

# AGEING AND LONGEVITY IN CZECHIA AND OTHER EUROPEAN COUNTRIES

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## Abstract

In economically developed countries life expectancy has been permanently growing in last decades and according to all population projections it is expected to grow until the end of the present century. Long life has become a reality for more and more people. The paper presents an analysis of the population ageing and increasing longevity in Czechia and other countries of the European Union up to now and also the overview of expected development until 2080 according to the population projection presented by Eurostat in 2015. The development will be analyzed by several indicators of population ageing and longevity, e.g. average and median age, proportion of seniors and the oldest-old persons, old-age dependency ratio, index of ageing, index of longevity and other indexes of the population age structure. Not only the development of indicators in individual countries in the period investigated, but also differences between countries in selected years will be presented.

**Key words:** population aging, prospective age, European Union

**JEL Code:** J14, J11

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## Introduction

Population aging is one of the most frequently discussed demographic phenomenon at last decades (see, e.g., Gavrilov and Heuveline, 2003), especially in the economically developed countries. It is caused by several reasons. The first is permanently continued increase in life span, the second one decrease of fertility, which dropped in many countries even below the replacement level. The third reason not so often mentioned is, that in some countries or regions the ageing of population is accelerated by massive emigration of young adult people in reproductive age.

The number and proportion of senior citizens (aged over 65) and oldest senior citizens (aged over 80) as well as long-living people (aged over 90) keeps growing. This trend has already become apparent in developed countries including Czechia. The higher number of senior citizens is, to some extent, a result of unevenness in the age structure of the population

caused mainly by an uneven development of fertility. For instance, the number of seniors has currently considerably gone up in many European countries because the populous generation born after WWII has reached old age. Another “wave” of increase in senior citizens in Czechia is expected after 2040 when the populous generation born in the 1970s will gradually exceed the age of 65 years.

The increase of number and proportion of seniors together with the decreasing number and proportion of younger adult persons is very often regarded as a serious threat to the sustainability of national welfare system (mainly of the pension and health care systems). But concerns of such or similar type are usually based on customary assumption of the fixed threshold of “old” age, usually equal to 65 years which is the retirement age in many countries at present. But in fact not only the total life expectancy but also the healthy life expectancy was permanently increasing during last decades and it is expected to continue to grow during this century as well. The threshold of retirement age also is or should be increasing in many countries, including Czechia. There arises a natural question if the assumption of fixed threshold of old age is correct.

The idea of re-examination of the concept of old age has been first published by Ryder. *“We measure age in terms of the number of years elapsed since birth. This seems to be a useful and meaningful index of the stages of development from birth to maturity. Beyond maturity, however, such an index becomes progressively less useful as a clue to other important characteristics. To the extent that our concern with age is what it signifies about the degree of deterioration and dependence, it would seem sensible to consider the measurement of age not in terms of years elapsed since birth but rather in terms of the number of years remaining until death.”* (Ryder, 1975, p. 16.) According to his suggestion the age threshold of old persons should be defined as the age at which the life expectancy is equal to e.g. 10 years.

In the 70<sup>th</sup> the population ageing has not been considered to be a serious issue and so the Ryder’s idea was mentioned very rarely. Fuchs (1984) suggested also the idea of flexible old age depending on the life expectancy. Siegel (1993) proposed the old-age threshold defined as the age when the life expectancy equals to 15 years.

The idea of new measures of human’s age based on forward-looking conception was more detailed treated by Sanderson and Scherbov in several papers. They introduced a new forward-looking definition of age, which, along with the traditional backward-looking concept of age, provides a more informative basis upon which to discuss population aging (Sanderson and Scherbov, 2005). Their concept of so-called prospective age was defined as the age in which the remaining life expectancy is the same as the remaining life expectancy of a person in given

standard year (Sanderson and Scherbov, 2007). The indicators of ageing based on prospective age instead of biological age show that the increase of the ratio of older persons will not be so increasing in comparison with standard indicators (Sanderson and Scherbov, 2010, 2013).

The aim of this paper is to compare development of selected standard indicators of population aging and indicators based on the concept of prospective age. For simplicity life expectancy from period life tables has been used for calculations.

## 1 Selected indicators of population aging

Standard indicators of population aging are based on commonly used chronological age, i.e. on the lengths of the time interval the person already lived, on the lengths of the time elapsed since the births. Because the commonly used threshold of old age in many countries is 65 years, a very frequently used indicator of population ageing is the proportion of person at the age of 65 years and older. Special attention should be paid to the oldest persons in the population, one of possible indicators can be the proportion of persons at the age 80 years and more.

The innovative concept of prospective age is based on the fact that for adult people living in different countries or in different periods it can be more important not their chronological age but the average lengths of their remaining life, i.e. their remaining life expectancy. Sanderson and Scherbov recommended to use the attribute remaining life expectancy to emphasize the difference between the commonly used life expectancy at births and the life expectancy at higher ages. (In fact the remaining life expectancy means life expectancy at ages higher than zero defined by standard way.) *“Using chronological age, we are lead implicitly to think that people of the same age in different years would behave similarly, but because of life expectancy increases there are aspects of behavior where this might not be the case. For example, a 45 year old in 2050 might well behave in many ways like a 35 year old in 2000 if they had the same remaining life expectancy. It is precisely because many behaviors depend on the number of years left to live that it is important to supplement the usual backward-looking definition of age with a forward-looking one”* (Sanderson and Scherbov, 2007, p. 28).

Possible indicator of population aging based on the concept of prospective age can be, e.g., the proportion of persons older than the age when life expectancy is equal 20 years. Similarly an indicator characterizing the share of very old persons can be the proportion of persons older than the age when life expectancy is equal 10 years. These indicators assume dynamic threshold of old age depending on the level of mortality in the population investigated.

## 2 Methodological remarks

The values of indicators of population aging mentioned in the previous chapter have been calculated for the countries of EU28, Norway and Switzerland in the period 1960-2080 using the data available in the Eurostat database. Indicators refer to the mid-year sex and age population structures calculated as the average of corresponding values as of 1<sup>st</sup> January. Linear interpolation method was used for calculating the values of prospective age corresponding to the life expectancy 20 years or 10 years respectively as well as for calculating the proportion of persons older than corresponding (not integer) value of prospective age. For simplicity unisex period life expectancies (calculated as the average value of life expectancy for males and females) were used for calculating the prospective age.

For the years until 2017 real sex and age population structures and real life expectancy values were used (Eurostat, 2019a). Since 2018 the values from baseline scenario of the Eurostat population projection 2015 were utilized (Eurostat, 2019b). For Switzerland no projection and thus no data were available for the period since 2018. Particular European countries are marked by abbreviations used in Eurostat database (see Table 1).

**Tab. 1: Abbreviations of European countries**

DK	Denmark	CY	Cyprus	AT	Austria	BG	Bulgaria
FI	Finland	MT	Malta	CH	Switzerland	HR	Croatia
NO	Norway	BE	Belgium	DE	Germany	RO	Romania
SE	Sweden	FR	France	CZ	Czechia	EE	Estonia
ES	Spain	IE	Ireland	PL	Poland	LT	Lithuania
EL	Greece	NL	Netherlands	SK	Slovakia	LV	Latvia
IT	Italy	LU	Luxembourg	HU	Hungary		
PT	Portugal	UK	United Kingdom	SI	Slovenia	EU28	European Union

Source: Eurostat Database, authors' table

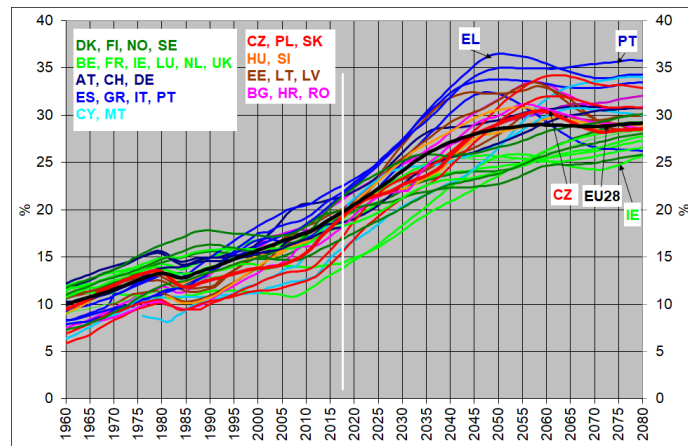
## 3 Main results

The proportion of persons at the age 65 years and higher in EU28 countries has doubled during the last almost 6 decades (see Fig. 1). While in 1960 the proportion of seniors in the EU was about 10% of the total population, at present it reaches about 20%. Relatively high growth of this proportion is observable for countries of Southern Europe, due to low fertility. Proportion of seniors in post-communist countries is on the contrary relatively low due to higher mortality and higher fertility. Values for Czechia are not too much different from European ones.

According to Eurostat projection the proportion of seniors in EU should continue to grow to more than 28% until the half of this century and later is should be relatively stable at

this level until 2080. Highest values (about 35%) are expected to be reached in South European countries, especially in Greece and Portugal, on the other hand the proportion of seniors in Western Europe and in Scandinavia should be lower due to expected relatively high fertility and immigration. Czech values would be close to European again.

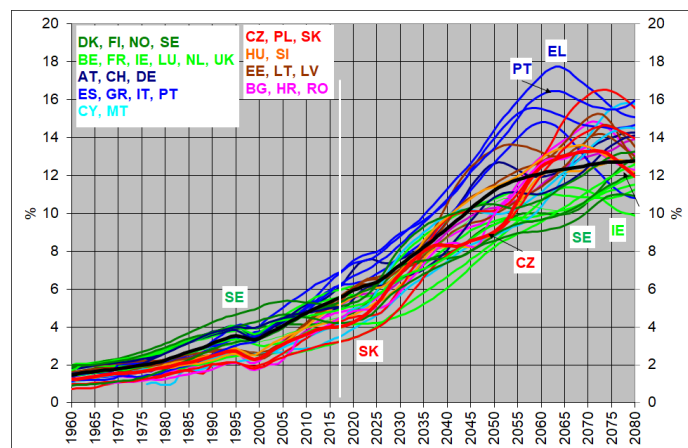
**Fig. 1: Proportion of persons at the age of 65 years and higher (in%)**



Source: Eurostat database, authors' calculation and graph

The trend of the development of the proportion of persons at the age 80 years and older is similar (see Fig. 2). The value in EU28 has increased since 1960 (1.5%) until 2017 (5.5%) almost 4 times. Relatively high growth can be seen for countries of Southern Europe again, the proportion of oldest seniors in post-communist countries (including Czechia) is by contrast relatively low. In the 1980s and 1990s the highest proportion is observable in Sweden, at present times lowest values have Ireland and Slovakia.

**Fig. 2: Proportion of persons at the age of 80 years and higher (in%)**

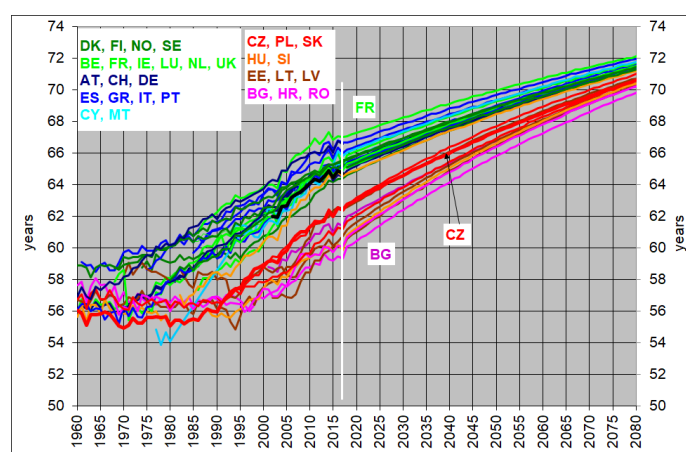


Source: Eurostat database, authors' calculation and graph

Eurostat projection assumes that the proportion of oldest seniors in the EU should gradually grow to almost 13% until 2080, in comparison with present values it will double. Highest values should be reached in South European countries again (almost 18% in Greece, over 16% in Portugal). On the contrary the proportion of oldest seniors in Western Europe and in Scandinavia should be about 10.12% only. Values in Czechia should be close to those of the European Union.

The trend of the development of the age at which the remaining life expectancy reaches the value 20 years corresponds the trend of development of life expectancy at the age near 60 (Fig. 3). There is apparent a gap between post-communist and other European countries arising during the 1960s-1980s when the mortality in post-communist countries stagnates and for males even grows in some years. At present the values of prospective age for West, South and North European countries are about 64-67 years while in post-communist East European countries reach only about 60-63 years. It indicates that lower value of retirement age than 65 years in East European countries can be justified by the fact that the average time of pension receipt would be approximately the same like in West, South and North European countries with the pension age threshold 65 years of age.

**Fig. 3: Age at which the remaining life expectancy is equal to 20 years**



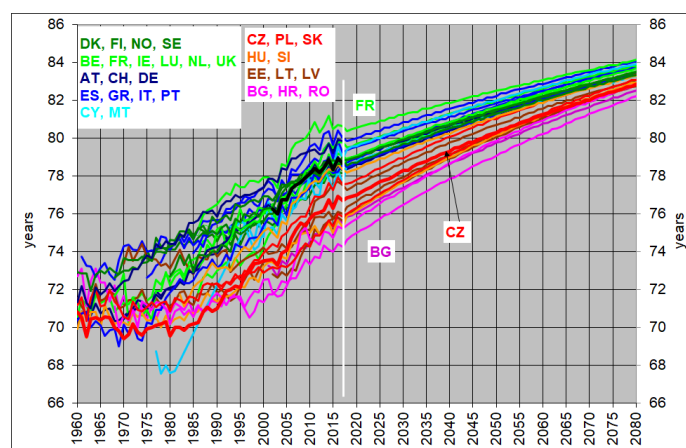
Source: Eurostat database, authors' calculation and graph

The Eurostat projection assumes the convergence of mortality in old age with highest life expectancy in France and lowest values in Bulgaria. Czechia has (together with Poland) highest values from post-communist countries except Slovenia, where the values of life expectancy at old age are close to those of Western, Southern and Northern Europe.

The trends of the development of the age at which the remaining life expectancy reaches value 10 years (Fig. 4) are quite similar to those for life expectancy of 20 years. The gap

between post-communist and other European countries is not so apparent like in the case of life expectancy 20 years. Present values for West, South and North European countries are about 7880 years while in post-communist East European countries only about 7478 years. Due to the assumption of the convergence of mortality in old age diminishing of the differences between countries is expected in the future decades.

**Fig. 4: Age at which the remaining life expectancy is equal to 10 years**

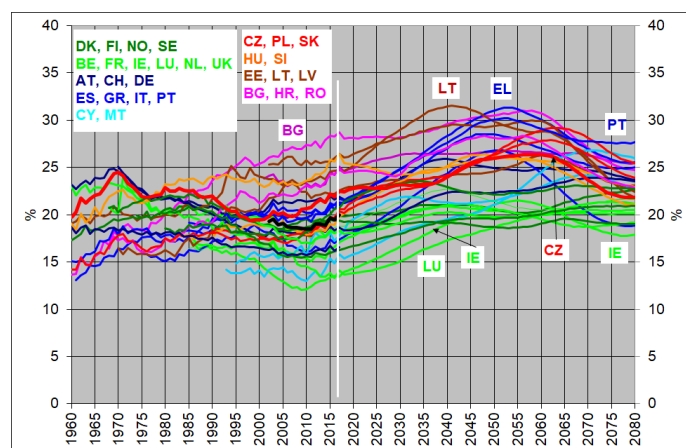


Source: Eurostat database, authors' calculation and graph

Using prospective threshold of old age (as the age when the remaining life expectancy is equal to 20 years), the proportion of “old” persons according to this prospective definition is not growing so dramatically (see Fig. 5). In 1960 the proportion of such defined seniors in the EU countries was in the range from about 13% (Bulgaria and Greece) to 23% (Belgium and Germany) of the total population. At present it reaches from about 13% (Ireland) to almost 29% (Bulgaria). High proportion of seniors in many post-communist countries is caused by the higher mortality in these countries which results in lower threshold of “old” age than in other European countries with lower mortality. In 2080 this proportion is expected to reach values form about 18% (Ireland) to almost 28% (Portugal).

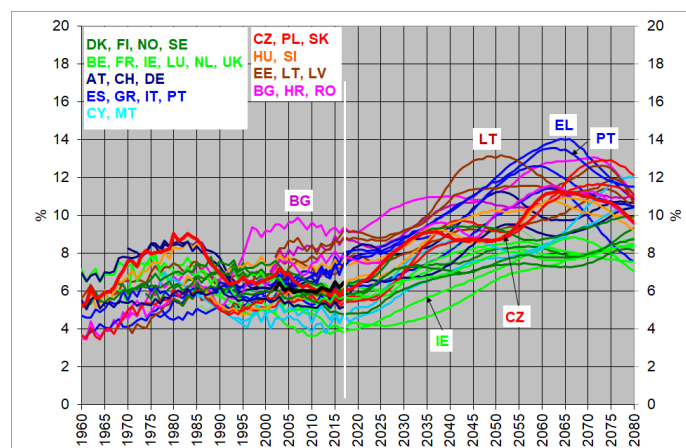
Similar prospective definition of oldest age (as the age when the remaining life expectancy is equal to 10 years or less) also shows that the proportion of “oldest” persons is not growing so rapid as the proportion of persons at the age 80 and more (see Fig. 6). In 1960 the proportion of such defined seniors in the EU countries was from about 3.5% (Bulgaria and Slovakia) to 7% (Belgium and Germany) of the total population. Now it reaches from about 4% (Ireland) to more than 9% (Bulgaria and Latvia). In 2080 this proportion is expected to be form about 7% (Ireland) to almost 12% (Cyprus and Poland).

**Fig. 5: Proportion of persons with the remaining life expectancy 20 years or less (in%)**



Source: Eurostat database, authors' calculation and graph

**Fig. 6: Proportion of persons with the remaining life expectancy 10 years or less (in%)**



Source: Eurostat database, authors' calculation and graph

## Conclusion

Population aging is apparent in all countries of European Union as well as in Norway and Switzerland. The proportion of persons aged 65 years or older doubled since 1960 until present times. It grows from about 10% to 20%. Until the half of this century it is expected to reach almost 30%. Values in individual countries are different. Lowest proportion of seniors are assumed in countries having relatively high fertility (West and North European countries), on the contrary countries of South Europe characteristic of low fertility and low mortality at the same time are supposed to have the highest proportion of seniors. The development of the proportion of oldest seniors (aged 80 years and more) is quite similar.

Indicators based on the concept of prospective age assume dynamic threshold of old age and oldest age defined as the age at which the remaining life expectancy equals 20 or 10 years respectively. Due to previous and expected future permanent decrease of mortality the old age



threshold is increasing during all the period investigated. There is apparent a gap between East European post-communist countries and other countries of the European Union. The values of this indicators based on the prospective age concept do not grow so dramatically as standard indicators of ageing.

Roughly speaking the prospective indicators of aging assume that if the remaining life expectancy would grow say by 5 years, people would become old at the age of 5 years higher than before. This assumption is probably not quite correct because the increase of life expectancy does not imply the same increase of healthy life years. Maybe more precise indicators of aging could be based on the concept of not absolute, but relative remaining life expectancy (see, e.g. Fiala, Langhamrová, 2018). The corresponding threshold of old age could be then e.g. the age when the relative remaining life expectancy equals say 25% of the total life span.

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