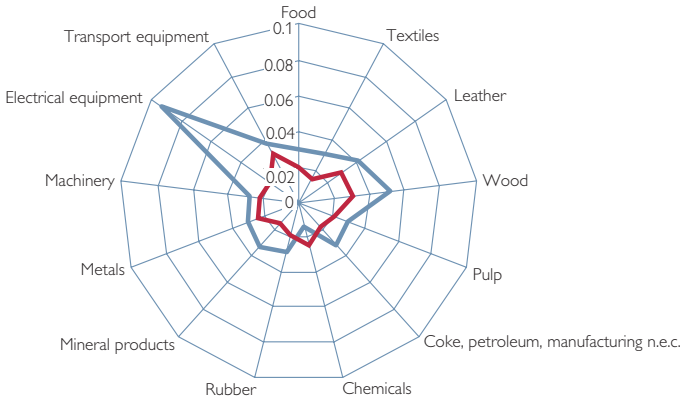
The ranking of individual industries (see table 1 in the appendix) indicates that the production of electrical and optical equipment underwent the most striking change. Whereas in 1993 this industry was one of the least concentrated

[13] *For the concentration indices based on employment data, X_{ij} refers to the number of people employed in sector i in country j. Then, absolute concentration is denoted by CIE_i^A, relative concentration by CIE_i^R, respectively.*

industries, it ranked among the most concentrated ones in 2000. This significant shift is attributable to the fact that the electrical and optical equipment industry became strongly concentrated in Hungary in the period under review (within our sample, the latter accounted for more than 40% of production activity in this industry in 2000[14]). Furthermore, the degree of concentration of the manufacturing of nonmetallic mineral products and the production of pulp, paper and paper products increased considerably. Both industries are concentrated predominantly in the Czech Republic and in Poland, the two largest producing countries in our sample. The pulp, paper and paper products industry also gained importance in the Baltic states. In absolute terms, the manufacturing of textiles and textile products became less concentrated. This can be explained by the fact that this labor-intensive industry became less important in several countries, including Hungary, Poland and the Czech Republic, resulting in a more dispersed production across countries.[15]

Chart 2

Evolution of Relative Concentration (Production) in the CEECs



Source: wiiw, OeNB.

Similar to the developments in absolute concentration, the geographical concentration of production also increased in relative terms, which – according to our measure of relative concentration – implies that the CEECs became more specialized.[16] Again, there is one exception: Concentration decreased in the chemical industry, causing the latter to rank last in 2000 (see table 2 in the appendix). This reflects a general decline of the chemical industry, which led to a more dispersed production structure. Again, the concentration of the man-

[14] *The four largest companies of the Hungarian electrical and optical equipment sector are IBM Storage Products Kft., Philips Group, GE Lighting Tungsram Rt. and Flextronics International Kft. (Hanzl, 2001).*

[15] *The textile sector is strongly affected by competition from cheap products coming from Asia and by relocation to countries with lower costs, especially to China (Hanzl, 2002).*

[16] *At first glance, this observation of increasing specialization stands in contrast to the observation of increasing intraindustry trade between the CEECs and the EU-15 during the same period (Fidrmuc and Djablik, 2003). Increasing intraindustry trade clearly implies decreasing specialization. This apparent discrepancy may be explained on the one hand by the fact that we are looking at intra-CEEC patterns of specialization, while Fidrmuc and Djablik analyze trade between the EU-15 and the CEECs. On the other hand, the level of disaggregation used in the two analyses is different. We use manufacturing data for only 13 industries whereas the study mentioned above uses data on a much more disaggregated level.*

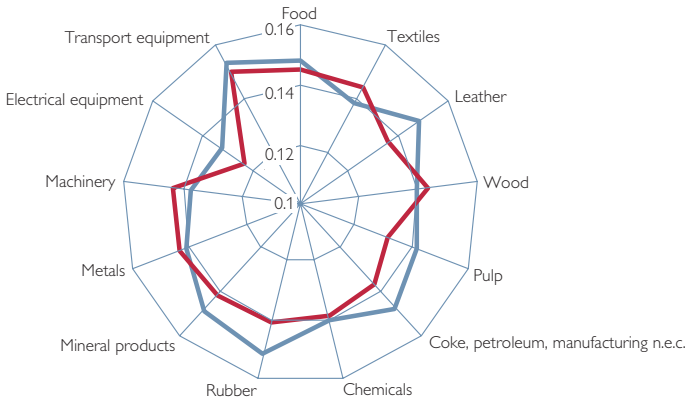
ufacturing of electrical and optical equipment increased most, reflecting Hungary's stronger specialization in this field (in 2000 the electrical and optical equipment industry accounted for almost 30% of Hungarian manufacturing). In addition, the concentration level of the wood and wood product industry rose significantly, given that the Baltic states, especially Latvia, specialized more strongly in this industry. Mirroring the development of absolute concentration, the production of mineral products became more strongly concentrated also in relative terms.

3.3 The Evolution of Concentration Based on Employment Data

Employment data also show the concentration of the labor force to have increased in general. Particularly employment concentrated in the leather and leather product industry both in absolute and relative terms (see also tables 3 and 4 in the appendix). Romania and Poland, the two largest countries,[17] are the dominant employers; some smaller countries, e.g. Bulgaria, have increased the share of employees in this sector. In 2000, the transport industry was the industry with the highest degree of employment concentration in absolute terms (because a mere three countries – Poland, Romania and the Czech Republic – account for the bulk of employees in this industry).

Chart 3

Evolution of Absolute Concentration (Employment) in the CEECs



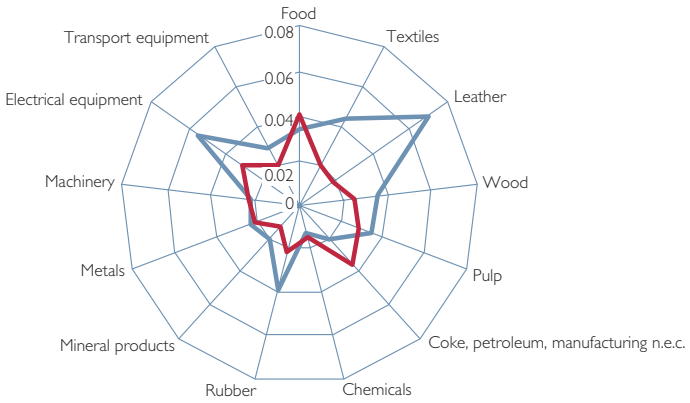
Source: wiiw, OeNB.

In terms of relative concentration, the coke, refined petroleum and manufacturing n.e.c. industry underwent the strongest decrease of concentration of the labor force, which contrasted with its increasing concentration in absolute terms. The decrease in the relative concentration level reflects the fact that the largest country, Poland, became the main employer in this industry (in our sample, more than 36% of all people working in this industry were employed in Poland in 2000), whereas smaller countries, such as Bulgaria and Slovakia, employed relatively fewer people in this industry in the year 2000 than in 1993. In addition, the degree of concentration also dropped in the food produc-

[17] *Based on employment data.*

Chart 4

Evolution of Relative Concentration (Employment) in the CEECs



Source: wiiw, OeNB.

tion industry, in the manufacturing of machinery and equipment n.e.c. as well as in the chemical industry.

The leather industry, by contrast, recorded the strongest increase in the degree of labor force concentration; in 2000, employment was most concentrated in this industry in relative terms. This can be traced to an increase of employment in this industry in the Bulgarian and Romanian economy, whereas the leather industry lost its important role for employment in all other sample countries.

3.4 A CEEC-EU Comparison

The analysis of the above-described structural changes raises the question whether the development in the CEECs corresponds to production and employment patterns in the EU-15.

We calculated corresponding geographical concentration indices, both in relative and absolute terms, for the EU-15 for the years 1985, 1993 and 2000. The time period allows us to draw some conclusions on the extent to which stronger economic integration has influenced geographic concentration in the EU.

From 1985 to 1993, which can be considered the pre-single market period, geographic concentration with regard to employment data increased in all industries in absolute terms and in 11 out of 13 industries in relative terms. In 1985 the three most concentrated industries in absolute terms were the following: the manufacturing of leather and leather products, the machinery industry and the manufacturing of electrical and optical equipment. A slightly different picture emerges with regard to relative concentration. Here the textile industry replaces the electrical industry in the group of the three most concentrated industries. The least concentrated industries in absolute terms were coke and refined petroleum products, food products and wood, and in relative terms chemicals, rubber and plastic products, and basic and fabricated metals.

The period from 1993 to 2000, which may be called the single market period and which corresponds to our observation period for the Central and Eastern European sample, was marked by a general decrease of concentration. Based on employment data, concentration decreased in absolute terms within all 13 industries and in relative terms within 7 industries. The ranking of industries according to their degree of concentration changed as well. Most strikingly, the production of transport equipment ranks among the most concentrated industries both in absolute and in relative terms. Notably, this industry became especially widespread in Germany. The manufacturing of leather and leather products is in both cases the most concentrated industry, because Italy is strongly specialized in this industry.

The evolution of concentration is less clear-cut with regard to indices based on production data. Over the period 1985 to 1993, concentration increased in only five (measured in absolute terms) and in nine (measured in relative terms) industries. From 1993 to 2000 there was a decrease in concentration within ten (measured in absolute terms) and an increase within nine (measured in relative terms) industries. The ranking of the most and least concentrated industries is almost equal to the concentration ranking based on employment data.

What are the most striking similarities and differences between the evolution of geographical concentration in the CEECs and in the EU, and what conclusions can be drawn?

Overall, Central and Eastern Europe has experienced a substantial amount of structural change since the start of the transition process, which has led to greater similarities both among the individual countries in the region and vis-à-vis the current EU Member States. Convergence results from the relative decline of initially important labor-intensive and low value-added activities. From 1993 to 2000, the concentration of the manufacturing industries in the CEECs increased both to higher levels and by a higher percentage than in the EU during the pre-single market period.

However, the ranking of industry types according to the degree of concentration in the CEECs deviates to a large extent from the structure which can be found in the current EU member countries.

Furthermore, in the EU the correlation between concentration indices based on employment and on production data is very high, whereas this correlation is very low in the CEECs. This can possibly be ascribed to the time lag between the adjustment of output and employment and relates to the prevalent lower level of productivity in Central and Eastern Europe compared to the EU countries.[18] Initially low levels of productivity allowed for rapid catching-up. This productivity boost implied increased concentration in output levels that was not accompanied by increased employment in the same industries.

[18] *In 2001, labor productivity for the manufacturing industry (converted with 1996 purchasing power parities for gross fixed capital formation) ranged between 10% (Bulgaria) and 41% (Hungary) of the productivity level reached in Austria (wiiw, 2003).*

4 Econometric Analysis

4.1 Theoretical Determinants

Given the brief review of the literature in section 2, we can identify a range of factors behind empirically observed patterns of industrial concentration. We use proxies for individual factors below to assess their importance in determining the structure of industrial production in CEECs.[19] As our observation period corresponds more or less to the transformation phase of these countries, we expect different factors to play an important role in shaping the industrial landscape as compared to Western Europe. For instance, traditional Ricardian and Heckscher-Ohlin factors are expected to still play a relatively strong role. In the following we discuss each variable and its calculation in turn.

Comparative advantages are at the heart of traditional Ricardian trade theory. *Technological differences* are captured by differences in productivity levels; more specifically we will use labor productivity, given our lack of good capital stock data. Large differences in technology levels between countries are expected to have a positive influence on the concentration of an industry after adjusting for country size (i.e. relative concentration). The variable is calculated as labor productivity in relation to the average labor productivity in each industry, adjusting for the country's overall productivity level.

In a Heckscher-Ohlin model, relative cost differences arise from *endowment structure* differences between trading partners. Greater differences will again induce a higher degree of relative concentration. As we are only interested in whether industries are concentrated or not, all that matters is whether an industry is intensive in the use of a certain factor or not. Thus, we only look at deviations in factor use from the mean regardless of the direction. We include the following factors in our analysis: labor, human capital and foreign-owned physical capital. Domestic physical capital is then implicitly captured by assuming that output is produced using only these four factors. With this, we assert a qualitative distinction between foreign-owned and domestically owned physical capital. *Labor intensity* is measured as absolute deviations in employment per unit of output from the sample mean. When explaining absolute concentration, we refine this measure and use the industry average employment level in relation to output. *Human capital intensity* is proxied for by deviations from the average labor compensation. If an industry's wage level lies above the average wage level of the region, it is said to be relatively human capital intensive, assuming that wages reflect employee qualification and education. We further include a measure of *foreign capital intensity* for the following reason: Economic development in all transition economies was naturally heavily influenced by privatization in those countries. Although privatization and FDI are distinct issues, they are closely related, especially in our sample countries. Privatization has dominated FDI inflows to a large extent (Kalotay and Hunya, 2000). However, privatization policies have been very distinct in individual CEECs. While Hungary pursued a policy of early privatization via the capital market, thus attracting large FDI inflows into all sectors, the voucher privatization in e.g. Romania and Bulgaria implied that foreign capital

[19] *Our analysis is similar to the one in Haaland et al. (1999), but in contrast to their paper, which analyzes structural developments in incumbent Member States of the EU, our paper puts the regional focus entirely on the Eastern European countries (including Bulgaria and Romania).*

was kept out of the country for a relatively long time. Poland delayed the privatization of state-owned firms, and therefore FDI inflows occurred at a later stage. Consequently, the timing and industrial spread of privatization-induced foreign capital inflows into individual CEECs differed according to FDI policies. Thus, FDI inflows can be seen as exogenous in this analysis. We measure FDI intensity as deviations of FDI inward stock over output from the mean; in the regressions for absolute concentration we use the average FDI stock.

In contrast to traditional trade theories, new trade theory adopts entirely different assumptions, allowing for increasing returns to scale, preference for variety and imperfect competition (Krugman, 1980; Helpman, 1981; Ethier, 1982). Industries with strongly increasing returns to scale in production can realize efficiency gains if they concentrate in certain locations. *Scale economies* can explain both absolute and relative concentration patterns. With the data we have at hand, we are unable to measure scale economies directly. To our knowledge, no recent study exists that has estimated scale economies for the industries we are looking at. Thus, we take scale elasticities from Forslid et al. (2002, table 5, p. 104), which are themselves based on estimates of scale economies by Pratten (1988). According to these figures, the transport industry realizes the greatest economies of scale in production, followed by chemicals, machinery (including electronics) and metals. The smallest efficiency gains from a larger scale of production are found to prevail in the textiles, leather and food industry.

The effect of *expenditure* patterns on concentration has been acknowledged by all of the theories outlined here: traditional and new trade theories as well as economic geography. Traditional trade theory predicts net imports of a good toward which home demand is biased. According to new trade theory, a home market bias for a specific product will induce concentration of production of this good in the home country. Finally, new economic geography models state that a larger demand for a certain product implies stronger backward linkages and hence induces an industry to concentrate absolutely. Thus, the location of demand (for an industry's output, regardless of whether it is used as an intermediate good elsewhere or for final consumption) matters for the concentration of industries and we expect a positive impact from a higher concentration of demand or expenditure on output concentration. The expenditure variable is calculated as output plus imports minus exports; the variable is constructed analogously to the concentration measure.

Traditional and new trade theories imply a negative relationship between *trade costs* and concentration. The more expensive it is to move goods around, the less likely it is that they will be produced in only one or a few locations. New economic geography models stress the existence of a nonlinear, inverse U-shaped relationship between trade costs and location decisions in industries with increasing returns to scale. At high levels of trade costs, production will be dispersed in order to serve all markets at low costs. Falling transport costs first induce a concentration of production, as this allows exploiting scale economies while it is still possible to serve all markets at reduced costs. Consequently, firms realize higher efficiency levels. However, increasing concentration also produces agglomeration costs (rising wages in the center, congestion, etc.). With further decreasing transport costs it becomes profitable to shift produc-

tion to the periphery again, taking advantage of low wage costs while transport costs no longer play any role at all. Transport costs are again taken from Forslid et al. (2002) and measured as the percentage of trade costs to Western Europe in producer prices, averaged by each industry over the region. We assume that we are still in the part of the curve where lower transport costs lead to an increase in concentration of industrial activity, as predicted also by traditional and new trade theory.[20] The empirical evidence confirmed this choice, as a linear specification of the transport cost variable gave a better fit of the regression than specifying a quadratic term.

Economic geography models put heavy emphasis on the role of forward (i.e. with intermediate input producers) and backward (i.e. with consumers) *linkages*. The strength of forward linkages in an industry is captured by the share of inputs in total costs that originate in the same industry. Again, we use estimates from Forslid et al. (2002), based on data from Central and Eastern European input-output matrices. From this data, textiles, chemicals, metals and the wood industry emerge as having strong intraindustry linkages. The expected sign of this variable is again positive; stronger forward linkages inside the same industry should ceteris paribus lead to more concentration in an industry. Thus, we would expect these industries to be more clustered than for instance the food, transport or leather industries, which show weak intraindustry forward linkages. Backward linkages measure the extent to which closeness to one's customers (who can be either purchasers of intermediate goods or final good consumers) creates positive spillovers and enhances efficiency. This effect can be proxied by the demand in the region for output of the respective industry and is captured by our expenditure variable.

4.2 Explaining Concentration inside CEECs

All the above measures are calculated as averages across all 10 countries for each industry, resulting in a panel of 13 industries over 8 years. We estimated a random effects model, using an instrumental variables estimator proposed by Hausman and Taylor (1981). We chose this estimator because it allows us to make best use of our knowledge of individual (i.e. industry) specific fixed effects (like scale economies, trade costs, forward linkages) that would be lost in a fixed effects regression, as the fixed effects estimator removes all individual specific time-invariant effects. A random effects model, however, would lead to inconsistent estimates in the presence of those fixed effects. In contrast to traditional instrumental variables estimation procedures, the Hausman-Taylor estimator assumes that a subset of the explanatory variables in the model is correlated with the individual-level random effects μ_i (i.e. the error component that varies across individuals but not over time), but none of the explanatory variables is correlated with the idiosyncratic error component.

The estimator requires discrimination between exogenous and endogenous (i.e. correlated with μ_i) as well as time-varying and time-invariant right hand-side variables. We identified labor intensity, wages and expenditure levels as endogenous and time-varying regressors and forward linkages as time-invariant

[20] *Thus, the transport cost variable does not allow us to distinguish between different theories. The purpose of the analysis is, however, to investigate the determinants of industrial location in CEECs rather than scrutinizing different theories.*

endogenous variables. Applying more or less the same model as Haaland et al. (1999) to Central and Eastern European data yields the results given in table 1. We find that relative concentration patterns are determined by comparative advantages (differences in technology), expenditure patterns and the location of FDI. In line with the observations in the descriptive part, differences between relative concentration in employment and output can be identified. These differences in concentration between output and employment data by themselves hint toward different developments in productivity levels between individual industries in Central and Eastern Europe as mentioned previously. This has not been observed between individual industries in Western European data and is as such an interesting observation. However, the differences in underlying factors driving these concentration patterns suggest that different mechanisms are at play in shaping the industrial landscape with respect to output and with respect to the allocation of the labor force.

Output patterns are more strongly influenced by expenditure patterns than employment. The coefficient on our variable for expenditure is more than twice as high and significant at a much higher level in the output equation as compared to the employment equation. Thus, the location of demand matters, which also implies a role for backward linkages. Also, the FDI variable turns out to be more significant in the output equation than in the employment equation, although the coefficient is of the same magnitude in both regressions. Consequently, FDI-intensive industries tend to be clustered in few locations. Moreover, the observation that FDI intensity spurs output (but not employment) concentration provides some indirect evidence of the productivity-enhancing impact of FDI. Industries with a high share of FDI produce more output in the same location with a less than proportional increase in labor.

Certain industries could be identified as driving the overall results. The strong increase in output concentration was heavily influenced by developments in the electrical equipment industry. Since 1997, strong increases in output levels in this industry have been observed. The fact that employment has not increased to the same extent suggests especially strong improvements in labor productivity inside the electrical equipment industry in the CEECs. As will be discussed below, high FDI inflows especially in Hungary play an important role in this context. Apart from the electronics industry since 1997, we also controlled for the general trend of increasing concentration, given our descriptive results. Although this is already captured by the time dimension in our panel specification, we further included a quadratic time trend, which greatly improved the fit of the regression. One may also assign an economic meaning to this exogenous time trend: It can control for changes in relative factor endowments that are endogenous to relative concentration. For instance, a sufficiently high degree of factor mobility would enable skilled and unskilled workers to relocate according to where demand for them is greatest. This actually describes exactly the picture drawn by new economic geography models and supports the idea that such models are relevant in explaining industry location in CEECs. However, there are few other indications of the empirical importance of these factors. Apart from the expenditure variable, the variables designed to capture explicitly new economic geography explanations – scale economies, trade costs and input-output linkages – remain insignificant.

Table 1

Regression Results for Relative Concentration Indices

	Output	Employment
FDI	0.0686 *0.002*	0.0682 *0.014*
Technological differences	0.0279 *0.000*	0.0371 *0.000*
Labor intensity	−4.01E-05 *0.430*	−1.26E-06 *0.986*
Human capital intensity	−5.45E-05 *0.045*	−5.05E-05 *0.132*
Expenditure	0.2652 *0.000*	0.1254 *0.055*
Scale economies	−0.0214 *0.198*	−0.0062 *0.876*
Trade costs	−7.99E-05 *0.319*	2.04E-04 *0.349*
Linkages	0.0014 *0.960*	−0.0304 *0.580*
Trend	0.0001 *0.003*	
Dummy 2000		0.0033 *0.048*
Industry dummy[1]	1.78E-06 *0.000*	0.0254 *0.000*
Constant	0.0161 *0.059*	0.0190 *0.227*
Wald-chi (square)	724.33	150.59
Probchi (square)	0.00	0.00
Number of observations	104	104

[1] *In the first regression for the electronics industry, in the second regression for the leather industry.*
p-values in italics.

The negative coefficient on the human capital intensity measure presents a puzzle. By construction, both the dependent variable and the endowment variables measure deviations from the average. Thus, we clearly expect clustering or concentration of industries which are especially intensive in the use of human capital (or use relatively little human capital). In either case, the sign of the endowment variable should be positive. The negative coefficient on the human capital variable implies that industries with an average use of human capital as measured by labor compensation concentrate in a few countries only. This result could also reflect the fact that differences in human capital intensity, as measured here, are in general rather small across industries. The reason might lie in the tradition of strong central wage bargaining, a heritage from the communist past that ruled out large differences between labor compensation for individual activities.

Like the concentration of industrial output, employment concentrates in industries with relatively high productivity levels, controlling for the average productivity level in each country. FDI levels again play an important role for relative employment levels, as do expenditure levels, though to a lesser extent than for output levels. Concentration in employment also shows a time trend, but it is much weaker than in output levels. A pronounced increase in relative concentration could only be observed very recently and is influenced strongly by developments in the leather industry. The leather industry, which is a typical labor-intensive industry, delivers especially high employment shares in a few

small countries, most notably so in Latvia. This is controlled for by a dummy variable for this industry that takes the value one from 1998 onward.

Again, the typical new economic geography variables remain insignificant, and apart from FDI stocks, relative factor endowments cannot explain employment patterns across industries either. Thus, employment is distributed according to comparative advantages and concentrates in relative terms in industries whose productivity levels differ most strongly from the average. Industries which produce at similar productivity levels in different countries are more dispersed across the region. This observation refers to both output and employment levels.

In contrast to Haaland et al. (1999), we include the same exogenous variables in our model for relative and absolute concentration. Although technological differences and differences in endowment structures cannot explain absolute concentration patterns, we view these characteristics as industry-specific fixed effects. Given our knowledge of these industry characteristics – such as the labor intensity of an industry, human capital intensity, etc. – we decided to include them in our regressions. The regression results for absolute concentration are given in table 2.

First of all, whereas technological differences and FDI determine relative concentration patterns, absolute concentration is driven by differences in human capital. The more human capital-intensive industries have experienced a stronger trend toward high concentration than industries whose use of human

Table 2

Regression Results for Absolute Concentration Indices

	Output	Employment
FDI	−0.0056 *0.543*	−0.0093 *0.159*
Productivity	−0.2329 *0.063*	0.0473 *0.593*
Labor intensity	5.02E-07 *0.992*	9.39E-05 *0.001*
Human capital intensity	7.78E-05 *0.003*	3.22E-05 *0.015*
Expenditure	0.3797 *0.000*	0.0411 *0.320*
Scale economies	0.0261 *0.409*	0.0383 *0.114*
Trade costs	0.0003 *0.142*	0.0003 *0.047*
Linkages	0.0417 *0.428*	−0.0299 *0.349*
Trend	−0.0008 *0.250*	
Dummy 1993		−0.0026 *0.014*
Industry dummy[1]	0.0093 *0.000*	0.0049 *0.010*
Constant	0.0646 *0.000*	0.1186 *0.000*
Wald-chi (square)	127.49	53.06
Probchi (square)	0.00	0.00
Number of observations	104	104

[1] *In the first regression for the electronics industry, in the second regression for the leather industry.*
p-values in italics.

capital deviates less from the average. The results again suggest pronounced differences between the absolute concentration in output and in employment. Output concentration is driven primarily by absolute expenditure, i.e. the home market effect matters, as might backward linkages. Scale economies, inputs from the same industry (forward linkages) and transport costs do not turn out to be significantly related to concentration. Again, electrical equipment accounts to a large extent for increases in output concentration due to the fact that this industry has become very concentrated in Hungary. Because Hungary is among the larger economies in the region, the relative and absolute concentration have both increased significantly.

From our descriptive analysis we know that the concentration of employment has in general risen, with some exceptions (wood, textiles, machinery, metals). Not surprisingly, this development results from increased concentration in labor-intensive industries, notably so in the leather industry. Our observation that formerly strongly concentrated industries were the ones which experienced decreases in concentration levels turns out to be a significant trend, as the significant coefficient on the dummy variable for 1993 in the second column of table 2 indicates. It is interesting to note that the location of demand (i.e. the concentration of demand for a certain industry's output in one or a few countries) has no influence on employment patterns, while trade costs show up with a weakly significant positive sign.

4.3 Developments in Individual Industries

Let us now turn to developments in individual industries. By calculating our concentration indices, all country-specific information is lost through averaging. To avoid this, it seems appropriate to take a closer look at specialization patterns of individual industries across countries. Thus, for each industry we now use a panel of all ten countries from 1993 to 2000. The dependent variable we look at is each country's share of output in the respective industry's total output in CEECs. We control for country size by including total manufacturing output on the right-hand side. Because of severe endogeneity problems we did not use a measure reflecting the labor abundance of each country.

Human capital is captured by the wage differential in the respective industry to the average wage level in each country. Under the assumption that qualified labor receives a higher wage than unskilled labor, those industries which require a higher share of skilled workers in production (i.e. human capital-intensive industries) should show a higher wage level than those with a less skilled (average) labor force. Consequently, we expect a positive coefficient on this variable for human capital-intensive industries (i.e. electronics, chemicals, etc.), as these industries would locate where human capital is abundant.

Technological differences are expressed through industry- and country-specific productivity levels. FDI also enters in the same way. We further included the share of exports to the EU over total exports as well as the import share from the EU to account for the amount of trade reorientation. As outlined before, the transition from communist to market economies implied a rapid and substantial reorientation of trade flows away from Eastern European partners and CIS countries toward the EU-15. This is likely to have had an impact also on location decisions of firms, albeit a different one in different industries.

Table 3 presents the results obtained from a fixed effects, two-way error component regression for the industries where we observed the greatest changes in absolute or relative concentration measures in section 2. Table 4 reports the results for all remaining industries. The results are well in line with our descriptive results: Country size does not matter for the industries with a high degree of relative concentration, such as electronics, wood, transport and leather. The first striking observation from both tables is that differences in productivity levels are the most important determinant for the location of industries across countries. The variable for technological differences is always highly significant, with the exception of the food industry.

Table 3

Regression Results for Individual Industries (I)

	Wood industry	Pulp and paper industry	Coke and petroleum	Rubber and plastics industry	Mineral products	Electronics
FDI	0.0001	−0.0003	0.0001	0.0003	0.0003	0.0004
	0.510	*0.208*	*0.134*	*0.170*	*0.000*	*0.002*
Technological differences	1.4244	1.3392	0.4859	1.5024	0.7207	1.7903
	0.002	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Human capital intensity	1.8368	0.0580	0.2672	−0.6783	0.6818	−0.6724
	0.027	*0.803*	*0.275*	*0.257*	*0.039*	*0.223*
Size	3.80E-07	9.33E-07	6.06E-07	1.03E-06	3.60E-07	2.46E-07
	0.238	*0.000*	*0.001*	*0.001*	*0.004*	*0.395*
Exports to the EU	0.7447	−0.9382	0.0971	−0.2721	0.0095	0.8800
	0.009	*0.000*	*0.179*	*0.482*	*0.971*	*0.005*
Imports from the EU	−0.9166	0.3661	−0.1747	−0.4321	−0.2741	−0.6022
	0.004	*0.267*	*0.178*	*0.198*	*0.221*	*0.066*
Constant	−5.3850	−4.8781	−4.4336	−5.0096	−4.3909	−4.5327
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
R (square)	0.584	0.604	0.628	0.803	0.687	0.813
Number of observations	80	80	80	79	80	80

Note: Year dummies are included.
p-values in italics.

When looking at the industries that experienced the strongest increases in concentration (or decrease in the case of chemicals), we find a rather diverse picture. It is surprising to note that relative human capital levels have no significant impact on concentration in the electronics industry, while they show a positive effect on concentration tendencies in the wood and mineral products industries. FDI plays a strong role in only two industries: electronics and mineral products, which have both become more concentrated in absolute terms. Not surprisingly, this increase in concentration in the electronics industry has occurred along with a reorientation of exports toward the EU-15. The export orientation toward the EU turns out to be highly significant in three out of the six industries. It increases concentration tendencies in the electronics and the wood industries, while the correlation is negative for the paper and printing industry. The share of EU imports is hardly ever significant, and if it is, its sign is opposed to that of EU exports. This hints toward interindustry trade, where inputs are sourced from one country and output is sold to another. This observation may reveal a successful price competition of CEECs in those industries that turn out to be highly concentrated. It is conceivable that inputs are purchased from other Eastern European partners or also from (Central or East) Asia at relatively low costs due to lower wages, while final products are sold into the EU-15 market, where higher prices can be achieved.

Table 4

Regression Results for Individual Industries (II)

	Food and beverages	Textile industry	Leather industry	Machinery	Transport equipment
FDI	4.48E-05	−5.47E-04	6.30E-03	2.80E-04	1.48E-04
	0.174	*0.212*	*0.085*	*0.097*	*0.098*
Technological differences	0.0457	2.7136	2.7764	1.5095	0.6926
	0.587	*0.000*	*0.000*	*0.000*	*0.000*
Human capital intensity	−0.4249	1.0287	−0.2006	−0.2237	1.2886
	0.16	*0.080*	*0.824*	*0.412*	*0.010*
Size	2.11E-07	5.92E-07	−1.16E-07	8.39E-07	6.32E-08
	0.102	*0.001*	*0.572*	*0.000*	*0.824*
Exports to the EU	−0.4619	−0.2887	−0.2948	0.2198	−0.1172
	0.020	*0.406*	*0.149*	*0.132*	*0.327*
Imports from the EU	0.0113	0.3125	0.2684	−0.2884	−0.2547
	0.907	*0.391*	*0.191*	*0.028*	*0.201*
Constant	−2.6179	−5.4225	−3.8522	−4.3637	−5.0504
	0.000	*0.000*	*0.000*	*0.000*	*0.000*
R (square)	0.204	0.584	0.675	0.735	0.699
Number of observations	80	80	80	80	80

Note: Year dummies are included.
p-values in italics.

Among the industries which experienced more modest changes in their concentration patterns (table 4), FDI induced concentration in the leather, machinery and transport industries. However, the coefficients are only weakly significant. Human capital plays a significant role in textiles and transport equipment, and EU export orientation is never significant (with the exception of the food industry). This is an interesting observation in contrast to table 3: Exports to the EU turned out to be a determining factor in many of those industries that experienced strong increases in concentration. Trade reorientation toward Western Europe has increased concentration, which implies that integration into those markets has a strong impact on industrial restructuring in the CEECs.

Thus, there are differences across industries with respect to the factors that determine industrial location patterns. Apart from the general importance of having an appropriate technology level, expressed here by productivity levels, some industries locate where they find high human capital levels, while others are attracted by high FDI stocks. Export orientation toward the EU always accompanies high concentration levels. Thus, the amount of trade reorientation toward the West clearly had a positive impact on the location of industry in Eastern Europe.

5 Conclusions

The aim of this paper was to shed new light on the determinants of the patterns of regional concentration and specialization in CEECs. Central and Eastern European countries have experienced a massive reallocation of production and the labor force, which strongly affected the patterns of regional concentration of manufacturing firms. If we compare the beginning and the end of our time series, we find that concentration – both in terms of production and employment – generally increased in the CEECs. This is in clear contrast to the trend inside the EU-15 during the same period. However, the recent deconcentration of industrial activity in Western Europe was preceded by a rise in

concentration in the pre-single market period from 1985 to 1992, albeit to a lesser degree than observed for CEECs. This suggests that economic integration initially induces a more efficient allocation of resources with an increase in concentration as predicted by traditional trade theories. However, ongoing economic integration will bring about higher factor mobility (especially for capital) and technology spillovers, thus eroding traditional Ricardian or Heckscher-Ohlin factors. This leads to a stronger role for intraindustry trade with a consequent decline in concentration patterns and less pronounced specialization of individual countries. The deepening of integration among the EU-15 and CEE (and consequently also among individual CEECs) following these countries' joining the common market thus leads us to expect a turning point in the concentration trends observed up to date. In the medium term, concentration of industrial activity inside CEECs is expected to decrease rather than increase further, along with an increased role for intraindustry trade. This view is based on the expectation that technology spillovers between Western and Eastern Europe are going to gain in scale and scope. Further, investment ratios (and especially foreign investment) are already higher in the new Member States than in incumbent members. FDI has been identified as one of the important determinants in shaping the industrial landscape in CEECs.

In our attempt to identify the driving forces behind the patterns of concentration in the CEECs, we referred to traditional and new trade theory as well as to the new economic geography models. We used a data set for ten Central and Eastern European countries and thirteen industries covering the period from 1993 to 2000. To explain the location of manufacturing activities in the CEECs, we used a random effects model employing an instrumental variables estimator proposed by Hausman and Taylor (1991) and two different measures of geographical concentration (relative and absolute concentration) as well as two measures of the size of an industry (production and employment).

Our results for relative concentration showed that relative concentration is strongly influenced by comparative advantages and by the location of demand and of FDI. However, we identified some differences between the relative concentration of output and employment: While the former is more strongly affected by expenditure patterns, the latter is driven by technological differences. We found that variables reflecting new economic geography models had very little impact on the evolution of concentration patterns in the CEECs. Furthermore, the electronics industry, probably the most typical high-skill, high-tech industry in this classification, accounts to a large extent for the strong increase in output concentration, while a typical labor-intensive, low-tech industry (namely leather) strongly influenced concentration in the location of the labor force.

In contrast to the determinants of relative concentration, our results provided support for the argument that absolute concentration was crucially driven by differences in human capital. Differences can again be found between the results of absolute concentration of output and of employment. Once again, the absolute concentration of production was mainly influenced by absolute expenditure. As was already the case for relative concentration, scale economies, forward linkages and transport costs had no significant impact on absolute concentration either.

In a further step we investigated the location of industries across CEECs by closely looking at specialization patterns inside individual industries. In doing so, we tried to explain the location of industries across countries. Our results suggest that differences in productivity levels – and thus traditional Ricardian factors – are the determining factor for a country's share of output in the respective industry's total output, whereas the influence of FDI was only important for two industries. The same applied to export orientation toward the EU, which plays a role in just a few industries. Thus, while FDI had a significant impact on relative concentration in production, its influence was confined to two industries, electronics and minerals. The concentration of the electronics industry in Hungary was certainly policy driven to a great extent. FDI was attracted to Hungary by distinct policies and a general attitude toward early and comprehensive capital market liberalization. The concentration of the mineral industry in Poland is more likely to be connected to the general importance of the construction industry in this country.[21]

As a prerequisite for accession, Central and Eastern European countries need to ensure the capacity to withstand competitive pressure and market forces within the European Union. In this respect, the question of the evolution of concentration and specialization patterns is highly relevant, e.g. countries are expected to specialize according to their comparative advantages. In this paper we provide some evidence that this development could be observed during the 1990s. Differences in productivity levels, which are themselves an expression of underlying differences in technology levels, have to date shaped the location of different industries in Eastern Europe. The accession to the EU of eight out of the ten countries that are included in this study is bringing about major institutional shifts in those countries and in their relations to incumbent Member States. These changes are expected to have implications on the factors that drive localization patterns, such as FDI flows, technology and technological spillovers, wage levels, etc. Consequently, in contrast to past developments, a turning point in the observed pattern of increasing concentration can be expected to occur in the near future. Along the same lines, it can be said that leaving out some countries would most likely help to reinforce existing differences in technology levels with consequent long-lasting effects on the industrial landscape in Eastern Europe. A distinct specialization pattern between "ins" (high-tech, high-skill production) and "outs" (labor-intensive, low-tech) can be expected to develop. The envisaged accession of the two Southeastern European countries Bulgaria and Romania as early as in 2007 is certainly to be welcomed and may in the longer term induce an upgrading of production structures away from the current specialization in labor-intensive industries toward more sophisticated activities with a higher long-term growth potential. This would then also lead to a more homogeneous production structure in the whole of Europe. All these predictions are at the moment speculative. However, similar developments were also observed in Western Europe.

In this paper, we tried to shed some light on the determinants of the ongoing concentration and specialization processes in the Central and Eastern European countries and to indicate existing differences between individual countries and

[21] *The importance of construction in Poland also shows up in its service trade balance with Austria.*

industries. For forthcoming research, and given the altered political landscape in Europe from 2004 onward, it would be interesting to integrate CEECs into a wider European context. Future research should certainly look at the EU-25 rather than analyze CEECs separately in order to give a comprehensive picture of the evolution of specialization and concentration patterns of incumbent and new members. Our study can serve as a basis for future studies by giving a good picture of the CEECs' industrial structures prior to accession.

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Appendix

Table 1

Ranking of Absolute Concentration Indices (Production)

for the years 1993 and 2000

Industry	1993		2000	
	Rank	Index	Rank	Index
Wood and wood products	1	0.1599	6	0.1636
Food, beverages, tobacco	2	0.1553	5	0.1643
Rubber and plastic products	3	0.1535	1	0.1678
Transport equipment	4	0.1523	7	0.1558
Pulp, paper and paper products	5	0.1495	4	0.1650
Mineral products (nonmetallic)	6	0.1491	3	0.1659
Coke, petroleum, manufacturing n.e.c.	7	0.1485	9	0.1489
Textiles and textile products	8	0.1483	13	0.1386
Basic and fabricated metals	9	0.1442	10	0.1476
Machinery and equipment n.e.c.	10	0.1423	8	0.1491
Electrical and optical equipment	11	0.1408	2	0.1664
Chemicals and chemical products	12	0.1378	11	0.1460
Leather and leather products	13	0.1356	12	0.1422

Source: wiiw, OeNB.

Table 2

Ranking of Relative Concentration Indices (Production)

for the years 1993 and 2000

Industry	1993		2000	
	Rank	Index	Rank	Index
Transport equipment	1	0.0315	4	0.0376
Wood and wood products	2	0.0298	2	0.0506
Leather and leather products	3	0.0290	3	0.0407
Chemicals and chemical products	4	0.0246	13	0.0129
Basic and fabricated metals	5	0.0244	8	0.0302
Machinery and equipment n.e.c.	6	0.0222	12	0.0275
Pulp, paper and paper products	7	0.0206	10	0.0296
Electrical and optical equipment	8	0.0202	1	0.0931
Food, beverages, tobacco	9	0.0198	9	0.0298
Rubber and plastic products	10	0.0185	11	0.0284
Coke, petroleum, manufacturing n.e.c.	11	0.0182	7	0.0307
Mineral products (nonmetallic)	12	0.0156	5	0.0329
Textiles and textile products	13	0.0151	6	0.0310

Source: wiiw, OeNB.

Table 3

Ranking of Absolute Concentration Indices (Employment)

for the years 1993 and 2000

Industry	1993		2000	
	Rank	Index	Rank	Index
Transport equipment	1	0.1500	1	0.1532
Food, beverages, tobacco	2	0.1453	5	0.1483
Textiles and textile products	3	0.1441	11	0.1385
Basic and fabricated metals	4	0.1435	8	0.1413
Machinery and equipment n.e.c.	5	0.1426	12	0.1371
Wood and wood products	6	0.1426	10	0.1388
Rubber and plastic products	7	0.1416	2	0.1517
Mineral products (nonmetallic)	8	0.1410	4	0.1486
Chemicals and chemical products	9	0.1391	9	0.1405
Coke, petroleum, manufacturing n.e.c.	10	0.1371	6	0.1471
Leather and leather products	11	0.1362	3	0.1489
Pulp, paper and paper products	12	0.1317	7	0.1418
Electrical and optical equipment	13	0.1232	13	0.1326

Source: wiiw, OeNB.

Table 4

Ranking of Relative Concentration Indices (Employment)

for the years 1993 and 2000

Industry	1993		2000	
	Rank	Index	Rank	Index
Food, beverages, tobacco	1	0.0407	7	0.0334
Coke, petroleum, manufacturing n.e.c.	2	0.0360	12	0.0195
Electrical and optical equipment	3	0.0308	2	0.0549
Pulp, paper and paper products	4	0.0286	6	0.0342
Wood and wood products	5	0.0246	5	0.0348
Machinery and equipment n.e.c.	6	0.0225	10	0.0212
Rubber and plastic products	7	0.0217	4	0.0388
Basic and fabricated metals	8	0.0216	9	0.0237
Textiles and textile products	9	0.0210	3	0.0431
Transport equipment	10	0.0205	8	0.0294
Leather and leather products	11	0.0183	1	0.0695
Chemicals and chemical products	12	0.0140	13	0.0120
Mineral products (nonmetallic)	13	0.0124	11	0.0197

Source: wiiw, OeNB.