DEMOGRAFIC AGING IN FRANCE AND ROMANIA.
A COMPARATIVE STATISTICAL ANALYSIS

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Abstract

Demographic aging is a problem found in all developed countries, especially in the European states, with social and economic consequences that are already taking place. Demographic aging means the change of the population structure according to age, in favour of older ages (65 years and more) as a share of the total population, to the detriment of young ages, as a long-term trend. Sociologists and demographers who have studied this phenomenon believe that the demographic aging process begins when the proportion of the elderly exceeds 12% of the total population. France has been facing this demographic phenomenon for several decades. Romania is also experiencing the aging process of population, and the main causes are the decline in birth rate and the external migration. This alarming phenomenon, through its long-term consequences, concerns the policymakers of the EU member states which, based on multidisciplinary analyses, have developed a number of public policies regarding the population which rather address the socio-economic consequences. This paper represents a statistical analysis of the demographic aging process both in France and Romania based on three main dimensions: the aging of the total population, the aging of the labour force and the aging of the elderly people. The analysis will concern the statistical and demographic indicators describing the population aging phenomenon (the young population percentage, the share of the economically active population, the share of the elderly population, the demographic aging index, the demographic dependency ratio, the population's average age and median age), based on a comparative approach between France and Romania, in the European context.

Keywords: demographic aging, old-age dependency, aging of the labour force, aging of the elders, statistical analysis

Résumé

Le vieillissement démographique est un problème auquel doivent faire face tous les pays développés, en particulier les pays européens, avec des conséquences sociales et économiques qui se manifestent déjà. Le vieillissement de la population signifie changer la structure par âge de la population en faveur d'un âge avancé (65 ans et plus) en pourcentage de la population totale au détriment des jeunes âges, ferme et tendance à long terme. Sociologues et démographes ont étudié ce phénomène considère que le processus de vieillissement démographique commence lorsque la proportion de personnes âgées est plus de 12% dans la population totale. La France est touchée par ce phénomène démographique depuis plusieurs décennies. Et la Roumanie connaît un processus de vieillissement de la population, ayant principalement pour cause le déclin de natalité et les migrations extérieures. Ce phénomène préoccupant en raison de ses conséquences à long terme concerne

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les décideurs politiques et administratifs des États membres de l'UE, qui, sur la base d'analyses multidisciplinaires, ont élaboré un certain nombre de politiques publiques dans le domaine de la population visant à faire face aux conséquences socio-économiques. Dans cet article, nous procédons à l'analyse statistique du vieillissement de la population en France et en Roumanie en dimensions suivantes: vieillissement de la population totale, le vieillissement de la population active et le vieillissement des personnes âgées. Indicateurs statistiques qui décrivant le vieillissement de la population (la part des jeunes dans la population totale, la part de la population active, la part de la population âgée, l'indice de vieillissement démographique, ratio de dépendance démographique, l'âge moyen de la population et l'âge médian de la population) sont analysés pour le cas de la France et de la Roumanie, en tenant compte des valeurs moyennes enregistrées au niveau de l'Union européenne.

Mots-clés: vieillissement démographique, dépendance des personnes âgées, vieillissement de la population active, vieillissement des personnes âgées, analyse statistique

Rezumat

Îmbătrânirea demografică este o problemă cu care se confruntă toate ţările dezvoltate, în special cele europene, cu consecinţe sociale şi economice care deja se manifestă. Prin îmbătrânire demografică se înţelege modificarea structurii populaţiei pe vârste în favoarea vârstelor înaintate (65 de ani şi peste) ca pondere în populaţia totală, în detrimentul vârstelor tinere, ca tendinţă fermă şi de lungă durată. Sociologii şi demografii care au cercetat acest fenomen consideră că procesul de îmbătrânire demografică începe în momentul în care ponderea persoanelor vârstnice este de peste 12% în populaţia totală. Franţa este afectată de acest fenomen demografic de câteva decenii. Şi România se confruntă cu un proces de îmbătrânire a populaţiei având ca principale cauze scăderea natalităţii şi migraţia externă. Acest fenomen îngrijorător prin consecinţele sale pe termen lung preocupă decidenţii politico-administrativi din cadrul ţărilor membre ale UE, care pe baza unor analize multidisciplinare au elaborat o serie de politici publice în domeniul populaţiei care vizează mai degrabă tratarea consecinţelor socioeconomice. Această lucrare este o analiză statistică descriptivă a procesului de îmbătrânire a populaţiei din Franţa şi România, urmărind următoarele dimensiuni: îmbătrânirea populaţiei totale, îmbătrânirea forţei de muncă şi îmbătrânirea "bătrânilor". Indicatorii statistico-demografici care descriu fenomenul de îmbătrânire a populaţiei (ponderea populaţiei tinere în populaţia totală, ponderea populaţiei active economic, ponderea populaţiei vârstnice, indicele de îmbătrânire demografică, raportul de dependenţă demografică, vârsta medie a populaţiei şi vârsta mediană a populaţiei) vor fi analizaţi comparativ pentru Franţa şi România, prin raportare la valorile medii care caracterizează ţările membre ale UE.

Cuvinte cheie: îmbătrânirea demografică, dependenţa demografică, îmbătrânirea forţei de muncă, îmbătrânirea vârstnicilor, analiza statistică

1. Introduction

The demographic aging process is usually analysed in distinct chapters of the works in the field of demography and sociology, or integrated in the broader study of the structure and dynamics of the population. One of the

most common definition of the demographic aging refers to the increasing number of elderly people of the total population. The older population brings together people aged 65 and over (or 60 years of age and over). In the United Nations reports, the elderly are people aged 60 and over. Romania used this age-category until joining the European Union (2007). After this moment, Romania adopted the EUROSTAT system according to which the elderly population includes people aged 65 and over.

Sociologists and demographers define population aging as the increase of the elderly people percentage (aged 65 and over) of the total population to the detriment of other age groups (youth and adults) as a firm and long-lasting tendency (Sora et al. 1996; Rotariu 2009, 2010, 2016; Netedu 2016; Jemna 2017). In the UN reports on the world's population, the population aging is the inevitable increasing of the elderly people as a result of the fertility decrease and the increase in life expectancy, phenomena that characterize the second demographic transition.

Demographic aging is a process that characterizes developed countries where the improvement of the living standards and the progress of medical science have inevitably led to increasing the life expectancy and, implicitly, the number of elderly people of the total population. Moreover, the increase of the living standard is associated with changes in social preferences and demographic behaviour. In the democratic, economically developed and culturally emancipated countries, young people postpone the moment of marriage and child birth, being more focused on the education and profes-sional insertion, on the various and attractive ways of spending their spare time. Fertility decline, as a typical characteristic of the developed countries in the second demographic transition phase, is considered the element that contributes the most to the population aging. According to UN data, in the long-term, the proportion of the elderly will increase even in regions where birth rates are higher than the reproductive rate (2.1 children), which represents the level where generational replacement occurs.

The aging population process is also generated by the migration of working force, which leads to a reduction in the number of young and adult population (0-64) in favour of the elderly population. In Romania's case, demographic aging is the result of the decrease of birth rates and migration of a significant contingent of young and adult population, rather than the increasing in expectancy life of the elderly people. In economically devel-oped countries where life expectancy exceeds 70 years, there is a clear aging trend of elders, visible in their increasing percentage of the total elderly population (Rotariu 2010, 79).

The most advanced population aging process is found in Europe and North America, continents with developed countries that find themselves in the second phase of demographic transition, characterized by low mortality, low fertility, urbanization, migration, aging population, advanced economies, democracies that are consolidated or in process of consolidation, welfare, gender equality (Jemna 2017, pp. 122-128).

According to the *World Population Aging 2017 Report*, the world's population is growing old, the number of elderly people is rising, with direct consequences on all aspects of social and economic life, labour market, goods and services, expenses on social protection and social services, pensions and public finances, family and intergenerational relationships. In 2017, the elderly population (60 years and over) counted 962 million around the globe, twice as high as in 1980 when the number of the elderly was 382 million. According to UN demographic projections, by 2050, the number of elderly people will double to reach 2.1 billion people aged 60 and more. Furthermore, by 2050, the elderly will exceed the number of adolescents and young people aged between 10 and 24 years. Between 2017 and 2050, we will also witness the enhancing of the elderly aging process, when the world's population aged 80 and over will triple from 137 million to 425 million "old elderly people". Europe has the largest proportion of population aged 60 and over (25%); the smallest share (5%) of the population aged 60 and more was recorded in Africa[1].

One in five people was aged 60 and over in Europe and North America (2017). The UN Population Division's demographic projections show that, by 2050, 35% of Europe's population will be made up of elderly, followed by North America (28%), Latin America and the Caribbean (25%), Asia (24%), Oceania (23%), Africa (9%) – the youngest continent (see **Fig. 1**).

The country with the most population aging is Japan, over 27% of the total population being aged 65 and over. In 2014, Japan's elderly population exceeded 25 percent of the total population, indicating that this age-segment has steadily increased. In Japan, more than one person in four is 65 years old and over, while the population aged 15-64 decreased by 4% between 2000 and 2010. It is estimated that, by 2030, more than 30 % of Japan's population will be formed of elderly people[2].

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[1] http://www.un.org/en/development/desa/population/publications/pdf/ageing/WPA2017_Highlights.pdf.

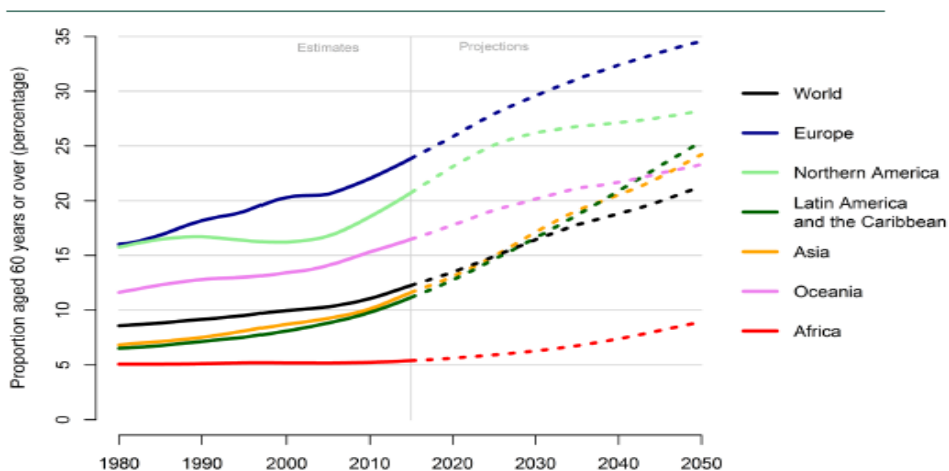[2] https://www.worldatlas.com/articles/countries-with-the-largest-aging-population-in-the-world.html

Fig. 1. Percentage of population aged 60 years or more according to region, from 1980 to 2050
Source: United Nations, *World Population Prospects. The 2017 Revision*

After Japan, in the aging countries ranking, the following places are occupied by European countries. With 23% old people of the total population, Italy is the most affected country by the demographic aging process. Despite the fact that Italy is a destination country for migratory flows from Eastern Europe, North Africa and the Middle East, mostly represented by young people, Italy's population aged 0 to 14 did not register any increase since 1999, but has remained until now capped at only 14% young people.

According to EUROSTAT, at the beginning of 2016, the European Union's population had reached 510 million inhabitants. At the level of the EU Member States, in comparison to 2012, in 2016 the population increased in 16 member countries, of which only 14 countries recorded population increases as a result of the contribution of both positive natural growth and positive net migration. The other two countries, Germany and Italy, recorded a negative natural increase of -867600 persons, respectively -564500 persons over the entire period, followed by a high net positive migration level, which was higher than the negative natural growth (3.1 million people in Germany and 1.8 million people in Italy for the entire period 2012-2016) (INS 2018a, 10).

The share of older people exceeds 19% of the France's total population. Romania is no exception to this aging process that characterizes all the European states, with over 17% elderly people of the total population.

2. Methodological Aspects in the Study of Demographic Aging

Population aging is a process that starts when the share of the elderly population in the total population exceeds the 5% threshold and ends when it exceeds 20% (Eggericks and Tabutin 2001).

Some demographers believe that a proportion of the elderly population under 7% of the total population shows that the population is "young" from the demographic approach. When the share of the 65 years old and more population exceeds 7% of the total population, the demographic aging begins. If the percentage of elderly people reaches and exceeds 12% of the total population, the demographic aging process is confirmed (Sora et al. 1996, 92).

Laslett and Paillat (1999) states that the "third age" occurs under several conditions: the ratio of the survivors aged 70 and 25 (Laslett index) exceeds 0.5 which would correspond to a life expectancy of 10 years (for the 70 years old people), and the share of people aged 65 and more to be 12% of the total population.

Demographic aging is reflected not only in the increase of the elderly percentage of the total population, but also in the increase of their number (Rotariu 2009, 64). From a methodological approach, in order to highlight this growth, the number of elderly at a reference point (t + 1) is divided by the number of elders recorded at the moment (t) and multiplied by 100. Thus, we use the formula $Ev = [P(t + 1) / P(t)] * 100$, where Ev (evolution) means the increase in the number of elderly persons at the time (t + 1) comparing to the number of elderly persons at the reference moment (t).

In order to analyse the process of population aging, demographers are using the following statistical indicators:

- The share of the young people in the total population, obtained by the relation *Y.pop= (P0-14 years / P) * 100*, where Y.Pop means the young population aged 0-14 and P-the total population;
- The share of the adult people in the total population, which is obtained by the relation *A.Pop = (P15-64 years / P) * 100*, where A.Pop means the adult population aged between 15 and 64 and the P- total population;
- The share of the elderly people in the total population, obtained by the relationship *E.Pop = (P65years and over / P) * 100*, where E.Pop means the elderly population aged 65 and more, and the P- total population. This indicator measures the aging through the age-sex pyramid's peak;
- Population aging index, *PAI = (P65 years and over / P0-14 years) * 100*, which means the ratio of elderly people to young people, and provides a cross-cutting perspective on the process;

- Demographic dependency ratio, *DR = [(P0-14 years + P65 years and over) / P15-64years] * 100*, expresses the ratio of the inactive population to the active population;
- Demographic aging index defined as the ratio between 70-years survivors and 25-years-old survivors, *DAI= (S70years / S25years)* for the same generation, provides a longitudinal perspective of the aging process;
- The active population aging, *AAP = (P45-64 years / P15-64years) * 100*, can be analyzed by residence areas and branches of the national economy;
- Seniority Index, *SI = (P80 years and over / P65 years and over) * 100*, expresses the aging of the elderly population, illustrated the so-called "aging of elders" phenomenon;
- The dependency ratio of the elderly, *DRE = (P65 years and over / P15-64years) * 100*, expresses the ratio of the elderly to the active persons;
- The dependency ratio of young people, *DRY = (P0-14 years / P15-64years) * 100*, expresses the ratio of young people to active persons;
- The femininity aging ratio, *FA = (F65 years and over / P65 years and over) * 100*, calculated as the ratio of the elderly women to the total elderly population;
- The male aging ratio, *MA = (M65 years and over / P65 years and over) * 100*, calculated as the ratio of the elderly males to the total elderly population;
- *Average age of population* – statistical indicator of the central trend that represents the average of the population ages (*age* means the continuous demographic variable that expresses the time elapsed between the date of birth of a person and a certain point of observation);
- *The median age of the population* – a statistical indicator of the central trend that divides the population into two equal parts, the median age being that middle value.

For the statistical description of the aging population, French demographers G. Calot and J.-P. Sardon (1999) have proposed two indicators – "aging in the vicinity of an age" or "similar age" (*l'age homologue*) – which describe the current age from which the proportion of the total population has the same value as the proportion of the population starting with another age at a given time in the past. As an example, the proportion of people aged 65 and more of the total population was 15.4% in 1960 and 20.3% 2010. We aim at finding out from what age upwards the population represented 15.4% of the total in 1960. We assume that in 1960, the proportion of 15.4% of the total population is reached from the age of 57.3 years. Similarly, for 2010, we

proceed to find out from what age is reached the proportion of 20.3% of the total population. In this case, we assume that the age is 68.5 years. It results that over the last 50 years (1960-2010), the population aged 7.7 years (from 65-57.3 = 7.7), and in 2010 we get an increase of 3.5 years (resulted from the difference 68.5-65 = 3.5). The arithmetic mean of the two deviations (7.7 and 3.5) is 5.6 years, it measures the progress of the demographic aging at the age of 65 years. The age of 68.3 years in 2010 is the similar age (*homologous age*) of 65 years in 1960 or the age of 57.3 years in 1960 is the similar age to 65 in 2010.

The demographic aging can also be analysed by a graphical illustration namely the population pyramid (*age-sex pyramid*). By convention, young ages are found at the base, men on the left and women on the right. The age-sex pyramid allows comparisons between populations and the analysis of different demographic phenomena, such as population aging, gender balance, including the demographic effect of catastrophes and wars.
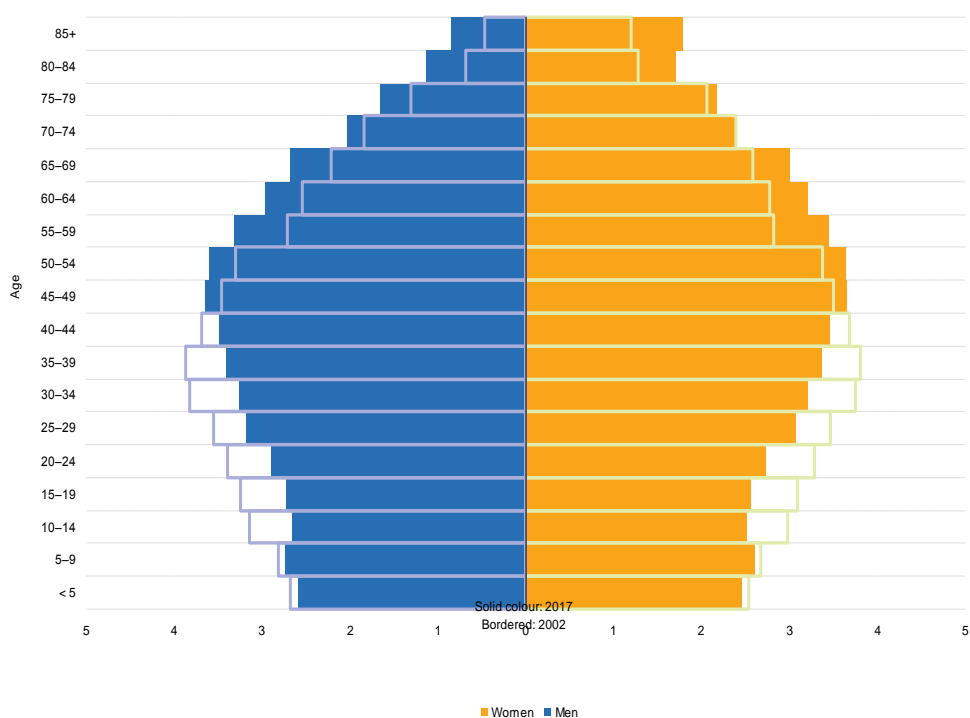
Fig. 2. Population Pyramids EU-28: 2002 versus 2017
Source: https://ec.europa.eu/eurostat/statistics-
explained/index.php?title=Population_structure_and_ageing, 2018.

When demographic aging is due to the birth rates decrease, the narrowing of the age-sex pyramid represents the reduction of the young age proportion and reflects aging through the pyramid base. When demographic aging is due to the increased life expectancy (reduced mortality for old ages), results aging through the top of the population pyramid.

In the case of a young population, enhanced by an increased birth rate and with a share of elderly people under 5% of the total population, the age-sex pyramid is a triangle with wide base and narrow peak. After the demographic aging process starts (over 5% of elderly people of the total population), the pyramid base gradually narrows and the top of the pyramid thickens, the population pyramid taking the appearance of a haystack.

As the demographic aging process advances due to the reduction of the young population and the reduction of mortality of both adults and elderly, the pyramid base is compressing more and more, and the top of the pyramid has an increasingly thicker appearance. Thus, the age population pyramid has the shape of a bell. When the proportion of the elderly exceeds 12% of the total population and the aging process is considered complete, the population undergoes a demographic rebalancing process by increasing birth rate as a firm trend and / or by migration that contributes to the growth of the young and adult population at risk of fertility.

The methodology used in studying the population's structure and dynamics according to certain age-categories (age-groups) and periods has been recently up-dated with a series of statistical indicators required to compare the sizes of different age-groups and their evolution. The old-age dependency ratio, calculated using the formula *DR = [(P0-14 years + P65 years and over) / P15-64years] * 100*, based on chronological age is reassessed from the perspective of the economically active age.

Starting from the hypothesis that the share of elderly people of the total population is quite heterogeneous in terms of economical activity and taking into account that chronological age is often a poor predictor for the period of population dependency (inactivity), demographers have proposed another statistical indicator, namely "prospective old-age dependency ratio" – POADR. In other words, not all the people aged 65 and over are dependent or inactive persons. Actually, they are many active (functional) people carrying out income-generating activities in specific areas of the national economy and contributing to the working force resources. At the same time, there are also adults (15-64 years) who are not active due to physical and / or psychological

needs which do not allow them to carry out economic activities and can therefore be considered "dependent" or "socially assisted", so to mention a stigmatising term that unfortunately is being used more often in Romania.
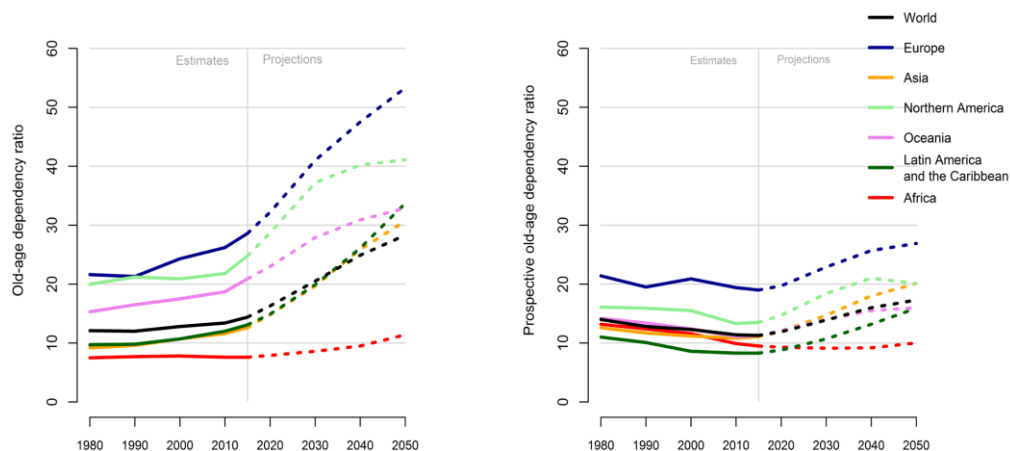
Fig. 3. Comparing the evolution of the old-age dependency ratio
and the prospective old-age dependency ratio, from 1980-2050

Source: OADR are from United Nations (2017). *World Population Prospects: the 2017 Revision. POADR are special tabulations provided to the United Nations by Warren Sanderson and Sergei Scherbov based on the methods outlined in Sanderson and Scherbov* (2005, 2010, 2015) *and consistent with the population estimates and projections published in the 2017 Revision of World Population Prospects.*

The prospective old-age dependency ratio (POADR) takes into account the number of people over the age of 65 whose life expectancy is 15 years, compared to the number of people aged 15 (or 20 years) and the given age (Sanderson and Scherbov 2005, 2010, 2015). This statistical indicator proposed by Sanderson and Scherbov refers to the remaining years of life as an approximation (prospection) of age dependency rather than the years of life that have passed since the age of 65. The POADR indicator takes into account the fact that the starting moment of "dependency" (inactivity) can be "delayed" as life expectancy increases. Recent demographic surveys that use the prospective old-age dependency rate show a slower evolution or even a decrease in dependence in many countries affected by the demographic aging process (Sanderson, Scherbov and Gerland 2017). The calculation of POADR can help sociologists to reassess the "third age" by the notion of "active aging".

3. Comparative statistical analysis of demographic aging: France *versus* Romania

The aging process started in France at the end of the nineteenth century, followed by most Western countries. In France in 1880, the population aged 60 years and more exceeded 12%, showing the characteristics of a clear and long-term population aging process. On this path of demographic aging, France was followed closely by Sweden (9.37% of 60 years old and more people) and Italy (8.96%), Switzerland, Spain, England and Wales (Rotariu 2009, 57).

Compared to France, in Romania the aging population began a century later. According to the data provided by the demographers Laslett and Paillat (1999), in Romania in 1950, the population of 65 years and over represented 5.3% of the total population, compared to Western countries where the proportion of elderly people was almost double. The start of the aging process of the Romanian population was somewhat postponed and then proceeded at a slow pace in the conditions of the increase of the birth rates generated by the pro-birth policy promoted by the communist regime, the decrease of the mortality and the increase of the average life expectancy. In 1989, Romania had the smallest aged population among the 28 states that are currently members of the European Union. The percentage of elderly people in Romania was 9.8% in 1977 and almost stagnated until 1989 when it was only 10.1% of the total population (Rotariu et al. 2017, 106)

In **Table 1** are illustrated the values of two indicators describing the demographic aging process – *the percentage of people aged 65 and more and the median age of the population* – at 25-years distances (1950, 1975 and 2000). We find that, at the middle of the last century, the French population was already experiencing demographic aging, with a share of elderly population of over 11% of the total population and a median age of over 34 years. By comparison, Romania achieved the values recorded by the two statistical indicators in France after half a century, in the 1950s, with the proportion of elderly people exceeding 12% of the total population and the median age of over 32 years.

According to EUROSTAT data, in 1991, the population of Romania was 23192274 people, and in 2017 there were 19644350 persons (a difference of 3547924 people), which represents a decrease of 15.29% of the population. In 1991, France numbered 58313439 people, and 16 years later 66989083 people, resulting in an increase of 8675644 people (14.87%). While the Romanian population decreased because of the birth rates decline, but

mostly because of the increasing external migration, the French population has slightly grown due to the influx of migrants from former colonies, Eastern Europe, North Africa and the Middle East.

Table 1. Evolution of the share of elderly and median age in Romania and France

Country	people aged 65 years and over (%)			Median age (years)		
	1950	1975	2000	1950	1975	2000
France	11,4	13,5	15,1	34,5	31,6	37,3
Romania	5,3	9,6	12,2	26,1	30,5	32,7

Source: processing according Laslett & Paillat (1999, 271; *apud* Rotariu 2009, 58)

Figure 4 shows the share of the elderly population (65 years and over) in Romania, France and the EU, corresponding to 1991 and 2017. We notice that in 1991, between the two analysed countries there was a demographic aging gap of about 4 percent. During the past decades, this distance has diminished and the share of the elderly population in Romania is approaching 18%, while France is part of the aging trend registered in the EU member states with a share of over 19% elderly people of the total population.

	ROM	FR	EU
>=65 (1991)	10.6	14	13.9
>=65 (2017)	17.8	19.2	19.4
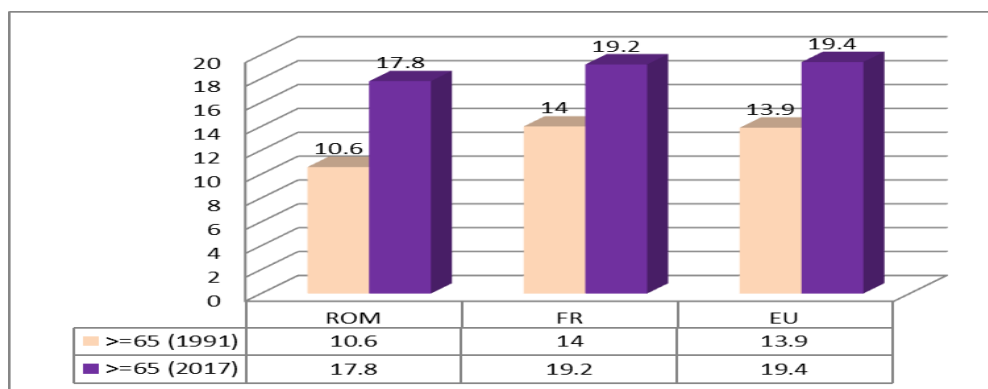
Fig. 4. People aged 65 and over in Romania, France, EU (%)

Source: own processing according EUROSTAT data (https://ec.europa.eu/Eurostat)

According to demographic projections made by EUROSTAT, compared to 2016, the elderly (65 and over) of EU-28 will increase by more than half (+54.1%) by 2050 when it will reach about 150.6 million inhabitants. At EU-28, the process of demographic aging will advance, the share of elderly

people aged 65 and more will increase from 19.2% (in 2016) to 29.1% (in 2080). The elderly population (aged 65 and over) will reach about 151.1 million people in 2080. It is estimated that the number of old people aged 80 and more will increase from 27.3 million people (in 2016) to 66.1 million people (in 2080).

The share of the young population (0-14 years) in the total population describes an aging through the population pyramid base. In 1991 in Romania, the share of the young population was more than double the share of the elderly population of the total population: 23.3% young people versus 10.6% elderly. After more than two decades of demographic transition characterized by decreased birth rates and external migration, the share of young people (15.6%) is outweighed by the share of elderly people (17.8%). Ireland and France are the countries with the largest share of young population (21.1% and 18.3%), and at the opposite side we find Germany (13.4%) and Italy (13.5%) (INS 2018b).

In France, in 2017, the share of young people (18.3%) was slightly outweighed by the share of old people (19.2%), a situation that characterizes countries at the end of the second demographic transition. **Figure 5** illustrates the share of young people in the total population of EU countries corresponding to 1991 and 2017.

	ROM	FR	EU
0-14 years (1991)	23.3	20.3	19.3
0-14 years (2017)	15.6	18.3	15.6
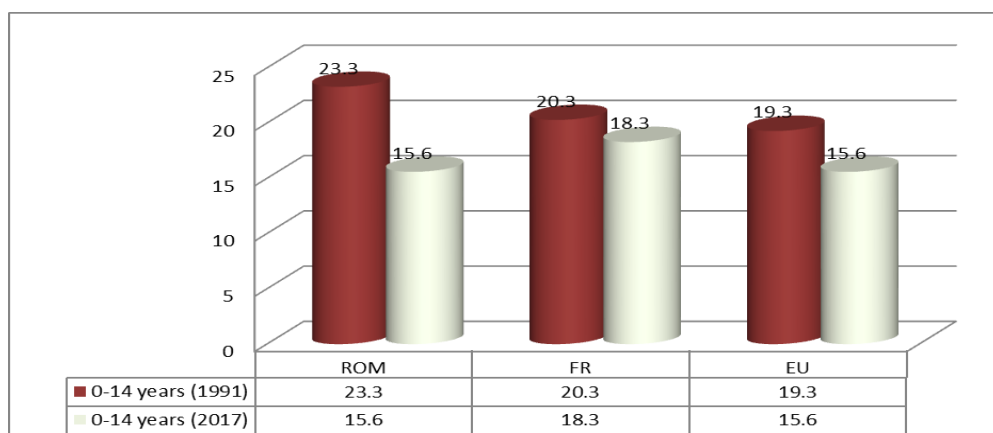
Fig. 5. People aged 0-14 years: Romania, France, EU (%)

Source: own processing according EUROSTAT data (https://ec.europa.eu/Eurostat)

The evolution of adult population (15-64 years) which is economically active and at risk of fertility is described in the above figure. This age-segment

does not present a spectacular variation compared to the age-segments from the extremities of the age-scale, the young population (0-14 years) and the elderly population (65 years and over). The "adult weight" indicator is important in calculating the so-called "dependency ratio" obtained by dividing the young population percentage together with the elderly population percentage by the proportion of the adult population.
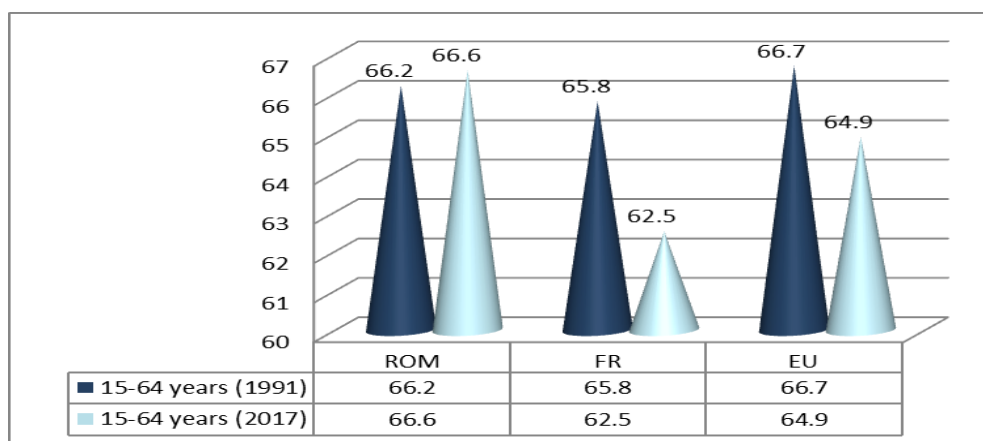

	ROM	FR	EU
■ 15-64 years (1991)	66.2	65.8	66.7
■ 15-64 years (2017)	66.6	62.5	64.9

Fig. 6. People aged between 15-64 years: Romania, France, EU (%)

Source: own processing according EUROSTAT data (https://ec.europa.eu/Eurostat)

According to EUROSTAT data, the proportion of the adult population in Romania has evoluated ascendently in the range of 66% (in 1990) and 68.5% (in 2001), and the proportion of the adult population in France has descended in the range of 66.5% (in 2017) and 65.8% (in 1991). Within 15 years (1998-2013), the evolution of the adult percentage in Romania was constant (68-68.5%), while in France we observed a slight decline of this population segment in the period 1991-2017. At the level of countries that are currently part of the European Union, this indicator does not present remarkable changes, with a minimum of 64% adults and maximum 67.2% adults in the total population. EUROSTAT's demographic projections show that the population of the European Union aged 15-64 will drop by 44.4 million people by 2080.

The adult population aged 15-64 is valuable for another statistical indicator – *the adult aging population* – which is calculated by dividing the share of population aged between 40-64 (or 45-64 years old) in the total population aged between 15-64. The aging of the active population demonstrates

how old is the active labour force, an issue that interests the evolution of human resources from the perspective of labour productivity and their allocation in certain sectors of the economy at national and European level.

The aging of the adult population (or labour force aging) is a process that usually precedes demographic aging. It means the increase of the percentage of active people aged 40-59 or 45-64 years, related to the total adult active population (15-59 or 15-64 years), while the specific weight of the young active population (20-39 or 25-44 years) is decreasing or remains almost unchanged. **Figure 7** describes the evolution of the active population aging in Romania, France and the European Union, between 1991 and 2017.
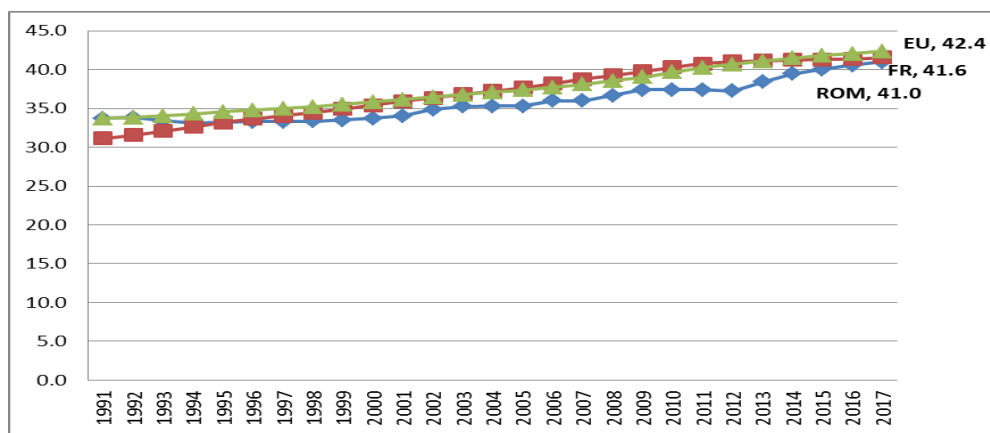
Fig. 7. Active population aging: Romania, France, UE (%)

Source: own processing according EUROSTAT data (https://ec.europa.eu/Eurostat)

The share of old adults (45-64 years) in the total adult population (15-64 years) has increased in Romania from 33.4% (in 1991) to 41% (in 2017). In France, the share of old adults evolved from 31.1% (in 1991) to 41.6% (in 2017). In the European Union, the share of old adults has increased from 33.9% (in 1991) to 42.4% (in 2017). From the above figure, it appears that between 1991 and 2012 the adult population aged 45-64 increased by 8-10 percent for both Romania and France. The same demographic trend characterizes the rest of the European area.

For a transversal approach of the aging process, we calculate the population aging index as ratio between elderly people (65 years of age and over) and young people (0-14 years). In other words, the population-aging index is the number of elderly people (aged 65 and over), which corresponds to 100 young people (under 15 years old).

In Romania in 1991, the aging population index was 45.3% which means that a number of 100 young people correspond to 45 old people. In 2017, the population aging index increased to 114.3%, which means 100 young people correspond to 114 old people. For comparison, in 1991, the aging population index was 68.9%, which is a trait characteristic to a more advanced demographic aging process, which has subsequently grown to 104.7% in 2017. The population-aging index of the EU Member States was 124.7% in 2017, meaning 125 elders per 100 young people.

The evolution of the aging population index in Romania, France and the European Union in the period 1991-2017 is illustrated in the **Figure 8**. It can be noticed that the starting with 2007, the aging population index of Romania exceeds the aging population index of France.
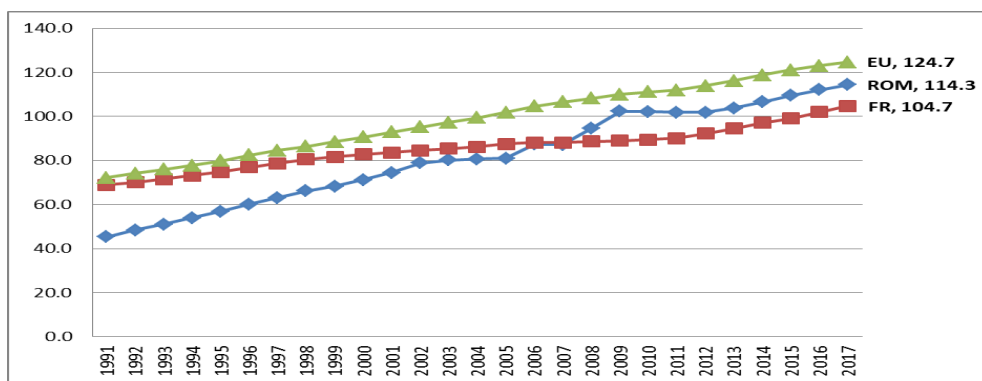

Fig. 8. Aging population index (%)

Source: own processing according EUROSTAT data (https://ec.europa.eu/Eurostat)

During the last decade (2007-2017), the distance between the value of the aging population index between Romania and France rises to 10 percent. These demographic developments are determined by the fact that, in France, during the last decade, a series of policies encouraged birth and the support for families with children were implemented with consequences in increasing the proportion of young people (0-14 years) of the total population.

In order to highlight the population age structure and the relationships between its segments (young and / or elderly versus adults), it is used a synthetic indicator – *the dependency ratio* – obtained by dividing the sum of young people and elderly population by the percentage of adult population. In other words, the so-called "demographic dependency ratio" is the ratio of

the number of "dependent" people (children and elderly people) and the number of working-aged people, expressed at every 100 persons.

In some papers, it is mentioned the synonym "economic dependency ratio" or indicator of the economic burden carried by the productive population even if some people defined as "dependent" are active, while other people with productive ages are economically dependent. In order to show the "weight" that the elderly put on adults (middle age group) and the weight that young people put on adults, the divided formula is used (divided ratio) as follows: *DR= [(P0-14years/ P15-64years) (P65years and over / P15-64years)]*.
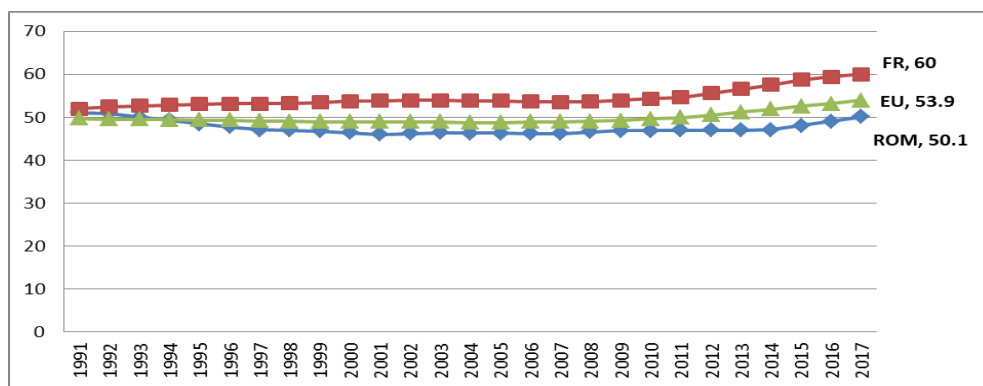

Fig. 9. Age-dependency ratio: Romania, France, UE (%)

Source: own processing according EUROSTAT data (https://ec.europa.eu/Eurostat)

The analysis of the above diagram leads to the following findings: in 2017, in Romania a total of 51 children and old people correspond to every 100 adults. At the same year, in France, a total of 60 children and elderly people correspond to 100 adults. In the European Union of 2017, approximately 49 children and old people correspond to 100 adults.

The dependency ratio for Romanian population indicates a consistent proportion of the age-segment from which the active population is recruited, being better placed, according to the **Figure 9**, compared to France that has a younger population or to the population of the European Union as a whole.

In the near future, the dependency ratio of the Romanian population will follow the trend of the European Union if we take into account the external migration phenomenon. About one quarter of a million people migrated from Romania in 2017 which significantly reduces the segment of adult population (aged 15-64), economically active and at risk of fertility.

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The median age of the population is one of the position indicators describing central trend of population aging, along with the population's average age. The median age for the population of Romania, France and the European Union, whose evolutions corresponding to the period 1991-2017 are shown in **Figure 10**.
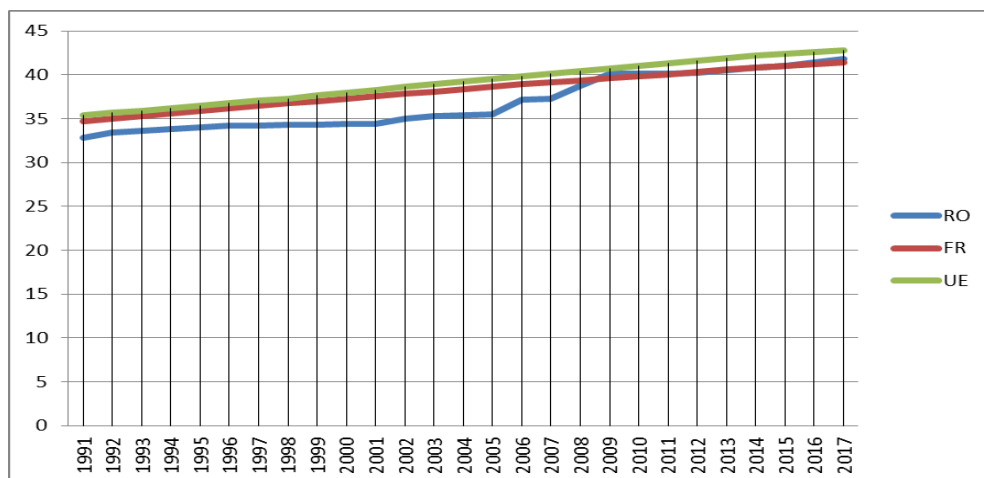
Fig. 10. Median age of population (years): Romania, France, and EU

Source: own processing according EUROSTAT data (https://ec.europa.eu/Eurostat)

In all three cases (Romania, France, and EU), there is a slow increase of the median age, which confirms once again that demographic aging is a firm process in the European area. In Romania, in 1991, the median age in years was 32.6 and it changed to 41.8 in 2017. In France, in 1991, the median age was 34.7 years and raised to 41.1 years in 2017. In 1991, the median age corresponding to the population of the current EU countries was 35.2 years and, in 2017, it was 42.8 years.

The feminisation of demographic aging (the share of elderly women of the total elderly population) and the masculinization of demographic aging (the share of elderly men in the total elderly population) are two statistical indicators that shapes the description of the aging population process.

The **Table 2** highlights a feminisation of the aging ("feminisation of old-age") in Romania, France and the European Union. In Romania, the feminisation of aging is more advanced than in France and the whole European Union. The feminisation of aging is due to the fact that women live on average five years longer than men.

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Table 2. Feminisation versus *masculinization of aging (%)*

Feminisation *versus* masculinization of aging	*Year*	**Romania**	**France**	**EU**
The share of old-age women in total old-age population	*1991*	58.3	60.6	61.2
	2017	59.7	57.1	57
The share of old-age men in total old-age population	*1991*	41.7	39.4	38.8
	2017	40.3	42.9	43

Source: own processing according EUROSTAT data (https://ec.europa.eu/Eurostat)

According to the National Institute of Statistics (NIS) of Romania, in 2017, the life expectancy level at birth was 72.3 years for men and 79.2 years for women, and the gap between the two values was 6.9 years. European statistics show that, in 2016, women in the European Union lived on average 83.6 years, while men live on average 78.2 years, the gap between the two values being 5.4 years[3].
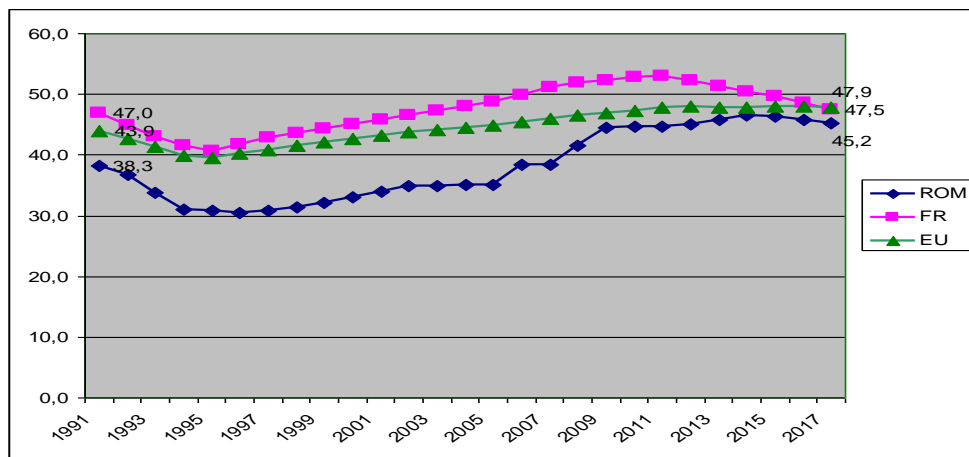

Fig. 11. Feminisation of old-age population (%)

Source: own processing according EUROSTAT data (https://ec.europa.eu/Eurostat)

Feminisation of aging is a feature of the global aging process. Worldwide, the male population ratio over 60 years old is 82 men per 100 women. After this age, the number of women becomes higher, reaching for the 80 and over age-group a level which is 1.8 times higher for women than for men (United Nations 2007).

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[3] EUROSTAT, http://ec.europa.eu/eurostat/data/database

The last indicator used in the statistical analysis of the demographic aging is the so-called "seniority index", which means the share of "old elderly" (80 years and over) of the total old-aged population (65 years and more). The increase of the share of old elderly people demonstrates the longevity that characterizes a population, being also an indicator of the quality of life.
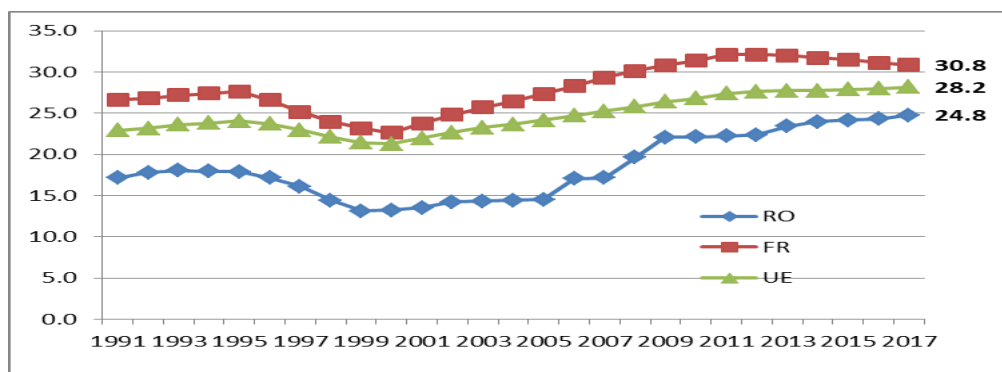

Fig. 12. The share of people aged 80 years and over in total old-aged population (%)

Source: own processing according EUROSTAT data (https://ec.europa.eu/Eurostat)

A quarter of the old people of Romania was 80 years or older in 2017. By comparison, "the old-aged elderly" ("seniors") represented 30.8% of all elderly people in France. The Seniority Index shows the longevity of a population is associated with an increased level of quality of life. The developed countries with population aging promote public policies that encourage active social participation of the elderly, the achievement of a greater independence and security, the development of social and medical services for answering the needs of this age-category, and also the support for bringing in the working field the "younger elderly people" capable of carrying out activities in certain sectors of the national economy.

4. Trends and projections on the evolution of the elderly population in the European Union and Romania

According to EUROSTAT, on January 1st 2017, the share of elderly people (65 years and older) was 19.4% in EU-28, which represents an increase of 2.4 percent, compared to 2007. In the list of EU Member States with the most aging population, Italy occupies the first place with 22.3% of old

people of the total population, followed by Greece with 21.5% and Germany with 21.2%. The least affected country by the demographic aging process is Ireland with a share of 13.5% of elderly people in the total population[4].
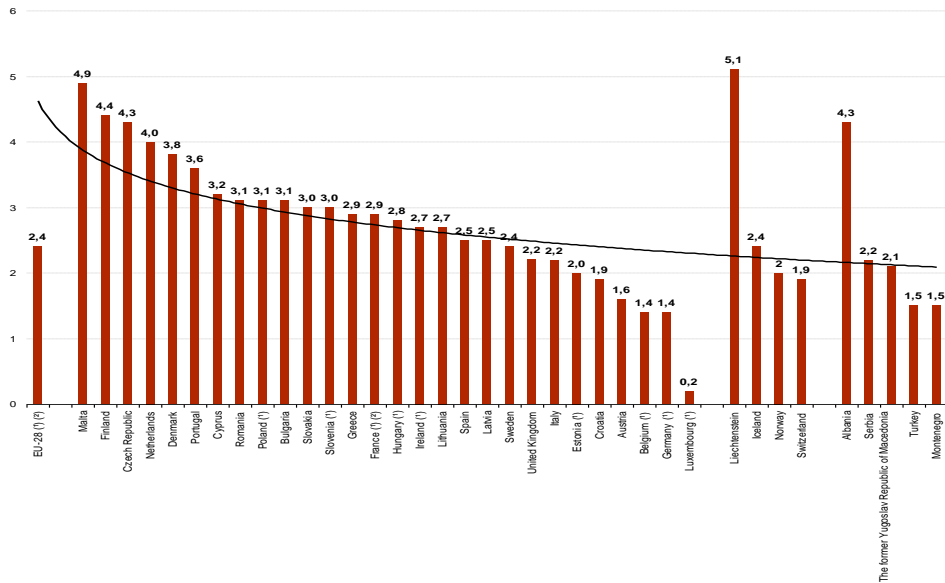

Fig. 13. Increase in the share of the population aged 65 years or more
During the period 2007-2017 (percentage point)

Source: EUROSTAT - Statistics Explained (http://ec.europa.eu/eurostat/statisticsexplained/) - 2018

During the period 2007-2017, the demographic aging trend at the EU-28 level is described by a logarithmic line in **Figure 13**. The share of old people in the total population of European countries such as Malta, Finland, the Czech Republic and Netherlands has increased over the past decade by four percentage points and more. In 2007-2017, in Romania, the share of old people increased by more than 3 percentage points. In France, the share of elderly people in the total population increased by 2.9 percentage points, a process attenuated by the increase of birth rates. EUROSTAT has also included into the study of demographic aging a group of non-EU countries such as Liechtenstein, Iceland, Norway, Switzerland, but also other countries from the close-vicinity or candidates to EU membership, such as Albania, Serbia, Northern Macedonia, Turkey and Montenegro. For the studied period,

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[4] EUROSTAT: Statistics Explained (http://ec.europa.eu/eurostat/statisticsexplained/ - 26/10/2018)

it can be noticed that the share of elderly people has increased in Liechtenstein by more than 5 percentage points and in Albania by more than 4 percentage points. The same trend towards increasing demographic aging in these non-EU countries, even in religious conservative countries such as Turkey can be also observed.

According to EUROSTAT data, in 2017, the median age of the EU-28 population increased by 2.7 percentage points compared to 2007, confirming the increasing trend of demographic aging at European level. In 2017, half of Europeans are younger than 42.8 years and half are over 42.8 years of age.
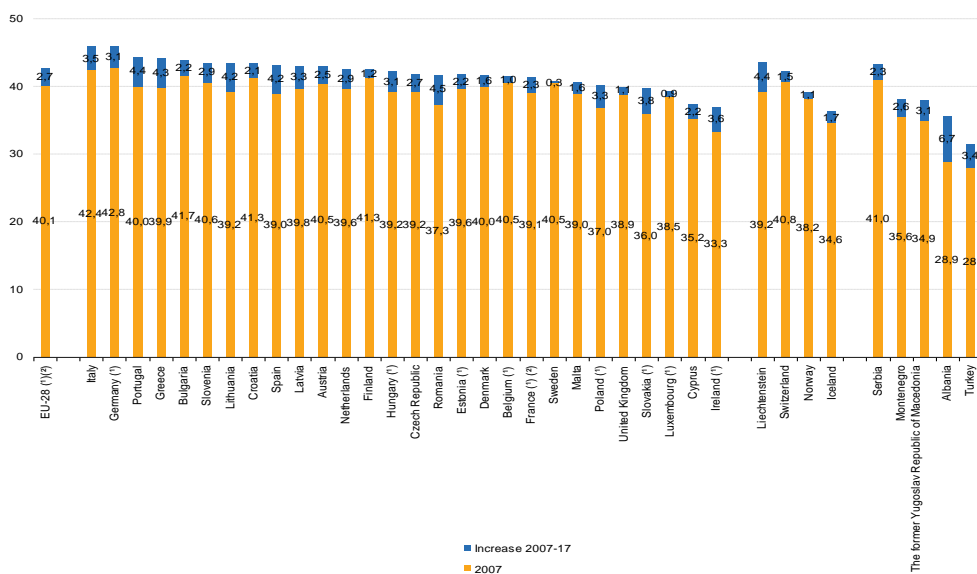

Fig. 14. Median age of population (years), 2007-2017

Source: EUROSTAT - Statistics Explained (http://ec.europa.eu/eurostat/statisticsexplained/) – 2018

Over the past ten years, Romania's average age has increased by 4.5 percentage points, which represents the highest increase in the EU-28, while France has seen a slightly slower growth of just 2.3 percentage points. In all EU Member States, the median age was between 36.9 years in Ireland and 45.9 years in both Germany and Italy, confirming the age structures in these countries over the last decade. Romania is gradually approaching the values describing demographic aging (the share of the elderly and the median age) in the EU-28 countries, the aging of the Romanian population being accentuated by the external migration.

According to demographic projections, the share of the population aged 80 and more (the proportion of old-aged people or "seniors") will double over the period 2017-2080, as shown graphically in the following figure.
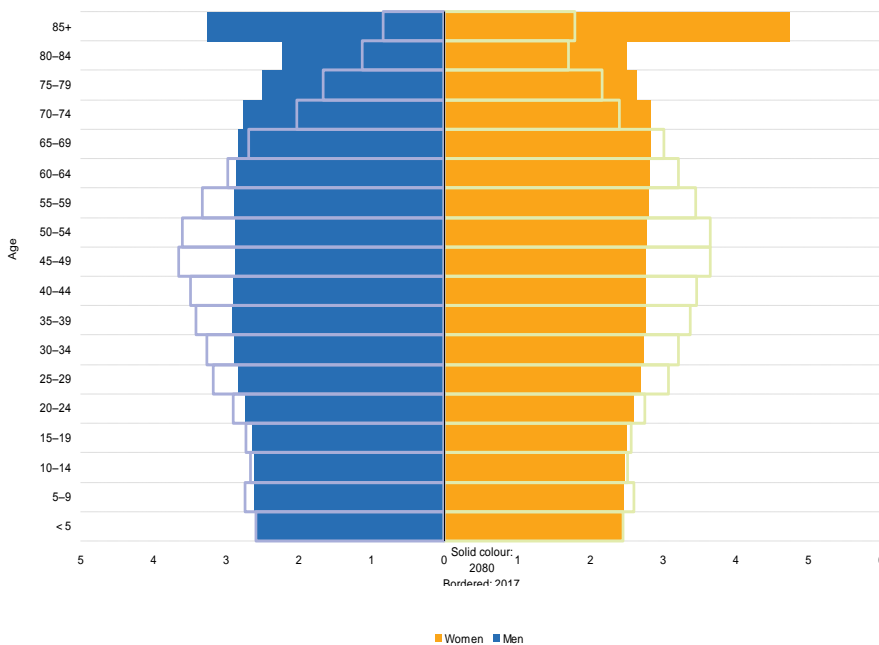

Fig. 15. Population Pyramids in EU-28: 2017 versus 2080

At the horizon of 2080, the EU-28 population pyramid will have the shape of a rectangle with a consistent segment of population aged 80 and more, which will grow from 5.5 percentage points (in 2017) to 12.7 percentage points (in 2080).

According to NIS data, on January 1st 2018, Romania's resident population was 1952400 persons, decreasing by 120700 thousand persons compared to January 1st 2017. The main reason for this decrease is the negative natural increase (the number of deceased persons exceeding the number of living births with 71125 people). The second important cause is migration. For example, the international migration balance in 2017 was negative, with the number of migrants exceeding the number of immigrants with over 53 thousand people.

The population aging in Romania continues its ascendant trend, the aging population index being 116.9 elderly people per 100 young people under 15 years of age. Demographic aging increased from 114.4 (on January 1st 2017) to 116.9 old people per 100 young people (January 1st 2018). The share of the population with ages between 0-14 years remained at the value of the 1st of January 2017 (15.6%), while the share of the population aged 65 years and over registered an increase of 0.4 percentage points (from 17.8% in 2017 to 18.2% on the 1st of January 2018). The gap between the old population aged 65 and over and the young population aged 0-14 years has reached 513,000 people (3551000 versus 3038000 people). The demographic dependency ratio increased from 50.1 to 50.9 young and old people per 100 adult (January 1st, 2018) (INS 2018c).

The EUROSTAT's demographic projection for 2080 regarding Romania's elderly population is 4.15 million elderly people, meaning more than 717.4 thousand persons compared to 2016 when there were 3.44 million elderly people aged 65 and over. In establishing the 2080 forecast, EUROSTAT has taken into account the socio-demographic differences between the Member States and has set the period when the fertility level and the level of life expectancy in each EU-28 Member State will converge and the demographic differences between states will fade away[5].

In 2018, the Directorate of Demographic Projection, Studies and Population Census of the National Institute of Statistics has conducted a series of demographic projections on the evolution of Romania's elderly population by 2060. Of the five demographic projections presented (constant, optimistic, medium, intermediate, pessimistic), we retain the medium approach on the population evolution considered the most plausible, according to which Romania would have an elderly population of approximately 4.1 million inhabitants in 2060, an increase of 18 percent (by 623,000 persons) compared to the population of the elderly living in 2016.

As a conclusion to the NIS study on the projection of the elderly population in Romania, at the horizon of 2060, due to low birth rates and fertility, and also to migration of the working population, the population structure will continue to change. Romania will register a reduction of the number of young people (aged 0-14) and adult population (aged 15-64), and an increase in the number of the elderly population (65 years and more) (INS 2018a, 26).

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[5] EUROSTAT, http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=proj_15npms&lang=en, 2018.

5. Consequences of demographic aging from the perspective of sociology and social work

The increase of the share (or the number) of old people in the total population, the change of the volume and structure of population by age groups, the impact of demographic phenomena, such as the decrease in birth rates and international migration, require a sociological re-assessment of what we call the "third age".

The progress of medical science, the development of social services and of the quality of life have contributed to the increase of the living standard and, implicitly, of the life expectancy. There is an association relationship between the level of development of countries and the average life expectancy. From the data presented in the present study, it results that demographic aging is a process characteristic to economically developed, socially emancipated and technologically advanced countries.

Demographic aging also implies a number of socio-economic consequences that concern the financial sustainability of public and private pension systems, lead to increased expenses with healthcare and social assistance for the elderly. As for Romania, if in the first decades of transition there was an emphasis on the social work oriented on vulnerable children, in the near future the policy makers' concern will be directed towards the development of social work for the old people. The Ministry of Labour and Social Justice of Romania has elaborated the *National Strategy for Promotion of Active Aging and Protection of the Elderly 2015-2020*, paper that exploits the demographic statistics carried out by National Institute of Statistics, EUROSTAT and the UN Population Division.

The population aging, including the economically active population aging, doubled by the need of labour force, will require a discussion regarding the strategies for bringing on available human resources in the working field. The working force will be formed by older people who have the physical and mental capacity for developing economic activities. In the Romania's public sphere, the discussions about increasing the retirement age are already being held. Recently, a legal framework has been created to allow retirees (elderly people) to continue their professional activity.

The consequences of the demographic aging must be analyzed taking into account the sustainable development objectives set out in the *2030 Agenda*, in particular those concerning poverty eradication, health insurance, gender equality, employment growth and ecological accommodation, all of them following the principle "no one will be left behind".

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