

AGEING OF LABOUR FORCE AND PRODUCTIVITY GROWTH IN THE CZECH REPUBLIC

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Abstract

Ageing of population belongs to important non-economic factors affecting not only the labour market but also economic performance. Ageing brings a threat of insufficient supply of new young workers to the labour market as well as a slowdown of economic growth. Population ageing influences different areas of national economy. Total factor productivity measurement represents one of possible methods to be used for these purposes. The paper focuses on estimating the impact of the workforce over 55 years on the economy of the Czech Republic. With respect to available data sources, we used a total productivity model. The key issue lies in the influence of the age composition of the workforce on real output. The increase of productivity is considered as an important factor of future economic growth. The relationship between labour productivity and age structure is presented on the level of industries of the Czech economy. The paper also discusses both the pros and cons of ageing of the workforce.

Key words: *ageing population, labour force, productivity.*

1. Introduction

Ageing of population represents very important and often discussed issue in the Czech Republic. The population ageing process is unprecedented and it will be influenced many areas of human life and national economy of the Czech Republic. Labour market belongs to the areas where the increasing proportion of older people will be evident, they become important part of labour force.

There can be found a lot of analyses of labour and workforce in the Czech Republic. Workforce or labour inputs can be analysed from any different perspectives ranging from discussion about quantity, quality, sex, citizenship etc. (e.g. Šimková and Langhamrová, 2015). We deliberately focus on labour of older people aged over 55 years and on the estimate of impact of them on the economy of the Czech Republic via expression their productivity. With respect to available data sources, we used total productivity model. The key issue we lied in the influence of age composition of workforce on real output. We discuss if that older workers are, on average, less productive than younger workers and if labour force ageing has a modest negative direct impact on productivity growth in the Czech Republic. The

relationship between productivity and age structure is presented on the level of industries of Czech economy over the period 1995 – 2014.

2. Older Employees on the Labour Market

A number of studies have shown that productivity declines with age (e.g. Freyer, 2007; or Tang and MacLeod, 2006). The factor of ageing is perceived in a wide range of activities. For example, Diamond (1986) shows the effect of ageing for mathematicians and scientists, Fair (1994) for athletes, Oster and Hamermesh (1998) for economists, and Bhattacharya and Smyth (2001) for Australian judges. But the other way around, Posner (1995) shows that judges might be an exception to this phenomenon. He argues that the productivity of judges increases with age as well as their creativity and achievements.

There are several reasons for less productivity of older workers compared to younger workers. Significant reason is that older workers have different adoption to new technology. Younger workers are beneficiaries of new technologies that are more productive than old technologies. The similar situation is possible to observe for computer use and internet access (Newburger, 2001). Tang and MacLeod (2006) present a work effort as significant difference between younger and older workers. It means that younger workers have more hours spent on the job as well as higher degree of concentration than older workers. An elderly workforce has a lower potential for economic innovation, professional and occupational mobility and productivity. The ageing of the working population will affect the performance of organizations in the years to follow, with two temporary consequences – a brain drain and a talent gap. Both the private and the public sector will face a shortage of qualified personnel (Leuprecht, 2010). Generally, today's economy and the output of organizations are mainly based on knowledge. The ageing workforce will mainly affect the ability of organizations to be knowledge-productive (Stam, 2009). Among other things, these factors can indicate concerns about a slowdown in economic development due to both the lack of young people on the labour market and the ageing workforce.

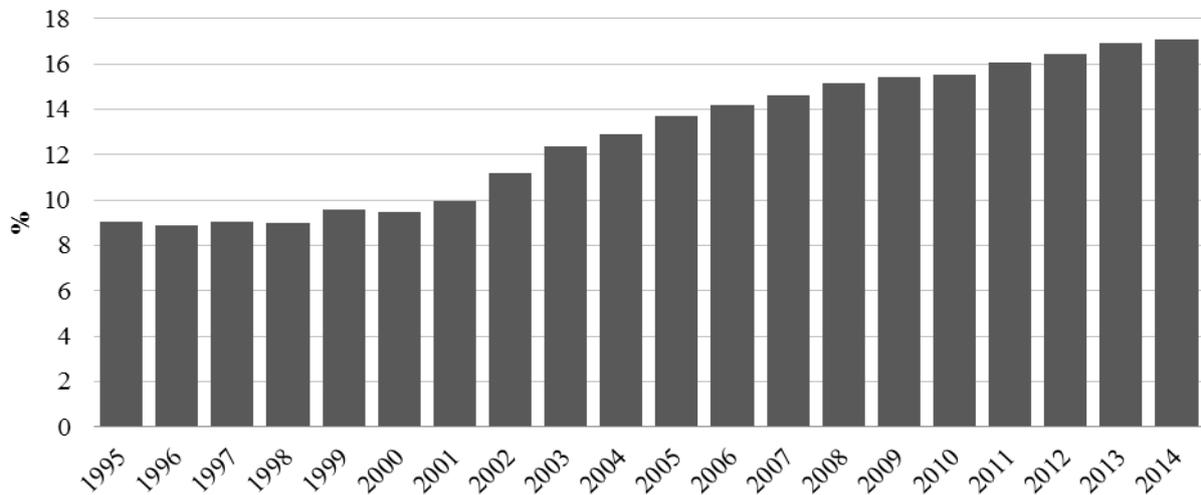
The aim of this paper is to present older labour force in industries in the Czech Republic. The labour force of the Czech Republic is ageing, definitely. The share of the labour force aged 55 or over in the total labour force will increase from 9.1% in 1995 to 17.1% by 2014 (see Figure 1) and this proportion will be continue given the projection of development of population Czech Republic.

However, the age profile is significantly different at industry level (see Figure 2). Most significant change in age structure by workers has been in industry of mining (B). 5.1% people aged 55 and more years worked in 1995 in industry B and 25.5% in 2014. High increase in the proportion of older workers is also seen in health and social activities (Q). In 1995 there worked 7.3% of people aged 55 and over and 22.1% in 2014. The high proportion of older workers has also remained in agriculture (A). But on the other hand, some industries have become younger in terms of labour force between 1995 and 2014. For example, accommodation (I) had 25.6% older workers in 1995 and 13.9% in 2014. The proportion of older workers has also declined in trade (G) and information and communication (J).

Primarily, the ageing population causes the increase of both absolute numbers and relative proportion of older people in total population (low mortality). But secondly it causes the reduction of young population (low fertility). On the labour market, population ageing reduces the base for replacing retired staff with young people. For example, construction needs strong and physically fit individuals, but physical strength is decreasing with increasing age. Another sector requiring young people is sector of military and security forces where ageing population might cause the lack of young recruits because of competing in the labour

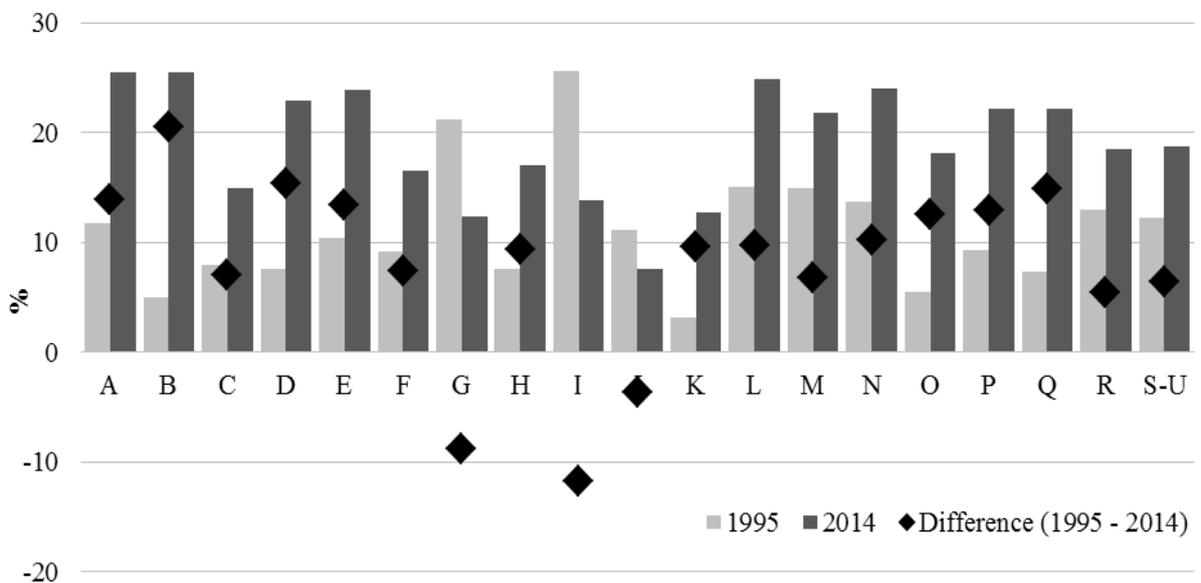
market with more attractive occupations (Šimková, 2014). Finally, the ageing of labour force will cause some difficulties in particular industries, where the young employees are especially needed.

Figure 1: Proportion of employees over 55 years in total labour force in the Czech Republic (%)



Source: the authors based on data from the Czech Statistical Office (2015).

Figure 2: Change in the proportion of employees over 55 years in total labour force in the Czech Republic between 1995 and 2014 by industry (NACE), %



Note: Classification codes are described in The Appendix.

Source: the authors based on data from the Czech Statistical Office (2015).

3. Labour Productivity of Older People

Labour productivity measurement represents one of possible methods to be used for determining impacts on population ageing to labour market and thus on the national economy. Labour productivity is a revealing indicator among economic indicators presenting dynamic

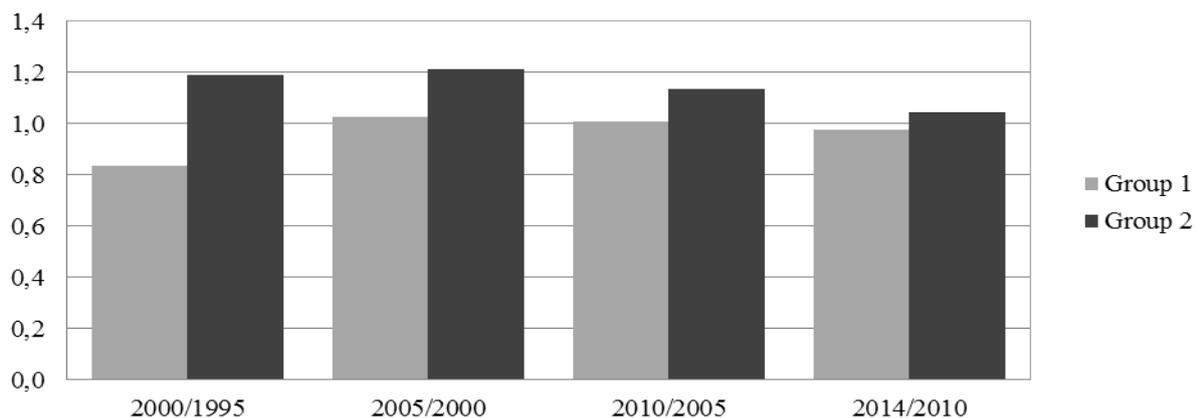
measures of economic growth, competitiveness and living standard. It is defined as the volume of output per input used. Labour input in this study is measured in the number of employees (in persons). We are aware of this data limitation, but we did not suitable data about full-time equivalents or worked hours by age. We calculate the development of labour productivity according formula (1):

$$LP_{t/t-5} = \frac{\frac{GVA_t}{E_t}}{\frac{GVA_{t-5}}{E_{t-5}}}, \quad (1)$$

where GVA is gross value added at constant prices 2010 and E is the number of employees (in persons).

The calculation of labour productivity allows identifying the differences between labour productivity of older and younger workforce. For this purpose we divided national economy to industries to two groups according to proportion of older employees (see Figure 3). Group 1 represents industries with more proportion of older employees (aged 55 years or over) and includes industries agriculture (A), water supply (E), information and communication (J), real estate activities (L), scientific and technical activities (M), administration (N), education (P), culture (R), other services (S-U). Group 2 represents industries with not so much older employees and includes industries mining (B), manufacturing (C), electricity, gas (D), construction (F), trade (G), transport (H), accommodation (I), finance and insurance (K), public administration and defense (O), health and social activities (Q). The proportion of employees aged 55 years or over in total economy determines the level for dividing industries to two groups.

Figure 3: Labour productivity growth in groups of industries by the proportion of older employees



Note: Group 1 includes industries with higher share of employees aged 55 years or over. Group 2 includes industries with lower share of employees aged 55 years or over. The threshold is given by the average share in total economy.

Source: the authors based on data from the Czech Statistical Office (2015).

In the period 1995 – 2014, labour productivity in industries of Group 1 decreased by 16.1%, while labour productivity of Group 2 increased by 70.3%. Labour productivity in Group 2 mostly increased in period 1995 – 2005. It is possible that the greater proportion

older employees in some industries can bring the lower labour productivity growth or its decrease.

4. Total Factor Productivity of Ageing Population

Besides labour productivity, it is common to carry out total factor productivity measurement including both labour and capital input. For estimation of total factor productivity we use the approach of neo-classic Cobb-Douglas production function and the index numbers. Employing the index of productivity of two factors (A_1/A_0) originates from the following decomposition (Jílek and Moravová, 2007):

$$\frac{Y_1}{Y_0} = \frac{A_1}{A_0} \cdot \frac{L_1^\alpha}{L_0^\alpha} \cdot \frac{K_1^{1-\alpha}}{K_0^{1-\alpha}}, \quad (2)$$

where Y_1/Y_0 is index of gross value added in constant prices of 2010, L_1/L_0 is index of the number of employees, K_1/K_0 is index of net fixed assets in constant prices of 2010 and α is the average proportion of compensation of employees on gross value added at current prices.

Table 1 shows the estimates of total factor productivity according to formula 2 for Czech economy between 1995 and 2004. The figures for productivity are supplemented by the information about the share of older employees for illustration of the context of an ageing population. Therefore, the last row represents the proportion of employees aged 55 years or over in 2014 in particular industries. The aim of our calculations is identifying industries with potential difficulties in connection with ageing employees.

Table 1: Calculation of total productivity factors (1995 – 2014)

	Total	A	B	C	D	E	F	G	H	I
Y	54.5	-6.4	-60.6	182.1	-11.2	-19.8	-24.3	195.1	-14.1	-46.1
A	26.3	-3.0	-44.9	94.8	-22.1	-41.2	-44.9	93.2	-29.5	-64.5
K	43.1	30.0	63.6	103.9	26.3	35.0	127.3	116.0	48.6	68.8
L	0.1	-36.9	-64.4	-1.5	-34.9	37.7	-19.0	4.9	-6.5	24.8
E55+	17.1	25.5	25.5	14.9	22.9	23.8	16.6	12.4	17.0	13.9
	J	K	L	M	N	O	P	Q	R	S-U
Y	161.2	124.2	27.8	24.6	34.3	17.7	24.4	-36.0	-19.4	-29.2
A	12.1	55.3	-15.8	-7.4	-26.6	31.1	25.6	-43.3	-47.0	-50.1
K	188.7	54.0	50.8	42.9	175.2	-1.9	-16.7	33.3	65.7	39.7
L	66.4	29.2	69.4	24.2	21.7	-15.2	7.0	4.5	37.0	46.4
E55+	7.5	12.8	24.8	21.8	24.0	18.1	22.2	22.1	18.5	18.7

Note: Classification codes are described in The Appendix. Y = Gross value added, A = productivity of two factors, K = net fixed assets, L = number of employees, E55+ = the proportion of employees aged 55 years or over on total employees in 2014.

Source: the authors based on data from the Czech Statistical Office (2015).

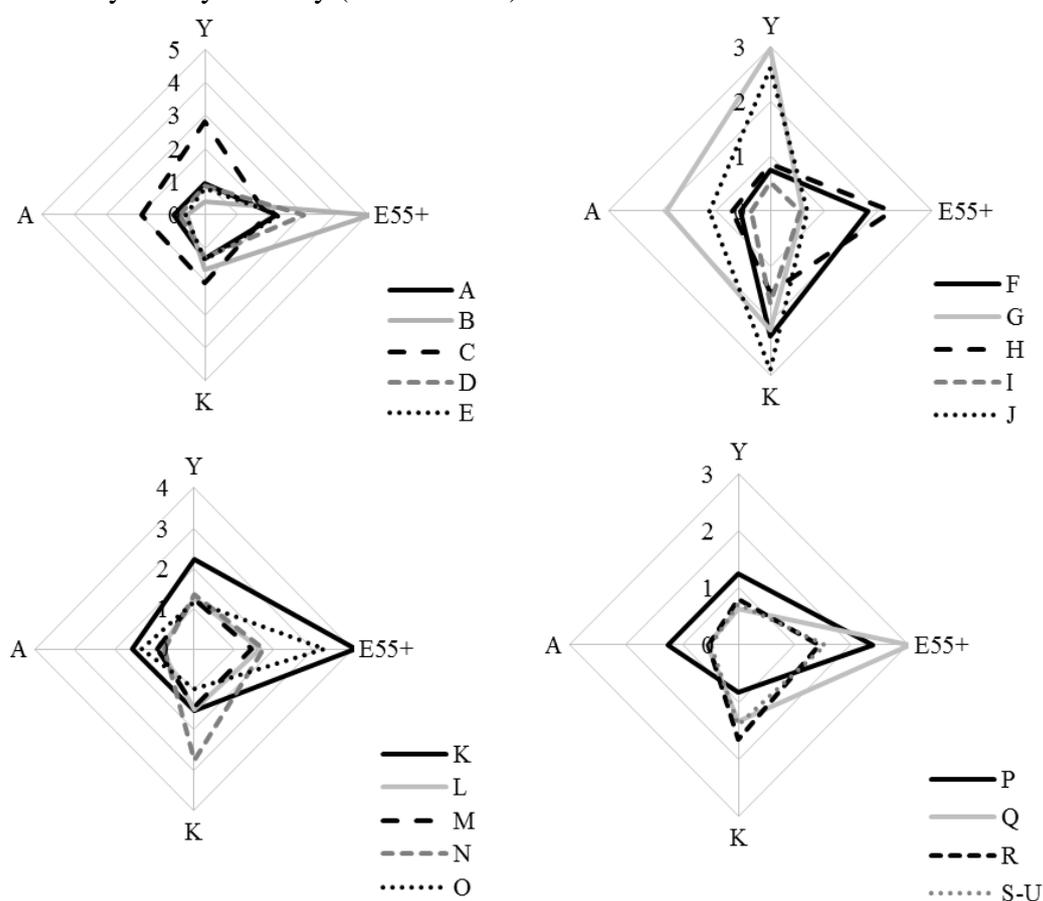
Gross value added in national economy increased between 1995 and 2014 by 34.9% in real terms. The increase of the stock of fixed assets had the most significant effect on the increase of GVA (43.1%) as well as the increase in total productivity of factors (26.3%). Obviously, the number of employees had no significant change (0.1%) in the period 1995-2014¹. The

¹ The authors are aware of the concept of employment. It is obvious that hours worked, labour services or at least total employment would be more appropriate indicators, see Vltavská (2011). The problem lies in the availability of information given by the fact that LFS that includes employees only. In the further research we will concentrate on the data availability.

higher increase in GVA is observed in the industries of trade (G), manufacturing (C) and information and communication (J). GVA in trade rose by 195.1%, in manufacturing by 182.1% and in the industry of information and communication by 161.2%. On the contrary, mining (B), accommodation (I) and health and social activities (Q) had most significant decrease in GVA between 1995 – 2014. GVA in mining decreased by 60.6%, in accommodation by 46.1% and in health and social activities by 36%. The decline of GVA in industries accommodation and health and social activities was influenced especially by the drop of total productivity of factors, whereas decline in mining is connected with the decrease of labour component.

In the context of population ageing, industries with high increase of value added do not face problems connected with increasing proportion of older employees. In these industries, older employees can positively contribute to the growth thanks to their knowledge and experience (see Figure 4).

Figure 4: Gross value added and total factor productivity and the proportion of employees aged over 55 years by industry (1995 – 2014)



Notes: Classification codes are described in The Appendix. Y = real gross value added (volume index), K = net capital stock (volume index), L = number of employees (index), E55+ = change the proportion of employees aged 55 years and over between 1995 and 2014.

Source: the authors based on data from the Czech Statistical Office (2015).

For example, in industry of financial and insurance service (K) the increase of the proportion of employees aged over 55 years vary from 3.1% in 1995 to 12.8% in 2014. This industry had very strong growth of gross value added. Trade industry (G) has sharp increase of gross value added, stock of net fixed assets, total factor productivity, while the proportion

of employees aged 55 years or over decreased from 21.2% in 1995 to 12.4% in 2014. On the contrary, the problem of ageing workforce is very serious for specific industries facing economic issues. It is well known situation of government institutions covering mainly public administration, health, social and education services. Besides, in some industries with the decrease of gross value added is accompanied with ageing of workforce. For example, in mining industry (B) the proportion of employees aged 55 years or over increased from 5.1% in 1995 to 25.5% in 2014, but the gross value added decreased by 60.6%, factor productivity decreased by 44.9%. With respect to the specific situation in mining, some activities are not regarded as perspective by younger workforce. In some cases, e.g. health, social services and education, the situation is going to be very serious.

5. Conclusion

Population ageing affects many areas of our society. Besides the increase of the number of pensioners, workforce is affected as well. Labour market is going to face serious problems because of the development of demographical situation. In the first place, education system is be affected by the decrease of students. It means that average age of labour force is going to increase in the near future. Lots of effects are currently influencing labour force in the same direction. The decrease of young workers, increase of statutory retirement age and unpleasant economic situation in government sector represent an important challenge to our policymakers.

Our paper discussed the impacts of population ageing on the labour market. In this context we focused on situation seen on the level of industries of Czech economy. With respect to available data sources, we took into account result of both foreign and domestic research done in this field. Macroeconomic approach using aggregated information about value added, comparable deflation techniques represent very suitable data source for such analysis. On the contrary, for further and more detailed research it is necessary to improve available data source. The most important is the precise identification of the product produced by the older workers (employees). There can be found two approaches. The first is connected with the change in statistical surveys and the second can be based on statistical models, e.g. adjusted input-output analysis.

The aim of the paper was to illustrate the impact of ageing workforce on the economy. For this purpose, we also used simple tool, total factor productivity measurement. It cannot be said that the increased number of older employees is a negative thing. Very necessary is the comparison of value added and composition of workforce between industries. Anyway, we think that this issue should be added on the “to do list” of policymakers soon.

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Appendix: European Classification of Economic Activities (NACE)

- A Agriculture, Forestry and Fishing
- B Mining and Quarrying
- C Manufacturing
- D Electricity, Gas, Steam and Air Conditioning Supply
- E Water Supply; Sewerage, Waste Management and Remediation Activities
- F Construction
- G Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles
- H Transportation and Storage
- I Accommodation and Food Service Activities
- J Information and Communication
- K Financial and Insurance Activities
- L Real Estate Activities
- M Professional, Scientific and Technical Activities

- N Administrative and Support Service Activities
- O Public Administration and Defence; Compulsory Social Security
- P Education
- Q Human Health and Social Work Activities
- R Arts, Entertainment and Recreation
- S Other Service Activities
- T Activities of Households as Employers; Undifferentiated Goods and Services-Producing
Activities of Households for Own Use
- U Activities of Extraterritorial Organisations and Bodies