DEMOGRAPHIC FACTORS OF INCOME

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Abstract

Unsurprisingly, the income of working people depends, among other things, on demographic factors such as sex and age. However, these factors gain in importance during demographic ageing of the labour force. Data from the EU-SILC survey allows a detailed analysis of workers' incomes in this paper and reveal the dependence of workers' incomes not only on demographic factors such as sex and age, but also on other factors such as education or health status. Given the lower productivity of the ageing labour force, such analyses of incomes are needed, since the compensations of employees represent the majority of value added of economy. We assume that the capital adequacy within individual industries of the economy is approximately comparable. The income of working persons is thus a suitable indicator by which we can estimate the added value, at the level of individual industries of the economy.

Key words: ageing population, income, labour productivity, value added

JEL Code: J21, J31, E24

Introduction and Background

Income inequality in the Czech Republic as well as other Central and Eastern Europe was historically considerably lower during socialism than in other countries at comparable levels of development, but it has been increasing since the fall of communist regimes (Bandejl & Mahutga, 2010). This natural process is going to be promoted in many countries in different level and the Czech Republic still very far from sharp inequality common in some very developed countries

In this paper, we focus on the relation of income with demographic and socio-economic factors as sex, age, educational level and health status. Such analyses were performed in other European countries some time ago. The effect of demographic factors on age-earnings profiles of U.S workers was examined in Freeman (1979). Stapleton & Young (1984) performed a similar analysis using the multiple skill model. Fatima et al. (2013) predicted the wages of workers in Pakistan using socio-economic and demographics determinants. Based on their

results the age, sex and area of working as well as socio-economic determinants as educational level are playing more important role as compare to the migration and marital status.

The dependency of educational level on incomes of workers was demonstrated in Huang (1999). He showed that more educated people lead to a larger increase in the wage rate for women than for men. Although men have been seen to benefit from the impact of additional education on wages, higher educational level for women may still help narrowing the gender-based wage gap. Marek (2018) deals with effects of education on wage level of workers in the Czech Republic. Zadražil (2015) focuses on research of the relationship between education and wage differences in Slovakia.

There are also some studies about relation between health status and incomes of workers which confirm that health has a significant and positive effect on wages. For example, Cai (2013) deals with effects of health on wages of Australian men. The aim of the study of Fan et al. (2008) is to determine the influence of poor health status on wage losses of Chinese workers aged over 20 years. Such analysis in the Czech Republic are not occur. Tijdens et al. (2013) in their paper explore wage level by health status in occupational groups in 20 countries including Czech Republic.

Demographic and socio-economic factors of income are important to study to investments in human capital because the level of a workers' skills is determined by the workers' characteristics, including age, sex and educational level.

1 Data and methodology

1.1 Data Description

The data for this paper has been obtained from the survey Statistics on Income and Living Conditions (SILC) that was conducted by the Czech Statistical Office (CZSO). The data from this survey allow research of dependency of workers' incomes on various determinants. We chose the following independent variables for our analysis - annual net incomes per person (in CZK), sex, age, health status, educational level, economic activity and economic industries.

We deal only with the workers' income, we do not count on the unemployed, people on parental leave, students, old-age pensioners, or other economically inactive people. We adjusted the variable age for people younger than 15 years and for older than 74 years. We use this variable either as age units or age groups, depending on the type of analysis. Analyses are performed for 2019 and for comparison 2013 is also given.

1.2 Methodology

Firstly, the calculations are performed for the whole Czech economy and then for particular groups of industries (divided according to the classification NACE rev.2 into 21 sections of industries). For the sake of clarity, we have grouped these industries into four branches - agriculture, manufacturing, construction and services.

Given that we want to express the influence of various factors on the workers' income and that the selected variables are not quantitative, we will use the analysis of variance (ANOVA).

Statistics on Income and Living Condition (SILC) is very popular data source that is standardised within the EU countries. It means that there is high level of harmonisation and such analyses can be performed in different countries.

2 Result and discussion

All the data and figures results from the annual survey SILC allowing separately assess the influence on income by different factors as described below. We focus on demographic factors such as sex and age[1] o and socio-economic factors such as the health status and educational level[2] of workers.

2.1 Determining Factors of Income

The analysis of variance showed a statistically significant effect of all studied factors on the level of workers' income. Nevertheless, there is high variability within the individual groups of studied factors. The highest share of intergroup variability in total variability was demonstrated for the factor of education.

Tab. 1: Workers' incomes by sex and age groups in 2019 (CZK)

	Men	Women	15-24	25-39	40-54	55-64	65-74	Total
Mean	346 958	255 184	200 601	305 053	316 036	299 343	385 695	305 451
Std. Deviation	155 962	113 519	99 246	143 270	149 618	136 501	147 324	145 731
Coef. of Variation	0,45	0,445	0,495	0,47	0,473	0,456	0,382	0,477

Source: SILC, authors' calculations

[1] The age is a quantitative variable that we have categorized into several groups for the purposes of this paper.
[2] We use four educational groups clustered according to classification ISCED.

Sex of workers was our first factor to study its influence on the level of income of workers. The average annual income of men was 91.7 thousand CZK higher than the average annual income of women in 2019 (see Tab.1). The variability of men's annual income had lower variability in 2013, measured by the coefficient of variation. In 2019, the variability of income decreased for both sexes, and is the same for men than for women, about 45%. When we focused on the factor of age, we can say that the income of workers in the age group under 25 years was 34.3% lower than the average in 2019. The incomes of workers aged 65-74 years were 26.3% higher than the average in 2019. The income of workers in this age group has the lowest variability (see Tab.1).

Tab. 2: Workers' incomes by health status 2019 (CZK)

	Very good	Good	Fair	Bad	Very bad	Total
Mean	328 412	306 104	280 791	234 172	200 510	305 451
Std. Deviation	155 463	139 644	134 912	116 492	50 590	145 731
Coef. of Variation	0,473	0,456	0,48	0,497	0,252	0,477

Source: SILC, authors' calculations

Another factor that we studied, was the health status of the workers measured by subjective feeling of workers. Analysis of variance showed that intergroup variability is not as high compared to other factors, however, statistically significant differences between income levels in particular health status groups were demonstrated. The incomes of workers who feel in good health are higher than the average. In 2019, the average income of people who feel in poor (or very poor) health was 23.5% (or 34.5%) lower than the average (see Tab. 2).

Tab. 3: Workers' incomes by educational level in 2013 and 2019 (CZK)

	Primary	Secondary without graduation	Secondary with graduation	Tertiary	Total
Mean	210 758	263 704	302 875	389 161	305 451
Std. Deviation	86 928	115 213	133 864	173 966	145 731
Coef. of Variation	0,412	0,437	0,442	0,447	0,477

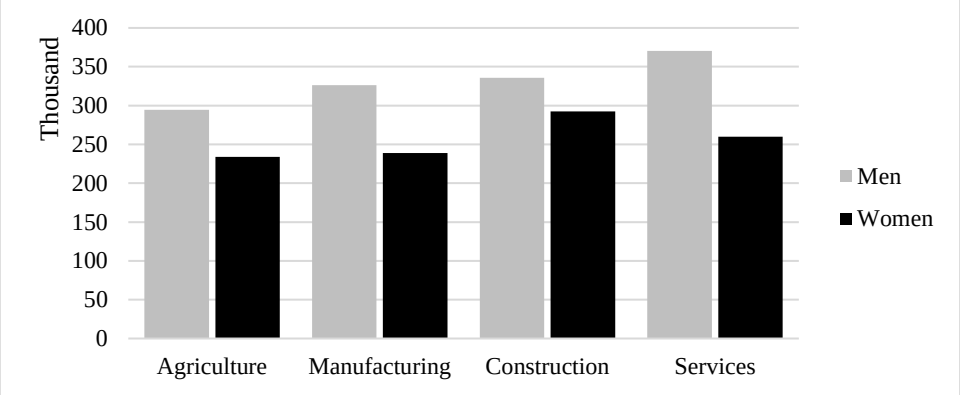
Source: SILC, authors' calculations

The income of employees divided by educational attainment level of workers brings interesting results. In 2019, workers with primary educational level had 31.0% lower incomes than the average. On the contrary, workers with a tertiary educational level had 27.4% higher than average incomes. Looking at the coefficient of variation, the relative variability of incomes increases with increasing educational level of workers.

2.2 Incomes by industries

The level of workers' incomes varies according to the industries (according to NACE classification), so we proceeded to a more detailed analysis of employee income according to selected factors in individual industries in this part of the paper. For simplification and greater clarity, we have combined the industries into specific four groups[3].

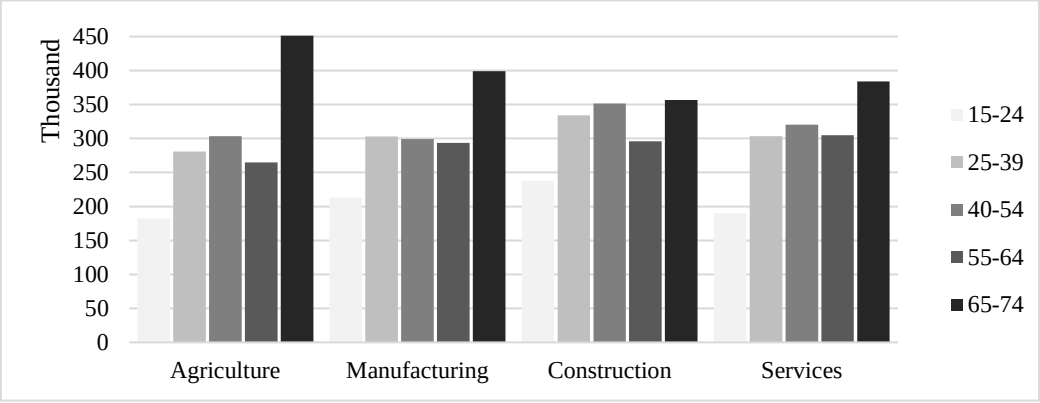
Fig. 1: Mean workers' incomes by sex in industries (2019, thousands CZK)



Source: SILC, authors' calculations

The greatest differences in incomes by sex are in industries of services. Incomes of men are up to 42.4% higher than incomes of women (in 2019). On the contrary, the lowest differences between incomes by sex are in construction (see Fig. 1). The lowest relative variability of incomes by sex is in manufacturing.

Fig. 2: Mean workers' incomes by age groups in industries (2019, thousands CZK)

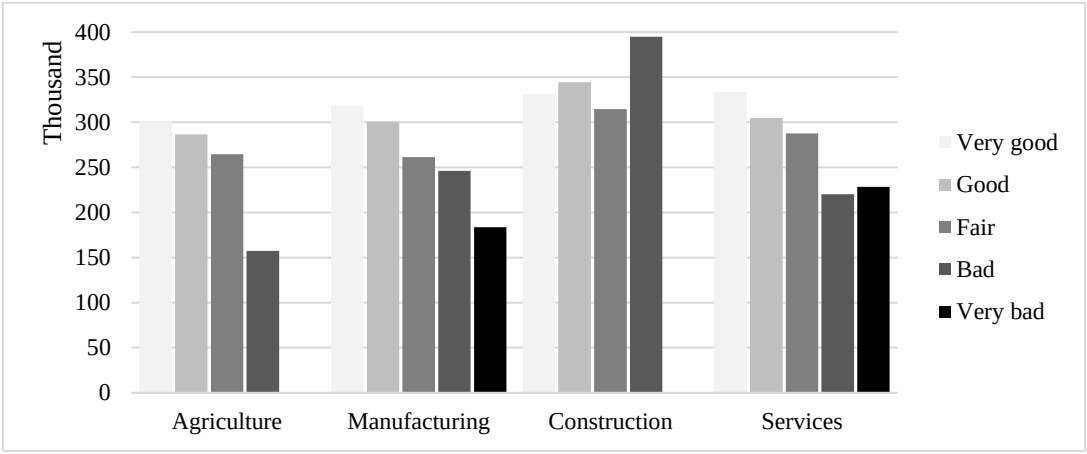


Source: SILC, authors' calculations

[3] Agriculture (A according to 21 section of NACE classification), manufacturing (including industries B-E), construction (F) and services (including industries G-U).

The structure of workers' income by age in individual industries is interesting. Workers in the age group of 15-24 years has the highest incomes in construction (compared to the average income in the age group of 15-24 years in the whole economy). Conversely, if we compare the incomes of workers in the oldest age group 65-74 years, we see that the highest incomes are in agriculture and the lowest in construction (see Fig. 2). These two industries in this age group are also characterized by the lowest relative variability of incomes.

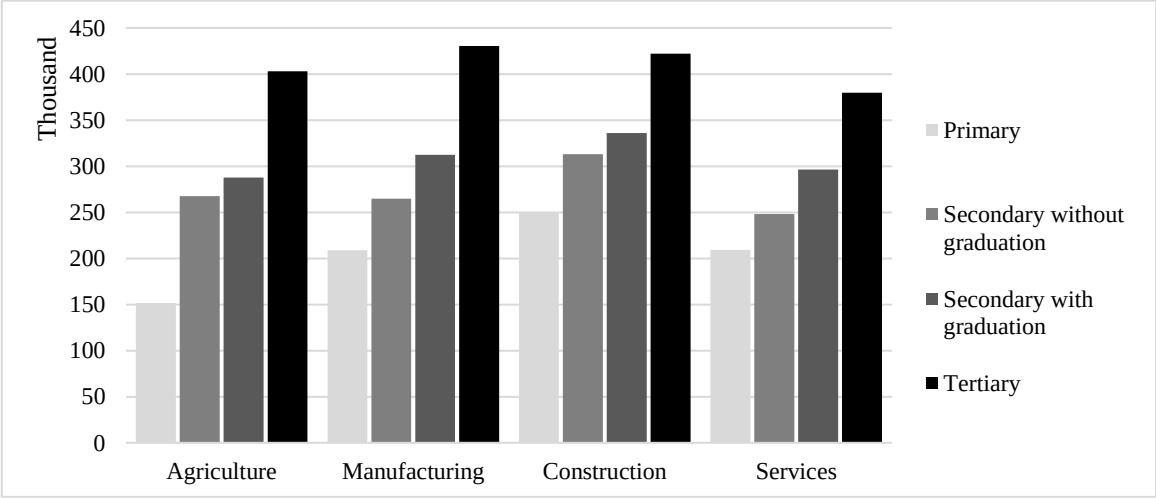
Fig. 3: Mean workers' incomes by health status in industries (2019, thousands CZK)



Source: SILC, authors' calculations

Fig. 3 shows the sensitivity of industries to health status of workers. This is because the demographic ageing of the population is different in each industry, which carries with it an average deterioration in health. In all industries, of course, workers' income is declining with deteriorating health. The exception is the construction sector (see Fig.3).

Fig. 4: Mean workers' incomes by educational level in industries (2019, thousands CZK)



Source: SILC, authors' calculations

With the increasing level of education workers' incomes grow, of course. The highest difference in incomes between primary and tertiary educational level is in agriculture. In services, on the other hand, workers with the tertiary educational level have lower incomes than in other industries in the category of tertiary educational level (see Fig. 4).

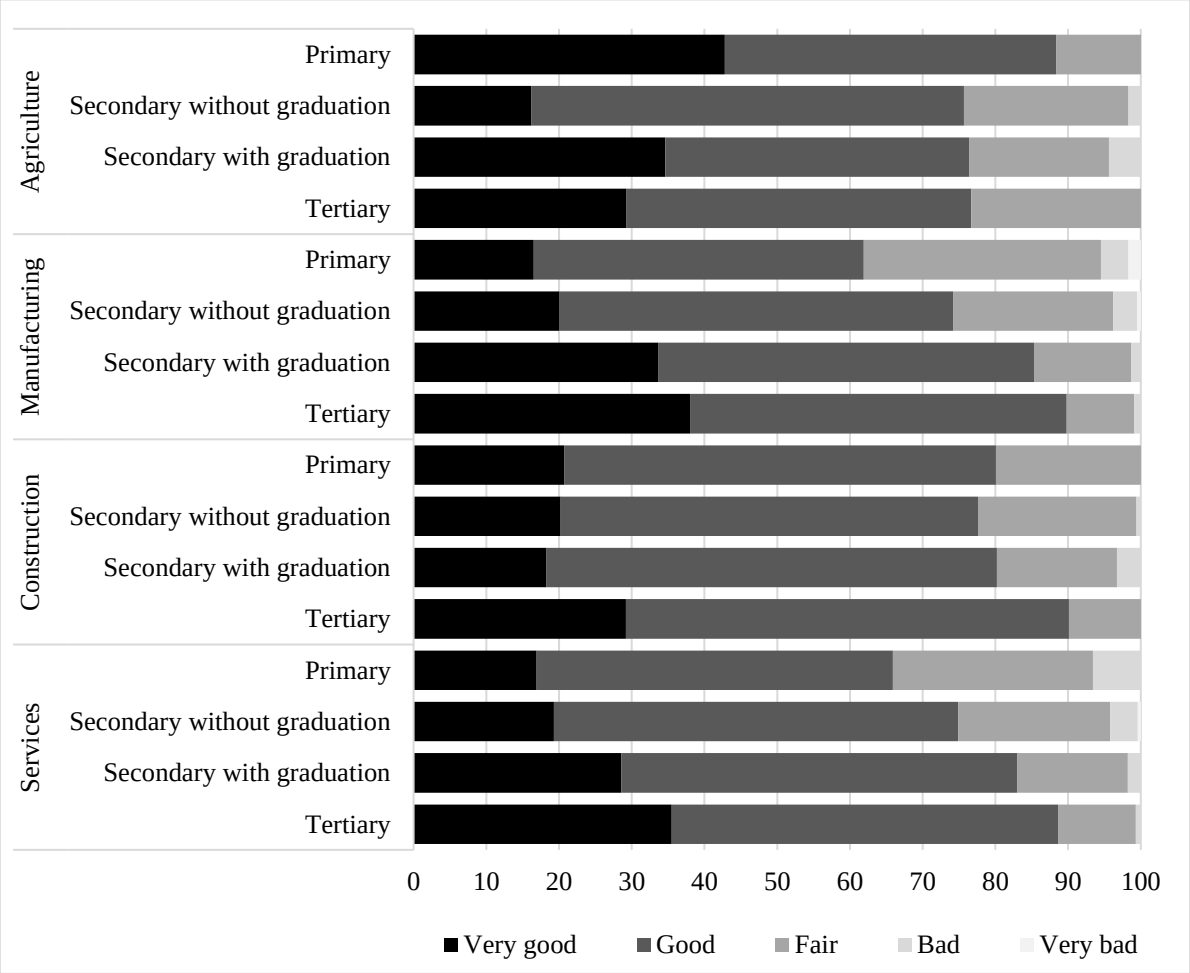
All these factors and their dependency on income of workers are reflected in labour productivity. The issue of the labour productivity is a relevant topic for economic studies dealing with ageing population because many studies confirm the impact of labour force age on productivity (e.g Prskawetz et al., 2005 or Grönqvist, 2009). There are several reasons to worry about lower productivity of older workers compared to younger workers. The income of working persons is a suitable indicator by which we can estimate the added value, at the level of individual industries of the economy, since the compensations of employees represent most of the value added of economy. Labour productivity can also be estimated from macroeconomic data, as we have done in some previous analyses (Šimková & Sixta, 2016).

2.3 Relation of factors

Finally, we looked at the relationship between our research factors, the level of education and the health status of workers. In general, despite all industries of the economy, there is a higher proportion of people in better health in the category of tertiary education compared to workers with primary education. The contingency coefficient between these two qualitative variables was 0.190 in 2019.

In the level of industries, the health status is not assessed in the same way for people with different levels of education. In 2019, 42.8% of workers with primary educational level rated their health as very good in agriculture. However, there were only 16.2% of such workers with secondary education without a graduation. In agriculture was the highest contingency coefficient, 0.236. The most workers rated their health as very good in category of tertiary educational level in the manufacturing. Contingency coefficient in Manufacturing was 0.225. In construction, the contingency coefficient was 0.174 and in services 0.185.

Fig. 5: Educational level of workers by health status (2019, %)



Source: SILC, authors' calculations

Conclusion

The relationship between workers´ productivity and their health is undisputable but it is quite difficult to prove in the aggregated level. From the statistical point of view, the most serious problem lies in suitable grouping since this is the key factor that can reduce or increase within group variability. Despite the analysis of variance is a quite simple method, when using on large and well grouped data it provides very illustrative outcomes. What proved to be clear from our analysis, is that education level significantly associates with the subjective perception of health status across the industries. We can assume that people with higher education has better health status maybe partly due to the nature of their work and partly due to the better maintain their lives ranging from food to sport activities.

The income of workers is the key proxy indicator for the generated value added of where labour takes prevailing share. Among other factors, income is dependent of education, health status and age group. Therefore, studies about education and health status of population in relation with income are important for discussion about the impacts of population ageing on economic development.

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References

Bandelj, N. & Mahutga, M. (2010). How Socio-Economic Change Shapes Income Inequality in Post-Socialist Europe. Social Forces 88 (5). pp. 2133–2162.

Cai, L.X. (2009). Effects of Health on Wages of Australian Men. ECONOMIC RECORD. 85 (270). pp. 290-306. Doi: 10.1111/j.1475-4932.2009.00552.x

Fan, M., Fan, Z.J. & Zhang, J.P. (2008). The Impact of Poor Health on Wage Losses in China. 2nd International Symposium on Intelligent Information Technology Application. Shanghai. P. 872-+ Doi: 10.1109/IITA.2008.560

Fatima, K. & Ahmad, Z. & Saleem, A. & Ahmad, Z. (2013). Predicting the Wages of Employees Using Socio-Economic and Demographic Determinants: A Case of Pakistan. 10th International Conference on Statistical Conference, Lahore, Pakistan.

Freeman, B. (1979). The Effect of Demographic Factors on Age-Earnings Profiles. Working Paper No. 316, National Bureau of Economic Research.

Grönqvist, Ch. 2009. The effect of labour force ageing on productivity in Finland. Bank of Finland Monetary Policy and Research. ISSN 1796-9123.

Huang, T.C. (1999). The impact of education and seniority on the male-female wage gap: is more education the answer? International Journal of Manpower. 20(5-6). pp. 361-374. Doi: 10.1108/01437729910289710

Marek, L. (2018). Effects of Education and High Wages on Average Wages in the Czech Republic. Proceedings of the 15th International Conference Efficiency and Responsibility in Education 2018 (ERIE). Prague, Czech Republic. pp.189-194

Prskawetz, A., Zagaglia, B., Fent, T., Skirbekk, V. 2005. Decomposing the change in labour force indicators over time. Demographic Research 13 (7). pp. 163-188

Stapleton, D.C. & Young, D.J. (1984). The Effects of Demographic Change on the Distribution of Wages, 1967-1990. The Journal of Human Resources. 19 (2). pp. 175-201. https://www.jstor.org/stable/145563

Šimková, M. & Sixta, J. (2016). Ageing of labour force and productivity growth in the Czech Republic. In: Applications of Mathematics and Statistics in Economics (AMSE) [online]. Banská Štiavnica,p. 350–358. ISBN 978-80-89438-04-4. ISSN 2453-9902. http://amse.umb.sk/proceedings/SimkovaSixta.pdf

Tijdens, K., de Vries, D.H. & Steinmetz, S. (2013). Health workforce remuneration: comparing wage levels, ranking, and dispersion of 16 occupational groups in 20 countries. Human Resources for Health. Vol. 11, Nb. 11. Doi: 10.1186/1478-4491-11-11

Zadrazil, P. (2015). Relationship between wage differences and education level in Slovakia. Era of Science Diplomacy: Implications for Economics, Business, Management and Related Disciplines (EDAMBA 2015), Bratislava, Slovakia. P: 930-937.

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