INTERGENERATIONALLY EQUITABLE NORMAL PENSION AGE IN CZECHIA

Tomáš Fiala

Abstract

The paper presents proposal of determining the flexible pension age (varying with changing mortality conditions) expressing the idea that members of each cohort should receive as much money in pension benefits as they contribute to the pension system. It is shown that the proportion of number of person-years lived by members of the cohort in the pre-pension phase to the number of person-years lived by members of the cohort in the pension phase must be constant in time. Calculations of equitable pension age for Czechia for the period 1960–2100 work on period life tables and latest population projection. The values of real pension age in Czechia of males were in the era of socialist regime little bit higher than equitable values, at present they are almost equal. The retirement age of females is still lower than equitable values. The proposed growth of real retirement age since 2030 is insufficient to keep the equitable values.

Key words: population ageing, prospective age, equitable pension age, Czechia

JEL Code: J26, J11.

Introduction

The phenomenon of population ageing is one of the most important of the latest decades of the previous and of course also of this century. This topic is not only very often analyzed by demographers and economists, but also widely discussed by general public and media. All demographically and economically advanced populations face and will face the ageing process, which is, in many aspects, unprecedented. Despite the continuing changes in demographic development, especially the continuing increase of the life span and also of the healthy life span, most of the analytical approaches to the population ageing use conventional tools and standard indicators and measures, based usually on the assumption that the threshold of old age is fixed, independent on the population analyzed, unchanged in time, equal usually to 65 years of age, which is the threshold of the retirement age in many countries.

But in fact, almost 50 years ago, Ryder has published the idea of re-examination of the concept of fixed threshold of old age. "*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.) He suggested to consider that the point of entry into old age should be the value of age at which the life expectancy is equal to a given, relatively low, value, say, e.g. 10 years. The idea of flexible old age threshold depending not on the standardly used chronological age but on the remaining life expectancy was suggested later also e.g. by Fuchs (1984). Siegel (1993) proposed to determine the old-age threshold as the age when the life expectancy equals not to 10 but to 15 years.

This idea of alternative concept of definition of human's age and new indicators based of forward-looking conception was particularly treated by Sanderson and Scherbov in several papers. They introduced a new forward-looking definition of age (so called prospective age) and argued that, along with the traditional backward-looking concept of age, this definition provides a more informative basis to discuss population ageing (Sanderson and Scherbov, 2005). Indicators of ageing based on prospective instead of biological age threshold of old age show that the increase of many indicators of ageing will not be so dramatic in comparison with indicators defined by standard way (Sanderson and Scherbov 2010, 2013). Calculations of some prospective indicators for Czech population were published by Klapková et al. (2016). An overview of prospective indicators presents e.g. Šprocha (2019).

In the case of fixed retirement age (e.g. 65 years) the decrease in mortality would result in increase of the time of the old-age pension receipt which could be a serious threat of the future financial sustainability of pension systems. Pension reforms in many states include the idea of further increase of retirement age even above the standard threshold of 65 years. The concept of prospective age can be used for determination of the flexible retirement age threshold reflecting the previous as well as expected future permanent increase of life expectancy. Sanderson and Scherbov presented the concept of so called Intergenerationally equitable normal pension age (Sanderson and Scherbov, 2014).

This paper is to present more detail about this concept and calculations of the development of values of this indicator in the period 1950–2100 for the population of

Czechia. The expected development after 2019 is based on the latest demographic projection of the Czech population presented by the Czech Statistical Office.

1 Intergenerationally equitable normal pension age

Among wealthier countries in recent years one topic has been particularly contentious – changes in pension ages. In order for people to understand, accept, and voluntarily adjust to changes in national pension ages, two criteria must be met. First, the rationale for pension age policy must be compelling, simple and transparent. Second, the resulting policies must be clearly intergenerationally equitable. Currently, in most high income countries, neither criteria is met. Under these circumstances, it is no surprise that pension age changes are so contentious. Sanderson and Scherov (2014) specified an analytically-based determination of pension age policy that meets both of those criteria.

The proposed pension age (varying with changing mortality conditions) expressed the idea that members of each cohort must receive as much money in pension benefits as they contribute to the pension system, i.e. that

$$\tau \cdot y \cdot u = p \cdot v \quad , \qquad (1)$$

where:

u is the number of person-years lived by members of the cohort in the pre-pension phase,

τ is the pension tax rate on income,

y is average income during the pre-pension years,

v is the number of person-years lived by members of the cohort in the pension phase,

and p is the average annual pension receipt.

Denoting β is the ratio of annual pension income to the income of people in the pre-pension period after adjustment for pension contributions we have

$$p = \beta \cdot y \cdot (1 - \tau) \qquad (2)$$

Combining equations (1) and (2) we receive

$$\frac{u}{v} = \beta \cdot (\frac{1}{\tau} - 1) \qquad (3)$$

If the generosity β of the pension system as well as the pension contribution rate τ should be fixed in time (which seems to be a reasonable assumption of equity of the system), then the ratio u/v – and of course also the ratio $v/(u+v)$ – has to be fixed. Under simplified assumption that the economic activity begins at the age of 20 and is finished after reaching

retirement age, the total number of years people of some cohort receive a pension must be a fixed proportion of total years they live from age 20 onward. A pension system based on this fixed ratio may be regarded as equitable because the ratio is the same for all cohorts regardless of the mortality conditions that they face.

In the stationary population model the characteristics u and v, respectively, can be expressed using the T_x values of life tables:

$$u = T_{20} - T_{\alpha} \quad v = T_{\alpha}, \tag{4}$$

where α denotes the retirement age. The equitable normal pension age $\alpha(g)$ for birth cohort g can be then determined as the (unique) solution of the equation

$$\frac{T^{(g)}_{\alpha(g)}}{T^{(g)}_{20}} = \frac{T^{(g_0)}_{\alpha(g_0)}}{T^{(g_0)}_{20}}, \tag{5}$$

where g_0 is a reference cohort. Cohort life table should be used for calculations; $T_x(g)$ denotes the T_x value of the life tables for the cohort of the birth year g.

Cohort life tables are very often unavailable. The idea of determination of pension age may be applied using period life tables. The equitable normal pension age $\alpha(t)$ in the year t can be then determined as the solution of the equation analogous to (5)

$$\frac{T_{t,\alpha(t)}}{T_{t,20}} = \frac{T_{t_0,\alpha(t_0)}}{T_{t_0,20}}, \tag{6}$$

where $T_{t,x}$ is the T_x value of the life tables for the year t and t_0 is a reference year. The pension age $\alpha(t)$ is determined in such a way that the ratio $T_{t,\alpha(t)}/T_{t,20}$ has the same value in each year t.

Calculation of the equitable normal pension age for Czechia according to (6) were performed for the period 1950–2100. Until 2019 life tables published by the Czech Statistical Office (CZSO, 2018a) were used for calculations. Since 2020 the life tables values were estimated using the medium variant of the population projection of the Czech population with no migration (CZSO, 2018b). Values of equitable normal pension age were compared with the real pension age according to current legislation (Act No 155/1995). As reference year t_0 has been chosen the year 2031 when the retirement age for both males and females with 2 or less children in Czechia should reach 65 years. We thus set in (6) t_0=2031, α(2031)=65.

Old-age pension system in Czechia is based on the PAYG principle. A simple (but very rough) indicator of the financial burden of this system is the old-age-dependency ratio (OADR) adjusted to the retirement age assumed, i.e. the ratio

$$AOADR = \frac{S_{t,r(t)+}}{S_{t,20-r(t)}}, \qquad (7)$$

where $S_{t,x}$ is the mid-year population size in the year t at the age x, $r(t)$ denotes the assumed retirement age in the year t. The values were compared with the model value equal to

$$MAOADR = \frac{T_{t,r(t)}}{T_{t,20} - T_{t,r(t)}}. \qquad (8)$$

In the case of stationary population model (i.e. stable mortality rate, stable fertility rates guaranteeing constant population size and no migration) the values T_x are equal to the number of persons at the age x and higher and so the values of *AOADR* must be equal to *MAOADR*. In real populations its size and structure are affected by changes in fertility and mortality in time as well as by migration. Thus there can be (sometimes remarkably high) difference between real and model adjusted dependency ratios.

For non-integer values of age, the linear interpolation method (between neighboring integer values) was used for calculations mentioned above.

2 Main results

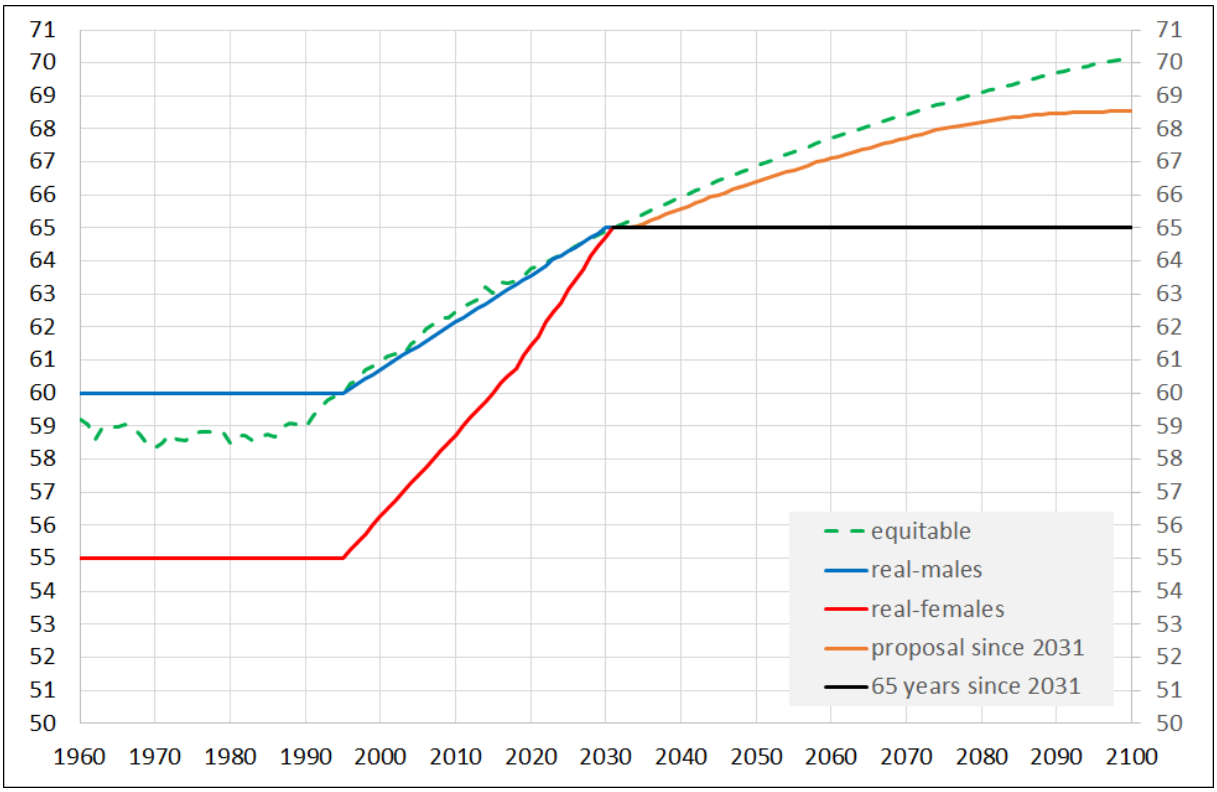
In former Czechoslovakia in the era of socialist regime the statutory retirement age was 60 years for males. For females it was differentiated by the number of reared children, for simplicity we consider only the case of 2 children, when the retirement age was 55 years (Act No 155/1995). Since 1996 the retirement age started slowly to grow. For each subsequent year of birth, the retirement age of males was 2 months higher than for the previous year of births. For females the increase was 4 months, since 2019 it has grown to 6 months for each subsequent year of births. The retirement age of males will reach 65 years of age in 2030, for females with 2 children in 2031.

Since 2030 there is a proposal that the retirement age should be determined so that people surviving until senior age should on average spend in retirement the last quarter of their lives, i.e that they should retire at the age when the proportion of their remaining life of expectancy to the expected total length of life equals to 0.25

$$\frac{e^{(g)}_{r(g)}}{r(g) + e^{(g)}_{r(g)}} = 0.25, \qquad (9)$$

where $r(g)$ is the retirement age for persons born in the year g, $e_x^{(g)}$ is the (unisex) remaining life expectancy at the age x of the generation g. Retirement age determined by this way is growing a little bit slowly than the equitable age because the time of receiving pension is related to the total life span, not to the "adult" period of life span only. The calculations should be updated each 5 years when the updated version of population projection would be published (Act No. 589/1992). But in 2019 this proposal of further growth of retirement age has not been accepted yet. (According to current legislation the retirement age after 2030 should remain constant at the level of 65 years.) The next chance of change will be in 2024 after updated version of population projection and updated proposed retirement age fulfilling (9) calculations.

Fig. 1: Statutory retirement age in Czechia, 1960–2100

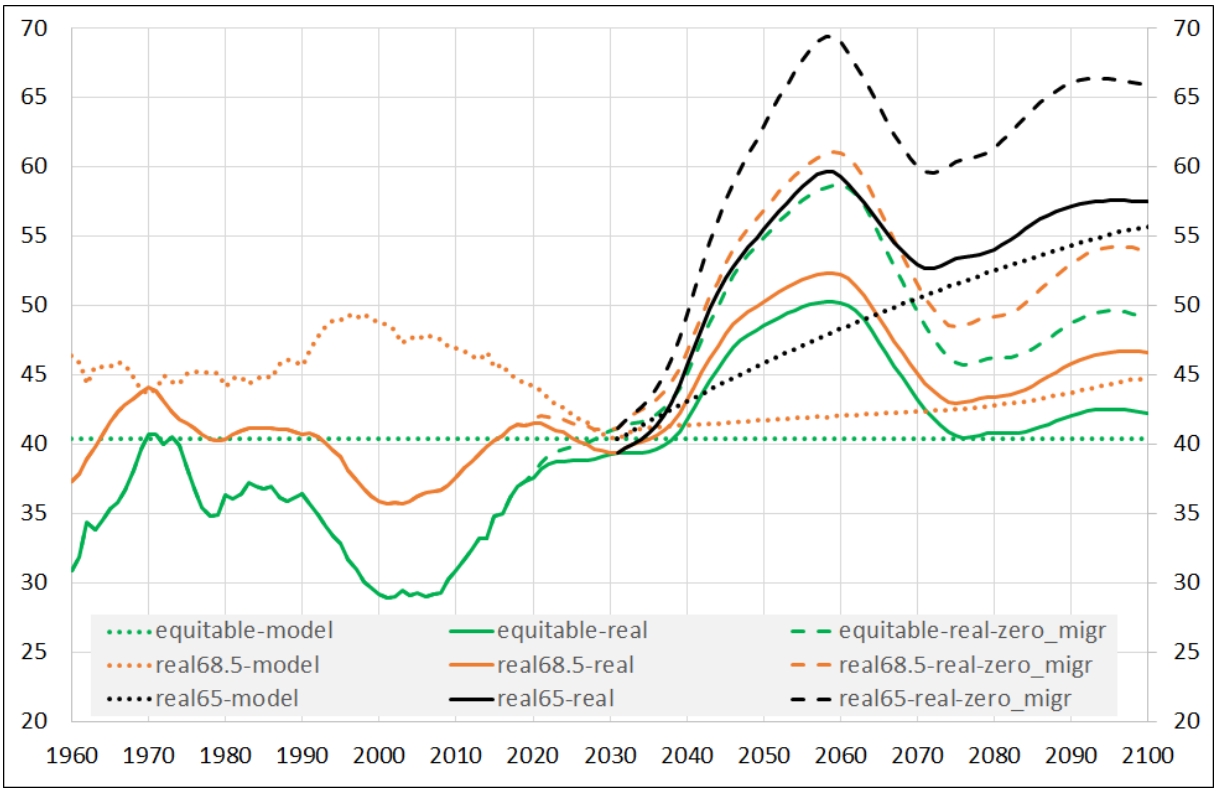


Source: Data: Act No. 155/1995. Author's calculations and graph

Due to mortality stagnation in Czechia during the 60th, 70th and 80th of the previous century the values of equitable retirement age are almost constant in that period. The real retirement age for males was about more 1 year higher while for females (with 2 children) almost 4 years lower than the equitable value (See Fig. 1). Since the second half of the

nineties the growing values of the retirement age of males are very close to the equitable values, values for females gradually converge to them. Since 2031 the retirement age for males and females should be unified, but lower than the equitable values. In 2100 the equitable value should be a little bit higher than 70 years while the proposed real value only about 68,5 years. See Fig. 1.

Fig. 2: Adjusted old-age dependency ratio in Czechia (in %), 1960–2100



Source: Source data: Czech Statistical Office. Author's calculations and graph

Because the real retirement age of females was remarkably lower than the equitable age, the values of model old-age dependency ratio in Czechia were several percentage points higher than the constant value (slightly over 40%) corresponding the equitable age. Nevertheless, the real values of the AOADR were much lower. After reaching the level of 44% in 1970 (the highest value until present times) they started to decrease. The main reason was the fact that the numerous generations born after the WWII reached the productive age and at the same time the number of pensioners dropped because of low fertility during WWI, continuing demographic transition after the war and mortality stagnation. Since 1995 the drop was for several years accelerated due to gradual raise of retirement age as well as the fact that the numerous baby-boom generations born in the 70th of the previous century entered the productive age. After 2000 the ratio started to grow again due to drop in fertility after 80th,

increase in life expectancy after 90th and the fact that numerous after-war generations gradually retired. At present the values are closed to the reference value 40% (see Fig. 2).

The situation will fundamentally change several years after 2030. The baby-boom generations born in the 70th will gradually retire and low level of fertility will not compensate it. At the same time the growth of retirement age should slow down. Even in the case of growing equitable retirement age the real AOADR should reach about 50% in late 50th, which is 10 percentage points higher than the reference value. Later the ratio should drop to 40–45% assuming that the retirement age would gradually grow to 70 years until the end of this century.

If the retirement age would grow until 2100 only to 68.5 years, the AOADR values would be about 47% in the end of this century. Under the (unrealistic) assumption that the retirement age would since 2030 remain constant at the level of 65 years, the values of ratio would reach even 60% (which is about one half higher than present values) and will remain at high level until 2100.

In the hypothetical case of no international migration in Czechia since 2020, the values of OADR in the end of this century would be in all variants of retirement age development about 7-8 percentage points higher than in the expected projection with migration. See Fig. 2.

Conclusion

The values of equitable normal retirement age for Czechia (but calculated by period life tables) are relatively close to the values of real statutory retirement age of males. In the era of socialist regime, the real pension was about 1-1.5 years higher, later the values of real and equitable retirement age are and until 2030 should be almost equal. The retirement age of females (depending on the number of children reared) was until 1995 on average 5 years lower than for males, it should be equalized with males until 2030.

Until the end of this century the equitable retirement age should grow to 70 years of age. According to the current proposal and the real retirement age (equal for males and females) should reach only about 68.5 years in 2100.

The values of model old-age dependency ratio were several percentage points higher than the constant value (40%) corresponding the equitable age. The real values of the AOADR (reflecting changes not only in mortality, but also fertility and migration) reached until present times its maximum (about 44%) in 1970.

The ratio will dramatically grow especially after 2040 when the baby-boom generations born in the 70th will gradually retire. Further raise of retirement age (over

65 years) at that times seems to be unavoidable. If the retirement age would remain at the level of 65 years, the OADR would reach even 60%.

The future development of course can change if there will come changes in mortality, fertility and migration not assumed in the projection used for calculations.

Acknowledgment

This article was supported by the Czech Science Foundation No. GA ČR 19-03984S under the title Economy of Successful Ageing.

References

Český statistický úřad (Czech Statistical Office – CZSO). 2018a. Úmrtnostní tabulky za ČR od roku 1920. Available at: https://www.czso.cz/csu/czso/umrtnostni_tabulky

Český statistický úřad (Czech Statistical Office – CZSO). 2018b. Projekce obyvatelstva České republiky – 2018–2100. Available at: https://www.czso.cz/csu/czso/projekce-obyvatelstva-ceske-republiky-2018-2100

Fuchs, V. R. 1984. Though Much is Taken: Reflections on Aging, Health, and Medical Care. Milbank Memorial Fund Quarterly. *Health and Society*. Vol. 62, No. 2, Special Issue: Financing Medicare: Explorations in Controlling Costs and Raising Revenues (Springer, 1984), pp. 142-166. Published by: Wiley on behalf of Milbank Memorial Fund. Stable URL: http://www.jstor.org/stable/3349821.

Klapková, M., Šídlo, L., Šprocha, B. 2016. Koncept prospektivního věku a jeho aplikace na vybrané ukazatele demografického stárnutí (The Concept of Prospective Age and its Application to Selected Indicators of Demographic Ageing). *Demografie*, Vol. 58, pp. 126-141. Český statistický úřad, Praha.

Ryder, N. B. 1975. Notes on Stationary Populations. *Population Index*, Vol. 41, No. 1, pp. 3-28. Published by: Office of Population Research. Available at: http://www.jstor.org/stable/2734140.

Sanderson, W. C. & Scherbov, S. 2005. Average Remaining Lifetimes Can Increase as Human Populations Age. *Nature*, 2005, Vol. 435, No. 7 043, p. 811–813. DOI: 10.1038/nature03593. Available at: <http://www.nature.com/doifinder/10.1038/nature03593>.

Sanderson, W. C. & Scherbov, S. 2007. A New Perspective on Population Aging. *Demographic Research*, Vol. 16, pp. 27–58. DOI: 10.4054/DemRes.2007.16.2.

Sanderson, W. C. & Scherbov, S. 2010. Remeasuring Aging. *Science*, Vol. 329, No. 5 997, pp. 1287–1288. DOI: 10.1126/science.1193647.

Sanderson, W. C. & Scherbov, S. 2013. The Characteristics Approach to the Measurement of Population Aging. *Population and Development Review*, Vol. 39, No. 4, pp. 673–685. DOI: 10.1111/j.1728-4457.2013.00633.x.

Sanderson, W. C. & Scherbov, S. 2014. An Easily Understood and Intergenerationally Equitable Normal Pension Age. In: *IIASA*, (*Interim Report* IR–14_020).

Siegel, J. S. 1993. *A Generation of Change: a Profile of America's Older Population*. New York: Russell Sage Foundation, 1993, xxxvi.

Šprocha, B. 2019. Niektoré nové prístupy k analýze populačného starnutia (Some New Approaches to the Analysis of the Population Ageing). *Slovenská štatistika a demografia* (*Slovak Statistics and Demography*). Vol. 29. No. 4, pp. 23¬35.

Zákon 155/1995 Sb. (Act No. 155/1995 Coll.). O důchodovém pojištění, aktuální znění.

Zákon 589/1992 Sb. (Act No. 589/1992 Coll.). O pojistném na sociální zabezpečení a příspěvku na státní politiku zaměstnanosti, aktuální znění.

Contact

Tomáš Fiala
Department of Demography
Faculty of Informatics and Statistics
Prague University of Economics and Business
Nám. W. Churchilla 4
130 67 Praha 3
Czechia
fiala@vse.cz