Labour productivity as a factor forming the economic efficiency and competitive ability of the country

Produktivita práce jako faktor formující ekonomickou výkonnost a konkurenceschopnost země

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Abstract: The paper is focused on the evaluation of labour productivity in industry as a whole and in the selected branches in the Czech Republic in 1997–2001. The labour productivity index for employees is the ratio of industrial production indices and indices of the number of employees. Methods of regression and correlation analysis and development trends were applied for the mathematical-statistical analysis.

Keywords: labour productivity, industry, Czech Republic, statistical processing, development trends

Abstrakt: Příspěvek je zaměřen na posouzení vývoje produktivity práce v průmyslu celkem a vybraných odvětvích v období let 1997 až 2001 v České republice, hodnocenou indexy produktivity práce vypočítanými jako podíl indexů průmyslové produkce a indexů počtu zaměstnanců. Pro matematicko-statistickou analýzu byly použity metody regresní a korelační analýzy a trendy vývoje.

Klíčová slova: produktivita práce, průmysl, Česká republika, statistické zpracování, trendy vývoje

Joining the European Union will require an increase in the economic efficiency of our country. In the field of macroeconomics, it is a question of the economic efficiency growth formed with the growth acceleration of the per capita Gross Domestic Product, an increase in the labour productivity in particular branches of the national economy. It will be necessary to deal with the problem of the undue development of registered unemployment, the state budget deficit and the deficit of the balance of payments. After the expected price level increase after our joining the European Union, the inflation should be cut down to the demanded level as soon as possible. In the business sphere, conditions should be created for increasing the competitive level of our business in the international trade.

A long-term problem of our economy is the labour productivity growth, that is the work effectiveness spent on creating the utility values. Therefore, the labour productivity growth is one of the important factors, possibly the decisive factor of the wealth growth of the entire society. The labour productivity growth depends not only on the increasing level of engineering and production technology but also on the rate of transferring the results of science and research into the economic practice routine, on the qualification of the labour force and its initiative.

The objective of the paper is to evaluate the development of labour productivity in industry as a whole and in the selected branches during the given reference period in the Czech Republic.

MATERIAL AND METHODS

Labour productivity indices in industry as a whole and in the selected branches during a given period come from data sources of the Czech Statistical Office for the reference period 1997–2001. Selection of the period was influenced by the fact, that the Czech Statistical Office had used other labour index calculation methodology until 1996 and at present, they have changed the methodology once again. The labour productivity index of the given period was calculated as the proportion of industrial production index and employee-number index. The source of data were the Statistical Yearbooks of the Czech Republic (1998–2002). The problem of labour productivity is solved in Dornbusch, Fischer (1990), Jílek. et al. (2001), Mankiw (1999), Synek (1996). Mathematical-statistical processing of the data comes from the methodology given in papers of Minařík (1995–1996) and Seger (1998).

RESULTS AND DISCUSSION

Labour productivity indices for employees in industry and energy producing materials during the period 1997–2001 are given in Table 1. Parameters of the models of labour productivity development trends indices for employees in industry and energy producing materials in the period 1997–2001 are given in Table 2. Models of

Table 1. Labour productivity indices for employees in industry and energy producing materials during the period 1997–2001

	1997	1998	1999	2000	2001
Industry, total	107.7	103.8	102.1	109.5	105.5
Mining and quarrying	104.7	101.9	100.7	120.5	103.7
Mining and quarrying of energy producing materials	104.9	102.8	100.2	122.6	103.7
Manufacturing	109.2	104.4	102.1	108.5	105.9
Manufacture of food products; beverages and tobacco	103.2	104.8	102.8	108.3	99.8
Manufacture of textiles and textile products	101.6	100.6	91.1	118.8	103.1
Manufacture of wood and wood products	106.5	92.4	102.0	122.6	116.2
Manufacture of chemicals, chemical products and artificial fibres	107.1	107.5	103.3	104.6	105.8
Manufacture of rubber and plastic products	111.6	104.1	119.3	103.9	100.7
Manufacture of machinery and equipment n.e.c.	122.1	104.8	105.3	118.4	119.9
Manufacture of electrical and optical equipment	128.4	138.4	125.2	100.5	119.0
Manufacture of transport equipment	117.0	109.0	95.1	117.8	91.9
Electricity, gas and water supply	102.4	102.1	99.4	114.1	108.0

Table 2. Models of development trends of labour productivity indices for employees in industry and energy producing materials in the period 1997–2001

Labour productivity indices for employees in:	Model type	Model parameters			I_{yt}
		a_{yt}	b_{yt}	c_{yt}	
Industry, total (y_1)	1	–154.15	0.1300	–	0.0693
	2	2 540 159.5	–2 541.455	0.6357142	0.4077
Mining and quarrying (y_2)	1	–3 212.04	1.66000	–	0.3245
	2	–2 001 211.5	2 000.659	–0.499999	0.3444
Mining and quarrying of energy producing materials (y_3)	1	–3 371.42	1.7400000	–	0.3064
	2	–2 458 056.5	2 457.654	–0.614285	0.3320
Manufacturing (y_4)	1	605.77	–0.250000	–	0.1349
	2	3 739 719.1	–3 741.2357	0.935714	0.6131
Manufacture of food products; beverages and tobacco (y_5)	1	763.45	–0.3300000	–	0.1679
	2	–3 624 178.4	3 626.4271	–0.907142	0.5715
Manufacture of textiles and textile products (y_6)	1	–4 134.84	2.1200000	–	0.3356
	2	2 222 207.4	–2 225.3371	0.557142	0.3514
Manufacture of wood and wood products (y_7)	1	–9 807.1	4.960000	–	0.6616
	2	7 525 505.3	–7 534.1257	1.885714	0.7255
Manufacture of chemicals, chemical products and artificial fibres (y_8)	1	1 205.11	–0.5500000	–	0.4985
	2	2 027 747.4	–2 028.1071	0.507142	0.7378
Manufacture of rubber and plastic products (y_9)	1	4 505.72	–2.200000	–	0.4628
	2	–6 274 921.2	6 280.3714	–1.571428	0.6060
Manufacture of machinery and equipment n.e.c. (y_{10})	1	–1 724.98	0.920000	–	0.1738
	2	14 326 785.7	–14 334.765	3.585714	0.8203
Manufacture of electrical and optical equipment (y_{11})	1	11 456.63	–5.670000	–	0.6375
	2	1 581 313.3	–1 576.312	0.392857	0.6396
Manufacture of transport equipment (y_{12})	1	8 382.02	–4.140000	–	0.5405
	2	236 724.8	–232.5971	0.057142	0.5406
Electricity, gas and water supply (y_{13})	1	–4 532.48	2.3200000	–	0.6242
	2	1 650 952.8	–1 653.9942	0.414285	0.6380

Type of the function: (1) – linear, (2) – quadratic
Correlation index I_{yt} significant on the level: + $\alpha = 0.05$, ++ $\alpha = 0.01$

development trends of labour productivity indices for employees in industry and energy producing materials in the period 1997–2001. Equation for the linear model is $y_t = a_{yt} + b_{yt}x$. Equation for the quadratic model is $y_t = a_{yt} + b_{yt}x + c_{yt}x^2$. Correlation indices I_{yt} are not significant on the level $\alpha = 0.05$. Linear trends are increasing for variables industry total (y_1), mining and quarrying (y_2), mining and quarrying of energy producing materials (y_3), manufacture of textiles and textile products (y_6), manufacture of wood and wood products (y_7), manufacture of machinery and equipment n.e.c. (y_{10}), electricity, gas and water supply (y_{13}).

Linear trends are decreasing for variables manufacturing (y_4), manufacture of food products; beverages and tobacco (y_5), manufacture of chemicals, chemical products and artificial fibres (y_8), manufacture of rubber and plastic products (y_9), manufacture of electrical and optical equipment (y_{11}), manufacture of transport equipment (y_{12}) – see positive or negative regression coefficients b_{yt} in Table 2. These developmental trends of labour productivity indices for employees in industry and energy producing materials in the period 1997–2001 are in the graphical form given in Figures 1–13. These labour productivity indices for employees increased in seven branches and decreased in six ones, however, for industry as a whole, they demonstrate a slightly increasing trend. A strong increasing trend is in the branch manufacture of wood and wood products (y_7) and a strong decreasing trend in the branch manufacture of electrical and optical equipment (y_{11}). It is important that in branches demonstrating a decreasing trend in the labour productivity indices for employees, in the period under investigation, a decrease begins from relatively high values of indices and with the exception of the branch manufacture of transport equipment (y_{12}), the decrease did not fall below the fitted value of 100.

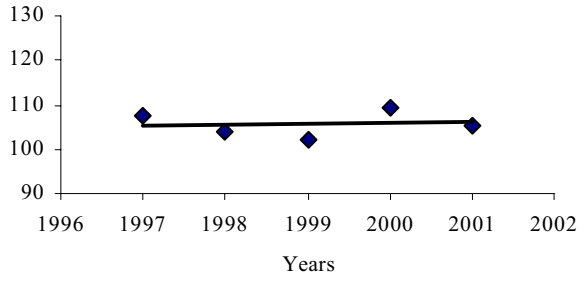

Figure 1. Labour productivity indices for employees. Industry, total

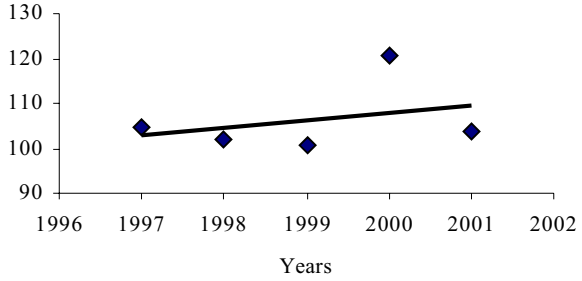

Figure 2. Labour productivity indices for employees. Mining and quarrying

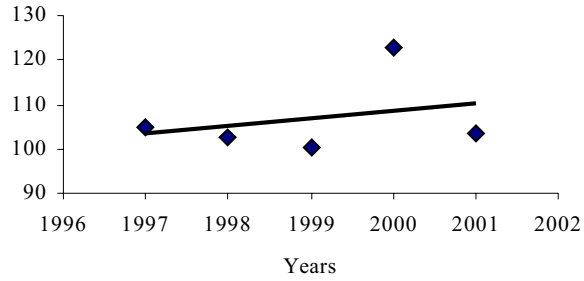

Figure 3. Labour productivity indices for employees. Mining and quarrying of energy producing materials

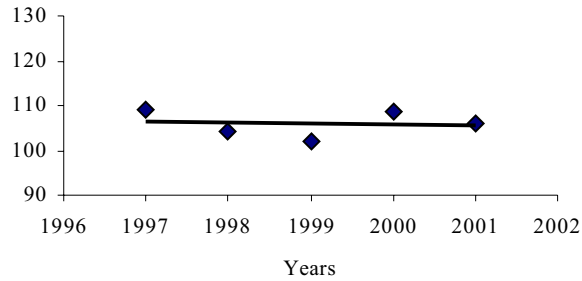

Figure 4. Labour productivity indices for employees. Manufacturing

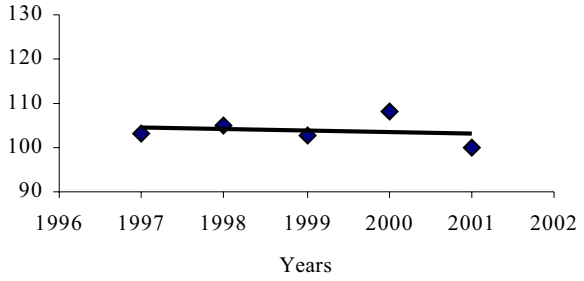

Figure 5. Labour productivity indices for employees. Manufacture of food products; beverages and tobacco

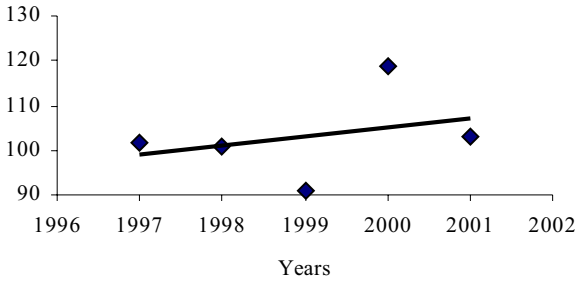

Figure 6. Labour productivity indices for employees. Manufacture of textiles and textile products

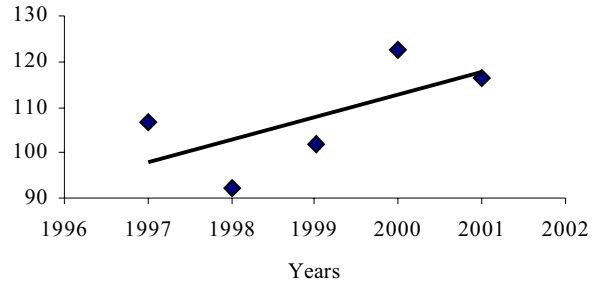

Figure 7. Labour productivity indices for employees. Manufacture of wood and wood products

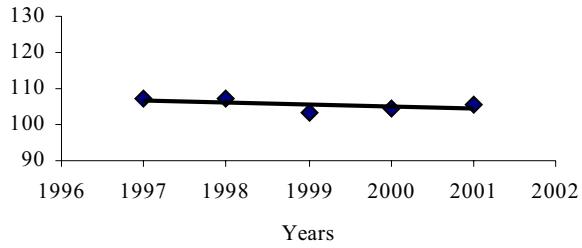

Figure 8. Labour productivity indices for employees. Manufacture of chemicals, chemical products and artificial fibres

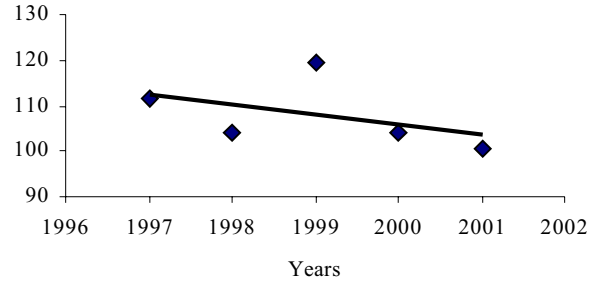

Figure 9. Labour productivity indices for employees. Manufacture of rubber and plastic products

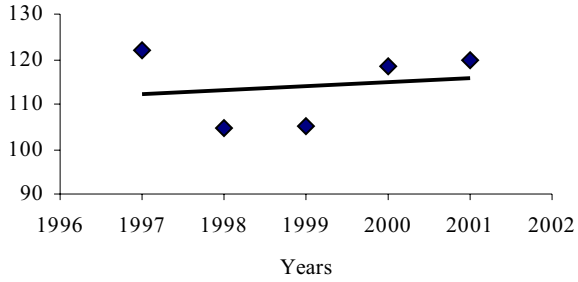

Figure 10. Labour productivity indices for employees. Manufacture of machinery and equipment n.e.c.

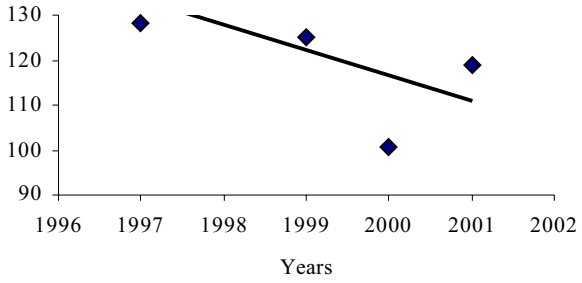

Figure 11. Labour productivity indices for employees. Manufacture of electrical and optical equipment

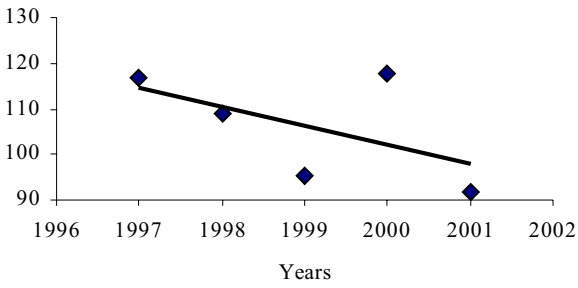

Figure 12. Labour productivity indices for employees. Manufacture of transport equipment

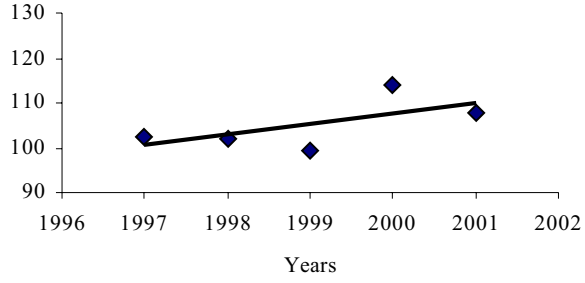

Figure 13. Labour productivity indices for employees. Electricity, gas and water supply

CONCLUSION

The paper is focused on the evaluation of labour productivity in industry in total and in selected branches in the Czech Republic in 1997–2001. Labour productivity indices for employees were evaluated by methods of regression and correlation analysis and development trends. These indices increased in some branches and decreased in the others, however, for industry as a whole, they demonstrate a slightly increasing trend.

The paper was prepared as a part of the project under the support of the CR Grant Agency. Our work will be

continued in evaluating labour productivity extended to other branches of the CR national economy.

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