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Integration of CEECs into EU Market: Structural Change and Convergence*

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Abstract

The central and eastern European countries (CEECs) have gone through a dramatic process of industrial restructuring in which the Europe Agreements have played a major role. Using detailed statistics, we analyse the transformation of CEECs' export structures and whether it led to structural convergence with the remaining EU members. We also analyse structural transformation within sectors in terms of quality ranges. The results show that, in general terms, CEECs have converged both at inter- and intra-sectoral levels towards pre-existing European Union (EU) members. We discuss whether further restructuring and relocation of CEECs' industrial patterns are probable in the aftermath of EU membership.

Introduction

The integration of central and eastern European countries (CEECs) into trade links with the European Union (EU) has been remarkable since the beginning of the transition, in 1989. The share of exports to the EU in the total exports of the CEEC-10 – the eight CEECs that joined the European Union in May

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2004 (the Czech Republic, Hungary, Poland, Slovakia, Slovenia, Estonia, Latvia and Lithuania) plus the two states that acceded in 2007 (Bulgaria and Romania) – was 60.2 per cent in 1995, increasing to 66.0 per cent in 2003, while the corresponding values for imports were 61.2 per cent and 63.0 per cent, respectively. This level of trade integration with the EU market is already higher than in the case of the majority of the EU-15.

This process of trade integration is a natural consequence of the dismantling of central planning, in the period 1989–91, as previously these countries undertraded with the EU and overtraded with each other and other members of the former Council for Mutual Economic Assistance (COMECON). However, such integration was also directly promoted by the EU response to the collapse of communism in these countries through the Europe Agreements (EA)[1] – a total of ten agreements signed between the EU and the CEECs in the period 1991–96 – which led to the abolition of tariffs in the EU for trade in manufactured products by January 2002. This process was asymmetric, favouring the CEECs that had to liberalize market access for industrial goods over a (maximum) period of ten years, while in the case of the EU it was only five years. The EA also laid the foundations of the accession process by implying full convergence of the CEECs' domestic system with the EU's *acquis communautaire*.

Several studies have shown that these new trade links reflect, in most CEECs, a dramatic process of change to their structure of production (Landesmann, 2000; Commission, 2003; Havlik, 2004). However, few concentrated on whether the evolution of CEECs' trade pattern led to greater convergence with the pattern of the EU-15 (on CEECs, see Landesmann, 2000; Landesmann and Stehrer, 2002; De Benedictis and Tajoli, 2004; Midelfart-Knarvik *et al*., 2000, is one of the pioneering studies on this subject, but it concerns only the EU-15). This is, nonetheless, a relevant topic as several advantages are associated with increased similarity: it requires smaller industry reallocations, facilitates monetary co-ordination and the definition of other common policies and accelerates convergence of factor prices (Deardorff, 1994), thus alleviating the pressure of migration flows from the CEECs to the EU-15 (De Benedictis and Tajoli, 2004).

Using detailed statistics, we analyse, over the period 1995–2003, i.e. in the aftermath of the EA, the path of industrial restructuring of the CEEC-10 as observed through the lens of their export performance to the EU market and whether it led to increased similarity with the export structure of the EU-15. The evolution and comparison of export structures first treats sectors as

[1] Initially the EU upgraded the status of the CEECs to that of the least developed countries by granting them a generalized system of preferences (GSP).

homogeneous, but we also perform an analysis at the intra-sectoral level by considering differentiation in quality levels within sectors.

Besides, it is important to investigate if, with accession to the EU, further restructuring of CEECs' export pattern may be expected, in spite of the high degree of trade integration of these countries in this area. We outline several arguments that support this hypothesis.

The remainder of the article is organized as follows. Section I describes the data and presents the notation used in the following sections. Section II analyses the degree of structural transformation of CEEC exports to the EU and investigates the nature of this change with alternative typologies. Section III evaluates the degree of structural similarity and convergence of CEECs' export structure towards the pattern of the EU-15. Section IV focuses on intra-sectoral changes in terms of quality ranges. Section V outlines some considerations on the effectiveness of CEEC adjustment to trade liberalization.

I. Data and Notation

The analysis developed in this article covers the ten CEECs included in the EU enlargement process. Since we address the evolution of CEEC exports to the EU, we also consider, as a reference term, the EU-15.[2] Accordingly, the article considers a total of 25 countries, in the period between 1995 and 2003.

The data are considered at the 6-digit level of the Combined Nomenclature (CN) for the manufacturing industry. However, in order to apply some sectoral taxonomies, in section II of the article, these sectors will be converted to the 3-digit level of NACE–Eurostat nomenclature. Thus, we will consider all sectors of the CN at the 6-digit level which, according to the CN-NACE conversion, are classified as manufacturing industry sectors. In total, we consider 4706 sectors. The data used in the article concern EU-15 imports (the information supplied by Eurostat), although these flows will be referred in what follows as exports to the EU-15.

Let x be exports to the EU-15. Indices i ($i = 1, \ldots, I$), j ($j = 1, \ldots, J$) and t express, respectively, the country from which the trade flow originates, the sector and the period. In the case analysed, $I = 24$ (see note 2) and $J = 4706$. For the sake of simplicity, $t = 0$ refers to 1995 and $t = 1$ to 2003. The world is designated as p.

We consider two matrices with the generic element $x_{ji}(t)$ representing the exports to the EU-15 of country i, in sector j, in period t. It is possible to

[2] Belgium and Luxembourg are presented together due to limitations in the available data.

obtain $x_i(t)$ which represents total exports from country i to the EU-15, in period t.[3] The share of sector j in total exports of country i to the EU-15 is designated as $v_{ji}(t)$ and, thus, the J values of $v_{ji}(t)$ depict the export structure of country i to this geographical space.

II. Structural Change

To evaluate the degree of transformation of the CEECs' export structure to the EU-15 market, we use the Lawrence index (T_i) which compares the export structure of country i at two different moments (see the Annex for the formula). In the present case, we compare the export structure of each CEE country to the EU-15 at $t = 0$ and $t = 1$. T_i ranges between 0 and 1, increasing with structural transformation.

The results, presented in Table 1, reveal that the CEECs registered a more profound change in their export pattern to the EU-15 than did intra EU-15 exports, as shown by the simple average of T_i for both groups of countries.[4] In fact, among the 24 countries, the CEECs, together with Ireland, Greece and Finland, display the highest degrees of structural change, during the period analysed. More specifically, Latvia, Lithuania, Slovakia and Estonia are the economies with the highest changes in their export structure to the EU-15, while Slovenia is the CEE country that changed least in this regard.

Table 1: Degree of Structural Change

	T_i
Bulgaria	0.536
Czech Republic	0.472
Estonia	0.606
Hungary	0.523
Latvia	0.702
Lithuania	0.637
Poland	0.492
Slovakia	0.622
Slovenia	0.429
Romania	0.462
CEEC average	0.548
EU-15 average	0.352
EU total imports	0.228

Source: Authors' own calculations based on Eurostat-Comext.

[3] Of course, $x_{jp}(t)$ and $x_p(t)$ represent, in period t, the world exports to the EU-15 in sector j and the world total exports to the EU-15, respectively.
[4] Germany is the country with the most stable export structure between 1995 and 2003 ($T_i = 0.234$).

To explain the basis of the structural transformation identified above, we make use of a common procedure (Commission, 2003) which consists of breaking down commodities into several groups according to pre-defined criteria and evaluating the share of each category in the total exports of each CEE country. With this objective, three taxonomies are considered. Two of them, proposed by Peneder (2001), take into consideration the following sectoral characteristics: (i) a factor input criterion, which categorizes the sectors as mainstream, labour-intensive industries, capital-intensive industries, market-driven industries and technology-driven industries; (ii) a labour skills criterion, which considers low-skill industries, medium-skill/blue-collar workers, medium-skill/white-collar workers and high-skill industries. A third taxonomy used in this article breaks the sectors down according to the dynamism of EU-15 demand, in the period 1995–2003; three groups were considered: slow growth sectors (annual average growth rate below 5 per cent), medium growth sectors (annual average growth rate between 5 per cent and 10 per cent) and dynamic growth sectors (annual average growth rate above 10 per cent).[5] In what follows, we stress the main conclusions of this exercise. Let us first consider the results concerning the factor input criterion. Table 2 shows, for each CEE country, the share of each category in total exports.

According to the results of T_i, Latvia, Lithuania, Slovakia and Estonia are the economies with the most profound structural changes during the period 1995–2003. Nevertheless, the factor input taxonomy allows us to conclude that the respective determinants are of a different nature. In all cases, there is a very sharp decrease in capital-intensive industries but, while Latvia and Lithuania predominantly register a significant increase in labour-intensive industries, in the case of Slovakia and Estonia that decrease is compensated mainly by an increase in technology-driven industries.

An additional feature to be stressed is the increase of the share of technology-driven industries in total exports in all CEECs, particularly in Hungary. In fact, in the case of this country, while this category displays a strong increase, all the remaining categories are reduced. This evolution confirms the gradual emergence, in the CEECs, of a specialization that is no longer solely based on low value-added goods, but also on goods with greater technological content, as also shown by Henriot and Inotaï (1998).

[5] Note that there is not a direct correspondence between the categories of each typology. For instance, let us consider the 13 sectors that are classified as technology-driven in the context of the factor input criterion: one belongs to medium-skill/blue-collar workers, nine to medium-skill/white-collar workers and only three to high-skill industries; and as regards the dynamism of EU demand, two fall in the less dynamic category, six in the medium growth one, whereas only five belong to the most dynamic category.

Table 2: Exports to EU-15 by 'Factor Inputs' (% of Total Exports)

	1995					2003				
	1	*2*	*3*	*4*	*5*	*1*	*2*	*3*	*4*	*5*
Bulgaria	12.61	25.86	41.87	16.12	3.54	14.52	37.23	29.29	13.91	5.07
Czech Republic	29.42	26.71	22.43	9.70	11.74	30.26	17.95	18.37	7.07	26.35
Estonia	9.60	38.05	33.98	7.32	11.05	13.87	43.15	8.96	7.46	26.56
Hungary	21.80	24.05	20.41	12.41	21.33	18.71	12.01	10.88	6.80	51.60
Latvia	4.52	30.57	60.42	3.76	0.73	8.31	69.40	14.87	4.96	2.46
Lithuania	6.09	33.62	47.13	9.03	4.12	10.68	55.23	16.23	9.29	8.47
Poland	17.63	38.30	24.26	9.92	9.90	22.64	28.37	17.86	9.36	21.77
Slovakia	20.87	27.19	33.94	7.78	10.21	21.12	22.46	14.81	5.40	36.20
Slovenia	28.16	28.67	18.12	7.67	17.38	30.12	21.91	17.89	5.68	24.41
Romania	15.33	47.67	21.93	13.57	1.50	17.59	50.14	10.28	16.46	5.53
CEEC average	16.60	32.07	32.45	9.73	9.15	18.78	35.78	15.95	8.64	20.84
EU-15 average	20.46	13.08	25.95	17.73	22.78	18.96	10.86	19.27	15.78	35.12

Notes: 1 mainstream; 2 labour-intensive industries; 3 capital-intensive industries; 4 marketing-driven industries; 5 technology-driven industries.
Source: Authors' own calculations based on Eurostat-Comext.

In spite of this trend towards a more technologically sophisticated pattern of exports, in 2003, amongst the 24 countries considered, the eight countries with the highest share of labour-intensive sectors belong to the CEECs. Moreover, the category of labour-intensive industries is the only category where the CEECs registered, in average terms, a share in total exports higher than that of the EU-15.[6] In this respect, it is possible to define two groups of countries: a first one which includes some less developed CEECs – Latvia, Lithuania, Romania, Estonia and Bulgaria – more specialized in labour-intensive products and displaying an increase in the share of labour-intensive exports; and another group, made up of Hungary, the Czech Republic, Slovenia, Slovakia and Poland, where the labour-intensive category registers the largest decreases.

We consider now the labour skill taxonomy. Table 3 presents the results.

With regard to this taxonomy, the general trend shows a fall in the share of low-skill industries in the CEECs. However, in comparison with the EU-15, it is the lower-skill sectors that still predominate in these countries. Bulgaria is the only economy that has an evident increase in low-skill industries. In fact, 70 per cent of Bulgarian exports to the EU-15 market, in 2003, are still intensive in low-skill labour.

[6] Portugal (21.56 per cent) and Greece (16.71 per cent) register the highest values in the context of the EU-15.

Table 3: Exports to EU-15 by 'Labour Skills' (% of Total Exports)

	1995				*2003*			
	1	*2*	*3*	*4*	*1*	*2*	*3*	*4*
Bulgaria	61.23	7.26	24.07	7.45	70.04	8.78	14.32	6.86
Czech Republic	33.95	28.08	25.41	12.56	20.52	33.55	25.21	20.72
Estonia	44.69	21.00	23.53	10.78	27.52	33.66	34.11	4.71
Hungary	36.81	24.81	29.85	8.52	16.20	29.58	38.95	15.27
Latvia	35.70	21.00	42.13	1.16	33.64	57.73	6.01	2.63
Lithuania	49.71	14.09	35.67	0.53	45.07	27.97	24.55	2.41
Poland	45.36	31.60	18.11	4.93	26.22	44.33	23.15	6.30
Slovakia	36.75	27.59	29.04	6.62	21.13	51.78	18.33	8.76
Slovenia	33.40	32.14	25.54	8.92	22.89	36.22	25.15	15.74
Romania	64.72	17.00	13.71	4.57	60.34	17.57	16.00	6.09
CEEC average	44.23	22.46	26.71	6.60	34.36	34.12	22.58	8.95
EU-15 average	35.24	20.27	30.32	14.17	29.17	22.08	26.30	22.45

Notes: 1 low-skill industries; 2 medium-skill/blue-collar workers; 3 medium-skill/white-collar workers; 4 high-skill industries.
Source: Authors' own calculations based on Eurostat-Comext.

The most favourable evolution occurs again in Hungary, the Czech Republic, Poland, Slovakia and Slovenia. The Czech Republic is the CEE economy that, in 2003, displayed the highest share of high-skill industries (occupying tenth place in the context of the 24 countries considered).

Finally, let us consider a third taxonomy based on EU-15 demand dynamism. The results are presented in Table 4.

The evidence shows a trend towards an increasing specialization in the most dynamic sectors, in terms of EU demand, in all CEECs. Hungary deserves, once again, a special mention with an increase in the share of its most dynamic sectors from 11.33 per cent, in 1995, to 31.70 per cent, in 2003. This value is clearly the highest in the context of the CEECs and well above the simple average of the CEECs (13.19 per cent) and even of the EU-15 (20.45 per cent). Latvia and Bulgaria display the lowest values in the most dynamic category. In short, in spite of the fact that CEECs show a relevant structural change in their export pattern, there are important differences amongst them (Kaminski, 2001; Brenton and Manzocchi, 2002; Landesmann, 2002; Havlik, 2004).

In fact, while in Romania, Bulgaria, Latvia, Lithuania and Estonia the traditional industrial specialization, based on labour-intensive industries, is still dominant, in most central European countries there is a trend towards new industries, requiring greater labour skills and being technologically intensive. The star performer, in this respect, is Hungary, but these changes have also occurred in the Czech Republic, Slovakia, Poland and Slovenia.

Table 4: Exports to EU-15 by Demand Dynamism (% of Total Exports)

	1995			2003		
	1	*2*	*3*	*1*	*2*	*3*
Bulgaria	54.05	44.16	1.80	34.76	61.66	3.58
Czech Republic	39.35	55.19	5.46	21.66	62.15	16.19
Estonia	42.11	46.41	11.48	26.49	48.89	24.62
Hungary	31.81	56.86	11.33	15.12	53.18	31.70
Latvia	72.76	26.89	0.34	51.98	46.19	1.83
Lithuania	64.26	33.62	2.12	32.73	56.33	10.94
Poland	36.22	59.61	4.18	22.73	66.79	10.48
Slovakia	38.94	53.38	7.68	16.51	68.55	14.93
Slovenia	33.48	62.87	3.66	25.37	67.79	6.84
Romania	30.37	66.09	3.54	18.06	71.18	10.76
CEEC average	44.33	50.51	5.16	26.54	60.27	13.19
EU-15 average	42.63	47.48	9.89	28.94	50.61	20.45

Notes: 1 annual average growth rate <5%; 2 annual average growth rate 5% ≤ <10%; 3 annual average growth rate ≥10%.
Source: Authors' own calculations based on Eurostat-Comext.

This differentiation points to a core–periphery structure across the CEECs, confirming the conclusions of Gligorov *et al*. (2003).

III. Structural Similarity and Convergence of the Export Structures

Have the above-mentioned changes in the CEECs' export pattern produced a convergence with the intra-EU export structures of the EU-15 market or, alternatively, a tendency towards divergence?

The relationship between trade integration and similarity of export structures is not obvious. There are, however, two arguments that support the possibility of divergence between export patterns, both related to increased specialization of the integrated economies. The first one is the comparative advantage mechanism. The standard drivers of comparative advantage are differences in endowments or technologies. Another mechanism that may promote specialization is clustering, driven by labour market effects, linkages with customers and suppliers and knowledge spillovers, as emphasized by the new economic geography. As trade integration reduces the extent to which firms need to be close to final consumers, it enables production to move in line with the comparative advantage and/or the clustering mechanisms (Midelfart-Knarvik *et al*., 2003).

In this section, we evaluate the degree of similarity for each of the CEECs' export structure to the EU-15 *vis-à-vis*: (i) world exports to the EU-15 and (ii) exports between the EU-15, at the bilateral level.

Table 5: Structural Similarity with EU-15 Total Imports and EU-15 Imports from Selected Countries

	Total		*USA*		*China*		*Japan*	
	1995	*2003*	*1995*	*2003*	*1995*	*2003*	*1995*	*2003*
Bulgaria	0.739	0.759	0.850	0.880	0.813	0.792	0.929	0.937
Czech Republic	0.583	0.545	0.748	0.752	0.764	0.748	0.865	0.818
Estonia	0.769	0.754	0.804	0.865	0.788	0.795	0.954	0.924
Hungary	0.594	0.573	0.770	0.749	0.765	0.704	0.885	0.821
Latvia	0.858	0.853	0.938	0.931	0.897	0.863	0.981	0.965
Lithuania	0.838	0.810	0.927	0.912	0.876	0.846	0.980	0.950
Poland	0.664	0.599	0.816	0.808	0.777	0.777	0.914	0.869
Slovakia	0.658	0.661	0.827	0.824	0.840	0.833	0.877	0.762
Slovenia	0.648	0.638	0.800	0.746	0.804	0.823	0.893	0.845
Romania	0.765	0.734	0.891	0.871	0.792	0.756	0.952	0.919
CEEC average	0.712	0.693	0.837	0.834	0.812	0.794	0.923	0.881
EU-15 average	0.495	0.473	0.686	0.656	0.824	0.768	0.864	0.813

Source: Authors' own calculations based on Eurostat-Comext.

For that purpose, we use the Krugman specialization index and start by applying it to the comparison with the structure of world exports to the EU-15 market (E_{ip}).[7] E_{ip} ranges between 0 and 1, increasing with structural dissimilarity. The evolution of the index between the two periods is also interesting as it provides an indication of the degree of structural convergence. In this context, a negative sign for the difference between the indices in 1995 and 2003 means a process of structural convergence. On the contrary, a positive sign indicates a process of structural divergence. Table 5, column 1, presents the results.

Table 5 shows that similarity with the structure of world exports to the EU-15 is greater for the EU-15 itself than for the CEECs. The ten countries with the highest structural similarity in this respect, expressed by a lower value for E_{ip}, do not belong to the CEEC group. However, Table 5 also reveals a convergence of the CEECs' export structure towards that of the world exports to the EU-15 between the two years analysed. In fact, only Bulgaria and Slovakia show a different evolution. The CEE country that converged most rapidly, in the period analysed, was Poland, while the Czech Republic and Hungary reveal, by the end of the period, the greatest similarity. This last result corroborates the conclusion obtained by Landesmann and Stehrer (2002) for the period 1993–98.

[7] See the Annex for formula.

In spite of this general tendency, there is still an important dissimilarity between CEECs' export structure and that of the world exports to the EU-15 space. In 2003, for the whole of the 25 countries, the highest differences occurred in some CEECs: Latvia, Lithuania, Bulgaria, Estonia and Romania.

To complement the previous analysis we have also compared the export structure of each CEE country to the EU-15 with that of the main EU-15 partners from the rest of the world (i.e. those with the highest shares in EU-15 total imports): USA, China and Japan. In this case, the sectoral export shares for each country *i* are not compared with the corresponding shares for world exports to the EU-15, as above, but with the shares for these individual countries. Table 5 reports these bilateral measures. We observe that CEECs have converged with all these three countries but dissimilarity is still high, mainly with Japan. Besides, comparing the similarity of the EU-15 and CEECs with each one of these countries, it is always higher in the former case, exception made to China, in 1995.

Keeping still our attention on the comparison at the bilateral level but now between the CEECs and each EU-15 Member State, we obtain a full matrix of bilateral indices of structural similarity. Table 6 presents the results for the year 2003. For each CEE country, we have highlighted in italics the most similar EU-15 country and in bold the most different.

Element by element study of the matrix is laborious, but it is worth drawing attention to some important features. The Czech Republic and Hungary resemble the EU-15 the most on average: the former being most similar to Germany, followed by Italy, Austria and Spain; the latter to Austria, followed by Germany, the UK and France. Other CEECs similar to the EU-15 are Poland, Slovenia and Slovakia. Poland is fairly similar to Italy, followed by Spain, Germany, France and Austria; Slovenia to Italy, followed by Spain, France and Germany; Slovakia to Spain, followed by Germany, Italy, France and Austria.

Turning to EU-15, Italy is the country that is, on average, most similar to the CEECs. This fact may explain why this is the country with the highest decrease in terms of EU-15 market share between 1995 and 2003. Ireland is the economy with the most different export structure from the CEECs, depicting the highest dissimilarity with eight CEECs.

Finally, Table 7 compares the similarity of the export structure to the EU-15 of each CEE country with the corresponding structures of both the EU-15 and the group of the remaining CEECs. With this objective, the average of the bilateral indices is calculated for each group. The last two columns of Table 7 show, respectively for the EU-15 and the CEECs, the number of countries in relation to which the export structure of each CEEC has converged.

Table 6: Structural Similarity at Bilateral Level (2003)

	Bulgaria	*Czech Republic*	*Estonia*	*Hungary*	*Latvia*	*Lithuania*	*Poland*	*Slovakia*	*Slovenia*	*Romania*
Austria	0.794	0.580	0.709	*0.556*	0.860	0.833	0.643	0.677	0.653	0.784
Belg-Lux.	0.821	0.662	0.821	0.706	0.891	0.854	0.696	0.706	0.723	0.817
Denmark	0.793	0.681	0.731	0.694	*0.839*	*0.784*	0.694	0.787	0.725	0.790
Finland	0.854	0.756	*0.669*	0.733	0.840	0.857	0.788	0.827	0.808	0.851
France	0.817	0.592	0.819	0.640	0.897	0.857	0.630	0.677	0.632	0.805
Germany	0.815	*0.544*	0.788	0.598	0.889	0.854	0.622	0.662	0.636	0.796
Greece	0.841	**0.847**	0.882	**0.852**	0.895	0.857	0.843	0.864	0.776	0.855
Ireland	**0.920**	0.834	**0.899**	0.815	**0.939**	**0.919**	**0.877**	**0.906**	**0.885**	**0.921**
Italy	*0.739*	0.574	0.772	0.651	0.859	0.809	*0.591*	0.673	*0.605*	0.727
Netherlands	0.825	0.682	0.799	0.661	0.879	0.846	0.720	0.759	0.756	0.808
Portugal	0.745	0.658	0.790	0.715	0.845	0.794	0.695	0.705	0.717	*0.691*
Spain	0.802	0.582	0.825	0.650	0.894	0.849	0.612	*0.640*	0.621	0.784
Sweden	0.839	0.643	0.767	0.658	0.865	0.838	0.676	0.739	0.714	0.816
UK	0.846	0.610	0.810	0.616	0.904	0.868	0.693	0.735	0.707	0.821

Source: Authors' own calculations based on Eurostat-Comext.

Table 7: Average Levels of Structural Similarity

	1995		*2003*		*Number of converging structures*	
	With EU-15	*With CEECs*	*With EU-15*	*With CEECs*	*With EU-15 (0-14)*	*With CEECs (0-9)*
Bulgaria	0.806	0.717	0.818	0.741	4	3
Czech Republic	0.693	0.678	0.660	0.691	13	1
Estonia	0.820	0.685	0.792	0.717	9	3
Hungary	0.698	0.686	0.682	0.727	9	2
Latvia	0.889	0.769	0.878	0.788	11	4
Lithuania	0.867	0.709	0.844	0.721	10	4
Poland	0.751	0.654	0.699	0.656	12	6
Slovakia	0.733	0.688	0.740	0.729	5	1
Slovenia	0.731	0.725	0.711	0.724	10	5
Romania	0.821	0.686	0.805	0.689	12	3

Source: Authors' own calculations based on Eurostat-Comext.

The evidence presented in Table 7 reveals that, while in 1995 all CEEC export structures were more similar to the other CEECs than to the EU-15, in 2003 all the CEECs (with the exception of Bulgaria and Slovakia) increased their similarity to the EU-15, but the Czech Republic, Hungary and Slovenia became more similar to the EU-15 than to the remaining CEECs. As happened in the case of world exports to the EU-15, Poland shows the strongest convergence process. On the other hand, the CEECs predominantly diverged relatively from the remaining nine members of the CEEC group. As expected, the number of countries to which each CEE country converged is always higher in the case of the EU-15 than in the case of the CEEC group.

Several factors may account for the fact that the EA free-trade orientation has produced greater convergence with the specialization pattern of the EU-15.

First, it may be argued that structural convergence was driven by CEEC-bound FDI. Since the political changes occurring at the beginning of the 1990s, there has been a continuous increase in FDI to the region. The FDI inward stock increased from a value of $32,607 million, in 1995, to $146,920 million, in 2002, in part stimulated by the EA, as they provided market access facilities as well as a favourable business climate for the development of the private sector. According to the European Competitiveness Report (Commission, 2003), the CEECs with the largest stock of FDI in the manufacturing industry, measured either in absolute terms or per employee, are Poland, Hungary, the Czech Republic, Slovakia and Slovenia. These are precisely the countries that we identified as displaying the highest degree of structural similarity with the

EU-15 both in 1995 and in 2003 and all of them significantly increased their structural similarity with the old members in the period analysed. In fact, it seems that the shift from unskilled labour to skilled labour-intensive and technology-based production in CEE countries – which was particularly significant in the above-mentioned countries – was largely due to FDI activity (Kaminski, 1999, 2001; Hunya, 2000; Caetano *et al*., 2004).

Second, convergence in terms of industrial structure has been associated with convergence in terms of income per head (Wacziarg, 2001; Barrios *et al*., 2002). In spite of the fact, pointed out by Barrios *et al*. (2002), that the direction of causality between income convergence and structural convergence may not be clear-cut – one can argue that the nature of a country's industrial specialization can be, simultaneously, an outcome and a determinant factor of income per head (for instance, specialization in high-tech sectors is likely to generate higher income than specialization in traditional industries) – CEEC incomes rapidly converged towards the EU-15 level, in the period analysed.

Finally, economic geography helps to explain why the industrial structure of the more advanced CEECs is converging towards the richer countries of the EU-15. Economic centrality (associated to pecuniary externalities) can trigger FDI (and other investments) to increasing returns to scale sectors with high-to-medium levels of technology, thus bringing specialization and trade patterns in the recipient countries more in line with the 'core' of the integrated space. Schürmann and Talaat (2000) used a measure of economic centrality (travel costs between points within the overall regions weighted by the purchasing power that each point represents) and concluded that the most peripheral regions at present are the Baltic states, northern Sweden and Finland, Bulgaria and Romania, while Hungary, Slovenia, the Czech Republic, Slovakia and the south-west of Poland are already no more peripheral than Ireland, Spain or Portugal and less peripheral than Greece. It is interesting to note that it is, precisely, this latter group of CEECs that has simultaneously received the highest stock of FDI, shifted its specialization more rapidly away from the low-skill, labour-intensive sectors towards the technologically more demanding and skill-based sectors and displayed a higher structural similarity to rich Germany.

IV. Quality Ranges Analysis

The analysis developed so far ignored the fact that goods are not homogeneous. However, specialization may also occur at the intra-sectoral level if goods are differentiated by quality. Thus, even for similar export patterns in

terms of the previous analysis, it is possible to observe significant differences in terms of R&D intensity, skills and specific factor content between high and low quality products within the same sector. In fact, a look at the high weight of vertical intra-industry trade (i.e. trade in similar products but differentiated by quality) on total intra-industry trade in all CEECs (see, for instance, Caetano *et al*., 2004, p. 50), together with the increasing importance of the two-way trade in these countries,[8] points to the need for an evaluation in terms of quality ranges within the sectors. To this end, we use a methodology, common in international economics, in which product quality is evaluated by its unit value (Nielsen and Lüthje, 2002). This procedure is based on the fact that, in a perfect information context, there is a positive relationship between the price and the quality of a product's variety. However, even in a context of imperfect information, quality will be reflected in price (Stiglitz, 1987).

Quality is evaluated by the unit value of exports to the EU-15, being the unit value of world exports to the EU-15 of that product taken as term of comparison. It is, therefore, a matter of calculating, for each sector j, the ratio between the unit value of the exports of country i to the EU-15 and the unit value of world exports to the same market (φ_{ji}) (see the Annex for the formula). We consider five quality ranges: HH (very high), H (high), M (medium), L (low) and LL (very low). We assume that if $\varphi_{ji} > 1.30$, x_{ji} is assigned to HH_i. The remaining ranges considered are H_i if φ_{ji} ε[1.15, 1.30], M_i if φ_{ji} ε[1/1.15, 1.15], L_i if φ_{ji} ε[1/1.30, 1/1.15] and LL_i if $\varphi_{ji} < 1/1.30$. Table 8 shows the share of each category in total exports.

In 2003, Estonia, Slovakia and Hungary were the economies with the highest share in category HH_i. All CEECs show a positive evolution towards a reduction of LL_i and an increase of HH_i. The ratio between the weight of the two higher categories and the two lower ones – λ_i – reflects this fact as in all CEECs except Slovenia it increases in the period under consideration. It is also worth pointing out that while in 1995 the ratio was lower than 1 in all CEECs, in 2003 the three above-mentioned countries (Estonia, Slovakia and Hungary) had already widely surpassed that threshold.

However, it is possible that some countries have higher quality in the sectors in which they are strongly specialized. Being so, it is important to complement Table 8 with an evaluation in terms of the number of products.[9] Table 9 reports the results.

[8] According to Caetano *et al*. (2004, Fig. 2.10), in the period 1993–2000, with data disaggregated at the 5-digit level of the SITC classification, intra-industry trade increased in all CEECs but Slovenia and Bulgaria. On average, these countries registered an increase of this type of trade from less than 40 per cent to almost 50 per cent of total trade.

[9] In this case, instead of the value of x_{ji} being assigned to each category, it is assigned the value 1 and the weight of each category is obtained relatively to the total number of sectors (J).

Table 8: Quality Ranges (% of Total Exports) – Volume of Trade

	1995					2003					λ_i	
	HH_i	H_i	M_i	L_i	LL_i	HH_i	H_i	M_i	L_i	LL_i	1995	2003
Bulgaria	6.1	3.6	34.1	12.6	43.6	9.9	5.3	47.0	10.8	26.9	0.17	0.40
Czech Republic	9.2	2.8	25.7	10.7	51.5	18.8	5.0	33.2	11.9	31.1	0.19	0.55
Estonia	9.9	3.0	28.6	15.7	42.8	37.0	6.7	30.8	6.7	18.8	0.22	1.71
Hungary	11.5	13.0	38.2	8.4	28.9	26.7	13.2	29.3	5.5	25.3	0.66	1.29
Latvia	3.1	1.7	61.6	3.5	30.1	10.3	5.0	53.5	6.2	25.0	0.14	0.49
Lithuania	3.3	4.4	29.0	11.8	51.5	10.4	7.2	28.3	11.7	42.4	0.12	0.33
Poland	5.5	5.0	34.3	10.0	45.2	6.9	4.8	37.4	15.6	35.4	0.19	0.23
Slovakia	4.5	10.3	30.0	11.1	44.1	28.3	13.6	32.3	4.5	21.4	0.27	1.62
Slovenia	19.8	17.4	20.8	8.3	33.7	23.7	3.4	35.8	10.2	27.0	0.89	0.73
Romania	3.8	2.1	28.1	14.1	51.9	15.7	11.0	30.1	11.8	31.5	0.09	0.62
CEEC average	7.7	6.3	33.0	10.6	42.3	18.8	7.5	35.8	9.5	28.5	0.29	0.80
EU-15 average	23.3	13.1	45.8	7.0	11.0	33.0	10.7	37.7	6.4	12.1	2.31	2.86

Source: Authors' own calculations based on Eurostat-Comext.

Table 9: Quality Ranges (% of Total Exports) – Number of Products

	1995					2003					λ'_i	
	HH'_i	H'_i	M'_i	L'_i	LL'_i	HH'_i	H'_i	M'_i	L'_i	LL'_i	1995	2003
Bulgaria	13.5	2.8	11.3	6.7	65.6	26.2	4.7	14.0	6.7	48.3	0.23	0.56
Czech Rep.	18.1	4.2	17.2	8.6	51.9	31.1	5.8	19.4	7.7	35.9	0.37	0.84
Estonia	16.6	3.3	12.3	6.2	61.5	36.8	5.9	14.1	4.6	38.6	0.29	0.99
Hungary	22.9	6.9	16.7	7.2	46.3	37.9	6.5	16.2	6.1	33.3	0.56	1.13
Latvia	11.8	3.2	13.9	6.0	65.1	33.7	5.4	11.5	5.0	44.4	0.21	0.79
Lithuania	14.3	3.9	9.2	6.1	66.5	34.3	4.7	13.0	6.5	41.5	0.25	0.81
Poland	15.3	4.1	16.6	7.3	56.8	26.7	6.3	18.8	7.7	40.6	0.30	0.68
Slovakia	15.4	4.7	15.0	7.1	57.8	30.5	4.8	16.9	6.7	41.1	0.31	0.74
Slovenia	25.9	5.2	15.5	6.9	46.5	36.8	5.7	15.8	6.2	35.5	0.58	1.02
Romania	12.2	4.1	13.1	6.2	64.3	27.5	5.7	15.1	7.4	44.3	0.23	0.64
CEEC av.	16.6	4.2	14.1	6.8	58.2	32.2	5.5	15.5	6.5	40.4	0.33	0.82
EU-15 av.	37.7	9.2	23.7	6.6	22.8	46.2	8.2	20.0	5.5	20.2	1.74	2.28

Source: Authors' own calculations based on Eurostat-Comext.

The ratio between the weight of the two higher categories and the two lower ones is now depicted by λ'_i. Comparing λ'_i with λ_i, the most interesting result is the fact that it is precisely in the case of countries displaying a λ_i higher than one – i.e. Estonia, Slovakia and Hungary – that λ'_i is lower than λ_i. One may then conclude that in these countries, exports of a higher quality correspond to sectors with a high weight on trade, i.e. where the country is

specialized. In terms of evolution, CEECs show an increase of λ_i' and HH_i' and a decrease of LL_i', in the line of the results for λ_i.

In short, in spite of the strong heterogeneity among CEECs, two main conclusions may be retained from the evidence presented in this section. First, there is a visible increase in the relative quality level of their exports to the EU-15, during the period considered. This catching-up process confirms the results of Landesmann (2002), Landesmann and Stehrer (2002) and Caetano *et al*. (2004) and shows that besides the inter-sectoral structural convergence process identified in the previous section, for the generality of the CEECs, there is an intra-sectoral structural transformation towards goods of higher quality. Second, in spite of this tendency, the average quality level of CEEC exports is still, in general, inferior to that of the EU-15.

V. Is Adjustment to Trade Liberalization Concluded?

As Europe Agreements have provided for the dismantling of formal EU trade barriers on industrial products (both tariff and quantitative restrictions) for imports from the CEECs prior to enlargement, a key issue is whether most of the direct economic benefits of EU membership in terms of enhanced trade and industrial restructuring have already been reaped. If this is the case, future trade developments will be determined by the natural evolution of income, endowments and preferences in market economies and no dramatic increase in trade is expected.

Empirical studies on this subject do not allow a consensual answer to this question. One common approach consists in using a gravity model (Brenton and Manzocchi, 2002). With this methodology, Nilsson (2000) defends that the trade adjustment is almost complete. On the contrary, Paas (2003) concludes that what he designates as East-West trade is still only 0.7 times as large as other flows under *ceteris paribus* conditions. Therefore, an increase in trade can be expected. Also with this type of modelling, the European Integration Consortium (2000) concludes that EU imports from the CEECs are only 60 per cent of that of 'normal' market economies and 40 per cent of the 'normal' level amongst EU members.

However, Brenton and Manzocchi (2002) suggest that predictions which point to an incomplete adjustment to trade liberalization may be overestimated due to two fundamental reasons. First, because the standard error associated with the gravity model tends to be high and predictions will then have a high associated margin of error. Second, because such estimates are based on levels of GDP in terms of purchasing power parities (GDP-PPP) whilst estimates of a country's trade potential should be made on the basis of

the international value of the goods and services it produces (i.e. GDP at market exchange rates), not on how well off its inhabitants are.[10] An additional problem of the gravity models, highlighted by Silva and Tenreyro (2003), concerns the fact that, in the presence of heteroscedasticity, log-linearizing a gravity equation and estimating the parameters by ordinary least squares, as is usually done, will lead to inconsistent estimates. To sum up, the results based on this methodology are inconclusive.

Nevertheless, there are valid reasons to consider that trade adjustment is still incomplete amongst the new members.

The incorporation of the CEECs into the EU involves access to the single market. The likely effects of the impact of the Single Market on CEEC trade flows are difficult to assess particularly because of the need to have an accurate measure for non-tariff barriers to trade, to take into account dynamic and scale effects and because the timetable for the expansion of the single market is uncertain, as there are likely to be transitional periods and derogations for some measures. Besides, the level of compliance of CEE companies with existing EU legislation appears to be (in general) low (Eurochambres, 2003).

However, in terms of a direct influence on trade flows, the main issue of the single market is the removal of the technical barriers to trade (TBT). It is estimated that more than 70 per cent of CEEC exports are subject to barriers to trade that arise from differences in national technical rules and regulations and the need for multiple testing and conformity assessment for firms selling in different markets (Brenton and Manzocchi, 2002; Landesmann and Stehrer, 2002). Removing these barriers will have structural implications that will depend upon the importance of technical regulations across sectors and countries. In their survey, at the firm level, of the expected impact of the removal of TBT in four CEECs – Bulgaria, Hungary, Poland and Slovakia – Čaplánová and Dezséri (2002) conclude that it is high in most cases.

Another element that may impact on trade in the future is related to FDI. It is broadly accepted that FDI has been a decisive factor in the change of the specialization and export patterns of the CEECs. The question that arises is therefore to what extent FDI flows to the CEECs have already attained their limit or if, on the contrary, significant FDI inflows are still to be expected in the near future.

The ratios between FDI inflows in the CEECs in 1998, 2000 and 2002 and the average for the period 1991–96 are, respectively, 2.68, 3.27 and 3.57,

[10] See also Gros and Gonciarz (1996) for an additional support to the use of income at market exchange rates in the calculation of trade potential. For an alternative point of view see, for instance, Iversen (1998), who argues that the proper measure of the transition economies' incomes should lie somewhere between the two measures and that it is impossible to settle this matter on a purely theoretical basis.

showing that these flows continue to increase (UNCTAD, 2003). Besides, it is to be expected that membership of the EU will stimulate further flows, in spite of the fact that privatization-related projects are essentially completed. First, because EU membership serves as a guarantee of transparency in the legal and business environment as a result of the *acquis communautaire* and increases the confidence of foreign investors, given the possibility of appeal to the EU courts in the case of legal disputes. Second, entry to the single market fully removes customs frontiers and trade barriers associated with technical standards and allows full access to government procurement contracts throughout the EU. In any case, the *acquis* compliance of the CEECs opens up new opportunities for investment and cost-optimizing strategies. These reasons are enough to expect a dramatic change in the CEE climate for foreign investors (Barry, 2003).

Additionally, it is important to note that investment flows previously destined for the cheap labour markets of southern Europe may be diverted to central and eastern Europe. Indeed, cursory evidence has shown that FDI flows into some southern European countries have declined during the 1990s, even if it has not been proven that the East receives what would otherwise flow to the South (see, for instance, Buch *et al*., 2001). However, some CEECs are in a better position than Portugal, Spain or Greece as regards host country characteristics that motivate an entrepreneur's decision to invest abroad, as shown, for instance, by Crespo *et al*. (2004), based on data from the Institute for Management Development, for the cases of the Czech Republic and Hungary.

A well-recognized CEEC weakness concerns the quality of the physical infrastructure, mainly those that connect to the EU centre. However, the Cohesion Fund – for environmental and infrastructure projects in countries with a per capita income of less than 90 per cent of the EU average – and, specifically, the implementation of the TINA transport infrastructures plans for CEECs – can be decisive in this respect. This is particularly relevant for the countries with a less favourable position in terms of centrality – the Baltic States, Bulgaria and Romania (Schürmann and Talaat, 2000). The improvement of economic centrality is not only an important stimulus for increased trade (Redding and Venables, 2004) but an additional factor for FDI attraction as well.

Conclusions

This article has evaluated the adjustment in CEEC exports to the EU-15 market, in the aftermath of the Europe Agreements. In the period

1995–2003, the CEECs showed a notable transformation of their export structure. The analysis of the composition of CEEC exports to the EU-15 reveals that the share of unskilled, labour-intensive products declined over the period analysed. On the other hand, there was a growth in technology and skilled, labour-intensive products and, as a consequence, the aggregate share of these products in EU-15-oriented exports increased. Nevertheless, this evolution has been uneven among CEECs. Hungary is the most dynamic economy in this respect, expressed in a significant and increasing share in high-technology and high-skilled industries, followed by the Czech Republic, Slovakia and Slovenia. However, in spite of these changes, a large part of CEEC exports is still labour-intensive and concentrated in low-skill sectors, mainly in the case of Bulgaria, Estonia, Latvia, Lithuania and Romania.

Moreover, there is evidence that CEEC trade specialization is evolving quickly towards the western partners, mainly in the more advanced CEECs. Some reasons were proposed for this occurrence, namely convergence in terms of income per head and inward FDI. Smaller differences in industrial structures may contribute to more rapid adherence to the monetary union as vulnerability to sectoral shocks is reduced. In spite of this convergence, most CEEC exports are still more similar to each other than to the EU-15. The exceptions, in this context, are the Czech Republic, Hungary and Slovenia.

Concerning intra-sectoral structural transformation, there was also a catching-up process expressed in a quality upgrading of CEECs exports, even if the average quality level is still higher in the case of EU-15 countries.

To sum up, the evidence presented in this article allows to conclude that the deep transformation of CEECs' export structures led to a convergence movement both at inter- and intra-sectoral levels: on the one hand, the CEECs' export structures converged towards the corresponding structures of the EU-15; on the other hand, relevant transformations were also observed within the sectors, expressed in a quality upgrading of exports from CEECs to the EU-15 market.

Finally, we argue that there are valid reasons to assume that the trade adjustment process is not concluded and that, with the accession to the EU, further industrial restructuring and relocation in the CEECs will occur.

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Annex

Indices i, j and t designate, respectively, the country from which the trade flow originates, the sector and the period; p designates the world. We consider that $t = 0$ in the year 1995 and $t = 1$ in the year 2003.

$x_{ji}(t)$ and $x_{jp}(t)$ represent, for sector j and period t, respectively the exports of country i to the EU-15 and world exports to the same market.

i) The Lawrence index (T_i) is given by:

$$T_i = \beta \sum_{j=1}^{J} |v_{ji}(1) - v_{ji}(0)| \quad [1]$$

where $v_{ji}(t) = x_{ji}(t)/x_i(t)$ and

$$x_i(t) = \sum_{j=1}^{J} x_{ji}(t).$$

It is assumed that $\beta = {}^1/_2$.

ii) The Krugman index is given by:

$$E_{ip}(t) = \beta \sum_{j=1}^{j} |v_{ji}(t) - v_{jp}(t)| \quad [2]$$

where $v_{jp}(t) = x_{jp}(t)/x_p(t)$. Once again, it is assumed that $\beta = {}^1/_2$.

iii) $$\varphi_{ji}(t) = UV(x_{ji}(t))/UV(x_{jp}(t)) \quad [3]$$

where UV is the exports' unit value.

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