LABOUR PRODUCTIVITY IN THE CZECH REPUBLIC, 1970 – 2014

Martina Šimková – Jaroslav Sixta

Abstract

Labour productivity is an important and widely used indicator of economic development. In the simplest form, it is estimated as gross value added at constant prices per worker. Such indicators cannot provide detailed description about the development of the economy but it refers to its crucial form. Assessment of this indicator in the long run needs comparable statistical data that are quite scarce. For such reason we constructed time series of gross value added at constant prices and number of workers for the period of socialism of the Czech Republic covering years 1970 – 1989. Our results are broken down by sections of CZ-NACE. These figures were prepared in line with ESA 2010 methodology and they are fully compatible with official statistical data published 1990 onwards. Data for the period between 1970 and 1989 come from our original research. They were calculated on the basis of published economic indicators based on the Material Product System used in socialist countries and transformed to the System of National Accounts. Our paper presents deep elaboration of the development of labour productivity by industries in the long time period. It brings an original view on the Czech economy.

Key words: ESA 2010, gross value added, labour productivity, national accounts

JEL Code: E01, E24, N01

Introduction

The development of the economy in the long represents often subject of scientific research. In the case of the Czech Republic, official statistical data are published from 1990 onwards by the Czech Statistical Office. With respect to the most requested statistical information, we prepared short analysis describing the possibilities of the outcomes of our research. For these purpose we analyse labour productivity since measuring of output and value added per worker or employee belongs to the important instruments for determining of the welfare of economy. Gross value added per capita is directly linked to value added per unit of labour, through a number of workers and demographics characteristics (Balk, 2014).

There can be found lots of analyses of labour and workforce in the Czech Republic (e.g. Miskolczi et al., 2011). Workforce or labour inputs can be analysed from any different perspectives ranging from discussion about quantity, quality, sex, citizenship etc. (e.g. Šimková, Langhamrová, 2015 or Kačerová, 2010). In terms of macroeconomic issues, labour inputs are included in the productivity model by several statistical indicators, number of employees, hours worked or full-time equivalent jobs (see Vltavská, 2011 or Sixta et al., 2011). However, assessment of labour productivity in the long run is quite scarce in the Czech Republic. Nevertheless, long time series provide important statistical information. For such reasons, we constructed time series of gross value added at constant prices and number of workers for the period of socialism of the Czech Republic covering years 1970 – 1989. Data for the period after 1989 were obtained from the Czech Statistical Office (CZSO). We used the data broken down by industry (sections of CZ-NACE). We prepared figures in line with ESA 2010 methodology, see Eurostat, 2013. Our results are fully compatible with official statistical data published 1990 onwards. Our paper presents elaboration of the development of labour productivity by industries in the long time period. It brings an original view on the Czech economy.

1   Data sources and methodology

Labour productivity is a revealing indicator among economic indicators presenting dynamic measures of economic growth, competitiveness and partially living standard. It is defined as the volume of output per labour input used. Output represents gross value added at constant prices. Labour input in this paper is measured by the number of employees (in persons). Data for the period between 1970 and 1989 come from our original research (see Sixta et al., 2016). They were calculated from published economic indicators based on the Material Product System used in socialist countries and transformed to the System of National Accounts (for more about these manuals see Sixta, Fischer, 2014).

We calculate the development of labour productivity according following equation (1):

$$LP_{t/t-5} = \frac{\dfrac{GVA_t}{E_t}}{\dfrac{GVA_{t-5}}{E_{t-5}}}, \tag{1}$$

where

GVA ....gross value added at constant prices 2010,

*E* ....the number of employees (in persons).

Labour productivity as described in formula 1 provides brief information about the development of economy. It is clear that Total Factor Productivity Measurement (TFPM) allows more detailed elaboration of the development but it is difficult to obtain capital stocks. Despite that GVA per worker provides valuable information. Of course, the most optimal way consists in analysis of hours worked based on total employment. These figures are not available in historical data. With respect to the economic system without small businessmen, the approximation of employment by employees is adequate.

Using the data about number of employees in persons as labour input has some limitations (see Vltavská, 2011). We are aware of these data limitation, but we did not find suitable data about full-time equivalents or worked hours for period 1970 – 1990.

2 Labour force and productivity

Before 1990, there were very limited opportunities to do some legal private business in the Czech Republic. There was nearly no other way than to be employed. After the Velvet revolution, there began to appear first self-employed people (small businessmen). Currently, the share of self-employed in total employment represents about 15% in 2014 (see Fig. 1).

Fig. 1: The number of employees in the Czech Republic in period 1970 – 2014
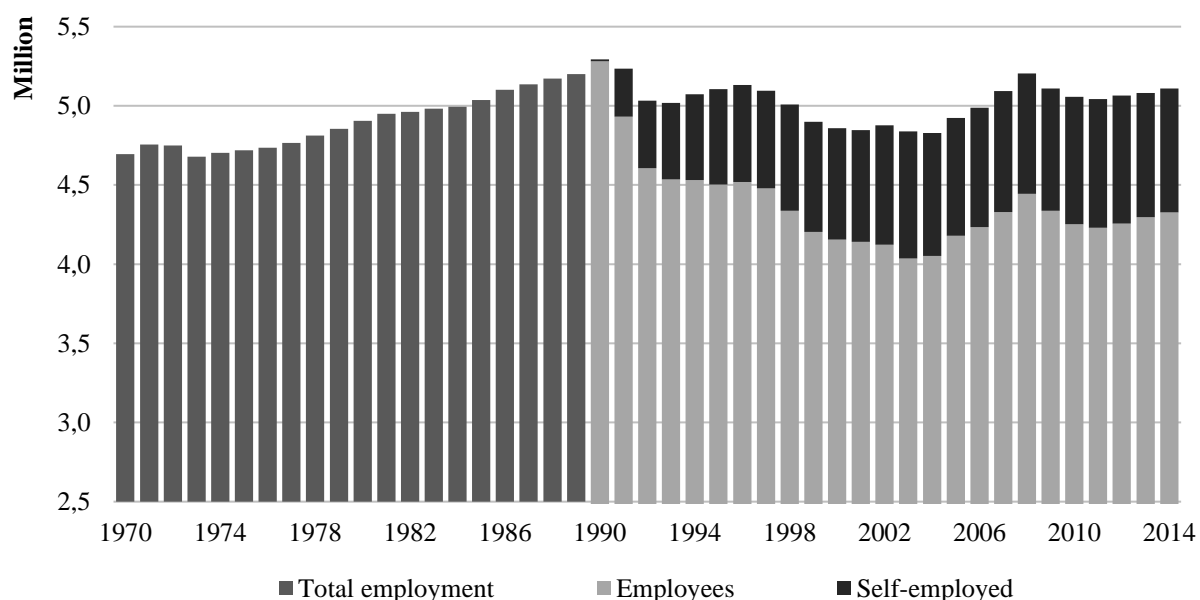
Source: data CZSO, authors' calculations

Labour productivity as an indicator combining gross value added at constant prices of 2010 and employment (in persons) leads to following results (see Table 1). Generally, labour productivity was increasing in whole period 1970 – 2014. Most of the increase was recorded

between 1970 and 1975, when labour productivity increased by 28.3%, while the average annual growth was 5.1%. It was caused by high increase of gross value added. Another high increase of labour productivity was found between 2000 – 2005 (19.8% in total and 3.7% on annual average).

The highest average annual growth was achieved in the agriculture (A) between 1990 – 1995 (19.6% on annual average) and in other activities (R–U) between 1970 – 1975 (14.8%). On the other hand, decrease of labour productivity is seen in some industries in period 1970 – 2014. E.g. in trade, transportation and accommodation (G–I) labour productivity decreased by 8.7% on annual average in 1990 – 1995. Labour productivity decreased also in construction (F) just before and after year 1990.

**Tab. 1: Development of labour productivity, average annual growth (%)**

	A	B-E	F	G-I	J-N	O-Q	R-U	Total
1970 – 1975	5.54	5.81	5.48	4.35	2.25	3.44	12.35	**5.11**
1975 – 1980	3.58	3.21	0.18	4.11	-1.16	1.16	-2.97	**2.25**
1980 – 1985	1.23	-0.48	1.54	0.33	1.05	0.45	5.97	**0.41**
1985 – 1990	1.18	2.28	-0.81	0.32	-1.98	-0.71	3.51	**0.80**
1990 – 1995	19.58	-1.97	-6.72	-8.73	5.44	3.57	6.39	**0.16**
1995 – 2000	1.84	5.30	-3.72	3.90	0.93	-0.17	-5.45	**2.61**
2000 – 2005	8.82	5.84	1.99	4.28	1.22	1.46	-2.18	**3.67**
2005 – 2010	-3.22	6.25	-0.64	0.11	0.56	-0.05	-3.65	**2.08**
2010 – 2014	0.89	-0.29	1.12	0.35	1.29	-0.12	-0.89	**0.45**

Note: A = Agriculture, Forestry and Fishing; B-E = Mining, Manufacturing, Electricity, Gas and Water Supply; F = Construction; G-I = Trade, Repairs, Transportation, Storage, Accommodation and Food Services; J-N = Information, Communication, Financial, Insurance and Real Estate Activities, Scientific and Technical Activities, Administrative; O-Q = Public Administration, Defence, Social Security, Education, Health and Social Activities; R-U = Other Activities (Arts, Entertainment, Activities of Households as Employers for Own Use or Extraterritorial Organisations and Bodies).
Source: data CZSO, authors' calculations

Comparison the development of average annual labour productivity before 1990 and after leads to interesting results, see Figure 2.

Fig. 2: Development of average annual labour productivity before 1990 and after 1990 (%)
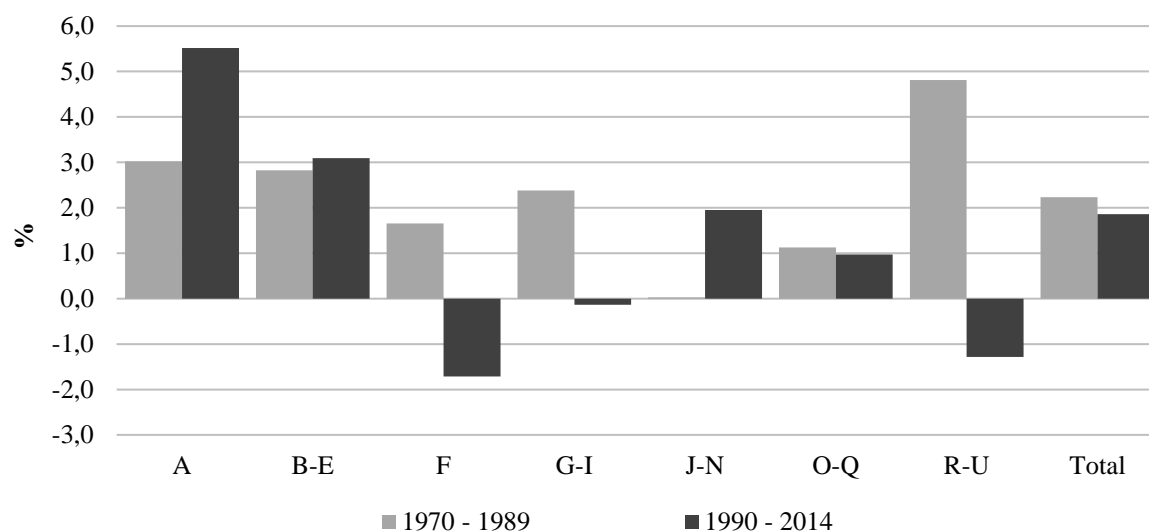
Note: A = Agriculture, Forestry and Fishing; B-E = Mining, Manufacturing, Electricity, Gas and Water Supply; F = Construction; G-I = Trade, Repairs, Transportation, Storage, Accommodation and Food Services; J-N = Information, Communication, Financial, Insurance and Real Estate Activities, Scientific and Technical Activities, Administrative; O-Q = Public Administration, Defence, Social Security, Education, Health and Social Activities; R-U = Other Activities (Arts, Entertainment, Activities of Households as Employers for Own Use or Extraterritorial Organisations and Bodies).
Source: data CZSO, authors' calculations

Labour productivity in whole economy in the period of socialism grew in the same level as after Velvet revolution, more or less. However, detail view on development of labour productivity in particular industries show significant differences before 1990 and after 1990. While labour productivity in construction (F) was increased in period 1970 – 1989 by 36% (1.7% on annual average), it decreased in period 1990 – 2014 by 34% (1.7% on annual average). Labour productivity in agriculture increased two times faster after 1990 than before 1990. On the other hand, labour productivity in other activities (R–U) was increased before 1990 annual by 4.8%, while after 1990 there is seen decrease annual by 1.3%.

3   Incomes and Expenditures of Labour Force

Besides statistics of employment and productivity, we also focused on the development of wages and household consumption expenditure between 1970 and 2014.

Available statistics of wages and salaries, employment (the number of employees[1]), allows us to calculate average monthly wages (see Table 2).

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[1] We consider total employment before 1990 because of absence of self-employed people in period of socialism. After 1990, we distinguish employees and self-employed.

Tab. 2: Average monthly wage in period 1970 – 2014 (CZK)

	A	B-E	F	G-I	J-N	O-Q	R-U	Total	Median	Variation coefficient
1970	2 100	2 211	1 987	1 884	2 462	2 539	2 202	2 182	2 138	0.094
1975	2 599	2 683	2 334	2 253	2 907	3 383	2 521	2 671	2 596	0.128
1980	3 082	3 088	2 641	2 525	3 273	3 743	2 467	3 034	3 022	0.128
1985	3 410	3 381	2 947	2 680	3 514	3 907	2 598	3 280	3 296	0.123
1990	3 911	3 756	3 262	3 088	3 916	3 889	3 169	3 618	3 609	0.090
1995	7 919	8 678	9 514	7 603	10 616	9 118	7 593	8 743	7 471	0.101
2000	11 569	13 742	14 119	12 896	17 070	13 922	11 256	13 848	11 555	0.096
2005	14 481	19 028	17 761	17 877	24 806	21 319	16 319	19 595	16 737	0.124
2010	18 770	23 460	20 824	20 695	29 257	26 136	19 616	23 698	20 249	0.128
2014	20 602	25 115	20 297	21 486	30 757	27 744	20 468	24 994	22 002	0.135

Note: A = Agriculture, Forestry and Fishing; B-E = Mining, Manufacturing, Electricity, Gas and Water Supply; F = Construction; G-I = Trade, Repairs, Transportation, Storage, Accommodation and Food Services; J-N = Information, Communication, Financial, Insurance and Real Estate Activities, Scientific and Technical Activities, Administrative; O-Q = Public Administration, Defence, Social Security, Education, Health and Social Activities; R-U = Other Activities (Arts, Entertainment, Activities of Households as Employers for Own Use or Extraterritorial Organisations and Bodies).

Source: data CZSO, authors' calculations

Average monthly wage in 1970 was 2 182 CZK and 3 618 CZK in 1990. Before 1990, the level of wages in public administration and defence was higher than in total economy. After 1990, the situation is different since the wages in private sphere increased rapidly with respect to particular industries. Wages in group J–N covering financial institutions, IT, communication etc. rose the most sharply Soon after year 1990, wages in construction (F) were higher than in total economy until 2000. Before 1990, variability of wages was lower in comparison with variability after 1990. Variation coefficient was 9.4% in 1970, 12.4% in 2005 and 13.5% in 2014. Also, median of wage was very close to average wage before 1990, while the difference between median and average wage has increased now.

Finally, we compared household consumption expenditures with earning. For this purpose, we use indicator from national accounts, compensation of employees containing wages and salaries plus social contribution paid by both employee and employer. This indicator allows comparison of the economical part of living standard before and after 1990. This indicator is higher than 1 because compensation of employees does not include mixed income and other incomes and social transfers. Therefore, for the years 1993 and onwards, we compute the share of household consumption expenditures on gross adjusted disposable income from 1993. Gross adjusted disposable income represents the income available to the households for

final consumption and saving. Unfortunately, we have not calculated this before 1990 in our research, yet.

Fig. 3: Ratio of Household consumption expenditures on Compensation of employees (1970 – 2014) and on Gross adjusted disposable income (1993 – 2014)
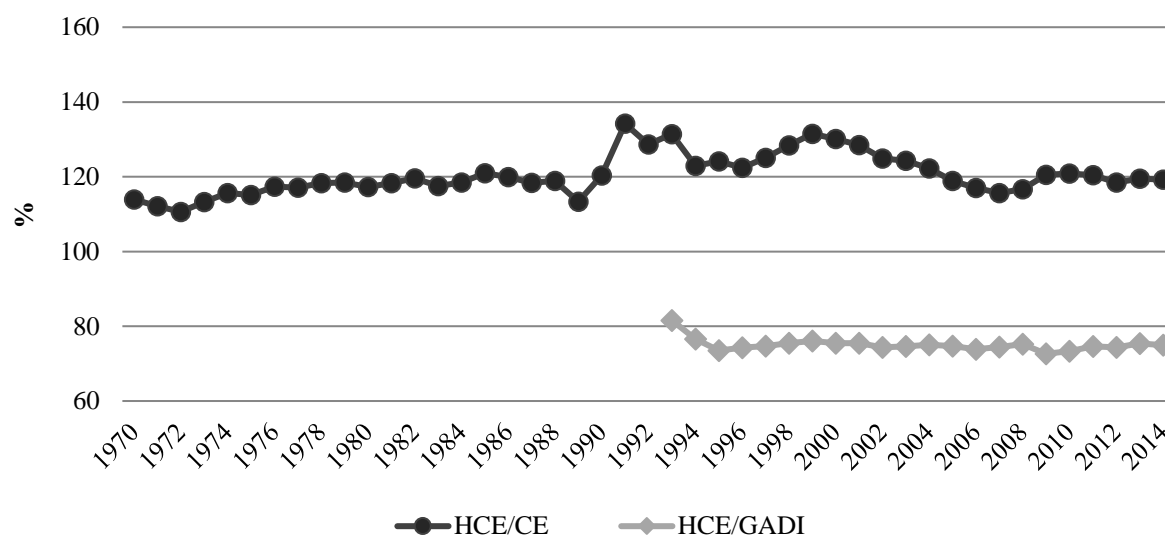
Note: CHCE = Household consumption expenditures, CE = Compensation of employees, GADI = Gross adjusted disposable income of households. Gross disposable income is published by the Czech Statistical Office from 1993 onwards.
Source: data CZSO, authors' calculations

Conclusion

Gross domestic product and gross value added are the most important indicators used for the description of the development of economy. These indicators are based on national accounts' methodology and they are officially published for the Czech Republic from 1990 onwards. Time series for period of 1970 – 1989 were prepared by the University of Economics as a research project. The analysis is used for illustration of possibilities of data for output and income approach to gross domestic product.

The paper brings brief elaboration of the development of labour productivity. Even though this approach to analysis of economy is rather descriptive, we could use only limited data that we obtained from our research. Since figures for gross value added and employment for the period 1970 – 1989 are not available from the Czech Statistical Office, we used originally published figures based on Material Product System and we transformed them into modern national accounts, standard ESA 2010. Therefore, our results for the period of socialism are comparable with the results for the period starting in 1990 onwards. Despite some minor methodical issue,

such as the difference between employees and employment in our centrally planned economy, the results should not be influenced.

The development of labour productivity of particular industries was quite different in the long run. In 1970s, our economy was developing fast with significant increase of labour productivity. Strong increase of labour productivity was repeated between 1995 and 2010. The most interesting is the development in agriculture and manufacturing where technological changes led to completely different industries. When comparing the development of average wages, the differentiation of economy is clearly seen. Variability increased measured by variation coefficient increased between 1970 to 2014 from 9.4 to 13.5%. Structural changes of economy were very significant and the current economy is hardly comparable with the situation in 1970s and 1980s.

Acknowledgment

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Contact

Martina Šimková

University of Economics in Prague

Nam W. Churchilla 4, Prague 3, 13067

Czech Republic

martina.simkova@vse.cz

Jaroslav Sixta

University of Economics in Prague

Nam W. Churchilla 4, Prague 3, 13067

Czech Republic

sixta@vse.cz