EUGENIUSZ KWIATKOWSKI, PAWEŁ GAJEWSKI

Comparative Analysis of three Accession Countries on Impact of Changes in Competitiveness on Labour Market Development[1]

Abstract

The paper constitutes a comparison of research outcomes carried out by the Czech, Hungarian and Polish teams on the dependency between domestic and external competitiveness one the one side and employment in manufacturing industry branches on the other. We try to verify the hypothesis of a positive effect of the rising competitiveness on labour market developments.

Generally we can conclude that the hypothesis mentioned has been confirmed only partially. These were mostly the industries of deteriorating competitiveness, which reduced employment. The industries, where positive changes in the level of competitiveness occurred, showed no clear pattern with regard to employment changes. We believe that among the possible factors of this situation are the restructuring and modernisation processes, which have been experienced in the industrial branches of the transition economies with differentiated intensity and range.

The complexity of the problem researched is confirmed also by the econometric analyses performed by all three national teams. Despite of numerous attempts, the results are not fully satisfactory, especially as far as the influence of external competitiveness on employment is concerned.

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1. Introduction

The main goal of the analysis is to discuss impact of changes in competitiveness on labour market developments in three countries: Czech Republic, Hungary and Poland. To this purpose industry has been divided into two and three digit level sections in order to identify sections of improving and worsening competitiveness. For assessing changes in competitiveness three competitiveness indicators were used. In the further parts of the paper we present common methodology of research, statistical data used, econometric model taken in the statistical analysis and empirical results in the three countries.

The paper is based on three analytical papers devoted to labour market impacts of changes in competitiveness in Hungary, the Czech Republic and Poland. The paper on Hungary was prepared by Sandor Buzas (Buzas 2005), the paper on the Czech Republic – by Lenka Filipova, Jaromir Gottvald and Milan Simek (Filipova, Gottvald, Simek 2005), whilst the Polish one was prepared by Pawel Gajewski, Pawel Kaczorowski and Tomasz Tokarski (Gajewski, Kaczorowski, Tokarski 2005).

2. Common methodology of research

In order to carry out an analysis of impact of changes in competitiveness on labour market developments, a methodology was employed assuring comparability of outcomes. It consists of a common theoretical model and two competitiveness indices measuring competitiveness of the industry. One of them (CCA) will measure competitiveness in the domestic market, whilst the two others (CCB and CCC) refer to the ability to compete in external markets.

2.1. Theoretical model

The three national teams made use of the framework based on a theoretical model suggested by Tokarski (2003). Underlying this model are the following assumptions:

- The production process is described by the production function:

$$Y = AK^{\alpha}L^{1-\alpha}; \quad A > 0,\ \alpha \in (0;1) \tag{a.1}$$

where Y is the output generated, K and L are (respectively) physical capital and labour outlays. A in the production function (A.1) is total factor

productivity (TFP). TFP can be equated to the production, which can be manufactured from unit outlays of K and L. It arises from the fact that for K=L=1 the output equals to A (Y=A). α i 1-α are elasticities of Y with respect to K and L or (on grounds of the Clark's marginal division theory) shares of those production factors in output.

- An increase of competitiveness (reflected by a competitiveness indicator's θ increase) leads to higher TFP levels. A particular case of TFP is the solution of the following equation:

$$\ln(A) = \beta_0 + \beta_1 \theta; \qquad \beta_0 \in \Re; \beta_1 > 0 \tag{a.2}$$

β_0 in equation (a.2) is some constant, which does not have any direct economic interpretation. β_1 in the equation is the growth rate of TFP, which would occur as a result of the competitiveness indicator rising by 1. The mentioned interpretation of the β_1 parameter arises from the fact that taking natural logarithms in equation (a.2) and derivating it with respect to time yields:

$$\frac{\dot{A}}{A} = \beta_1 \dot{\theta}$$

- Growth of capital stock is described by the identity:

$$\dot{K} = I - \delta K \tag{a.3}$$

where I is the volume of investments and $\delta \in (0;1)$ is a depreciation rate of capital. In short and medium run the capital/output ratio $v_K \equiv K/Y$ is approximately constant

- Labour demand is derived from the reversed production function with a given K and Y. From equations (a.1) and (a.2), after taking logs and derivating with respect to time, we can arrive at a following equation:

$$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + \alpha \frac{\dot{K}}{K} + (1-\alpha)\frac{\dot{L}}{L} \tag{a.4}$$

$$\frac{\dot{A}}{A} = \beta_1 \dot{\theta} \tag{a.5}$$

Substituting equation (a.5) to (a.4) yields:

$$\frac{\dot{Y}}{Y} = \beta_1 \dot{\theta} + \alpha \frac{\dot{K}}{K} + (1-\alpha)\frac{\dot{L}}{L}$$

and, after several simple transformations:

$$\frac{\dot{L}}{L} = \frac{1}{1-\alpha}\frac{\dot{Y}}{Y} - \frac{\beta_1}{1-\alpha}\dot{\theta} - \frac{\alpha}{1-\alpha}\frac{\dot{K}}{K} \tag{a.6}$$

Equation (a.6) defines labour demand growth rate $\frac{\dot{L}}{L}$ in dependence from output growth rate, $\frac{\dot{Y}}{Y}$, changes of economy's competitiveness $\dot{\theta}$ and the pace of capital accumulation $\frac{\dot{K}}{K}$.

From the equation presented above it emerges moreover that the labour demand growth rate, in the model employed, should be positively dependant on output growth rate, but negatively dependant on both competitiveness and capital stock changes.

Furthermore, dividing equation (a.3) by K and accounting for assumption 4 (permanence of capital/output ratio v_K in short and medium run) we arrive at a following formula:

$$\frac{\dot{K}}{K} = \frac{1}{v_K} i - \delta \tag{a.7}$$

where i is an investment rate defined as a share of investments in output (i≡I/Y). Merging equations (a.7) and (a.6) we arrive at a dynamic labour demand function given by the formula:

$$\frac{\dot{L}}{L} = \frac{\alpha\delta}{1-\alpha} - \frac{\beta_1}{1-\alpha}\dot{\theta} - \frac{\alpha}{v_K(1-\alpha)} i + \frac{1}{1-\alpha}\frac{\dot{Y}}{Y} \tag{a.8}$$

From equation (a.8) a conclusion can be drawn that the labour demand growth rate should be a linear and positive function of output growth rate and negative function of both the competitiveness indicator changes and the investment rate.

The relations between the level of labour demand and its dynamics can also be found on grounds of the Harrod-Domar model, a compilation of the Harrod growth model, 1939, 1942 and Domar growth model, 1962. In the Harrod-Domar growth model (Allen 1975, s. 199–202 or Barro, Sala-i-Martin 1995, s.46–49) a Leontief production function is employed defined as: $Y = \min\left\{\frac{K}{v_K}; \frac{AL}{v_L}\right\}$, where K and L are defined as above. The AL expression are effective labour outlays (that is, labour outlays enhanced by the average level of technology, dynamics of which reveals a character of the Harrod technical progress), whilst v_K i v_L>0 are capital/output and labour/output ratios[2], constant in time.

[2] Labour/output ratio v_L in the Harrod-Domar model is defined as number of effective labour units necessary to generate a unit of output Y.

It emerges from the Leontief production function that one of the conditions to achieve full accommodation of production potential in the Harrod-Domar growth model is the fulfilment of the following relation: $Y = \frac{AL}{v_L}$. This in turn means that with a constant labour/output ratio v_L the following relation occurs: $\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + \frac{\dot{L}}{L}$, implying an equation: $\frac{\dot{L}}{L} = -g + \frac{\dot{Y}}{Y}$, where $g \equiv \frac{\dot{A}}{A}$ is the Harrod exogenous technical progress rate. From the equation mentioned it appears that the labour demand growth rate in the Harrod-Domar model is a difference between the output growth rate and the technical progress rate g.

2.2. Competitiveness indices

The three competitiveness indices employed in the research were suggested by CASE. These are the following measures of a given's country competitiveness, related to market penetration:

- share of domestic production in total domestic demand (CCA), and
- share of export from a given country in total demand of the European Union (CCB);
- in case of Poland, following poor preliminary results with CCB defined as above, the CCB indicator was modified to: the share of exports from Poland in total internal exports of the European Union (CCC).

The **CCA** index (domestic economy's share in total consumption) is given by the following formula:

$$CCA_{it} = \frac{Y_{it}}{Y_{it} - Ex_{it} + Im_{it}}$$

where: CCA_{it} – value of competitiveness indicator CCA of *i*-th branch in year *t*;

Y_{it} – volume of production sold in *i*-th branch in year *t*;

Ex_{it} – volume of export of *i*-th branch in year *t*;

Im_{it} – volume of import of *i*-th branch in year *t*.

An increase of the CCA reveals relative improvement of the domestic production against import, which means a rising competitiveness of the economy (industry).

A **CCB** index, defined as the share of import from a given country in the total EU demand, is given by a formula:

$$CCB_{it} = \frac{Ex_{it}^{UE}}{D_{it}^{UE}}$$

where: CCB_{it} – value of competitiveness indicator CCB of *i*-th branch in year *t*;

Ex_{it}^{UE} – volume of export from Poland to the European Union of *i*-th branch in year *t*;

D_{it}^{UE} – volume of total demand in the European Union for goods manufactured by *i*-th branch in year *t*.

An increase of the CCB value would indicate improving evaluation of goods brought from the analysed country, thus rising competitiveness of the country of their origin.

A **CCC** index was introduced on the recommendation of CASE, following poor statistical results obtained regarding CCB in Poland. In fact, it is a modification of the aforementioned measure and defined as the share of import from a country in total internal exports of the European Union, which can be written as:

$$CCC_{it} = \frac{Ex_{it}^{UE}}{IEx_{it}^{UE}}$$

CCC_{it} – value of competitiveness indicator CCC of *i*-th branch in year *t*;

Ex_{it}^{UE} – volume of export from Poland to the European Union of *i*-th branch in year *t*;

IEx_{it}^{UE} – volume of total internal exports in the European Union comprising products manufactured by *i*-th industry in year *t*.

A general economic interpretation is similar to the one referring to CCB, that is: CCC evaluates ability of a branch to compete on external markets.

2.3. Econometric model

The statistical analyses are carried out on the basis of the theoretical model presented in point 2.1. The following type of equations, emerging from the Harrod-Domar model, was estimated:

$$\frac{\dot{E}}{E} = -g + \gamma\dot{\Theta} + \phi\frac{\dot{Y}}{Y} \qquad \text{(a.9)}$$

where E stands for employment (approximated by number of employees), g>0 is a rate of technical progress, which is not directly linked to competitiveness changes in the economy (but is an effect of e.g. *learning by doing*), $\phi \in (0;1)$-*ceteris paribus*-elasticity of employment with respect to output, whilst $\gamma \in \Re$ is a growth rate of labour demand being a result of the competitiveness indicator increase by $\dot{\Theta} = 1$. If, however, rising competitiveness lifts up productivity of capital and labour, than-also on grounds of the Leontief-type production function-γ coefficient describing an impact of competitiveness on the size of labour demand in equation (a.9) should be negative.

The equation (a.9) in a ready-to-use form can be written as follows:

$$\Delta \ln Et = \alpha 1 + \alpha 2 \Delta \ln Yt + \alpha 3 \Delta CCAt(orCCBorCCC) - \alpha 4 \frac{I}{Y} t + \varepsilon t$$

For purposes of estimations with use of cross-section and time-series pooled data, the fixed effect method was employed. The national teams, accordingly to their preliminary results and other specifics estimated the basic equation in several versions (but not necessarily in all of the given below). In every case, the dependant variable was the rate of growth approximant of number of employees – $\Delta \ln E_t$.

- Equation with constant slope coefficients (semi-elasticities of employment with respect to CCA and CCB) but intercepts diversified across industries:

$$\Delta \ln E_{it} = \alpha_1 + \alpha_2 D_{2i} + ... + \alpha_n D_{ni} + \beta_2 \Delta \ln Y_{it} + \beta_3 \Delta CCA_{it}(orCCBorCCC) - \beta_4 \frac{I}{Y}_{it} + \varepsilon_{it}$$

- Equation with constant slope coefficients (semi-elasticities of employment with respect to CCA and CCB) but intercepts diversified across time:

$$\Delta \ln E_{it} = \gamma_0 + \gamma_2 D_{t0} + ... + \gamma_4 D_{tm} + \beta_2 \Delta \ln Y_{it} + \beta_3 \Delta CCA_{it}(orCCBorCCC) - \beta_4 \frac{I}{Y}_{it} + \varepsilon_{it}$$

- Equation with constant slope coefficients (semi-elasticities of employment with respect to CCA and CCB) and intercepts diversified across both industries and time:

$$\Delta \ln E_{it} = \alpha_1 + \alpha_2 D_{2i} + ... + \alpha_n D_{ni} + \gamma_0 + \gamma_2 D_{t0} + ... + \gamma_4 D_{tm} +$$
$$+ \beta_2 \Delta \ln Y_{it} + \beta_3 \Delta CCA_{it}(orCCBorCCC) - \beta_4 \frac{I}{Y}_{it} + \varepsilon_{it}$$

- Equation with common constant but diversified slope coefficients:

$$\Delta \ln E_{it} = \alpha_1 + \phi_1 D_{2i} \Delta CCA_{it}(orCCBorCCC) + ... + \phi_2 D_{ni} \Delta CCA_{it}(orCCBorCCC) +$$
$$+ \beta_2 \Delta \ln Y_{it} + \beta_3 \Delta CCA_{it}(orCCBorCCC) - \beta_4 \frac{I}{Y}_{it} + \varepsilon_t$$

3. Statistical data

The statistical data availability used for estimations differ across the analysed countries.

Table 1 shows periods, for which particular competitiveness indicators have been calculated and used for estimations. Therefore, it indicates not only data availability for competitiveness indices components, but also accounts for availability of data on all variables considered in statistical analyses.

Table 1. Periods analysed in statistical analyses by country and competitiveness index

		CCA	CCB	CCC
Czech Republic	NACE 2 digits	1998–2001	1998–2000	–
	NACE 3 digits	1998–2001	1998–2000	–
Hungary	NACE 2 digits (22 sections)	1997–2001	1997–2001	–
	NACE 3 digits (93 sections)	1999–2000	1999–2000	–
Poland	NACE 3 digits (91 sections)	1995–2001	1995–2001	1995–2001

While performing the research, the national teams encountered various problems regarding data. Some of the most important, which have been reported, are listed below:

Czech Republic

- Instead of turnovers of each 3 digit CPA product group, value of production revenues was used in the related NACE group, because the CPA (product) data were not available in such a detailed level of classification (the 3 digit level NACE data were available).
- The converse situation was in the field of foreign trade statistics: Import/Export statistics relate only to CPA (products), but not NACE (producers).

- In the structural analyses based on 3-digit levels of classifications, in individual sectors visible and invisible mistakes appeareed that were impossible to eliminate. In the case of "share indicators" visible mistakes were all figures over 100 % and negative values. Those industries were deleted on 3-digit level of classification from database and not further analysed. From this "corrected" database 2-digit level database was recalculated. It is worth mentioning, that the scale of this problem is quite evident, as almost half of the NACE 3 digit database was deleted.
- Short time series, which may have influenced the estimation results.

Hungary

- At the NACE 3 digit level data from 1998 and later are not compatible with data from prior years. Moreover, NACE and CPA databases are reported not be compatible as well.
- In the structural analysis based on 3-digit levels of classifications, in individual sectors visible and invisible mistakes appeared that were impossible to eliminate. In the case of "share indicators" visible mistakes were all figures over 100 % and negative values. On contrary to the Czech side however, those industries were not deleted, since there is no consistency whether this is a mistake or data re-export problems. This issue is subject to further research and the problem should be resolved in the next stage of work.

Poland

- No deflators for investment outlays were available in NACE 3 digit breakdown. The deflators used were estimates and the reliability of them are very hard to be evaluated. The investment rates had to be calculated as investment shares in revenues.
- Revenues were deflated with the NACE 2 digits deflator in absence of more detailed (NACE 3 digits) deflators.

4. Comparison of empirical research

4.1. Changes in employment

The most impressive growth in employment (nearly eleven-fold) of all three countries was seen in Hungarian NACE 267 (Cutting, shaping and finishing of ornamental and building stone). A substantial increase of

employment in this industry was also recorded in Poland (by 61%). Another well performing industry turned out to be NACE 323 (Manufacture of television and radio receivers…), which revealed highest growth of employment in the Czech Republic (by 333%) and took third position in this ranking among Hungarian industries (increase of 148%). In Poland employment rose most in NACE 296 (Manufacture of weapons and ammunition), mainly due to an extremely high jump increase in 2001, by almost 200%. One more thing worth mentioning is a good performance of NACE 204 (Manufacture of wooden containers). In the three researched countries employment in this industry went up by 55–68%.

Table 2. NACE 3-digit branches with highest reported increase in employment in particular countries

Hungary		Czech Republic		Poland	
Best 6 branches (NACE 3-digit)					
NACE	Change (1998–2001, 1998=1)	NACE	Change (1997–2001, 1997=1)	NACE	Change (1995–2001, 1995=1)
267	11.88	323	4.33	296	4.67
314	2.52	300	3.74	362	1.75
323	2.48	372	2.17	204	1.68
172	1.57	284	1.87	267	1.61
316	1.56	343	1.83	252	1.60
204	1.55	314	1.81	343	1.53

Source: own elaborations based upon the country reports.

Table 3. NACE 3-digit branches with highest reported decline in employment in particular countries

Hungary		Czech Republic		Poland	
Worst 6 branches (NACE 3-digit)					
NACE	Change (1998–2001, 1998=1)	NACE	Change (1997–2001, 1997=1)	NACE	Change (1995–2001, 1995=1)
191	0.51	176	0.55	171	0.39
181	0.45	273	0.51	293	0.39
341	0.44	293	0.50	172	0.37
247	0.41	183	0.36	191	0.34
334	0.25	191	0.32	247	0.29
183	0.21	355	0.14	363	0.19

Source: own elaborations based upon the country reports.

While analysing industries, which saw substantial decline in employment, it can be concluded that the light industry branches (NACE 171 to 193) were among those most severely affected in all three countries. A half of the six branches listed in table 3 in each country belong to this group. The apparent exception is NACE 172 (textile weaving) in Hungary (see: table 2).

4.2. CCA index and employment

Table 4. NACE 3-digit branches of highest growth in domestic competitiveness in the researched countries

	Hungary			Czech Republic			Poland		
	NACE	CCA Change 1998–2001 1998=1	Employment Change 1998–2001 1998=1	NACE	CCA Change 1997–2001 1997=1	Employment Change 1997–2001 1997=1	NACE	CCA Change 1995–2001 1995=1	Employment Change 1995–2001 1995=1
1	341	31.39	0.44	335	5.89	1.43	296	1.73	4.67
2	172	14.32	1.57	174	4.82	1.71	342	1.40	0.97
3	267	10.52	11.88	323	3.87	4.33	263	1.25	1.19
4	192	5.33	0.80	353	2.09	0.91	362	1.25	1.75
5	262	4.76	1.06	268	1.35	1.13	221	1.14	1.49
6	313	2.43	0.92	181	1.32	0.82	267	1.12	1.61

Source: own elaborations based upon the country reports.

As it can be seen from table 4, most of the branches, which improved its competitiveness in domestic markets also increased their employment. A completely reversed situation occurred only in Hungarian NACE 341 (manufacture of motor vehicles) where outstanding improvement in competitiveness was accompanied by substantial reductions of employment. Several other industries listed in table 4 saw some declines in number of employment, the reductions there were however much less severe. We can only presume that the reductions may have resulted from profound restructuring actions implemented in those industries, which were necessary to achieve a more competitive position in the market. Although it is difficult to construct a clear pattern of dependency between changes in CCA value and employment, it should be noted that in case of each country the industry ranked on the top regarding employment increase was also among those, which significantly improved its internal competitiveness.

Table 5. NACE 3-digit branches of highest decline in domestic competitiveness in the researched countries

	Hungary			Czech Republic			Poland		
	NACE	CCA Change 1998–2001 1998=1	Employment Change 1998–2001 1998=1	NACE	CCA Change 1997–2001 1997=1	Employment Change 1997–2001 1997=1	NACE	CCA Change 1995–2001 1995=1	Employment Change 1995-2001 1995=1
1	300	0.58	1.43	*192*	*1.22*	*0.58*	364	0.37	0.74
2	177	0.50	1.36	*291*	*1.18*	*0.79*	363	0.32	0.19
3	171	0.46	0.68	*233*	*1.00*	*n.a.*	183	0.31	0.48
4	316	0.40	1.56	287	0.91	0.77	351	0.27	0.77
5	365	0.18	1.03	267	0.69	0.86	192	0.27	0.48
6	293	0.00	0.88	300	0.06	3.74	321	0.21	0.54

Source: own elaborations based upon the country reports.

The majority of industries (12), in which a decline in domestic competitiveness was observed, also experienced reductions in employment. This regularity is observed particularly in Poland, whilst Hungarian industry seems to deny it. Perhaps the most surprising is the large increase of employment in the Czech NACE 300 (computers and office machines). As we will see soon, this cannot be anyhow justified by the growth in external competitiveness of this branch (see: table 7). On the whole, the Czech Republic shows surprisingly positive results in this field considering that only three industries recorded deterioration in the level of domestic competitiveness[3].

4.3. CCB index and employment

The most outstanding growth in external competitiveness in our panel analysis was recorded in Hungarian NACE 351 (Building and repairing of ships and boats). A very expansive turned out to be also the Hungarian manufacture of jewellery (NACE 362) and manufacture of cement, lime and plaster (NACE 265). A similar high increase in CCB values (ca sixteen-fold) in both Hungary and Poland was observed in manufacturing of batteries and accumulators (NACE 314). One should bare in mind however, that it took 6 years in Poland to achieve this increase, while only half of this time was needed in Hungary.

[3] The substantial deterioration may have occurred in up to three other branches, which had to be excluded due to evidently implausible data. Exclusion of eleven Hungarian branches was executed for the same reasons.

The Czech industry saw highest growth in CCB in processing of nuclear fuels (NACE 233) and manufacturing of radio, television and communication equipment (NACE 322 and 323). A well represented group of activities comprise manufacturing of transport equipment. To the already mentioned Hungarian NACE 351 we should add NACE 352 in Poland (manufacture of railway, tramway locomotives, rolling stock) and NACE 353 (production of aircraft) in both Poland and the Czech Republic. Poland stands out from the group due to the presence of two agricultural branches in the ranking (NACE 156 and 157: grain mill products and animal feeds, respectively).

Table 6. NACE 3-digit branches of highest growth in external competitiveness in the researched countries

	Hungary			Czech Republic			Poland		
	NACE	CCB Change 1998–2001 1998=1	Employment Change 1998–2001 1998=1	NACE	CCB Change 1997–2001 1997=1	Employment Change 1997–2001 1997=1	NACE	CCB Change 1995–2001 1995=1	Employment Change 1995–2001 1995=1
1	351	77.75	1.17	233	15.09	n.a.	314	16.61	0.89
2	362	28.97	0.85	323	12.00	4.33	157	10.29	1.36
3	265	23.37	0.65	322	10.19	0.74	352	4.40	0.57
4	314	15.59	2.52	353	5.13	0.91	353	3.58	0.68
5	322	14.93	0.67	245	3.67	0.86	243	3.45	0.89
6	243	14.18	0.89	316	2.90	1.63	156	2.92	0.65

Source: own elaborations based upon the country reports.

If we collate changes in external competitiveness together with developments of employment, a conclusion can be drawn of some kind of negative correlation between these two variables in most cases. In 13 out of 18 branches listed in table 6[4], the volume of employment decreased. A fair growth was recorded only in manufacturing of TV and radio transmitters section (NACE 323) in the Czech Republic and in Hungarian NACE 314. The deepest reduction of employment was performed in Polish enterprises producing tramways, railway and rolling stock (NACE 352).

[4] Out of 17 in fact, as no data on employment changes in the Czech NACE 233 is available.

Table 7. NACE 3-digit branches of highest decline in external competitiveness in the researched countries

	Hungary			Czech Republic			Poland		
	NACE	CCB Change 1998–2001 1998=1	Employment Change 1998–2001 1998=1	NACE	CCB Change 1997–2001 1997=1	Employment Change 1997–2001 1997=1	NACE	CCB Change 1995–2001 1995=1	Employment Change 1995–2001 1995=1
1	355	0.13	1.02	231	0.72	n.a.	192	0,52	0,48
2	342	0.07	1.10	191	0.55	0.32	296	0,52	4,67
3	268	0.06	1.06	242	0.54	1.47	355	0,50	0,47
4	365	0.05	1.03	265	0.48	0.58	267	0,47	1,61
5	160	0.02	1.03	335	0.26	1.43	242	0,46	0,48
6	271	0.02	0.99	300	0.00	3.74	265	0,19	0,55

Source: own elaborations based upon the country reports.

The good results of the most expansive Hungarian branches must be appreciated, but some lagging industries in this country performed distinctively worst of all analysed. As it is presented in table 7, five worst Hungarian branches decreased their share in EU demand by 93 percentage points or more. With one exception of Czech NACE 300 (manufacture of office machinery and computers), which apparently vanished from the EU markets, this scale of decline was not seen elsewhere. More interestingly, this extraordinary decline was not linked neither with employment reductions nor with improvement in domestic competitiveness (see: table 5). All of the worst Hungarian industries practically increased or at least preserved its initial level of employment.
A different situation was observed in Poland. Employment went up in only two of six branches listed in table 7. If we compare tables 7 and 4, it becomes clear that employment increased only in those Polish industries (NACE 296: weapon and ammunition and NACE 267:processing of stone), which reoriented their activities towards domestic expansion, and did so successfully. A similar process probably occurred in the Czech NACE 365 (manufacture of clocks and watches).

4.4. CCC index and employment (Poland)

If competitiveness is measured by the share of export in total internal export of the European Union, only two out of ten best industries in Poland increased employment between 1995 and 2001 (see: table 8). Other branches saw declines in the number of employed. The average decline in the top ten

industries amounted to –4.3%. This can imply that the necessary condition of achieving success in foreign markets (revealed by the CCC growth) was a reduction of employment. This strengthens the hypothesis that indices measuring domestic and external competitiveness reveal opposite directions of impact on employment.

Table 8. NACE 3-digit branches of highest improvement in external competitiveness measured by CCC in Poland

	Poland		
	NACE	CCC Change 1995–2001 1995=1	Employment Change 1995–2001 1995=1
1	183	1.057	0.48
2	352	1.048	0.57
3	205	1.042	1.39
4	283	1.036	0.63
5	361	1.035	1.09
6	314	1.032	0.89

Source: own elaborations based upon the country reports.

Table 9. NACE 3-digit branches of highest decline in external competitiveness measured by CCC in Poland

	Poland		
	NACE	CCC Change 1995–2001 1995=1	Employment Change 1995–2001 1995=1
1	192	0.9919	0.48
2	274	0.9914	0.60
3	201	0.9910	0.76
4	182	0.9892	0.64
5	204	0.9194	1.68
6	265	0.8982	0.56

Source: own elaborations based upon the country reports.

In case of branches arranged in table 9, a decline in value of competitiveness indices entailed reduction of employment. The direction of dependency stands in line with our expectations emerging from theoretical assumptions regarding appraisal of relations between the competitiveness

measures and labour demand. The obtained results can be interpreted as follows: industries, which recorded deterioration in competitiveness (that is industries, which have lost the competitiveness battle against foreign enterprises) were forced to limit their area of activity and, consequently, reduce employment. The only exception from this regularity occurred in NACE 204 (manufacture of wooden containers), where a significant increase of employment (by 68%) was recorded during the researched period.

4.5. Conclusions from statistical analyses

- In the Czech case a regular correlation was found between employment as dependent and revenues and (partly) investment rate as explanatory variable. A surprising result obtained was the lack of dependency on NACE 3-digit level between changes in any of competitiveness indicator and employment. The possible explanation are: lack of lags in the estimated equations (impossible to include due to short time series) or the rigidity of labour market, where only the level a production is changing and the level of employment is relatively stable in mid term, and the change of market share is implicated by the changing productivity (in this case: number of employees/ level of production). On NACE 2-digit level, some cases are found of changes in domestic market shares being significant, and in every case negatively correlated to the change of the level of employment. In short term growing market share seems to be linked with decreasing (in relative terms) employment. In absolute terms growing output accompanied by increasing productivity can foster employment growth. The Czech results also reveal very little correlation between the two competitiveness indices, which suggest different character of domestic and external competitiveness.
- The Hungarian results show weak dependency between employment and both competitiveness measures as far as cross section analyses are concerned. CCA on 2 digit level turned out to be significant (and negative) in 2000 and nearly significant (with the same sign) in 2001. CCB on the other hand was nearly significant (and positive) only in 1997. These estimations cannot be however considered successful if we account for other variables' coefficients and the model's statistics. Somewhat better results were obtained in case of the pooled data regressions on 2 digit level. Regardless of the variant, the pattern was CCA index significant (or nearly significant) and negative and CCB insignificant. But an attempt to confirm these relations on the NACE 3

digit level was not successful. In neither case did CCA or CCB appear significant in these estimations. The other coefficients however are mostly consistent in confirming the expected dependency between employment and both output and investment rate.

- In the Polish case both descriptive and statistical analyses of an impact of these measures on labour demand in particular branches lead to conclusions that, firstly, a fairly strong and positive impact existed of CCA indicator value on employment in the Polish industrial branches. Secondly, the dependency between the indicator reflecting the expansion to foreign markets (CCC) on one hand and the volume of employment on the other hand, seems to have been negative in the analysed period. The expansion to external markets of the European Union was linked with a decline in employment in many branches. Thirdly, the changes in values of the indicators turned out to have much smaller impact on employment than the volume of production as the estimated values of parameters show.

5. Final remarks

The main goal of the three country studies was to answer the question about dependency between competitiveness and employment in industrial branches of economy. Having compared and analysed all the main findings reported by the Czech, Hungarian and Polish teams, the following key conclusions can be drawn.

- The most unequivocal results were achieved for Poland. Both descriptive and econometric analyses show that growth in domestic competitiveness of a branch is most commonly accompanied by an increase of employment. On contrary, in order to compete effectively in foreign markets, industry branches enterprises tend to reduce employment.
- The Czech results are more ambiguous and the interpretation is not that straightforward. The econometric analysis carried out suggests that domestic competitiveness is negatively correlated with level of employment. However, branches ranked at the top regarding improvement of domestic competitive-ness do not reveal this regularity. Moreover, no significant dependency has been found between external competitiveness and employment in the Czech industry.
- Perhaps the biggest problems were reported by the Hungarian side. Neither descriptive nor econometric analysis entitles to propose unequivocal

conclusions regarding the character of an impact of competitiveness in an industry on level of employment. However, at NACE 2-digit level, some negative dependency was found between domestic competitiveness and employment. No clear evidence of an influence of external competitiveness on labour markets was found.

This inconsistency of results obtained in the Czech and Hungarian studies to certain extent is explained by various data problems. Most importantly, the research teams grappled with problems of inexact databases, not fully compatible industry classifications over the whole period and short time-series.

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ANNEX

NACE 3-digit classification of branches analysed in the paper.

NACE	Name
151	Production, processing and preserving of meat and meat products
152	Processing and preserving of fish and fish products
153	Processing and preserving of fruit and vegetables
154	Manufacture of vegetable and animal oils and fats
155	Manufacture of dairy products
156	Manufacture of grain mill products, starches and starch products
157	Manufacture of prepared animal feeds
158	Manufacture of other food products
159	Manufacture of beverages
160	Manufacture of tobacco products
171	Preparation and spinning of textile fibres
172	Textile weaving
173	Finishing of textiles
174	Manufacture of made-up textile articles, except apparel
175	Manufacture of other textiles
176	Manufacture of knitted and crocheted fabrics
177	Manufacture of knitted and crocheted articles
181	Manufacture of leather clothes
182	Manufacture of other wearing apparel and accessories
183	Dressing and dyeing of fur; manufacture of articles of fur
191	Tanning and dressing of leather
192	Manufacture of luggage, handbags and the like, saddlery and harness
193	Manufacture of footwear
201	Sawmilling and planing of wood; impregnation of wood
202	Manufacture of veneer sheets; manufacture of plywood, laminboard, particle board, fibre board and other panels and boards

ANNEX – cont.

203	Manufacture of builders carpentry and joinery
204	Manufacture of wooden containers
205	Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials
211	Manufacture of pulp, paper and paperboard
212	Manufacture of articles of paper and paperboard
221	Publishing
222	Printing and service activities related to printing
231	Manufacture of coke oven products
232	Manufacture of refined petroleum products
233	Processing of nuclear fuel
241	Manufacture of basic chemicals
242	Manufacture of pesticides and other agro-chemical products
243	Manufacture of paints, varnishes and similar coatings, printing ink and mastics
244	Manufacture of pharmaceuticals, medicinal chemicals and botanical products
245	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations
246	Manufacture of other chemical products
247	Manufacture of man-made fibres
251	Manufacture of rubber products
252	Manufacture of plastic products
261	Manufacture of glass and glass products
262	Manufacture of non-refractory ceramic goods other than for construction purposes; manufacture of refractory ceramic products.
263	Manufacture of ceramic tiles and flags
264	Manufacture of bricks, tiles and construction products, in baked clay
265	Manufacture of cement, lime and plaster
266	Manufacture of articles of concrete, plaster and cement
267	Cutting, shaping and finishing of ornamental and building stone
268	Manufacture of other non-metallic mineral products
271	Manufacture of basic iron and steel and of ferro-alloys

ANNEX – cont.

272	Manufacture of tubes
273	Other first processing of iron and steel
274	Manufacture of basic precious and non-ferrous metals
275	Casting of metals
281	Manufacture of structural metal products
282	Manufacture of tanks, reservoirs and containers of metal; manufacture of central heating radiators and boilers
283	Manufacture of steam generators, except central heating hot water boilers
284	Forging, pressing, stamping and roll forming of metal; powder metallurgy
285	Treatment and coating of metals; general mechanical engineering
286	Manufacture of cutlery, tools and general hardware.
287	Manufacture of other fabricated metal products
291	Manufacture of machinery for the production and use of mechanical power, except aircraft, vehicle and cycle engines
292	Manufacture of other general purpose machinery
293	Manufacture of agricultural and forestry machinery
294	Manufacture of machinetools
295	Manufacture of other special purpose machinery
296	Manufacture of weapons and ammunition
297	Manufacture of domestic appliances n.e.c.
300	Manufacture of office machinery and computers
311	Manufacture of electric motors, generators and transformers
312	Manufacture of electricity distribution and control apparatus
313	Manufacture of insulated wire and cable
314	Manufacture of accumulators, primary cells and primary batteries
315	Manufacture of lighting equipment and electric lamps
316	Manufacture of electrical equipment n.e.c.
321	Manufacture of electronic valves and tubes and other electronic components
322	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy.
323	Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods

ANNEX – cont.

331	Manufacture of medical and surgical equipment and orthopaedic appliances
332	Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment
333	Manufacture of industrial process control equipment
334	Manufacture of optical instruments and photographic equipment
335	Manufacture of watches and clocks
341	Manufacture of motor vehicles
342	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers
343	Manufacture of parts and accessories for motor vehicles and their engines
351	Building and repairing of ships and boats
352	Manufacture of railway and tramway locomotives and rolling stock
353	Manufacture of aircraft and spacecraft
354	Manufacture of motorcycles and bicycles
355	Manufacture of other transport equipment n.e.c.
361	Manufacture of furniture
362	Manufacture of jewellery and related articles
363	Manufacture of musical instruments
364	Manufacture of sports goods
365	Manufacture of games and toys
366	Miscellaneous manufacturing n.e.c.