Impact of Population Ageing on Education Level and Average Monthly Salary: The Case of Slovenia

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Population ageing is a contemporary problem, which does not only mean changing demographic structures, but also affects economy. Based on our research we cannot reject our main research thesis that population ageing has a significant impact on human capital in Slovenia. Using multiple regression analysis, on cross-section data of Slovenian municipalities, we cannot reject our first hypothesis that population ageing in Slovenia leads to lower education level and our second hypothesis that population ageing leads to lower average net monthly salary. Main contribution of this research therefore is the finding and empirical confirmation of the specific impact that population ageing has on human capital based on specific case of Slovenian cross section data. Results of the research imply that some measures have to take place in order to mitigate the unfavourable effects of population ageing on human capital.

Key Words: education level, average salary, population ageing, human capital, Slovenian municipalities
JEL Classification: E24, R23

The Phenomenon of Population Ageing

The fundamental motivation for our research are the significant population ageing (figure 1) in Slovenia, across Europe and in many other countries and the various mostly unfavourable economic consequences that arise from those demographic changes.

For instance, in Slovenia, the average age of Slovenian population rose from 35.9 years in the year 1991 to 42.4 years in the year 2014 and ageing index from 53.6 to 120.5 in the same period. Similarly, the share of old people (people who are 65 years old or more) in total Slovenian population increased from 12.6% to 17.7% from the year 1991 to 2014. The long run

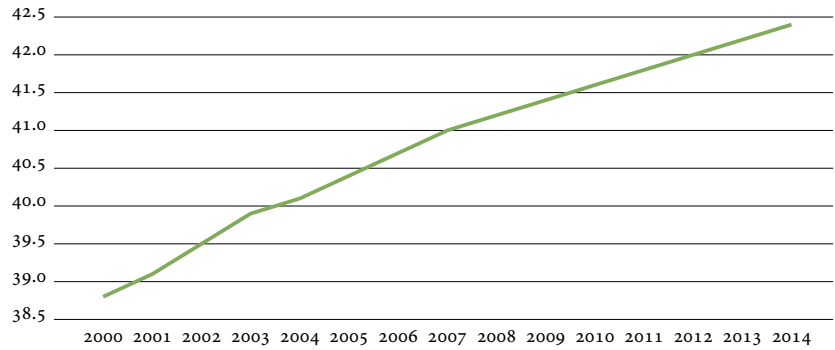

FIGURE 1 Average Age of Slovenian Population, 2000–2014 (based on data from Statistical Office of the Republic of Slovenia, http://pxweb.stat.si)

projections forecast natural increase in Slovenian population to be –6.7 in the period 2045–2050 if constant fertility is assumed (United Nations 2015), which will further increase the share of old and decrease the share of young people in Slovenian population. According to United Nations projections, in the year 2050, the share of old people in total Slovenian population will reach 30.4%, while median age will rise up to 48.2 years according to the medium projection variant (United Nations 2015). According to the main scenario of the Eurostat population projections, in the year 2050, the median age of Slovenian population is projected to be 46,8 years, the share of old people in total Slovenian population 29,8% and old dependency ratio 53,9% (Eurostat 2015).

The evident population ageing has not only economic, but also social, psychological, cultural, institutional and political consequences (Malačič 2008, 795) and therefore requires changes and adjustments in many different fields. Obviously, population ageing affects living standard of some country, the quality of life and welfare, which are quite a complex concepts (Mandič and Filipovič Hrast 2011, 16–17; Dubska 2010; Osberg and Sharpe 2011, 1–5; Watson, Pichler, and Waallace 2010, 1–3).

Of course, the fact that people are living longer and longer is not a problem but a huge achievement of a society. The problem is the disturbed balance between the relative number of young and old people due to the low fertility and to too slow response of the government with necessary reforms, which would help to adjust the new demographic reality.

In the second section, we review some previous research about effects of population ageing on human capital and labour market. In the third section we present our research hypotheses, methodology, assumptions, limitations and data used. In the fourth section, econometric results are

summarised and in the fifth section our key findings and implications are presented. Conclusions are drawn in the sixth section.

Some Previous Investigation of Impact of Population Ageing on Human Capital and Labour Market

Much different research has already investigated impact of population ageing on human capital including on its education level and cost. Here we present findings based on the results of some previous empirical studies. These finding are not subjective personal opinions of these researchers but are inferred from their quantitative analyses.

Malačič (2008, 796) emphasizes, that population ageing has impact on economic activity, economy structure by activities and economic process phases: on production, distribution, trade, consumption, savings and investment. He also adds that population ageing means also an ageing of workforce, which leads to a decrease of innovativity, productivity and consequently to a decrease of economic activity. New knowledge, fresh challenges, innovative ideas, propensity to growth are attached mostly to young people, so young economies create a fast economic and social development, provide development and modernisation (Malačič 2003, 294).

Malmberg (2011, 279) proves that population ageing negatively affects economic growth. Based on human capital theory and theory of life cycle, he found out that an increase in an active workforce and an increase of its savings caused that the economy was growing, however the growth was slowed down and income was reduced when dependent (supported) population was increasing. Similar effects of population ageing might be observed regarding technological changes and innovation.

Dimovski and Žnidaršič (2007, 2–15) show that there are different consequences of population ageing for labour market like an increase of expenditures for pensions for healthcare, social security and care for old people, a decrease in the number of people who constitute workforce, a decrease of workforce motivation, competencies and knowledge, a changed perception of work and life, an ageing workforce, lack of workforce, loss of knowledge and loss of experiences and skills.

In their research of human capital impact on economic growth by Slovenian municipalities, Bojnec and Novak (2005, 158) also confirm that age structure of human capital (because of population age structure) is an important determinant of the level of economic development.

Some researchers (Campbell and Siegel 1967; Handa and Skolink 1975; Sloan et al. 1990) pointed out the importance of the size of young gener-

ations of some population for higher education attainment of that population. If population is older, that means that younger generations are relatively smaller compared to generations of old people. In addition, today that means an increasing relative number of those older people who were typically less included in higher education when they were young compared to today's young generations. Consequently, that leads to lower aggregate population education level. Moreover Caron et al. (2005) and Dixon (2003) confirm that older populations are less educated because older people find it more difficult to learn and to acquire new knowledge because they have more difficulties with their memory, find it more difficult to concentrate and focus and are less motivated. Besides, knowledge of older people is more likely to be outdated compared to knowledge of younger people (Vanags 2007).

Similarly, Čepar and Bojnec (2013; 2014) prove a negative impact of population ageing on demand for higher education, which probably leads also to lower relative number of higher education graduates and lower general population's level of education attainment. Lower fertility results in smaller generations of traditionally young students, which consequently results in lower absolute and relative number of graduates.

However, on the other hand, there are some researches proving that population ageing is actually increasing the populations education level. Just recently, Kluge at al. (2014) at the Max Planck Institute for Demographic Research conducted a study on German population, which is with its median age 44.3 years the second oldest population in the world. They found out that an increasing population ageing is actually increasing education level and productivity through a continuous lifelong learning and additional education of adults and older people who constantly update and build up their skills, competencies, knowledge and experiences throughout their lives.

Higher share of older people in population age structure means less innovations, lower professional mobility, slower follow up to technological improvements, pension and healthcare system problems, financial and labour market problems; population ageing affects consumption and savings as well as economic development and growth of a country (Redek and Godnov 2007, 125–6). Consequently, a country's welfare measured by income per capita might be reduced. Population ageing affects public as well as private sector, which further on affects investment, labour force supply, tax rates and wage growth (Miles 2005, 1–3).

Similarly, Dixon (2003, 70–4) as well as Johnson and Zimmermann

(1993, 1–22) in their research find out that a workforce ageing brings an increase in labour cost, an outdated knowledge, an increase of structural unemployment, a decline in work competences, an increase in disability and sick benefits and consequently lower revenues and economic activity.

On another hand, there are also some researchers who do not see an increased cost of labour associated with older workforce as a problem and some researchers who prove the opposite effect of population ageing on wages. Some believe that higher salaries of older people is justified and compensated by their higher work results, work efficiency, accumulated knowledge and many years' experience about work process – know-how (Disney 1996). On the other hand, their productivity might be lower due to a higher risk for health issues and sometimes consequent early retirement which builds a pressure on a pension system (Auer and Fortuny 2000) and a downward pressure on their salaries (Skirbekk 2003; Thießen 2007) through a decreasing productivity of older people. Serban (2012) is one of those researches who believe that population ageing decreases labour cost in a short run. A downward pressure on aggregate salaries is also conducted through lower aggregate population education level of older populations however that is in some cases offset by several salary benefits and extras which increase overall older people's salaries (Fallick, Fleischman, and Pingle 2010).

Obviously, there are also many other different consequences of population ageing that have already been explored in different contexts and different relations by other researchers. However, we can see from the previous research, that the population ageing impact on population education level and salaries is not quite clear and unambiguous. Next, in our empirical investigation, we are focusing specifically on consequences of population ageing for education level and average monthly salary in case of Slovenian municipalities and present our original findings. We want to see whether our empirical study supports those previous studies, which prove a negative impact of population ageing on education level and salaries or those, which prove a positive impact and what are other particular differences of the results of our research compared to previous researches.

The Research Hypotheses, Methodology, Assumptions, Limitations and Data Used

In this section, we present the research hypotheses and the methodology, which was used to achieve the goals of the research and to test the research

hypotheses. Next, we present the assumptions on which our research is based as well as its limitations in a sense of its scope, geographical limits and time frame. Finally, the most important data used in this investigation is explained.

THE RESEARCH HYPOTHESES

It is obvious already from the review of the previous investigation and research, that there are many different consequences of population ageing for human capital and labour market. In our research, we wanted to statistically test the human capital effects of population ageing on cross section data about 210 Slovenian municipalities in the chosen year 2009. Our *main research thesis* is:

> *Population ageing is an important factor, which significantly deteriorates the quality of human capital in Slovenia.*

In order to test our main research thesis, we set the following two hypotheses:

HYPOTHESIS 1 *Older populations have lower education level.*

HYPOTHESIS 2 *Older populations have lower salaries.*

It follows from the literature review, that there are different and in some cases contradictory findings regarding the (unfavourable) consequences of population ageing for labour market. Some studies prove a positive and some a negative influence of population ageing on populations education level and average salaries. Using cross section data for Slovenia, we want to test, what is the role of population ageing for the two chosen human capital dimensions (education level and salaries) in case of Slovenia, especially what is the direction of the influence of population ageing on them.

METHODOLOGY

In order to test the main research thesis and the two hypotheses set, we run several regression models. First, we collected secondary data from the databases of Statistical office of Republic of Slovenia. The data refer to several demographic and economic variables by 210 Slovenian municipalities for the year 2009. Statistical observation units are Slovenian municipalities. The cross section data enable us to exclude any time related effects from the analysis. The cross section demographic and economic data were properly arranged, transformed and entered into a statistical computer package SPSS, which was used for regression analysis.

First, bivariate and later also multivariate regression models were tested in order to analyse the connection between variables, which measure population age structure, and variables, which measure education level and average monthly salary in Slovenia. Variables, which measures education level and average monthly salary in Slovenia were used as dependent variables and variables, which measure population age structure, were used as explanatory variables. The general form of the regression models used in case of the first hypothesis was:

$$\textit{Educ. level indicator} = \alpha + \beta_1 \textit{determinant}_1 + \cdots + \beta_n \textit{determinant}_n + \textit{error term } \mu \quad (1)$$

and in case of the second hypothesis was:

$$\textit{Salary indicator} = \alpha + \beta_1 \textit{determinant}_1 + \cdots + \beta_n \textit{determinant}_n + \textit{error term } \mu. \quad (2)$$

An advantage of a regression analysis compared to correlation analysis is that it allows us to estimate the percentage of the variance of the dependent variable (education level or average net salary in our case) that can be explained by the variability of the in the model included explanatory variables. Next, correlation analysis tells us only how strong is the association between the variables, while regression analysis explains which variable is the cause and which the consequence is. Regression analysis also allows us to estimate beta coefficients, which show the strength of the impact of a particular explanatory variable on the observed dependent variable. Conducting *t*-tests within the regression analysis, we also statistically tested the statistical significance of the explanatory variables. So regression analysis provides richer information for interpretation of results compared to a simple correlation analysis. Using regression analysis, we estimated parameters of the models and chose the best fitting models based on the standard error of the models, adjusted determination coefficient, *F*-tests and *t*-tests. In the regression analysis, some control variables were employed too, in order to eliminate their effects from the explanatory power of the demographic variables.

RESEARCH ASSUMPTIONS AND LIMITATIONS

Assumptions of our investigation mostly refer to the indicators, which are used to measure population ageing as well as education level and average monthly salary. We assume the following. Lower percent of peo-

ple with tertiary education means lower quality of human capital. Lower monthly average salary means lower quality of human capital. Lower share of young people or/and higher share of old people, and/or higher ageing index, and/or lower natural population increase means older population age structure.

Limitations of our investigation narrow the scope of investigation and address some methodological problems. Most important limitations are the following. The research is conducted using data for all Slovenian municipalities for the chosen year 2009; consequently, the results of the research are valid for the whole Slovenia for the year 2009. We were especially interested in analysing variations across cross section observation units in some chosen year and not in variations over some time period. Generalisation of those results on other countries is limited and depends on the specificities of those other countries. When analysing average wages, we were limited on net average monthly wages. The choice of the proxy measures or indicators used in our investigation depends also on the data availability. The size of a municipality was proxied by the number of its population and the gross investment by the number of enterprises. Due to the data confidentiality, the data on gross investment by municipalities were not available. Our research does not investigate all the factors of education level and average salary but focuses on population ageing factor only.

DATA USED

All secondary data were collected from the databases of Statistical office of Republic of Slovenia. The data refer to several demographic, human capital and other socio-economic variables by 210 Slovenian municipalities for the year 2009.

Demographic data were mostly used to measure population ageing. Below is a list of demographic data used in regression analysis (see http://www.stat.si/doc/pub/rr776-2002/met_izracun/izracun.htm):

- *Average population age* is defined as a weighted arithmetic mean of a certain group of people.
- *Ageing index* is calculated as the number of persons 65 years old or over per hundred persons under age 15.
- *Natural population increase per 1,000 population* is the rate between the difference between the number of live births and the number of deaths of a chosen area in a chosen calendar year in a numerator and

the number of population in the middle of the same year and of the same area in the denominator multiplied by 1,000.

- *Net migration population increase per 1,000 population* is the difference of immigrants and emigrants of an area in a period of time per 1,000 inhabitants in the middle of the same year and of the same area. A positive value represents more people entering the area than leaving it, while a negative value means more people leaving than entering it.

The data below were used in a regression analysis to measure human capital conditions:

- *Percent of people with tertiary education* is defined as a ratio between the number of population with a tertiary education attainment (ISCED level 5 and 6) and total population in a chosen year and municipality multiplied by 100.
- *Average net monthly salary* is gross monthly salary less social security and income tax.

In our regression analysis, we included additional independent variables in order to control for the 'size of the municipality' (measured by the number of population), 'the existence of a university in a municipality' and 'the number of enterprises in a municipality.' By the size of the municipality, we tried to capture the positive synergies and economies of scale that may occur in bigger municipalities. By the existence of a university in a municipality, we wanted to capture the positive effects of the availability and accessibility of higher education and the many other positive effects of a university on the local environment. By the number of enterprises, we wanted to capture the economic activity by municipalities. When analysing the dependence of economic welfare on the population ageing, we wanted to test, whether the presence of the control variables changes the results of the regression analysis or not.

Econometric Results

In this section, we present statistical results only. Their contextual interpretation and the reasoning which is in behind is provided in section five. In order to test each of the two hypotheses we run several bivariate and multivariate linear and logarithmic regressions. In all the regression models, we analysed the explanatory power of the independent explanatory demographic variables as well as the strength and the direction of the association between an indicator of human capital conditions and an indi-

cator of population ageing. Using regression and correlation coefficients, we measured the existence and the direction (positive/negative) of the association and impact that was assumed for each factor in each hypothesis. Using adjusted determination coefficient we wanted to measure the share of the variance of the particular human capital indicator that could be explained by the independent variables including population ageing. On the basis of *t*-test results, we tested statistical significance of each individual explanatory variable, where on the basis of *F*-test results we tested statistical significance of the regression model as a whole. Within the regression analysis we run many different models, however only those which were significant and those with highest explanatory power were selected for interpretation in this paper. After the control variables were entered into the initial regression models, we checked if the direction of the influence or statistical significance or the explanatory power of the explanatory demographic variable were changed or not and again for final interpretation used the most appropriate models. Our intention was not to find all the factors that influence the particular human capital aspect (percent of people with tertiary education in case of the first hypothesis and average net monthly salary in case of the second hypothesis), but to show that population ageing is one of them. That is also why we first started with bivariate models.

RESULTS OF THE REGRESSION ANALYSIS OF THE FIRST HYPOTHESIS-EDUCATION LEVEL OF POPULATION

We run several linear and non-linear regression models where the percent of people with tertiary education (measuring one aspect of human capital conditions) was a dependent variable and ageing index, population's average age (both measuring population ageing) together with some control variables were independent variables.

Preliminarily we calculated spearman correlation coefficient between dependent and independent variables, which all confirmed the later in the regression analysis calculated relationships between the percent of people with tertiary education and population ageing expressed by the regression coefficient beta. Spearman correlation coefficient (r) in the first three models shows, that older population is associated with lower percent of people with tertiary education.

As we can see from regression analysis results in table 1, all the included independent variables in all three regression models are statistically significant, while *F*-test shows that all four models as a whole are statisti-

TABLE 1 Regression Models Results: Logarithm of the Percent of People with Tertiary Education Depending on the Logarithm of the Population Ageing Indicators and Control Variables and some Descriptive Statistics, Slovenia, 2009

Item	Regression coefficient (β)*		
	Model 1	Model 2	Model 3
Constant	9.006 (0.007)	4.066 (0.000)	0.038 (0.048)
Log. of average age	−3.969 (0.050)	–	–
Log. of ageing index	–	−0.714 (0.043)	−0.377 (0.001)
Log. of no. of population	–	–	0.223 (0.001)
Log. of no. of enterprises	–	–	0.870 (0.000)
F-test	3.794 (0.050)	3.791 (0.043)	2437.733 (0.000)
Adjusted R^2	0.282	0.306	0.672
Spearman's r	−0,541 (0.000)	−0,563 (0.000)	−0.563* (0.000)
Average age = 41.4 (min. = 36.9, max. = 49)			
Ageing index = 117,8 (min. = 65.4, max. = 323.9)			
Number of population = 2,042,335 (min. = 320, max. = 278,314)			
Number of enterprises = 160,931 (min. = 14, max. = 33,223)			
Percentage of people with tertiary education = 24.6% (min. = 5%, max. = 42%)			

NOTES * Exact two-tailed significance levels in the brackets. $N = 210$. Based on data from Statistical Office of the Republic of Slovenia (http://pxweb.stat.si).

cally significant too. Based on t-tests (sig.(t) < 0.05) and based on F-tests (sig.(F) < 0.05), we may always reject the null hypothesis that there is no influence of the logarithm of the population ageing indicator on the logarithm of the percent of people with tertiary education, taking almost no risk of making the type I error (which would be the incorrect rejection of a true null hypothesis). Thus we may conclude from all the three models that the population ageing has an influence on the percent of people with tertiary education in Slovenia.

Adjusted determination coefficient (adj. R^2) from the first two models tells us that around 30% of the variation of the logarithm of the percent of people with tertiary education could be explained solely by the variation of the logarithms of the in the model included population ageing indicators by the Slovenian municipalities (28.2% in the first model and 30.6% in the second model). That is actually quite a lot, considering that no other explanatory variables are included in those first two models. After some control variables are added, the explanatory power of the model is increased to 67.2% (model 3) however the direction of the impact of pop-

ulation ageing indicator remains unchanged and statistically significant. Our main purpose was simply to show that population ageing itself has some significant impact on the percent of people with tertiary education.

When average age is increased by 1%, the percent of people with tertiary education is decreased on average by 3.969% (model 1). When ageing index is increased by 1%, the percent of people with tertiary education is decreased on average by 0.714% (model 2) or by 0.377% holding other variables constant when control variables are included (model 3). Higher number of enterprises increases the percent of people with tertiary education, as well as does the higher number of people.

At the bottom of the table 1 we can see some descriptive statistics for Slovenia in 2009 (an average of 210 municipalities) and extreme values for the municipality with the highest value and for the municipality with the lowest value. For example, the ageing index recorded in 2009 in Slovenia was 117.8, meaning that there were on average 117.8 persons who are 65 years old or over per hundred persons under age 15. The average age of Slovenian population recorded in 2009 in Slovenia was 41.4 years.

RESULTS OF THE REGRESSION ANALYSIS OF THE SECOND HYPOTHESIS: AVERAGE NET MONTHLY SALARIES

Also in case of the second hypothesis testing, we run several regression models; however we present here only those, which were most statistically significant and consistent.

Again we first calculated spearman correlation coefficient between dependent and independent variables, which all, also in the case of the second hypothesis testing, confirmed the later in the regression analysis calculated relationships between logarithm of the average net monthly salary and population ageing expressed by the regression coefficient beta (table 2). Spearman correlation coefficients (r) show that higher population ageing is associated with lower average net monthly salary. Here we assume that the natural population increase per 1,000 population could be used as a long term proxy measure of population ageing. We assume that the lower the natural population increase, the older the population will be in the future. Similarly we believe that the net migration population increase per 1,000 population will influence population ageing. Higher net migration population increase per 1,000 population is leading into lower average age of population. We explain that by assuming that higher net migration population increase means higher number of net immigrants, which are generally younger, working-age people, who con-

TABLE 2 Regression Models Results: Logarithm of the Average Net Monthly Salary Depending on the Logarithm of the Population Ageing Indicators and Control Variables and Some Descriptive Statistics, Slovenia, 2009

Item	Regression coefficient (β)*		
	Model 1	Model 2	Model 3
Constant	3.389 (0.000)	2.892 (0.000)	2.897 (0.000)
Log. of average age	−0.290 (0.049)	–	–
Log. of the nat. pop. increase	–	0.026 (0.000)	–
Log. of the net mig. pop. increase	–	–	0.017 (0.002)
F-test	3.253 (0.049)	19.151 (0.000)	9.797 (0.002)
Adjusted R^2	0.377	0.148	0.069
Spearman's r	−0,624 (0.000)	0,390 (0.000)	0.277 (0.000)
Average age = 41.4 (min. = 36.9, max. = 49)			
Natural population increase = 0.015% (min = −0.172, max. = 0.125)			
Net migration population increase = 0,056% (min. = −0.228%; max. = 0.831%)			
Average net monthly salary = 930 € (min. = 530 €, max. = 1,148 €)			

NOTES * Exact two-tailed significance levels in the brackets. $N = 210$. Dependent variable: Logarithm of the average net monthly salary. Based on data from Statistical Office of the Republic of Slovenia (http://pxweb.stat.si).

sequently decrease the average population age. These results were confirmed and upgraded by the regression analysis.

Adjusted determination coefficient (adj. R^2) tells us that even more than one third of the variation of the logarithm of the average net monthly salary could be explained solely by the variation of the logarithms of the in the model included population ageing indicators by the Slovenian municipalities (37.7% of the variation in the first model, 14.8% in the second model and 6.9% in the third model). Again, these adjusted R^2 are quite high, considering that there are no other explanatory variables included in the models, while that is obvious, that there also other factors influencing the average net monthly salary. However our main purpose was not to build a model of all facto, but was simply to show that population ageing or its determinants have some significant impact on the average net monthly salary.

The beta regression coefficients from table 2 show that when average age is increased by 1%, the average net monthly salary is decreased on average by 0.29% (model 1). When natural population increase is increased by 1%, the average net monthly salary is increased on average by 0.026%

(model 2). When the net migration population increase is increased by 1%, the average net monthly salary is increased on average by 0.017% (model 3).

At the bottom of the table 2 we can see some descriptive statistics for Slovenia in 2009 (an average of 210 municipalities) and extreme values for the municipality with the highest value and for the municipality with the lowest value. For example, the average natural population increase per 1,000 population recorded in 2009 in Slovenia was 1.5 persons, and the average net monthly salary was 930 €.

Key Findings and Implications

Based on the results of our empirical investigation we came to the following key findings. In the first part of our empirical study, we investigate the impact of population ageing on population education level. Based on spearman correlation coefficients, but most importantly on the regression analysis results, we see that higher average age and higher ageing index decrease the percent of people with tertiary education. Even, when the control variables are employed in the regression model, the negative direction of an influence of population ageing variables on the percent of people with tertiary education stays the same (stays negative) and the statistical significance is still ensured. We believe that population ageing means an increasing share of those older people who were typically less included in higher education when they were young, compared to today's young generations. Consequently that leads to lower aggregate population education level. Younger generations, which are typically included in formal (tertiary) education, are declining due to the declining fertility and consequently there is lower inflow of young educated people. Older people also find it more difficult to learn and to acquire new knowledge because they have more difficulties with their memory, find it more difficult to concentrate and focus and are also less motivated compared to young people. Consequently, knowledge and competencies of older people are more likely to be outdated compared to younger people which number is in decline.

Our findings are thus consistent with the results of some other recent studies, which prove, that population ageing decrease populations' education level (Caron et al. 2005; Dixon 2003; Vanags 2007) and oppose to some other studies which try to prove the opposite (Kluge at al. 2014). We confirm the high importance of population ageing as a factor of populations' education level, since based on our empirical findings, population

ageing explains around 30% of the education level variations, which is not negligible.

According to the control variables within the regression analysis results, higher number of enterprises increases the percent of people with tertiary education, as well as does higher number of people. We believe that is because enterprises attract younger working-age people with higher education attainment. On the other hand, many municipalities with lower number of people have older population age structure, since emigrant are normally younger working-age people with higher education. Besides, many municipalities with higher number of people are younger also because bigger municipalities are more likely to have universities or at least some faculties and are together with their better infrastructure and other positive externalities generally friendlier to young people and families, which additionally attract younger people and consequently increase education level. Based on all the above mentioned findings, *we cannot reject our first hypothesis* that older populations have lower education level.

In the second part of our empirical study, we investigate the impact of population ageing on average monthly salaries. Even though, the population ageing is obviously not the only factor, we found out that municipalities with higher average population age have lower average net monthly salary. Moreover, in municipalities where natural population increase is higher and where net migration population increase is higher, the average net monthly salary is higher too. We believe that higher natural and net migration population increase is associated with younger populations. The first one is obvious while at the second one we believe, that is because immigrants are generally younger, working-age people who with their families (also children) consequently decrease the average age of population in which they are immigrating to. With our empirical findings we join to the group of researchers who prove that older people have lower education or more outdated knowledge, lower productivity and lower efficiency also due to the health issues, are less flexible and less innovative and consequently have lower salary (Redek and Godnov 2007, 125–6; Skirbekk 2003; Thießen 2007; Serban 2012). Our findings do not support those studies, which prove that accumulated experiences and salary benefits offset factors that decrease older people salaries (Disney 1996; Miles 2005, 1–3; Fallick, Fleischman, and Pingle 2010). Our empirical study confirms the high importance of population ageing as a factor of populations net average monthly salaries, since based on our empirical

findings, population ageing explains more than one third of the average salary variations, which is a significant share. Based on all that findings we *cannot reject our second hypothesis* that older populations have lower average salaries.

Our empirical findings might also be useful for governing economic policy. The findings imply that demographic processes like population ageing significantly impact the quality of human capital, meaning that proper population policy might also be used as an instrument of a labour market policy in a wider sense. Higher fertility and higher number of children per family does not mean lower prosperity and welfare in a long run as it was speculated sometimes but just the opposite.

Finally, our findings imply that population ageing is leading into lower society's economic welfare, since lower aggregate education level and productivity do not go hand in hand with economic growth.

Conclusion

The main contribution of our study is that we upgraded the various theoretical views and interpretations of some other researchers with our own original and specific empirical findings regarding the interrelation between population ageing and quality of human capital. Throughout the body of empirical research, which is presented in the literature, we may find various examples of population ageing impact on population's education level and average salary. Here we bring forward another empirical evidence of a negative impact of population ageing on aggregate education level and average monthly salaries, which is consistent also with some other previous research. However on the other hands, in the literature, we may also find studies, which prove the opposite.

Yet, based on our research we cannot reject our *main thesis* that population ageing is an important factor, which significantly deteriorates the quality of human capital in Slovenia. Most probably that could also be explained by the lower productivity and flexibility of the ageing labour force, its lower and outdated knowledge and competencies. Thus we may conclude that, even though, the quality of older people's human capital (education level, productivity, . . .) might be improving over time, it is still much lower compared to that of younger generations. We do not disagree with those studies, which prove that the quality of human capital even in older populations is improving over time 'ceteris paribus,' due to many reforms and steps within the population policies, which concern older people. However we see the findings of our study as another proof, that

younger populations are still more competitive in terms of human capital, compared to the old ones, meaning that population ageing, holding other things constant, is a negative process, which negatively affects a society's economic welfare and wellbeing.

References

Auer, P., and M. Fortuny. 2000. *Ageing of the Labour Force in OECD Countries: Economic and Social Consequences.* Geneva: International Labour Office.

Bojnec, Š., and M. Novak. 2005. 'Human Capital and Economic Growth by Municipalities in Slovenia.' *Managing Global Transitions* 3 (2): 157–77.

Campbell, R., and B. Siegel. 1967. 'The Demand for Higher Education in the United States, 1919–1964.' *American Economic Review* 57 (3): 482–94.

Caron, G., D. Costello, N. Guardia, G. Mourre, B. Przywara and A. Salomaki. 2005. 'The Economic Impact of Ageing Populations in the EU25 Member States.' European Economy 236, European Commission, Brussels.

Čepar, Ž., and Š. Bojnec. 2013. 'Macro-Level Determinants of Relative Participation in Undergraduate Higher Education in Slovenia.' *Eastern European Economics* 51 (6): 77–95.

———. 2014. 'Does Higher Relative Participation in Higher Education Also Mean a Higher Absolute Number of Students? The Case of Slovenia.' *Eastern European Economics* 52 (2): 85–100.

Dimovski, V., and J. Žnidaršič. 2007. 'Ekonomski vidiki staranja prebivalstva Slovenije: kako ublažiti posledice s pristopom aktivnega staranja.' *Kakovostna starost* 10 (1): 2–15.

Disney, R. 1996. *Can We Afford to Grow Older? A Perspective on the Economics of Aging.* Cambridge, MA: MIT Press.

Dixon, S. 2003. 'Implications of Population Ageing for the Labour Market.' In *Labour Market Trends,* edited by A. Flowers, 67–76. London: Organisation for Economic Co-operation and Development.

Dubska, D. 2010. 'The New Paradigm – Why Is It Important to Measure the Progress of Societies?' Paper presented at Statistical Days 2010, Radenci, 8–10 November. http://www.stat.si/StatisticniDnevi/Docs/Radenci%202010/Dubska_New%20paradigm-prispevek.pdf

Eurostat. 2015. 'Population Projections.' http://ec.europa.eu/eurostat/cache/metadata/en/proj_esms.htm

Fallick, B., C. Fleischman, and J. Pingle. 2010. 'The Effect of Population Aging on the Aggregate Labor Market.' In *Labor in the New Economy,* edited by K. G. Abraham, J. R. Spletzer, and M. Harper, 377–417. Chicago: University of Chicago Press.

Handa, M. L., and M. L. Skolink. 1975. 'Unemployment, Expected Returns, and the Demand for University Education in Ontario: Some Empirical Results.' *Higher Education* 4 (1): 27–44.

Johnson, P. A., and K. F. Zimmermann. 1993. 'Aging and the European Labor Market: Public Policy Issues.' In *Labor Markets in an Aging Europe,* ed. P. A. Johnson and K. F. Zimmermann, 1–22. Cambridge: Cambridge University Press.

Kluge, F., E. Zagheni, E. Loichinger, and T. Vogt. 2014. 'The Advantages of Demographic Change after the Wave: Fewer and Older, but Healthier, Greener, and More Productive?' *PLOS ONE* 9 (9): e108501.

Malmberg, B. 2011. 'Age Structure Effects on Economic Growth – Swedish Evidence.' *Scandinavian Economic History Review* 42 (3): 179–295.

Malačič, J. 2003. *Demografija: teorija, analiza, metode in modeli.* Ljubljana: Ekonomska fakulteta.

———. 2008. 'Socialno ekonomske posledice staranja prebivalstva.' *Zdravniški vestnik* 77:793–8.

Mandič, S., and M. Filipovič Hrast. 2011. 'Blaginja v starajoči se družbi: analitična izhodišča.' In *Blaginja pod pritiski demografskih sprememb,* edited by S. Mandič and M. Filipovič Hrast, 7–25. Ljubljana: Fakulteta za družbene vede.

Miles, D. 2005. 'Modelling the Impact of Demographic Change upon the Economy.' *The Economic Journal* 109 (452): 1–36.

Osberg, L., and A. Sharpe. 2011. 'Comparisons of Trends in GDP and Economic Well-Being: The Impact of Social Capital.' http://www.oecd.org/innovation/research/1824740.pdf

Redek, T., and U. Godnov. 2007. 'Vpliv kakovosti vladanja na gospodarsko rast.' *Management* 2 (2): 121–36.

Serban, A. C. 2012. 'Aging Population and Effects on Labour Market.' *Procedia Economics and Finance* 1:356–64.

Skirbekk, V. 2003. 'Age and Individual Productivity: A Literature Survey.' MPIDR Working Paper WP2003-028, Max Planck Institute for Demographic Research, Rostock.

Sloan, J., M. Baker, R. Blandy, F. Robertson and W. Brummitt. 1990. *Study of the Labour Market for Academics.* Canberra: Australian Government Publishing Service Press.

Thießen, U. 2007. 'Aging and Structural Change.' Discussion Papers 742, German Institute for Economic Research, Berlin.

United Nations. 2015. 'World Population Prospects: The 2015 Revision.' http://esa.un.org/unpd/wpp/index.htm

Vanags, A. 2007. 'Employment and Labour Market Policies for an Ageing Workforce and Initiatives at the Workplace: National Overview Report; Latvia.' European Foundation for the Improvement of Living and

Working Conditions, Dublin. http://www.mature-project.eu/materials/ef0705l6en.pdf

Watson, D., F. Pichler, and C. Waallace. 2010. *Subjective Well-Being in Europe: Second European Quality of Life Survey.* Luxembourg: Office for Official Publications of European Communities.