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## **Wyzwania i perspektywy demograficzne państw europejskich**

### **Streszczenie**

Celem artykułu jest wskazanie na wybrane procesy demograficzne, których konsekwencje mają i będą mieć w przyszłości zasadniczy wpływ na funkcjonowanie państw europejskich. Znaczenie poszczególnych krajów związane jest bezpośrednio z ich potencjałem demograficznym, którego wielkość ulega gwałtownym zmianom w ostatnich latach. Prawidłowa diagnoza występujących problemów demograficznych wymaga zastosowania właściwych narzędzi poznawczych służących do ich opisu. Do wyjaśnienia zachodzących współcześnie procesów demograficznych autor zastosował nie tylko klasycznie stosowane narzędzia demograficzne, ale wykorzystał również inne rzadziej wykorzystywane metody m.in. metody demografii potencjalnej. Porównując poszczególne państwa europejskie uwypuklono różnice w zakresie ich potencjalnych zdolności do reprodukcji, wielkości obciążenia demograficznego czy zaawansowania procesów starzenia się populacji. Zaproponowano również miarę, która może stanowić punkt odniesienia przy wyznaczaniu ustawowego wieku przejścia na emeryturę. Aktualne prognozy demograficzne wskazują na niekorzystne perspektywy rozwoju demograficznego dla wielu państw europejskich oraz dla całego kontynentu.

**Słowa kluczowe:** demografia potencjalna, starzenie się populacji, wiek emerytalny, prognozy demograficzne

### **The challenges and demographic prospects of European countries**

#### **Abstract**

The aim of the article is to indicate selected demographic processes, their consequences and how they will have a major future impact on the functioning of the European countries. The importance of individual countries is directly connected to their demographic potential, the size of which has been changing rapidly in recent years. A proper identification of the existing demographic problems requires the use of appropriate cognitive tools for their description. To explain the ongoing contemporary demographic processes the author applied not only traditional demographic measures, but also other less frequently used approaches among other methods of potential demography. Comparing different European countries highlights the differences in terms of their potential ability to reproduce, the age dependency ratio or advanced aging populations. The author proposed a measure which may be a reference point in determining the statutory retirement age. Current demographic projections indicate unfavorable demographic prospects for many European countries and for Europe in general.

**Keywords:** potential demography, population aging, pension age, demographic forecasts

**JEL CODE:** J11, J14

#### **Introduction**

The basic characteristic of demographic processes in Europe is the declining rate of their development, whose one of the consequences is the unfavorable changes in population age structure. In most European countries, an increasing proportion of people are already of post-working age or close. Europe's population growth is slowing down, with some areas of the continent experiencing depopulation. The demographic potential of Europe is losing importance compared to other continents, especially against the dynamic increase in population

in third-world countries. As a result, in many European countries an increased risk of instability can be expected, i.e. in health care, social security or the pension system. The European countries are trying to counteract these trends, e.g. by increasing spending on pronatalist policies, encouraging the influx of immigrants or raising statutory thresholds for retirement.

The purpose of this article is to indicate selected demographic processes, such as an aging population or an increase in the age dependency ratio of working-age people, whose consequences may threaten the stability of European countries. However, the correct identification of demographic problems requires using appropriate cognitive tools to describe them. To explain the ongoing demographic processes, the author applied not only traditional measures, but also less frequently used methods of analyzing population phenomena, such as methods of potential demography (Panush, Peritz 1996, p. 27, Murkowski 2015, pp. 15-24, Blangiardo, Rimoldi 2013) or alternative ways of measuring the advancement of the processes of human population ageing (Abramowska-Komon 2011). The main advantage of the potential demography methods is their ability to assign different degrees of importance to individual age groups of a given population, depending on their life potential. On the other hand, the advantage of the alternative measurement of the population aging process is age diversity, i.e. the border between middle-aged people and elderly, or old, people for particular populations. To estimate future demographic trends, the Eurostat population forecast "EUROPOP2013" was used, prepared for the European Union (EU) countries and members of the European Free Trade Association (EFTA). In addition, the age bracket from 20 to 65 years old was assumed as working age for the purposes of this article.

### **Demographic potential**

The importance of individual countries is directly related to their demographic potential, the size of which has been changing rapidly over the last couple of decades. Demographic potential can be defined as the ability of the population to reproduce its size while maintaining favorable age relations in the population structure (in particular, the relations between groups of people of pre-working, working and post-working age). The demographic potential of individual countries is usually determined by analyzing the dynamics of the number of people in a given population, but it should be noted that this is a simplified approach and it does not fully reflect the complexity of the concept at hand. In potential demography, the concept of total life potential is used as an expression of demographic potential, which means the total remaining lifetime of the members of a given population. The measure reflects not only the size of a given population, but also characterizes its structure by sex and age, depending on the size of the average continued life span of its particular age groups. In addition, the average life potential, which is the average remaining number of years to live of a typical country resident, is also used for comparison between individual countries (it is the quotient of the total life potential and the average population). This measure can be a synthetic indicator of the demographic potential of a given population. Detailed principles of calculating the total life potential and its various forms can be found in the study by Egon Vielrose (1956).

The population of the 28 EU countries in 2014 was approximately 508 million, with an approximate total of 20,949 million years to live. Over the next decades, the EU population will increase slightly, reaching around 525 million in 2050, while its total life potential will increase to over 22,530 million years. The anticipated changes in population numbers up to 2050 indicate that we will face a phenomenon of depopulation in the countries of the eastern part of the EU (in particular post-socialist countries) plus Germany, Spain and Portugal. Depopulation processes will be most strongly marked in the Baltic States, while the Polish population will decrease to less than 35 million people in 2050 - a decrease by 8.5% compared to 2014. At the same time, the total life potential of the Polish population will drop even more, to about 1,350 million years - a decrease by as much as 11.5% compared to 2014. This change will occur despite the forecasted increase in the average continued lifetime of Polish residents

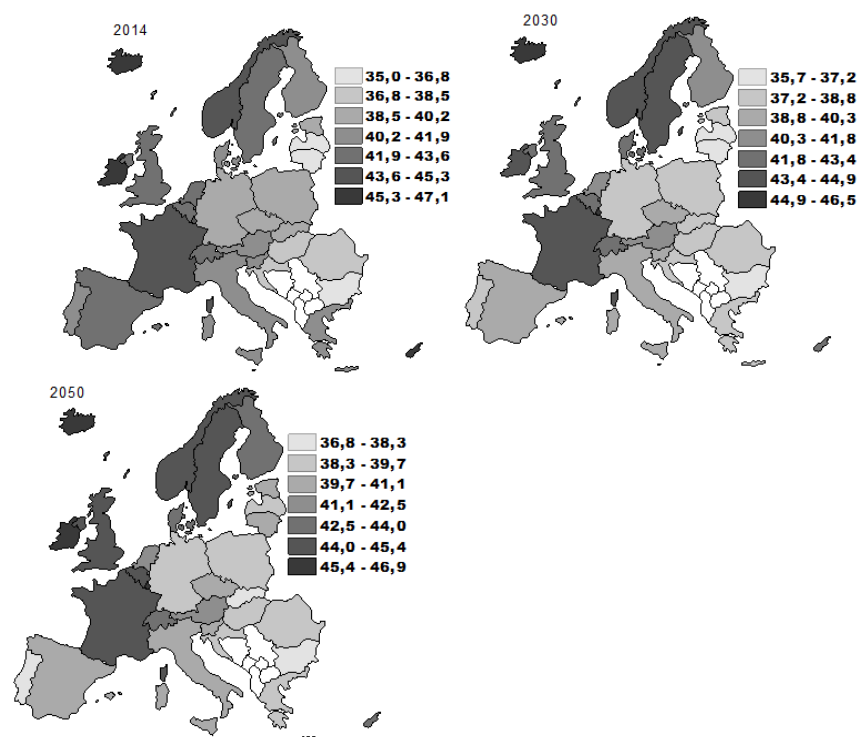
by approximately 5 years for women and 7 years for men, which indicates the aging of population age structure. On the other hand, a contrary trend is to be observed in the countries of Northern and Central Europe whose population is expected to increase. This includes countries like: the United Kingdom, Norway, Iceland, Sweden, Switzerland, France and the Benelux countries. It should be expected that, in 2050, the population of Great Britain will be as high as 77 million - the most numerous from all analyzed countries. Populations of France and Germany are forecasted at approximately 74.5 million, although they will significantly differ in terms of total life potential in favor of France as the country characterized by a clearly younger population age structure. Analogous relations will also be observed in 2050 for the following pairs of countries: the Netherlands and Romania, the Czech Republic and Switzerland, Norway and Portugal, Ireland and Bulgaria (Table 1).

**Table 1. Population and its life potential**

Country	Population [mln]			PC [mln years]			Country	Population [mln]			PC [mln years]		
	2014	2030	2050	2014	2030	2050		2014	2030	2050	2014	2030	2050
Austria	8,5	9,3	9,7	354	380	402	Latvia	2,0	1,6	1,5	72	59	58
Belgium	11,2	12,9	14,8	476	556	656	Malta	0,4	0,5	0,5	18	19	20
Bulgaria	7,2	6,5	5,8	254	230	217	Germany	81,0	79,7	74,5	3177	3063	2909
Croatia	4,2	4,1	3,8	162	155	150	Poland	38,0	37,5	34,8	1518	1443	1344
Cyprus	0,9	0,9	1,0	39	39	44	Portugal	10,4	9,8	8,8	420	372	332
Czech Republic	10,5	10,8	11,1	416	421	454	Romania	19,9	19,0	17,9	743	719	707
Denmark	5,6	6,1	6,4	236	255	280	Slovakia	5,4	5,3	4,9	215	200	179
Estonia	1,3	1,2	1,1	51	46	45	Slovenia	2,1	2,1	2,1	84	82	84
Finland	5,5	5,9	6,2	227	246	267	Sweden	9,7	11,0	12,5	417	482	562
France	66,2	70,5	74,4	2931	3074	3322	Hungary	9,9	9,7	9,3	364	363	365
Greece	10,9	10,1	9,1	442	389	354	UK	64,6	70,6	77,3	2793	3 062	3432
Spain	46,5	44,5	45,6	1992	1759	1829	Italy	60,8	64,2	67,0	2486	2 580	2735
Netherlands	16,9	17,6	17,4	718	728	731	UE	508	519	526	2094 9	2103 6	2183 0
Ireland	4,6	4,6	5,0	213	208	228	Iceland	0,3	0,4	0,4	15	17	19
Lithuania	2,9	2,2	1,9	108	79	77	Norway	5,1	6,4	7,7	228	286	349
Luxembourg	0,6	0,8	1,1	25	36	49	Switzerland	8,2	9,6	10,9	354	412	476

Source: own study based on Eurostat data

In 2014, European countries could be divided into two groups depending on their demographic potential. The post-socialist countries had an average life potential clearly below 40 years. In addition, this group also included the population of Germany, which, despite high average life expectancy of its citizens, was marked by an unfavorable population age structure. On the other hand, the countries of the northern, southern and eastern parts of Europe showed high values of the demographic potential of their inhabitants from 40 and up to 47 years for the populations of Iceland and Ireland. It is expected that in the following years, despite the increase in the average life expectancy in all analyzed European countries, a group of countries with a relatively small life potential will include as of 2030 not only the countries of Central and Eastern Europe, but also the countries from the southern part of the continent. In turn, high values of demographic potential will be observed mainly in the countries of western and northern part of Europe (Figure 1).

**Figure 1. Average life potential**


Source: own study based on Eurostat data.

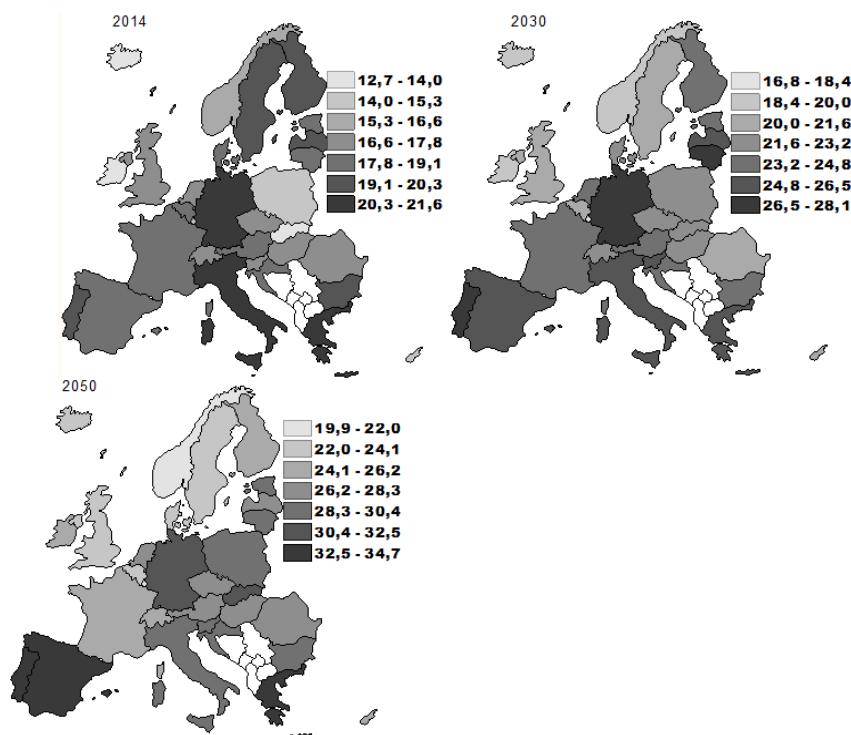
### Population aging

The aging of societies - an increase in the percentage of elderly people in the population - is a process widely discussed by demographers, economists and social politicians alike due to the fact its consequences have a significant impact on the functioning of many expensive government programs, such as the pension system or the elderly care system. Proper measurement of the advancement of this phenomenon therefore seems to be of paramount importance, especially in the times of extremely dynamic improvement in mortality rates and healthy life expectancy (HALE). The most frequently used measure for the study of the advancement of aging processes in human populations is the percentage share of people aged 60 or 65 and over in the entire population. However, the very act of labelling a person as “elderly”, or “old”, is considered fluid and it changes along with the increase in average continued life expectancy. From the standpoint of this process, today's sixty-year-olds cannot be ascribed the same meaning as those who lived a hundred years ago; the same goes sixty-year-olds in developed countries and those living in places with a significantly lower life expectancy. For the proper measurement of the advancement of population aging, it is extremely important how we define elderliness, or what age we recognize as the border between middle age and old age. Defining the demographic perspectives of European countries in the field of the aging of their populations, two measures of the advancement of this process were used: a traditional measure, the percentage share of people aged 65 and over in the population, and an alternative measure proposed by Wolfgang Lutz, Warren Sanderson and Sergei Scherbova (2005a, 2005b, 2008, 2008), i.e. the percentage share of people who have an average 15 expected remaining of life. In the alternative approach to this process, along with the increase in longevity, the minimum age of people who are considered elderly increases as well.

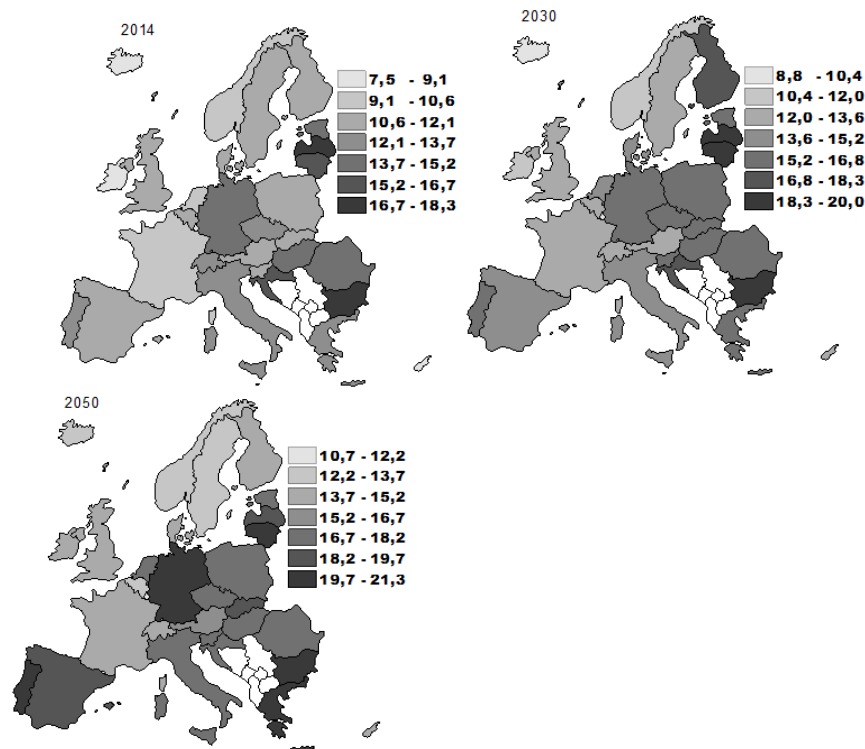
92 million and 62 million people would be recognized as “old” in 2014 under the traditional approach and the alternative approach, respectively (Table 2). The results of measuring

the advancement of the aging process of the population are closely correlated with the definition of an “old person” that is considered appropriate. Among 28 EU countries, in 2014 there was as much as 18.7% of people aged 65 and over, while only 12.3% of the population of the 28 EU countries was aged 15 or less. In countries like Germany, Italy, Greece and Portugal, people over 65 years old made up for over 20% of the population in 2014. On the other end of the spectrum, Ireland, Iceland, Slovakia and Cyprus were among the countries with the youngest population age structure (Figure 2). In contrast, using the alternative approach to measuring population aging resulted in a drastic change in the territorial diversity of European countries as regards this process. In 2014, the countries of Eastern and Central Europe - in particular Bulgaria, the Baltics, Romania, Croatia, Hungary and Germany – had the highest proportions of elderly people. As a threshold for old age, the values of approximately 64 years for men and about 68 years for women are assumed, rather than 75 years for women or 70 years for men as for some Western European countries. The reason for this are the differences in average continued life expectancy. On the other hand, the group of countries with a low percentage share of people with 15 expected remaining years of life will involve primarily western and northern parts of Europe, namely Ireland, France and the Scandinavian countries (Figure 3).

**Figure 2. Percentage of people aged 65 and over in the population**



Source: own study based on Eurostat data

**Figure 3. Percentage of people with 15 or less expected remaining years of life in the population**


Source: own study based on Eurostat data

**Table 2. Number of people over 65 and with 15 or less expected remaining years of life**

Country	Number of people 65+			Number of people 15–			Country	Number of people 65+			Number of people 15–		
	2014	2030	2050	2014	2030	2050		2014	2030	2050	2014	2030	2050
Austria	1,6	2,2	2,7	1,0	1,2	1,6	Latvia	0,4	0,4	0,4	0,3	0,3	0,3
Belgium	2,0	2,8	3,4	1,3	1,6	2,0	Malta	0,08	0,11	0,12	0,04	0,07	0,07
Bulgaria	1,4	1,6	1,7	1,3	1,3	1,2	Germany	17,0	22,4	23,7	12,2	13,0	14,9
Croatia	0,8	1,0	1,1	0,6	0,7	0,7	Poland	5,8	8,5	10,4	4,1	5,8	5,8
Cyprus	0,12	0,19	0,26	0,07	0,11	0,15	Portugal	2,1	2,6	3,1	1,4	1,6	1,9
Czech Republic	1,9	2,4	3,0	1,3	1,7	1,9	Romania	3,3	4,0	5,0	2,9	3,1	3,3
Denmark	1,0	1,4	1,5	0,6	0,9	0,9	Slovakia	0,7	1,1	1,5	0,6	0,8	0,9
Estonia	0,2	0,3	0,3	0,2	0,2	0,2	Slovenia	0,4	0,5	0,6	0,2	0,3	0,4
Finland	1,1	1,4	1,5	0,6	1,0	0,9	Sweden	1,9	2,4	2,8	1,1	1,5	1,7
France	12,0	16,4	18,7	6,6	9,3	10,9	Hungary	1,7	2,1	2,6	1,5	1,6	1,6
Greece	2,3	2,6	3,1	1,5	1,6	1,9	UK	11,4	15,1	18,5	7,0	8,9	10,8
Spain	8,5	11,3	15,2	5,0	6,2	8,8	Italy	13,1	16,3	20,0	8,1	9,5	12,2
Netherlands	3,0	4,3	4,7	1,8	2,6	3,0	UE	95,0	124,8	147,9	62,3	76,0	89,1
Ireland	0,6	0,9	1,2	0,4	0,5	0,7	Iceland	0,04	0,07	0,09	0,02	0,04	0,05
Lithuania	0,5	0,6	0,5	0,5	0,4	0,4	Norway	0,8	1,2	1,7	0,5	0,7	1,0
Luxembourg	0,08	0,13	0,21	0,05	0,07	0,11	Switzerland	1,4	2,1	2,8	1,1	1,2	1,6

Source: own study based on Eurostat data (in millions of people).

It is expected that the percentage of people aged 65 and over will systematically increase in EU countries, only to reach approximately 24% in 2030 and approximately 28% in 2050. However, changes in the fraction of people with 15 or less expected remaining years of life indicate that the aging process of European countries will become less dynamic in the future. It can be predicted that the proportion of people with a continued life expectancy of 15 years or less will make up for about 15% of the EU population in 2030, and just about 17% in 2050. The territorial diversification of the advancement of the aging processes of individual European countries will also change. The percentage of people aged 65 and over will reach approximately 27% of the population in some countries in 2030, and even up to 34% for Spain, Portugal or Greece in 2050 (Figure 2). However, in 2050, countries with a high proportion of people with 15 or less expected remaining years of life will predominantly include the countries of Eastern, Central and Southern Europe (Figure 3). Then, on the basis of both criteria of advancement of the aging processes of European populations, the least “old” countries in 2050 should be mainly countries of the northern part of Europe and some countries located in the western part of the continent.

### Age dependency ratio

The extent of the age dependency ratio can be measured using traditional methods illustrating the relationship between the number of people of non-working and working age, or by the potential age dependency ratio indicator proposed by the author, which expresses the ratio of the number of years to live of the members of non-working age in a given population to the number of years to live of the members of working age in the same population. Assuming the limits for working age to be from 20 to 65, we can calculate the value of this rate using the following formula (Murkowski 2011, 2012a):

$$W_{OB_{pot}} = \frac{P_{0-19} + P_{65+}}{P_{20-64}}, \text{ where:}$$

(2)

$P_{0-19}$  – number of years to live under 20 years of age;

$P_{65+}$  – number of years to live over 65 years of age;

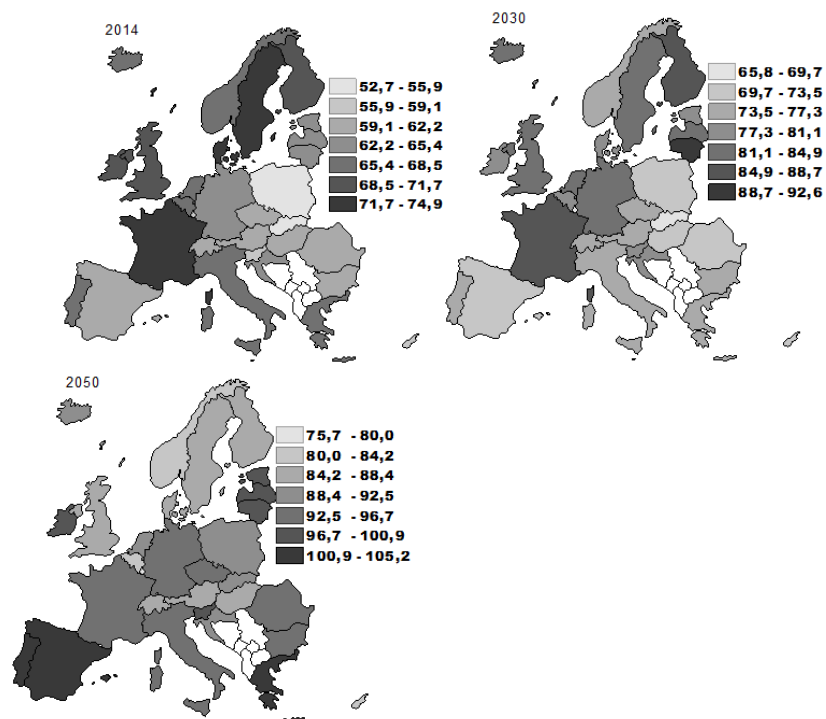
$P_{20-64}$  – number of years to live from 20 to 65 years of age.

Detailed rules for determining the appropriate values of the number of years to live at a particular age can be found in the study by E. Vilrose (1956), while the description of the use of the indicator and its advantages are contained also in other studies by this author (Murkowski 2011, 2012a). The potential age dependency ratio is essentially a traditional age dependency ratio but “weighted”, where the weight is the average number of years to live of the population of working and non-working age. Its advantage is the assignment of different age dependency ratios of individuals depending on their age and the average number of years to live for working and non-working age. Therefore, a 5-year-old does not carry the same “burden” as a 65-year-old, i.e. someone who is soon to be of non-working age and someone who has just reached working age.

In 2014, there were almost 66 persons of non-working age per 100 working-age EU citizens, of which 34 were of pre-working age and 31 of post-working age. The countries of the eastern part of Europe and Spain had the lowest age dependency ratio of people of working age with people of non-working age in 2014 (Figure 4). Then, for every 100 working-age years to live in 2014 there was about 86 non-working-age years to live. However, the lower age dependency ratio expressed by the traditional measure was not always accompanied by low values of the potential measure, as can be seen with the population of Spain characterized by a relatively low age dependency ratio expressed by the traditional measure (in connection, among others, with a decrease in the number of people of pre-working age) and at the same

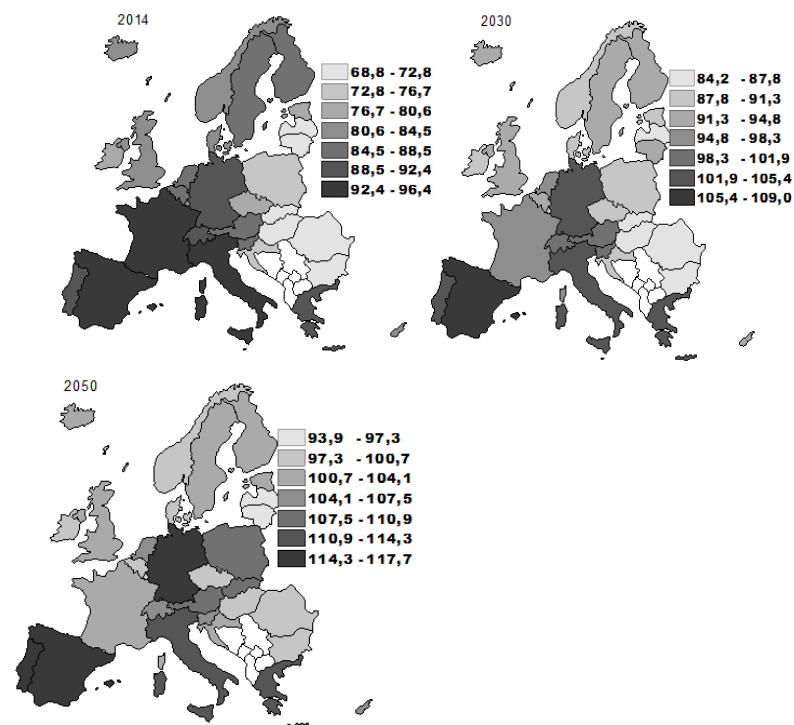
time high in the case of the potential measure (many generations of people who are currently of working age, but are close to being of post-working age) .

**Figure 4. Traditional age dependency ratio**



Source: own study based on Eurostat data

**Figure 5. Potential age dependency ratio**



Source: own study based on Eurostat data

It is expected that, in 2050, for every 100 people of working age there will be as many as 93 people of non-working age, mainly of post-working age. In addition, as of approximately



2035, the EU population will have a smaller number of remaining years of life between 20 and 65 than under 20 and over 65 (the potential age dependency ratio will exceed 100). In 2050, for 100 years to live at working age there will be as many as 107 years to live at non-working age. The territorial diversification in terms of the size of the age dependency of European countries will also change. In the future, the most favorable demographic situation in this respect will be observed in the countries of the northern part of Europe, for which a relatively low age dependency will be recorded in 2050. On the other hand, the most unfavorable relations in this respect will occur in countries such as Germany, Portugal, Greece or Spain (Figure 5).

### **Retirement age from a demographic perspective**

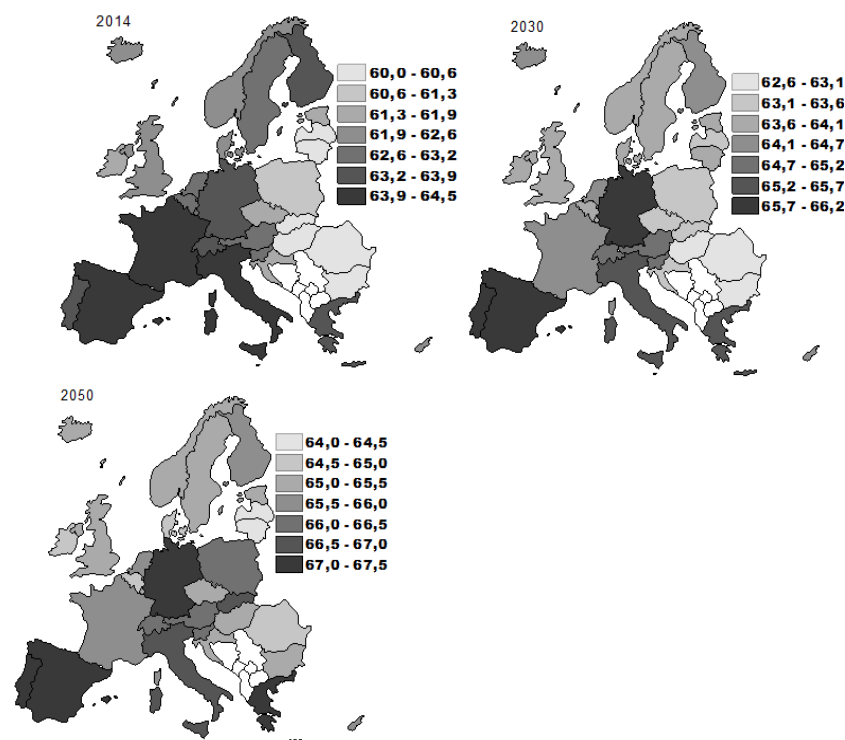
The aging of societies directly affects the pension system, making it necessary to raise the statutory retirement age. From a demographic point of view, the argument for politicians to raise the statutory age thresholds for retirement is to increase the value of the average life expectancy. However, it is not just the fact that we live longer that necessitates raising the retirement age. Population age structure is extremely important in this respect, and it is the relationship between the number of people potentially able to work and the number of people receiving retirement benefits that give rise to reforms changing the statutory retirement age. Assuming that, for a given population, the total number of remaining years of life at non-working age should not exceed the total number of remaining years of life at working age, a measure has been proposed that can serve as a benchmark when determining the statutory retirement age. This tool indicates the age for which the population has at a given time the same number of years to live in the period from 20 until that age than when aged under 20 or over that age. For the purpose of this study, this age was marked as a postulated minimum retirement age. The high values of this measuring tool are due not only to the process of increasing human longevity, but they are also a consequence of a disadvantageous population age structure.

In 2014, the values of the postulated minimum statutory retirement age ranged from 60 years in Romania to 64.5 years in Italy. As a rule, high values of this measure were recorded in the countries of the western and northern parts of Europe, and they were lower for post-socialist countries. It is nevertheless expected that the increase of this value will be much more marked in the future for the countries of Eastern rather than Western Europe. It is forecasted that the postulated minimum retirement age will be at 64-65 in 2050 in countries such as Belgium, Denmark, Ireland, Lithuania, Latvia and Romania. On the other hand, high values at above 67 years will occur in Greece, Spain, Germany and Portugal (Figure 6). In addition, it is expected that in the next decades the increase in its value for these countries may reach a maximum of about 0.5 years for the next ten years.

**Table 3. Postulated minimum retirement age**

Kraj	2014	2020	2030	2040	2050	Kraj	2014	2020	2030	2040	2050
Austria	63,1	63,6	64,8	65,4	66,2	Luxembourg	62,6	62,9	63,6	64,2	65,0
Belgium	62,8	63,0	63,7	64,2	64,9	Latvia	60,4	61,5	63,1	63,9	64,3
Bulgaria	60,3	61,5	63,0	64,3	65,1	Germany	63,5	64,5	65,7	66,4	67,0
Croatia	61,3	62,1	63,3	64,4	65,3	Poland	61,1	61,9	63,5	65,0	66,3
Cyprus	62,1	62,9	64,2	65,2	65,8	Portugal	63,4	64,1	65,7	66,8	67,5
Czech Republic	61,6	62,3	63,5	64,5	65,1	Romania	60,0	61,0	62,6	63,9	64,7
Denmark	62,3	62,8	63,6	64,3	64,9	Slovakia	60,2	61,3	63,2	65,0	66,5
Estonia	61,3	62,3	63,6	64,7	65,4	Slovenia	63,1	63,7	64,8	65,5	66,0
Finland	63,2	63,6	64,2	64,7	65,5	Sweden	63,0	63,3	63,9	64,5	65,1
France	63,9	63,9	64,6	65,1	65,6	Hungary	60,3	61,2	62,8	64,1	65,0
Greece	63,4	64,0	65,4	66,5	67,0	UK	62,5	63,1	63,9	64,6	65,2
Spain	64,0	64,6	66,2	67,1	67,1	Italy	64,5	64,6	65,6	66,3	66,7
Netherlands	63,0	63,5	64,4	65,1	65,7	Iceland	62,2	63,3	64,1	64,7	65,2
Ireland	61,7	62,4	63,6	64,4	64,6	Norway	62,5	62,8	63,6	64,2	65,1
Lithuania	60,5	61,9	63,8	64,1	64,0	Switzerland	63,7	64,2	64,9	65,5	66,0

Source: own study based on Eurostat data

**Figure 6. Postulated minimum statutory retirement age**


Source: own study based on Eurostat data

## Conclusions

Along with the processes of increased life expectancy, healthy life expectancy or medical advancement, one should expect an upward shift of the demarcation line separating middle-aged people from the elderly. The previous approach of recognizing as “old” people aged 60 or even 65 should be considered outdated, especially in the most developed countries. In addi-

tion, one should expect a future increase in the economic activity of people who are today considered “old” in many countries. Due to the change in population age structure and increased human longevity, the increase in the statutory retirement age should also be expected. However, the author does not consider it appropriate to correlate the thresholds of the statutory retirement age with the value of the average continued life expectancy, as planned in some European countries. High values of average continued life expectancy do not necessarily translate into unfavorable relations between the number of people of working and non-working age in countries previously characterized by a relatively high birth rate. In Sweden, for example, life expectancy will increase by 2050, most likely by an average of 4 years, while the postulated minimum retirement age will increase by 2 years only. In conclusion, it can be said that an aging society can pose not so much a problem but rather a challenge for Europe – a challenge to ensure that the elderly whom we consider “old” today do not prematurely retire from economic activity. In some European countries, however, the problem may be the “upward” aging of the population in the age pyramid, caused by the birth rate insufficient from the perspective of generational replacement. This problem will be more evident in those countries where the numerical imbalance between some generations cannot be compensated by the increase in the economic activity of older people.

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