Development of Socio-Economic Indicators and Mortality Rates during Ten Years of the CR Membership in the EU

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Abstract
Since the accession of the Czech Republic (CR) to the European Union (EU) in 2004, there have been many socio-economic changes in our society. Differently set conditions have caused the changes in economic activity and inactivity of the population, employment and unemployment, living standards, public health, and the mortality rates in the population. This paper will evaluate the population development in the CR since 2004until 2012 based on selected demographic approaches. These include the evaluation of socio-economic demographic structures, from which arise the changes in the economic activity of the population by age groups and sex and changes in employment structures of the population, again by age groups and sex. Due to the fact that since the accession to the EU the living standards in the CR has improved as same as the access to medical care, the mortality rates of Czech population have decreased during the evaluated period. Based on the known tendency of the selected indicators there the trends will be presented and the possible future development will be discussed.

Keywords: *Employment, EU Membership, Mortality Rate, Socio-Economic Demographic Structure, Unemployment*

JEL Classification: *C22, E24, J11*

1. Introduction

The accession of the Czech Republic (CR) to the European Union (EU) in 2004 brought many changes in our society. Freer labour market, easier import and export of goods and services, easier traveling, better access to information and education are some positives that have had an impact on the CR in past ten years. On the other hand, there are also negative factors such as more extensive and lengthy administrative and bureaucracy, fragmented management etc. In this paper, we examine the development of socio-economic factors in the CR since its accession to the EU. Since 2004, there was a significant breakthrough in the educational structure, the proportions between age groups by employment and unemployment have changed, the standard of living of the population has increased and the availability of information, goods and services, social welfare and medical care has improved. The need to obtain a higher and quality education has become increasingly important, because the demand for the human capital and knowledge is higher. The probability of finding a good job with a low education level is low and Czech society is aware of this. The mortality rates of the population decrease (and the life expectancy increase) with increasing living standards

and education and with the better availability of welfare and healthcare systems. (Arltová et al., 2013) The increasing life expectancy is related to the fact that the population will have to be more economically active in the highest ages than ever before. (Langhamrová, Fiala, 2008) The retirement age is shifting to the later ages, the population is aging. If the labour market is opened, the supply of job opportunities will be dynamic and these people will be allowed to work, then it might not represent the significant problems. (Park, Yu, 2013) However, if the potential of the EU is optimally used and the economic growth slows down, we will not be able to keep the sustainable rising of standard of living. (Miskolczi et al., 2011)

For the purposes of the International Standard Classification of Education the methodology ISCED 97 was created in cooperation with the Organisation for Economic Co-operation and Development (OECD) and the European Statistical Office (Eurostat). This standard is also acknowledged by the CR and through the relevant information resources, CR provides to Eurostat the information about the specific numbers of people by age and sex by the highest level of education attained. Given that the point estimates of these persons are complex and their calculation takes a long time, we consider only the time series from 2004 to 2012 (the latest year for which there are complete data). (Eurostat, 2013) On the basis of Eurostat data about the total persons, economically active persons and employed persons (all by age, sex and highest level of education attained), we use a Multi-Tree Charts (Šimpach, 2013) and comment the development and changes in socio-economic demographic structures by age, sex and ISCED 97 level of education. We include decreasing age-specific mortality rates during the period, because they are related to the above mentioned factors as they influence the standards of living. Data about the age and sex specific numbers of deaths and numbers of mid-year population are obtained from Czech Statistical Office (CZSO, 2013). Next section of the paper confronts the results of the socio-economic development and mortality analysis. Mutual relations are characterised and the conclusions about the expected future development are formulated.

2. Methodology and Data

Given that the population (*POP*) according to the methodology of International Labour Organisation (ILO) is divided into the population economically active (*ACT*) and economically inactive (*INACT*), using the known time series is possible to calculate the inactive population as $INAC_{x,t}^{s,e} = POP_{x,t}^{s,e} - ACT_{x,t}^{s,e}$, where $x \in \langle 15-19\,;\,70-74 \rangle$, x is the age-group in population, t is the time, where $t \in \langle 2004\,;\,2012 \rangle$, s is *male* or *female* and e is the code of ISCED 97 level. Eurostat database uses 3 groups of ISCED 97 levels, where ED0-2 are persons with pre-primary, primary and lower secondary education (without high school diploma), ED3-4 are persons with upper secondary and post-secondary non-tertiary education (with HS diploma) and ED5-6 are persons with first and second stage of tertiary education (with university degree). If a person is economically active, may be classified (again according to ILO) as an employed or unemployed person. We will calculate the

unemployed persons as $UNEMP_{x,t}^{s,e} = ACT_{x,t}^{s,e} - EMP_{x,t}^{s,e}$, where EMP denotes employed persons. Inactive and unemployed population by age, sex and highest level of education attained is published in regional statistics of the Eurostat database, but only for years 2009–2013. For the calculation of age-specific mortality rates $m_{x,t}^{s}$, we need to know $M_{x,t}^{s}$ (numbers of deaths at age *x*, year *t* and sex *male* or *female*), and numbers of mid-year population ${}_{1.7.}S_{x,t}^{s}$, where the lower index in front of the letter mean 1st July of a given year. Consequently we are able to calculate $m_{x,t}^{s} = m_{x,t}^{s} / {}_{1.7.}S_{x,t}^{s}$, which is better to express in logarithms $\ln\left(m_{x,t}^{s}\right)$, because the values especially between the ages of 1–40 years limit to zero. The socio-economic data will be displayed in the population pyramids as Multi-Tree Charts. Multi-Tree (Šimpach, 2013) is a special bar chart, where the bars are displayed in contour without padding. In order to highlight the development in time it is a good to use the appropriate rainbow spectrum of these contours. The resulting stripes represent higher or smaller deviations of observed characteristics over time. Development of $\ln\left(m_{x,t}^{s}\right)$ will be displayed by 3D charts by Charpentier, Dutang, (2012), using R package by Dutang et al. (2008). Detailed rainbow charts were used in papers by Hyndman, Khandakar (2008), Hyndman, Shang (2009) and programmed by Hyndman (2012) to R package. We use MS Excel 2013 and R Studio v. 0.98.490 (R Development Core Team, 2008) in this paper.

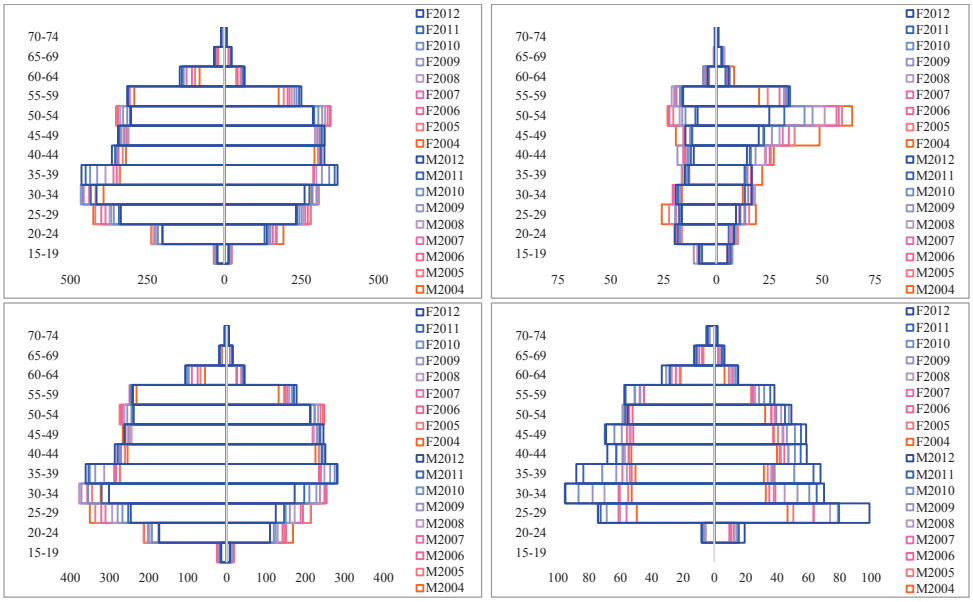
3. Socio-economic Development

This section describes the development of socio-economic characteristics of the population. At Figure 1 there are 4 Multi-Tree Charts that gradually show the development of economically active population of the CR in 2004–2012. On the left side of the zero centreline is always displayed the male population, on the right are females. We see that in the total population there are the highest numbers of economically active males and females aged 25–29 to 55–59. The most significant changes occurred in the male population in the age group 25–29 years (decrease - due to study at the university) and 35–39 years (increase - the older leavers from secondary schools with a HS diploma and universities who have extended their education throughout the years 2004–2012). High decline of economically active females without HS diploma (ED0-2) in the age groups 45–49, 50–54 and 55–59 is caused by their moving into the category of economically inactive, because they were in their economically active process since their very young years.

Development of economic inactive population (shown in Figure 2) supplements the mentioned trends. Looking at the total population, we see that economic inactivity of females prevails over the males in age groups from 25–29 to 70–74. In the lower ages this is due to university studies and parental leave, in the higher ages due to earlier retirement and higher female life expectancy. Higher representation of economically inactive females in the majority of age groups is evident in all educational levels of

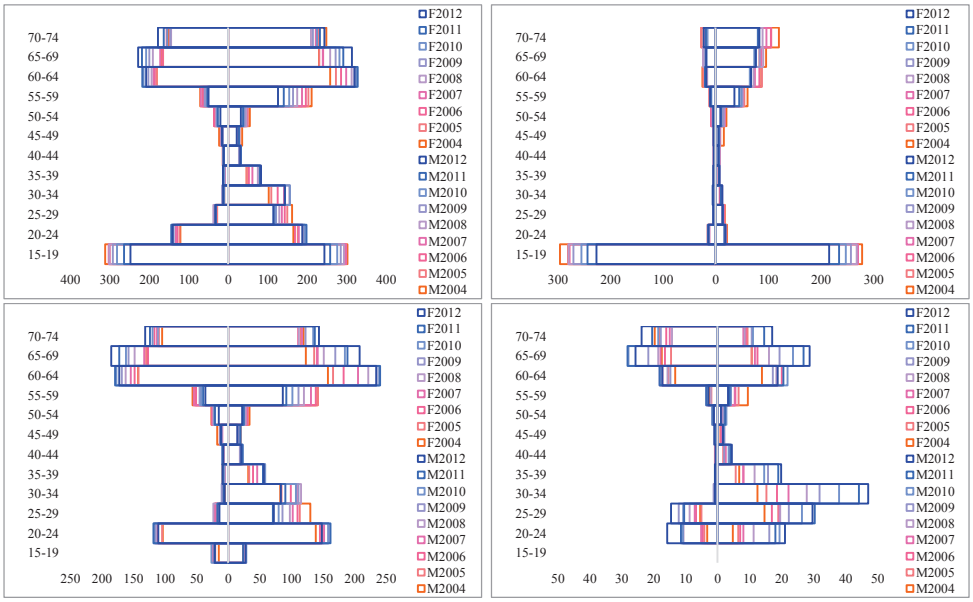
ISCED, but the most significant changes over time occurred at the level of ED5-6 from 25–29 to 35–39 years (increased numbers of females at universities).

Figure 1: Economically Active Population in 1 000 persons – Total Numbers (top left), ED0-2 (top right), ED3-4 (bottom left) and ED5-6 (bottom right)



Source: data Eurostat, author's construction and illustration

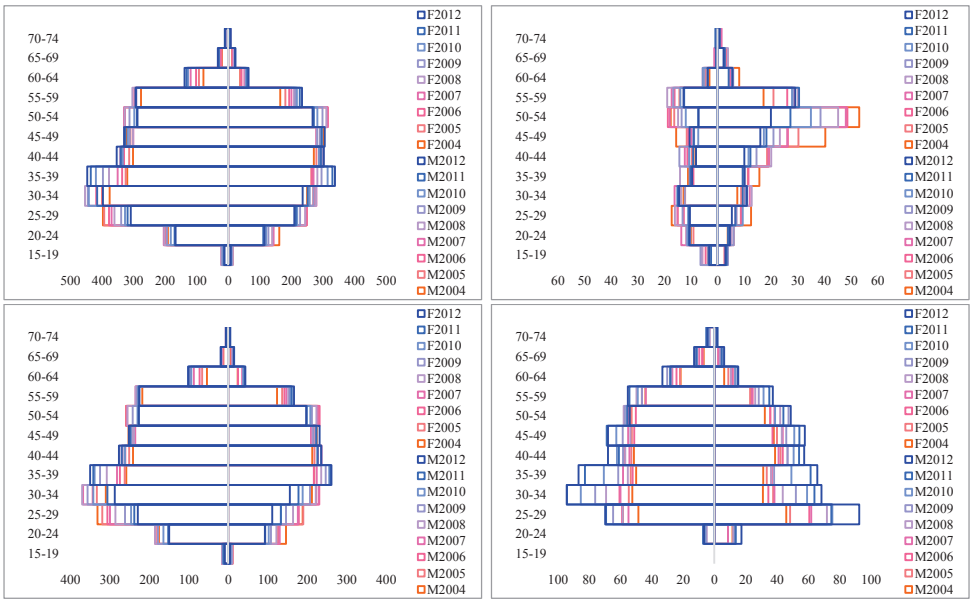
Figure 2: Economically Inactive Population in 1 000 persons – Total Numbers (top left), ED0-2 (top right), ED3-4 (bottom left) and ED5-6 (bottom right)



Source: data Eurostat, author's construction and illustration

Employment and unemployment has always been an important economic issue. Figure 3 shows the employed population by age and sex and by the highest level of education attained. Over time, the most significant decreases were observed in the numbers of 45–49 and 50–54 years old females at the level of ISCED ED0-2 level. It is because these females with education without HS diploma (see the comments in the part of economically active population) left the labour process as they started to work as teenagers. The numbers of employed males with HS diploma always predominated (and still dominate) over the females. However, there have been decline in the age groups 25–29 and 30–34 years recently. These males probably expanded their education and later were included into the workforce as a group of ED5-6 educated people. The significant increase in the numbers of employed university graduates is evident from the graph ED5-6 (bottom right). At the time of membership in the EU Czech tertiary education system began to expand and produce the huge amounts of university educated workforce. This might be also thanks to the Lisbon strategy and Europe 2020, which financially supports the target to increase the share of graduates from tertiary education to at least 40 % by 2020. On the other hand, many graduates were unable to find jobs, as will be described below. The most significant increase in the numbers of employed persons with a university degree is certainly evident in female population aged 25–29. It is caused not only by increment in the numbers of graduates, but also that the employers have begun to employ more young females to senior positions.

Figure 3: Employed Population in 1 000 persons – Total Numbers (top left), ED0-2 (top right), ED3-4 (bottom left) and ED5-6 (bottom right)

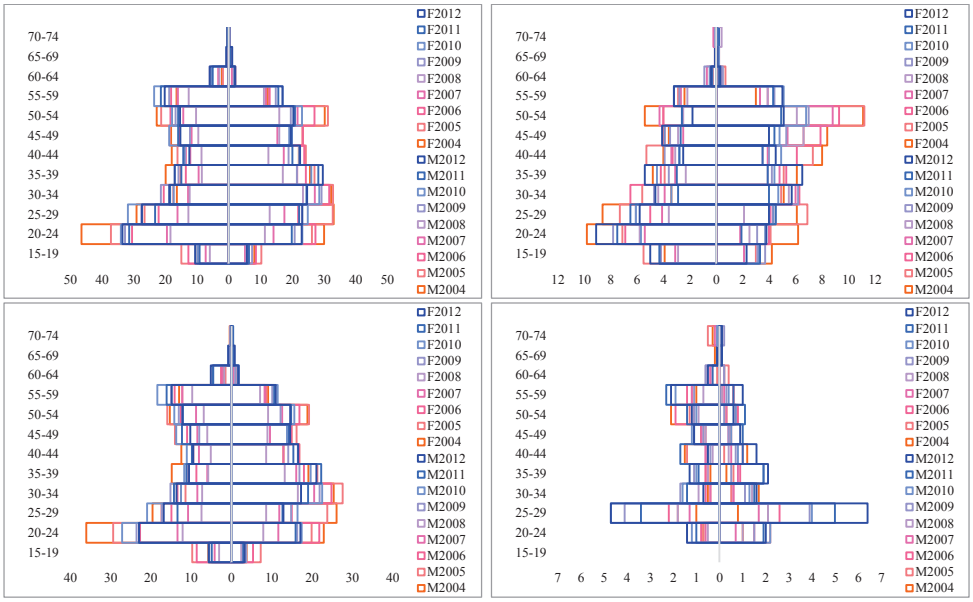


Source: data Eurostat, author's construction and illustration

In Figure 4 (top left) there is displayed for about 400–460 thousand unemployed persons (according to the considered year), while absolutely the worst year was 2004. If we look at the number of unemployed males in total population, at the population

ED0-2 and at ED3-4, we see the crisis year of 2004, which was modal for the age group 20–24 years old males.

Figure 4: Unemployed Population in 1 000 persons – Total Numbers (top left), ED0-2 (top right), ED3-4 (bottom left) and ED5-6 (bottom right)



Source: data Eurostat, author's construction and illustration

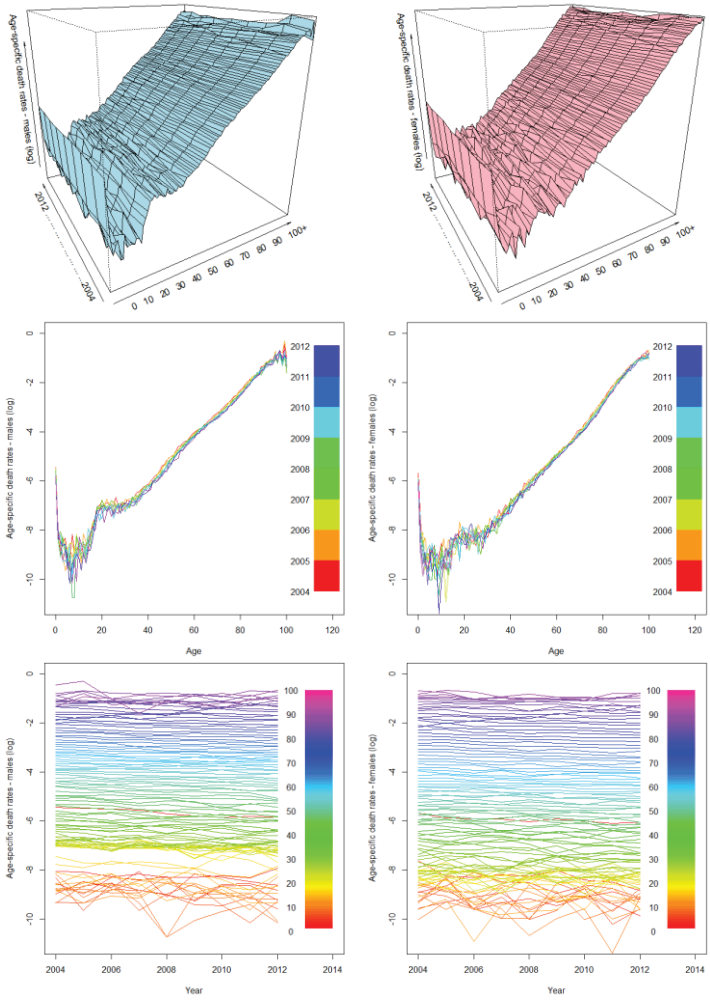
The situation in the majority of young age groups has improved over time, but the deterioration has appeared in the highest ages. It was due to the fact that employers started to prefer the employees in the middle age (i.e. those who already have the sufficient experience, but are not so old), and dismiss those in age before the retirement. They supposed that these employees cannot provide sufficient working performance. The last mentioned include the situation of unemployed tertiary educated males and females (ED5-6) aged 25–29. They are the freshly unemployed university graduates, whose numbers have enormously increased in the years 2010, 2011 and 2012 and it is still rising. On one hand, there is a goal to increase the number of university graduates, but on the other, they lack the jobs opportunities.

4. Mortality Development

At Figure 5, we can see (on the top left and right) the development of males and females logarithms of age-specific mortality rates in the considered period. At the first glance there can be seen the decline of this rates, especially in the lowest and highest ages. This is related to the better health condition of the population, higher living standards and other related issues. The decrease in the lowest ages indicates the reduction of infant mortality, the decrease in the highest ages indicates longevity. This development is in detail evident in rainbow chart of these rates for males and females in the middle left and right in Figure 5. It is possible to see the male excess mortality in ages 20–29 due to suicides, poisoning, dangerous behaviour, gambling, etc., but this

is unfortunately a long-term trend. At the bottom there is evident the development of logarithms of age-specific mortality rates across all ages. We can identify the most significant decreases in specific ages, (mainly 0–9 and 90+).

Figure 5: Logs of Age-specific Death rates in 2004–2012 for Males (top left), Females (top right) and Detailed Rainbow Charts for Males and Females (middle right and left), and for Males and Females aged 0–100+ (bottom right and left)



Source: data CZSO, author's construction and illustration

5. Conclusion

During the period from the accession to the EU, our population did not develop poorly according to presented socio-economic statistics. The standard of living (measured by the GDP per capita) increases, but we need to remember that increasing education level of the population and a higher level of human capital brings also the need to keep a population more economic active than before (as long as possible), because

the population live longer. Life expectancy at birth was calculated by CZSO at the time of accession to the EU at the level of 72.6 years for males and 79.4 years for females, in 2012 it was already 75.0 years for males and 80.9 years for females. Retirement will have to be in later ages and the numbers of economically active persons (and if possible also employed persons) displayed in Multi-Tree Charts will have to move to higher age groups. Mortality rates of males and females will continue to decline in the future.

Acknowledgement

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