

Selected Coefficients of Demographic Old Age in Traditional and Potential Terms on the Example of Poland and Czechia

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Abstract

The aging process of the population is a natural demographic process, which is gaining more and more intensity both in Poland, Czechia and other countries. This is a demographically important issue, as it is related to many aspects of life, such as the social care system, the healthcare system or the pension system. The article presents selected demographic coefficients in the traditional approach, in which the construction of measures is based on determining the participation of elderly people in the total population or reflecting the relationship between different age groups. The article also presents coefficients in potential (static) terms, in which not only the number of age groups is important, but also how many years a person or age group can still survive. The values of population ageing coefficients in terms of potential and traditional demography were calculated on the example of Poland and Czechia.

Keywords

Demography, population ageing, traditional demographic, potential demography

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J11, J14

INTRODUCTION

Population ageing is a process that can be considered from both an individual and a collective point of view. An individual's old age is the last stage of a person's life in which many vital functions decrease, physical fitness decreases and the level of health declines. From a community perspective, the phenomenon of population ageing is often defined as an increase in the proportion of older age groups in the total population, resulting from long-term changes in mortality and fertility. The changes are an increase in the older age groups and a decrease in the younger age groups. Factors generating the aging process of the population are also the increasing life expectancy and future life expectancy and low fertility rates

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(Okólski and Fihel, 2012). Population ageing is a demographic phenomenon in which the age structure of the population is changing from stagnant to regressive, with an increasing proportion of the population at old age (Kurkiewicz, 1992). Population ageing is a demographic process, which increase can be observed in recent years both in Poland and Czechia, as well as in other European societies. The phenomenon of population ageing is an important issue in demographic research, especially in European countries (Długosz, 1996 and 2002). The population ageing process is an intensifying phenomenon leading to significant changes in the demographic structure of the country. The decreasing number of people of working age and the increasing number of people of old age (requiring support and care) has a number of socio-economic consequences.

The ageing of the population in terms of research requires ongoing monitoring and analysis, in order to capture both the general trend and interregional differences. The article aims to illustrate the aging process of the population of Poland and Czechia against the background of 27 countries of the European Union (excluding the United Kingdom). The analyses presented in this article serve to show the growth of measures that define the aging process of the population. The analysis of demographic indicators is carried out on the basis of indicators of traditional demography and potential demography. In the traditional view, the measurement of the ageing of a population usually involves determining the relationship between the size of age groups, an example of which is, among others the determination of the proportion of people aged 65 and over in the total population, i.e. the demographic ageing coefficient.

However, it is important not only the very fact of reaching a certain age of 65 years, referred to as the beginning of old age (Rosset, 1959; Wierzchoślawski, 1999), but also how many years after reaching it a person is likely to live. It is clear that, depending on the country, a person aged 65 may have a different number of years to live, which is reflected in life expectancy tables. Potential demography takes that fact into account. In terms of potential, an individual is considered through their life potential, i.e. the number of years they can still live according to current life expectancy tables. The process of ageing of a potential population is considered not through the prism of the number of people who have reached a predefined ageing threshold, but in terms of the years that individuals would live beyond the age considered to be the beginning of that period (Murkowski, 2018). The potential approach to population ageing complements the traditional methods, as it can take into account not only the life expectancy of people currently regarded as elderly but also the number of years that would be lived at old age by people who have not yet reached that age (Murkowski, 2018). The analysis conducted in this article compares selected indicators of population ageing for Poland and Czechia for 2010 and 2019. A comparison of measures from 2019 with measures from 2020 as the first year of the Sars-Covid-19 pandemic is also presented. The aim of the study is to show the phenomenon of population ageing in Poland and Czechia using two approaches – traditional and potential. The analysis involves comparing these measures. In the case of the traditional approach, the analysis consists in identifying the country with the highest value of the indicator and the country with the lowest value, as well as in assessing the difference of the selected indicator for Poland and Czechia in relation to the lowest and the highest value recorded in the given period in the group of 27 EU countries. In the case of the potential approach, it is a comparison of the values of potentials of given age groups as well as the values of potential population ageing rates defined analogically to traditional measures. For indicators in potential terms, an analysis using data from 2010 and 2019 is presented. The values of demographic coefficients in traditional and potential terms presented in the article are calculated on the basis of data from Eurostat, the Central Statistical Office (GUS) and the Czech Statistical Office (CZSO).

1 SELECTED MEASURES OF ADVANCED AGEING

1.1 Demographic coefficients in classical terms

The article contains an analysis of the level of the population ageing in 27 European Union countries using the values of selected demographic coefficients in classical terms (Długosz, Kurek, Kwiatek-Sołtys,

2011; Murkowski, 2018a and 2018b; Cieślak, 2004; Kot and Kurkiewicz, 2004; Holzer, 2003). Classical measures are based on established old-age thresholds and reflect the relationship between different age groups. In the analysis, age 65 was taken as the old age threshold.

The traditional demographic coefficients considered in the analysis are:

- Demographic old age ratio – share of population aged 65 and over in the total population:

$$\frac{L_{65+}}{L_{0-14}} \cdot 100\%, \quad (1)$$

where: L_{65+} – number of people aged 65 and over, L – total population;

- Demographic old age index defined as the quotient of the number of older people, e.g. aged 65+ and over, to the number of young people, e.g. aged up to 15 years:

$$\frac{L_{65+}}{L_{0-14}}, \quad (2)$$

where: L_{65+} – number of people aged 65 and over, L_{0-14} – number of people up to 15 years of age;

- Ageing rate, defined as the quotient of the number of people aged 85 and over among older people, e.g. aged 65 and over (double ageing index):

$$\frac{L_{85+}}{L_{65+}}, \quad (3)$$

where: L_{85+} – number of people aged 85 and over, L_{65+} – number of people aged 65 and over;

- Median age – the median value marks the age limit that half of the study population has already exceeded and the other half has not yet reached.

In order to determine the level of population ageing, a scale of a given measure must be used. The literature describes many proposals for an ageing scale, but none of them is universal.

The ageing of the population is a dynamic phenomenon and the scales are period-adapted and therefore modified over the years. In the case of the demographic old-age coefficient in the Polish literature, the scale proposed by E. Rosset (Rosset, 1959) was most often used, assuming the age of 60 as the threshold of demographic old age. The scale used in the analyses of this article is proposed by J. T. Kowaleski (Kowaleski and Majdzińska, 2012) which is a modification of the Rosset scale with age 65 as the value of old age (Table 1).

In the case of the demographic age index, the scale used in the analysis is presented in Table 2. According to this scale, the actual old age of a population starts when the 0–14 age group becomes less numerous than the 65+ age group, i.e. when the demographic old age index takes on a value greater than unity (Kowaleski, 2011; Kowaleski and Majdzińska, 2012).

To determine the level of old age on the basis of the median, a modified scale is used in the article, in which demographically old are those populations in which the median age of the population exceeds 30 years, and the percentage of the population aged 65+ is at least 15% in them (Maksimowicz, 1990; Kowaleski and Majdzińska, 2012). If the median value is greater than 35 years and the proportion of the population of 65+ is above 20%, then the population is defined as very old.

Table 1 Demographic old age scale based on the proportion of the population aged 65 and over

Share of population aged 65+ (in %)	Demographic study
Stages of population ageing	
Below 10	Demographic youth
10–12	Foreground of ageing
12–14	Ageing well
Over 14	Demographic ageing
Degrees of demographic ageing	
14–16	I
16–18	II
18–20	III
20 and more	IV

Source: Kowaleski and Majdzińska (2012)

Table 2 The scale of advancement of demographic old age based on the index of old age

Demographic age index	Demographic study
Stages of population ageing	
Up to 0.6	Demographic youth
0.6–0.8	Foreground of ageing
0.8–1.0	Ageing well
1.0 and over	Demographic ageing
Degrees of demographic ageing	
1.0–1.2	I
1.2–1.4	II
1.4 and over	III

Source: Kowaleski and Majdzińska (2012)

1.2 Demographic coefficients in potential – static terms

From the point of view of potential demography, it is not the fact of living to a certain age that is important, but how many years one will live after reaching that age. In potential demography, it is not people or events that count, but time – understood as the life potential of individuals. This potential is established on the basis of life expectancy tables. A full description of life tables can be found in the book by Kędelski and Paradysz (Kędelski and Paradysz, 2006).

The basic value of potential demography is the life potential of an individual, defined by the expected number of years (defined in life tables by the symbol e_x) and will be calculated from the formula:

$$V(x) = \frac{e_x + e_{x+1}}{2}, \quad (4)$$

where: e_x – the average life expectancy of people at the exact age of x .

The second basic value in the theory of potential demography is the total life potential (Vielrose, 1958; Murkowski, 2013 and 2018), which we will denote by the symbol PC . It determines the expected number of years that the study population has to survive in total. It is calculated from the formula:

$$PC = V(0, \omega; 0, \omega) = \sum_{x=0}^{\omega-1} P_x \frac{e_x + e_{x+1}}{2}, \quad (5)$$

where:

ω – the upper age limit in the life expectancy table, in which the number of living people is equal to zero, in this analysis was assumed that $\omega = 100$,

P_x – the average population for a given age group,

e_x – the average life expectancy of people at the exact age of x .

The analysis presented in the article contains the values of potential demography coefficients in static terms. In this approach, it is used the fact that the total life potential can be divided into partial potentials, i.e. the life potentials of people of a certain age for the whole of their further life. Thus, from the total life potential, we extract partial potentials, i.e. the expected number of remaining years of life among people in a fixed age group (Murkowski, 2018a). The potential of people aged from m to M years in relation to their further period of life will be marked with the symbol $V(m, M; m, \omega)$ and will be calculated from the formula:

$$V(m, M; m, \omega) = \sum_{x=m}^{M-1} P_x \frac{e_x + e_{x+1}}{2}. \quad (6)$$

Potential ageing rates are calculated by analogy with traditional coefficients, replacing the size of the age groups with the corresponding partial potentials, i.e. the number of years to live of a given population group included in the definition of the coefficient.

Demographic coefficients in potential terms included in the analysis are:

- Demographic old-age ratio:

$$W_{65+} = \frac{V(65, \omega; 65, \omega)}{PC} \cdot 100\%, \quad (7)$$

where: $V(65, \omega; 65, \omega)$ – determines the expected number of remaining years of life among people aged 65+,

- Demographic old age index defined:

$$W_{65+/0-15} = \frac{V(65, \omega; 65, \omega)}{V(0, 15; 0, \omega)} \cdot 100\%, \quad (8)$$

where: $V(0, 15; 0, \omega)$ – determines the expected number of remaining years of life among people aged 0–14 years,

- The advanced ageing index (double ageing index):

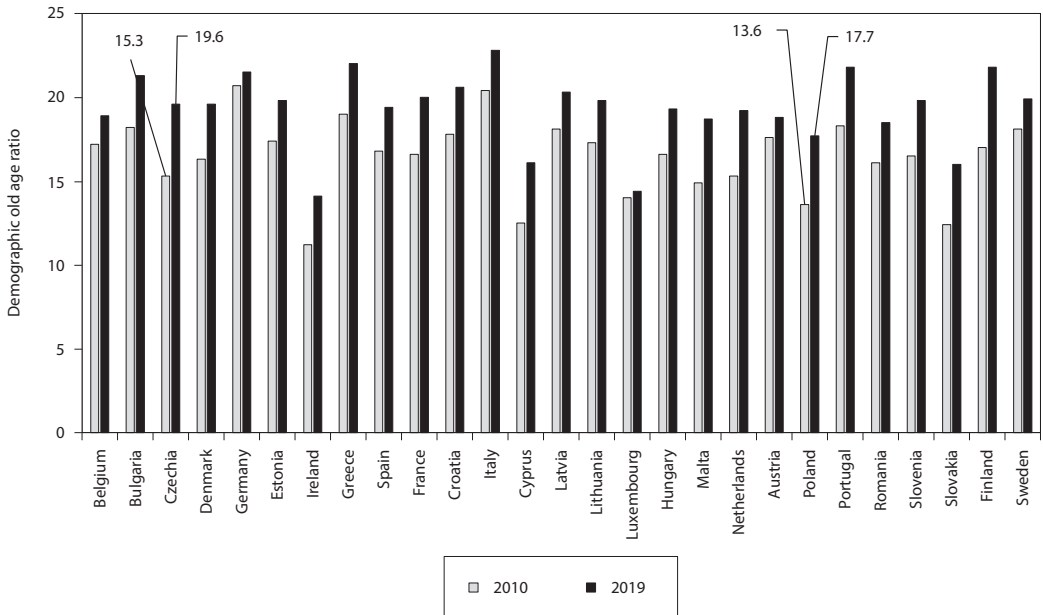
$$W_{85+/65+} = \frac{V(85, \omega; 85, \omega)}{V(65, \omega; 65, \omega)} \cdot 100\%. \quad (9)$$

where: $V(85, \omega; 85, \omega)$ – determines the expected number of remaining years of life among people aged 85+ years.

2 ANALYSIS OF SELECTED MEASURES OF POPULATION AGEING BASED ON CLASSICAL AND POTENTIAL MEASURES

The first demographic coefficient analysed is the demographic old age coefficient – defined as the share of the population aged 65 and over in the total population. The old age dependency ratio for all 27 countries has increased when comparing the 2010 values with those in 2020. For Czechia, the old-age dependency ratio value in 2010 is 15.3%, in 2019 it is 19.6% and in 2020 19.9%. For Poland the value of the coefficient in the following analysed years is 13.6%, 17.7% and 18.2%. The increase in the coefficient between 2010 and 2019 for the Czechia is 4.6 percentage points, for Poland 4.1 percentage points, which gives a similar value of growth for these countries. Comparing the year 2019 with the first year of the Sars-Covid-19 pandemic, i.e. 2020, for Czechia the increase in the demographic ageing coefficient is 0.3 pct %, for Poland the increase was slightly higher – 0.5 pct% (Figure 1 and Figure 2).

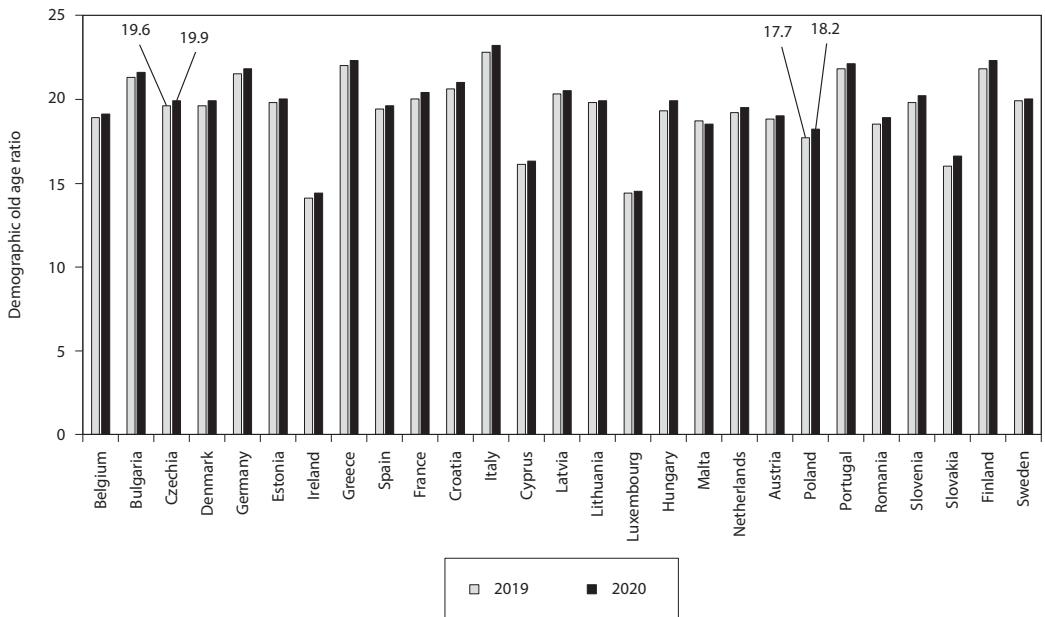
Figure 1 Demographic ageing index values compared to the 27 EU countries



Source: Own elaboration

The country with the highest demographic coefficient over the analysed period was Germany, in 2010 with a coefficient value of 20.7, followed by Italy in 2019 and 2020 with values of 22.8 and 23.2. The state with the lowest value in the three years analysed was Ireland with values of 11.2 – 14.1 – 14.4, respectively (Table 3). Czechia in the ascending ranking among EU-27 countries in 2010 was in the seventh position and Poland in the fourth (Table 4). In 2019 and then in 2020, Czechia moved up the ranking to the thirteenth then the twelfth place, bringing it closer in value to countries defined as demographically old. Poland occupied the fifth position in these two years.

Figure 2 Demographic ageing index values compared to the 27 EU countries



Source: Own elaboration

Table 3 Demographic demographic old age ratio compared to the 27 EU countries

Year	Czechia	Poland	Country with the highest coefficient value	Country with the lowest coefficient value
2010	15.30	13.57	Germany 20.7	Ireland 11.2
2019	19.60	17.70	Italy 22.8	Ireland 14.1
2020	19.90	18.20	Italy 23.2	Ireland 14.4

Source: Own elaboration

Table 4 Place of Czechia and Poland in the ascending ranking of the EU-27 countries

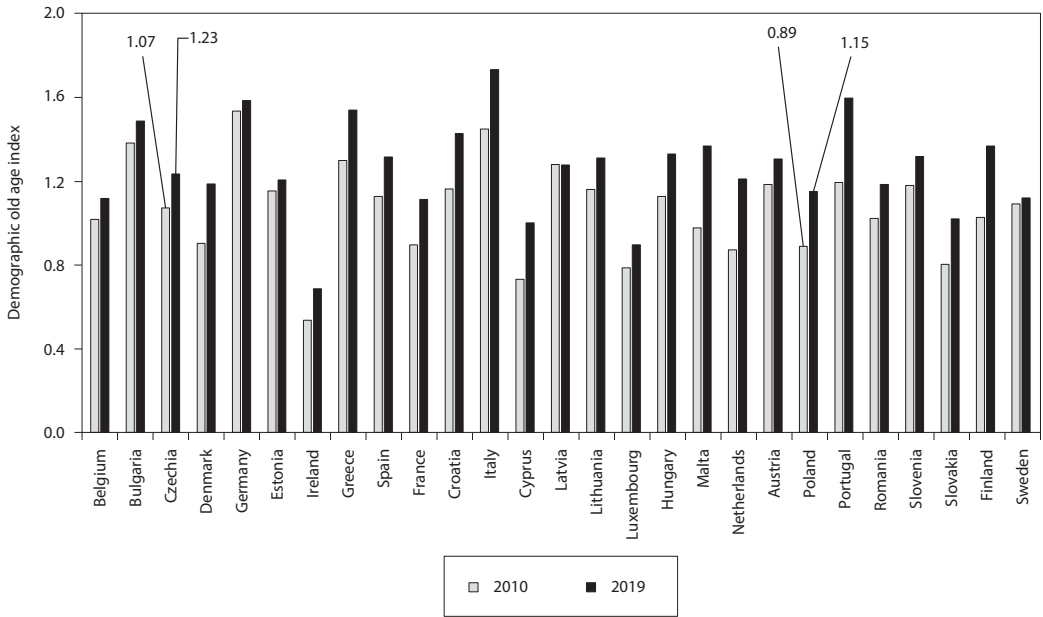
	2010	2019	2020
Czechia	7	13	12
Poland	4	5	5

Source: Own elaboration

According to the scale presented in Table 1, only Ireland was at the pre-ageing stage in 2010, while Slovakia, Cyprus and Poland were at the appropriate ageing stage. The other countries included in the analysis reached the stage of demographic old age, including Czechia of the first degree and Italy and Germany of the IV degree.

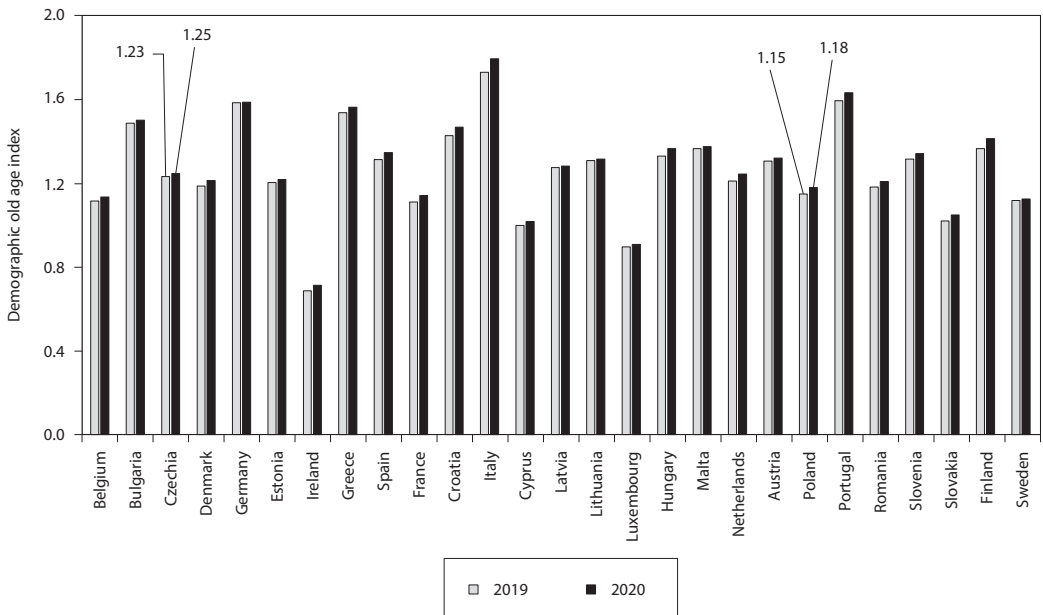
All 27 countries have already reached demographic old age in 2019 and 2020. Czechia has moved to level three of demographic old age, Poland from level two in 2019 to level three in 2020. The group

Figure 3 Demographic age index values compared to the 27 EU countries



Source: Own elaboration

Figure 4 Demographic age index values compared to the 27 EU countries



Source: Own elaboration

of the oldest countries in 2019 was joined by: France, Latvia, Croatia, Bulgaria, Portugal, Greece and Finland, in 2020 this group already consisted of 12 countries. Another factor is the demographic old age index. This ratio determines the quotient of the number of people aged 65 and over to the number of children aged 0–15 years. The literature states that the demographic old age of a population begins when the group of children becomes less numerous than the older population group, i.e. when the coefficient takes a value greater than unity (Kowaleski, 2011; Kowaleski and Majdzińska, 2012; GavriloVA and GavriloV, 2009).

In the three analysed years, the country with the lowest value of the demographic old age index was Ireland with values of 0.54, 0.69 and 0.71, which, according to the scale (Table 2) placed the country into the group of demographically young countries. The country with the highest value of the measure in 2010 was Germany while in 2019 and 2020 it was Italy (Table 5). Poland in 2010 was at the stage of proper aging with the value of 0.89, Czechia with the value of 1.07 had already reached the demographic old age of the first degree. In 2019 and 2020, both countries Poland and Czechia have already reached index values that allow them to be classified as demographically old countries of the second degree. In 2019 the countries that did not exceed an index value greater than unity were only Ireland, Luxembourg, Cyprus, in 2020 only Ireland and Luxembourg. In the ascending ranking of the 27 countries analysed, Czechia maintained its 13th position in the indicated years, Poland moved from the 6th to the 8th position (Tables 5 and 6).

Table 5 Demographic age index values compared to the 27 EU countries

Year	Czechia	Poland	The country with the highest index value	The country with the lowest index value
2010	1.07	0.89	Germany 1.53	Ireland 0.54
2019	1.23	1.15	Italy 1.73	Ireland 0.69
2020	1.25	1.18	Italy 1.79	Ireland 0.71

Source: Own elaboration

Table 6 Place of Czechia and Poland in the ranking of the EU-27 countries

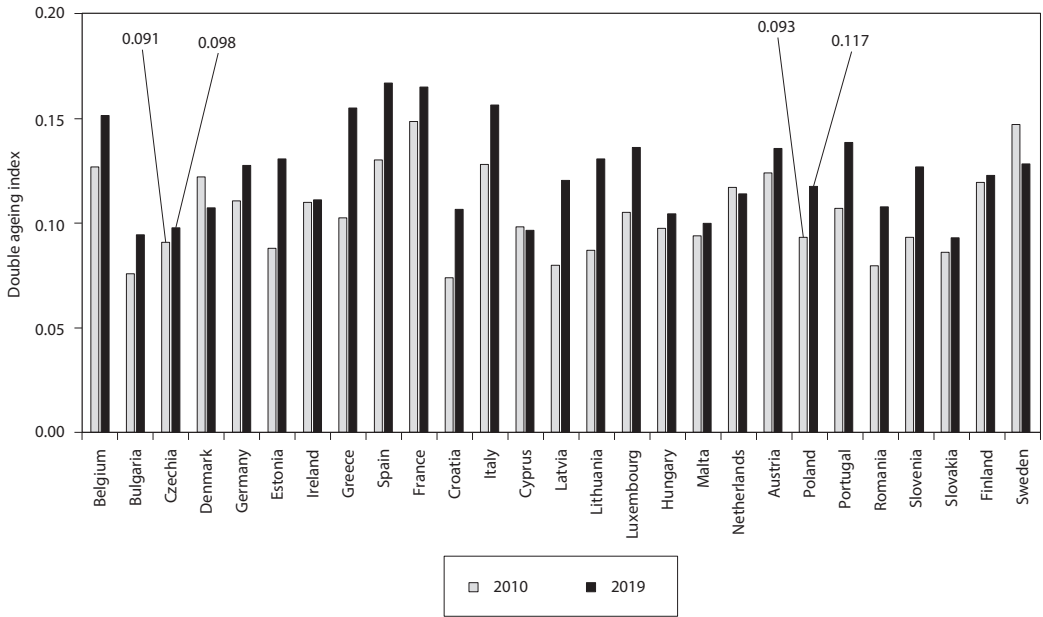
	2010	2019	2020
Czechia	13	13	13
Poland	6	8	8

Source: Own elaboration

Another coefficient determining the level of ageing of the population is the quotient of the number of people aged old to the number of people aged 65 and over, referred to as the double ageing index or the index of old age. Figures 5 and 6 present a picture of the situation described by the old age index for the group of countries being under consideration for the years 2010, 2019 and 2020. Comparing the values from 2010 to 2019, apart from Cyprus, Denmark and Sweden, the remaining countries had higher index values. Both for Poland and Czechia the value of the coefficient has also increased between 2010 and 2019 in the case of Poland by 0.024 and in the case of Czechia by a much smaller value of 0.007. This indicator decreased marginally in 2020 compared to 2019 in the case of Poland the value did not change.

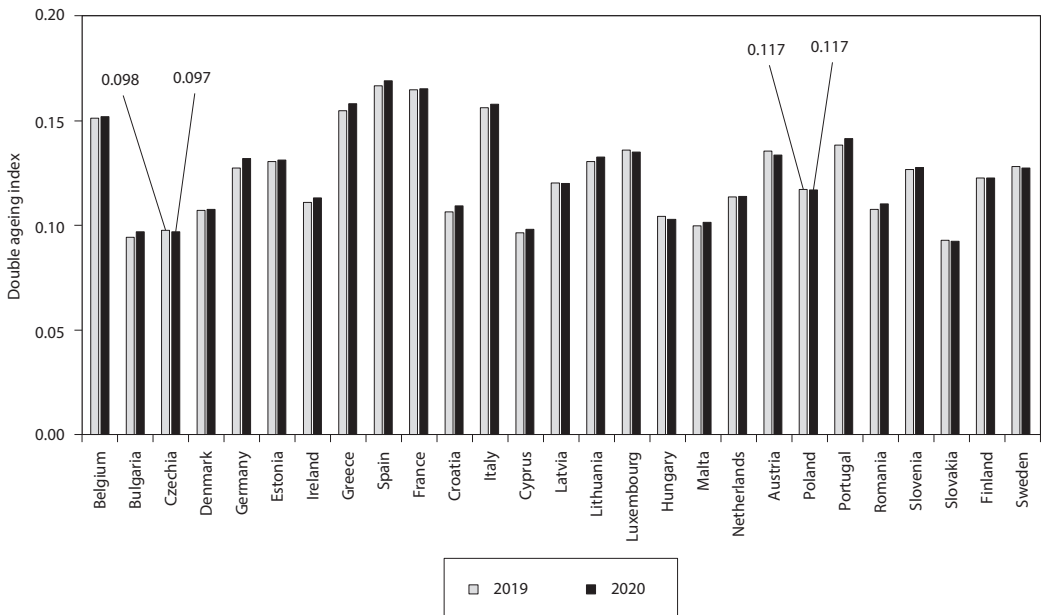
In the ranking of analysed countries (Table 8), Poland in 2010 occupied position 9th then moved towards countries previously described as old countries and occupied position 12th in 2019 and 2020. Czechia was in the 8th position in 2010 then moved up the ranking to be in the 3rd position in 2020 – where the top five countries with the lowest values are: Slovakia, Bulgaria, Czechia, Cyprus and Malta.

Figure 5 Double ageing index values compared to the 27 EU countries



Source: Own elaboration

Figure 6 Double ageing values compared to the 27 EU countries



Source: Own elaboration

Table 7 Double ageing index values compared to the 27 EU countries

Year	Czechia	Poland	The country with the highest index value	The country with the lowest index value
2010	0.091	0.093	France 0.148	Croatia 0.0738
2019	0.098	0.117	Spain 0.167	Slovakia 0.093
2020	0.097	0.117	Spain 0.169	Slovakia 0.092

Source: Own elaboration

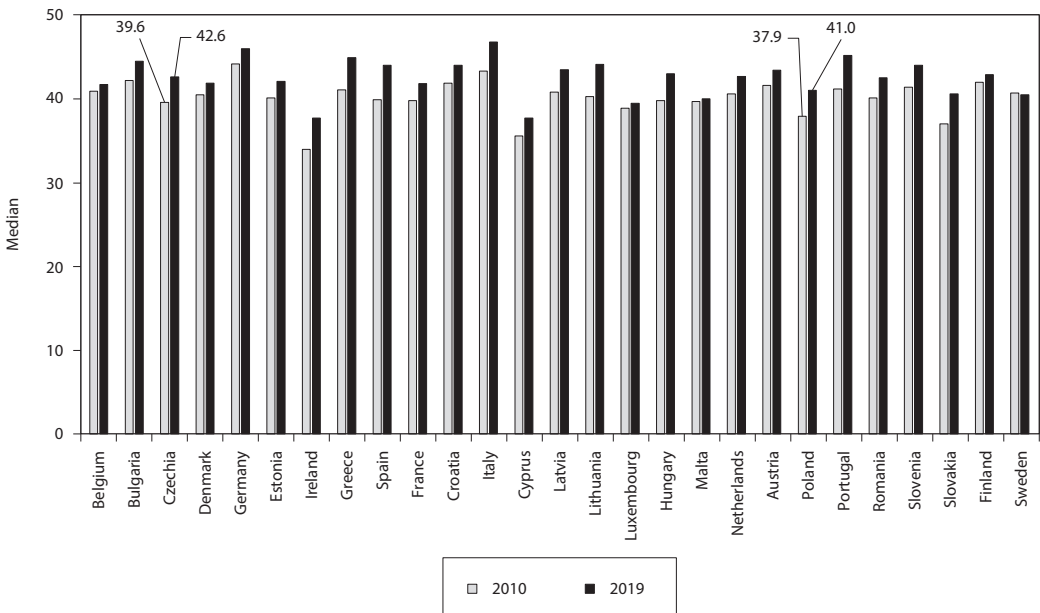
Table 8 Place of Czechia and Poland in the ascending ranking of the EU-27 countries

	2010	2019	2020
Czechia	8	4	3
Poland	9	12	12

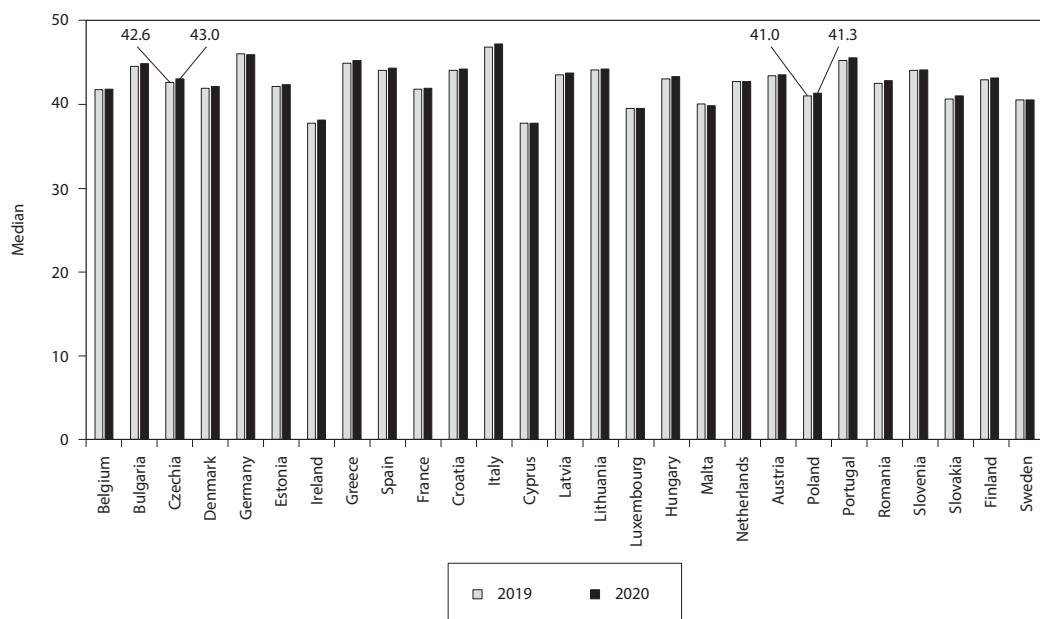
Source: Own elaboration

The last classical measure discussed is the median. In 2010 the country with the lowest median value of 34 was Ireland, in 2020 the lowest median was recorded in Cyprus 37.7. The country with the highest value at the beginning of the considered period was Germany with a value of 44.2, in 2019 and 2020 it was already Italy with a value of 46.8 and in 2020 with a value of 44.7 (Table 9). The median values (Figure 7) of 2019 for countries outside Sweden (median decreased by 0.2) were higher than in 2010. Between 2019 and 2020 (chart 8) there was still an increase in value apart from Germany and Malta where the decrease in value was 0.1 and 0.2, respectively.

Figure 7 Median values compared to the 27 EU countries



Source: Own elaboration

Figure 8 Median values compared to the 27 EU countries

Source: Own elaboration

For Poland the increase in the median value in 2019 compared to 2010 was 3.1, for Czechia in the same period was 3.0. In 2020 there was also an increase in this indicator respectively for Poland by 0.3 and Czechia by 0.4. In the increasing ranking presented in Table 10, Poland was ranked 4th out of 27 countries in 2010, and in the following years it moved up to 7th position. In contrast, Czechia has moved from the sixth place in 2010 towards demographically old countries, taking 13th place in 2019 and 14th place the following year.

Table 9 Median values compared to the 27 EU countries

Year	Czechia	Poland	The country with the lowest median value	The country with the highest median value
2010	39.6	37.9	Germany 44.2	Ireland, 34.0
2019	42.6	41.0	Italy 46.8	Ireland, Cyprus 37.7
2020	43.0	41.3	Italy 47.2	Cyprus 37.7

Source: Own elaboration

Table 10 Place of Czechia and Poland in the ranking of the EU-27 countries

	2010	2019	2020
Czechia	6	13	14
Poland	4	7	7

Source: Own elaboration

According to the ageing level scale of A. Maksimowicz (Maksimowicz 1990), Poland was an ageing population in 2010, while Czechia was in the phase of advanced ageing. In 2019 and 2020, both countries were advanced old countries.

The basic value of potential demography is the life potential of the unit $V(x)$ (defined by Formula 4), in which the main unit is e_x – the average life expectancy of people at the exact age of x .

The data in Tables 11 and 12 give examples of average life expectancy for people over 0, 14 and 65 years of age, as well as potential values for people of over the indicated age. In 2010, the average life expectancy for newborn babies under one year of age is longer for people from Czechia than for people from Poland. For people aged 14, the life expectancy for boys from Czechia is longer than for men from Poland. Life expectancy tables show that life expectancy for men up to the age of 70 in Czechia is longer than for men of the same age in Poland. For men from Poland aged 71 and over, life expectancy is longer than for men of the same age from Czechia. However, in case of women from the first year of life onwards Polish women are characterized by a longer life expectancy. The values of individual life potentials in 2010 for Czech men aged 0–70 are higher than for Polish men, in case of Polish women the values of individual life potentials are higher.

In 2019, for Czech men aged 0–69, life expectancy was longer than for Polish men. In case of individual potential, it was higher for Czech men aged 0–70 than for Poles in the same age range. For women aged 0–59 in 2019, both life expectancy values and individual potential values were higher for the Czech women than for the Polish ones. At the age of 60 and over, women in Poland in 2019 were characterized by longer further age and higher values of individual potentials.

Table 11 Unit life potential values for Poland for 2010 and 2019

Sex	Age (x)	2010		2019	
		e_x	$V(x)$	e_x	$V(x)$
Male	0	72.10	71.60	74.07	73.71
	14	58.63	58.14	60.46	59.97
	65	15.06	14.76	15.95	15.65
Female	0	80.59	80.26	81.75	81.40
	14	67.09	66.60	68.14	67.65
	65	19.39	18.99	20.10	19.71

Source: Own elaboration

Table 12 Unit life potential values for Czechia for 2010 and 2019

Sex	Age (x)	2010		2019	
		e_x	$V(x)$	e_x	$V(x)$
Male	0	74.40	74.01	76.33	75.94
	14	60.74	60.25	62.66	62.16
	65	15.29	14.97	16.29	15.95
Female	0	80.63	80.23	82.10	81.69
	14	66.95	66.46	68.38	67.89
	65	18.75	18.35	19.94	19.53

Source: Own elaboration

According to Formula (5), the total potential of a given population (and partial potential) of the population is calculated by adding the average numbers of years of people from given age group multiplied by the average duration of life of people aged x corresponding to the different age groups according to the Formula (4).

Population ageing rates in potential (static) terms are compiled for Poland and Czechia for 2010 and 2019. The life potentials that form the basis for the calculation of the coefficient values in the potential demography theory were expressed in years and listed in Table 13.

Table 13 Static potential values for the populations of Poland and Czechia in 2010 and 2019

Description	2010		2019	
	Poland	Czechia	Poland	Czechia
Population	38 022 869	10 462 088	37 972 812	10 649 800
Total life potential PC	1 512 678 908.32	408 997 284.06	1 483 686 379.11	417 076 022.68
The number of years to live for people up to 15 years of age $V(0, 15; 0, \omega)$	402 320 042.03	105 482 444.56	412 190 272.64	121 824 764.80
Number of years to live for people over 60 years of age $V(65, \omega; 65, \omega)$	57 769 382.35	17 689 148.42	82 282 911.02	26 590 534.46
Number of years to live for people over 85 years of age $V(85, \omega; 85, \omega)$	2 315 979.12	599 849.67	3 843 824.52	890 176.58
Number of years (%) to live for the population in the period of 65+	3.82	5.55	4.33	4.24
Number of years (%) to live for the population in the period of 85+	0.15	0.26	0.15	0.14

Source: Own elaboration

The level of advancement of population ageing in potential (static) terms is much lower than in case of traditional measures. The population of Poland aged 65 and over in 2010 accounted for more than 13% of the country's total population had to live 3.82% years of the total years to be lived by the entire population (Table 12). In the case of Czechia, the traditional demographic ageing coefficient was 15.3%, in potential terms it is 5.55, i.e. the potential of the old age group represents more than 5% of the total potential of Czechia's population. In 2019, the values of the discussed coefficient for both countries increased – for Poland by 1.73 percentage points and for Czechia by 0.88 percentage points. The contributing factors are both the higher percentage of old people in the population of Poland and the fact that people aged 65 and over in Poland are characterised by longer life expectancy as defined by life expectancy tables. In the case of the potential old-age ratio for Poland, the value increased by 0.66 % percentage points in 2019 compared to 2010. For Czechia, the ratio decreased by 1.32 % percentage points (Table 14 and Figure 9).

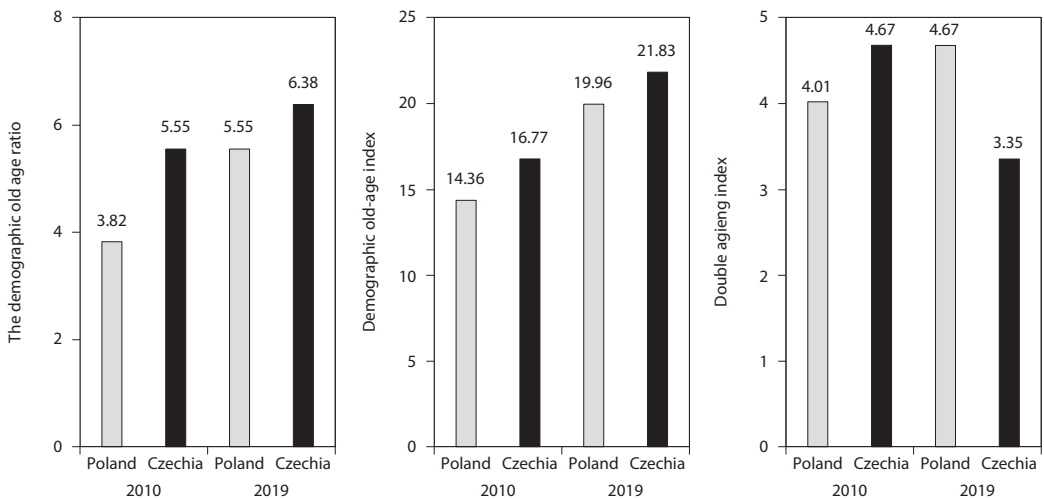
Note that both coefficients analysed here - demographic old age and old age – in potential terms reach much lower values (in percentage terms) than the corresponding coefficients in traditional terms. This is due to the fact that the average life span of people included in the so-called older subpopulation is much shorter than the average life span of other members of the population. The last of the analysed coefficients - the demographic ageing index determines the share of the potential of people aged 65–100 years to the value of the potential of people aged 0–15 years. Based on the values from Table 12 and it can be seen that in 2010 in Poland the potential of young people was almost 7 times greater than the potential of people of post-productive age, in Czechia it was 6 times greater. In 2019, as a result of the change

Table 14 The values of the rates of demographic old age potentially static terms, calculated for Poland and Czechia for 2010 and 2019

Potential coefficients – static approach	Value of the coefficient			
	2010	2010	2019	2019
	Poland	Czechia	Poland	Czechia
Demographic old-age ratio	3.82	5.55	5.55	6.38
Demographic old-age index	14.36	16.77	19.96	21.83
Double ageing index	4.01	4.67	4.67	3.35

Source: Own elaboration

in the number of the discussed age groups, the potential of young people in Poland was almost 6 times greater and in Czechia 4.5 times greater. The values of the demographic aging index in 2019 were higher than in 2010, increased for Poland by 5.6% percentage points for the other country by about 5% percentage points. Thus, the potential of people 65 years and older in the final analysed period accounted for almost 20% of the years for further living of the group of people up to 15 years for Poland, while for Czechia this potential accounted for almost 22% of the total potential of people up to 15 years. The increasing value of the demographic old age index is influenced by the fact that the dynamics of the growth of the potential of people 65+ is greater than the dynamics of the growth of the potential of the age group up to 15 years old. The values of particular coefficients and their dynamics are presented in Figure 9.

Figure 9 Values of demographic indicators in terms of potential for Poland and Czechia in comparison between 2010 and 2019

Source: Own elaboration

CONCLUSION

Traditional indicators for measuring the degree of ageing of the population are based on the number of people in individual age groups. In the article, the traditional approach to the study of the ageing process of the population has been extended by a potential approach in a static approach, i.e. using potentials

in calculating measures, which are the number of years that a given population group can still live based on life expectancy tables. The analysis was carried out for Poland and Czechia. Most of the metrics discussed in both potential and traditional terms for both countries reached values greater in 2019 than in 2010. The exception was the ratio defining the share of people 85+ and over to people 65+ and over, whose value for Czechia decreased in 2019 compared to 2010. When analyzing the ranking of the 27 EU countries, Poland and Czechia are placed at the beginning or below the middle position of the ranking. That is why Poland and Czechia are referred to as relatively "young" countries in comparison with the above mentioned group of EU countries. However, the increasing number of people of post-productive age and also extension of life expectancy, and thus the increasing potential of the countries, suggest that in the future both Poland and Czechia will catch up with the countries which are already achieving now high rates of population ageing coefficients.

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