Review Paper

ROMANIA'S POPULATION DECLINE AND DEMOGRAPHIC FUTURE: SOCIO-ECONOMIC ASPECTS

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Abstract. *Like most of the countries around the world, European member states are suffering from the declining population, due to low birth rates and decreasing death rates. Romania's population is undergoing a series of changes that will continue to unfold in the foreseeable future. Demographic transitions are taking place in the case of all member states that are part of EU-28, with various degrees of intensity. Romania's population has been shrinking and undergoing a continuous process of erosion since 1992 when it hit a peak of 23.2 million. Under the influence of a decreasing birth rate and death rate, the population is projected to decrease from 19.8 million in 2015 to 14.5 million in 2080. This article examines how these inevitable changes will shape Romania's demographic landscape, with an emphasis on the changes over time suffered by the total population, birth rates, and life expectancy, as seen through the "Demographic Transition Model" stages as put forward by Thompson in 1929. Also, this article will touch upon some of the main economic consequences that arise as a result of these demographic transitions.*

Key words: *demographic transition, population decline, birth rates, death rates, economic consequences, pension expenditures, social expenditures, ARMA*

INTRODUCTION

Many European countries are facing the effects of demographic transitions, which are taking place with different levels of intensity. The birth rate and the death rate in all member states are below critical levels and are not showing signs of improvement in the near future.

Since 1960, Romania's population has seen birth rates higher than death rates, thus leading to an increase in the population, reaching a total of 23.2 million in 1992; however, this trend started to reverse reaching „22,435,205 persons in 2000, reaching 19,913,193 people in 2014" (Cristea et al., 2016, p. 29). This high point culminated with a reversal of the birth rate being surpassed by the death rate, resulting in a new phase of growth for Romania's population.

Population transition is a highly debated subject among researchers and governmental circles, its effects ranging from a smaller workforce, decreased economic growth, higher expenditures on social security programs and decreased investments (Cristea et al., 2010).

This article focuses on the demographic changes that Romania's population has gone through, with a focus on current and future trends and changes, both demographic and economic. These changes and the main causes that are responsible for the shifts that are taking place will be looked at through the "Demographic Transition Model". Also an analysis of the most pressing economic consequences will be presented.

The expected results are that Romania is currently experiencing a late stage Post-Industrial phase defined by very low birth rates and low death rates, which will continue in the future, resulting in a much smaller population with all the effects that it brings with. On the economic side, a gradual rise in government expenditures on social security and pensions is expected, also as a consequence of the demographic transition, an increase in the old-age dependency ratio is also expected.

1. THEORETICAL FRAMEWORK

The demographic aging process has emerged at a certain stage in the development of human evolution as a result of the simultaneous actions of decreasing fertility rates, a longer life expectancy, and changes in the demographic structure, caused by post-war generations on top of the age pyramid.

Population aging can be looked at as an increase in the median age of the population in a region, under the effects of a decrease in fertility rates and a simultaneous increase in life expectancy (Eurostat, 2000).

As Cristea and Mitrică (2016) presented, „at a global level, the number of older people is increasing by 2.6% per year, at a faster rate than the annual increase of the entire population, which is increasing by 1.2% per year" (Cristea & Mitrică, 2016, p. 65).

Europeans in developed countries enjoy a longer and healthier life, and the generations that follow will benefit from a better quality of life. This spectacular achievement is nevertheless accompanied by inferior fertility rates where the population replacement rate, in a large number of countries, has fallen below the natural threshold of sustainability (Börsch-Supan, 2013).

This is registered in developing countries also, Romania being one of them, with demographic shifts that are taking place in neighboring countries.

As a result, birth rates continue to decline, while the aging process of population accelerates, anticipating rapid increases in the elderly population over the coming decades (Börsch-Supan, 2013).

The challenges posed by demographic change have increasingly been the focal point of debates on the future of the EU. Population and aging of the labor force, in particular, accompanied by a decrease in the labor force, raise concerns about the future economic growth (Weil, 2006).

The natality and fertility of a population are influenced by a series of "biological, social, cultural, traditional etc. factors that are interdependent and sometimes have contradictory action on birth" (Mihăescu, 2001, p. 216).

The evolution of mortality "has an inertial load higher than any other demographic phenomenon, as well as greater stability over time" (Mihăescu, 2001, p. 220). Thus, the pursuit of its evolution over time presents fewer challenges. The interaction between fertility, mortality, and migration determines the magnitude of change in the composition of ages in different European countries, under a common direction, but at a different pace, under the impact of demographic aging. The speeding up of the aging process of the population is a constant trend. Changes in the population age structure were predictable, but the magnitude and speed with which they occurred were to some extent surprising.

Radu (2007) summarized that demographic dynamics in contemporary times can be essentially explained by four fundamental processes: the demographic transition, the population aging, the shifts in women professional activity and the migration (politic, demographic or economic).

Oliviera-Martins et al. (2005) identified the underlying causes of demographic aging, responsible for present and future challenges that need to be addressed until they are out of control. These causes are the following (Oliviera-Martins et al., 2005):

- first of all, the decrease in fertility rates recorded in recent decades led to a reduction in the relative number of young people and pushed up the share of elderly people;
- the second factor relates to the recent increases in life expectancy. When one of the key factors of aging is longevity, the aging process is treated as inevitable and global.

To better explain the changes in fertility rates and life expectancy, there are a number of models, studies, and theories that have punctuated demographic changes in the literature.

Thompson (1929) introduced the demographic transition model that laid the foundation for the study of demographic developments and changes, which were carried out in five stages (see Figure 1).

The first is the pre-industrial stage, characterized by high rates of birth and mortality. The population lives in an agrarian community characterized by a high level of birth, but which is prone to the spread of disease.

The second stage is the development stage, which is also known as the rapid expansion phase of the population, characterized by high birth rates and high mortality rates, with mortality rates lower in the first phase. At this stage, agricultural methods and food supply are improved, with crop rotation, selective growth and seeding technology being introduced. In addition, public health is increased, reducing the mortality rate, especially in childhood. Moreover, automation at an early stage is emerging and rail transport appears to allow higher mobility.

The third stage is distinguished by the urbanization process and is the late extension phase. Urbanization changes the traditional values for families, therefore increases the cost of having children and increasing women's participation in the workforce. Birth rates and mortality rates are now declining, but mortality rates are lower than birth rates, leading to annual population growth.

The fourth stage is the industrialization phase where low birth rates and low mortality rates occur.

Finally, the fifth stage is the post-industrial phase, which is defined by the overrun of the birth rate by the mortality rate, unless there is an increase in immigration (Thompson, 1929, quoted in Blacker, 1947).
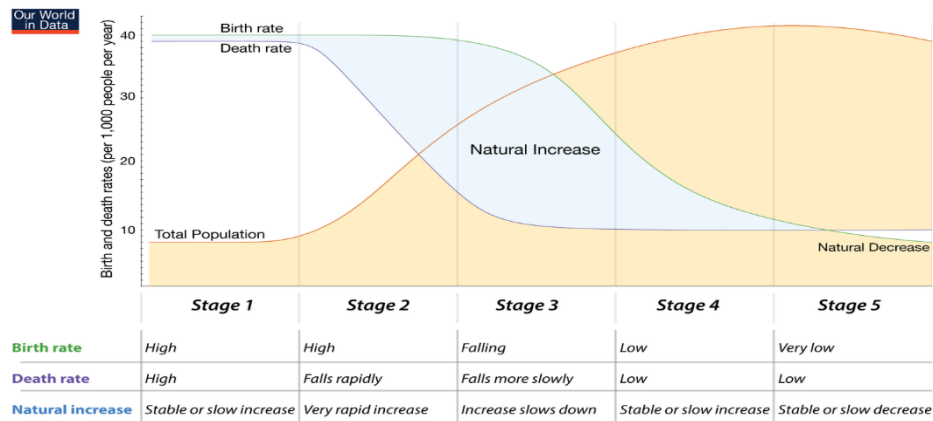
	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Birth rate	High	High	Falling	Low	Very low
Death rate	High	Falls rapidly	Falls more slowly	Low	Low
Natural increase	Stable or slow increase	Very rapid increase	Increase slows down	Stable or slow increase	Stable or slow decrease

Fig. 1 Demographic Transition Model
Source: http://OurWorldInData.org/data/
population-growth-vital-statistics/world-population-growth

When Thompson (1929) presented the theory of demographic transition, he defined three types of industrialized countries in which the population growth rate differs (Kirk, 1996):

- the first country, called A, faces a population decline due to the rapid decline in birth rates and the slow decline in mortality;
- for the second country, B, the birth rate, and mortality rates have fallen. However, the mortality rate has fallen earlier and faster than the birth rate, so there has been an increase in the population to the point where the birth rate has started to decline, compensating for the initial gains and the population entering in decline;
- in the third country, C, the birth rate and mortality rate change in an uncontrolled manner, as population growth will gradually decrease.

When the theory of demographic transition was presented, Thompson warned of the economic consequences of demographic change (Thompson, 1929, quoted in Kirk, 1996).

Demographic transitions are accompanied by economic patterns that result in the transfer of resources from vital areas of the economy (infrastructure spending, education, R&D) to social security, health care and pensions.

Prettner (2012) found the existence of a positive relationship between aging and economic growth, as the elderly tend to save more, thus resources are available for investments that ultimately positively affect economic growth.

Demographic aging is accompanied by increased transfers from the active segment of the population to the inactive segment represented by the elderly, by raising income taxes and increasing family expenses (Mason & Lee, 2011).

The increase in the dependency ratio as a result of demographic aging is expected to diminish the disposable income of the active population and lead to a decrease in the fertility rate (Hock & Weil, 2012).

An additional argument suggests that, with the aging of the population, there will be an increase in how funds are allocated by the government to social security programs to the detriment of education and infrastructure investment, these changes in government priorities will have a negative impact on developing countries (Eiras & Niepelt, 2012).

Population aging is often seen as a burden, which produces harmful effects on the economy, but this view is to some extent exaggerated. Some of the main challenges that arise as a result of population aging are universal and include (Prettner, 2012, p. 824):
- increasing demand for long-term care, and rising medical costs of the elderly;
- disruptions in pension and social security systems;
- pressure on public budgets and tax systems;
- adapting the economy and jobs to an aging workforce;
- potential labor market shortages as the number of older workers decreases;
- the likely need to increase the number of trained health professionals;
- the potential conflict between generations about the distribution of resources.

Wanless (2001) argues that a quarter of total health spending in a person's life is achieved over the last period of his life and does not tend to increase proportionately with age.

On the other hand, lifetime health expenditures are likely to decrease with age as the elderly cannot physically support complex medical procedures (Graham, et al., 2003).

Current pension system will cause an increase in the government budget deficit and much of the current budget deficit is due to the retirement of more educated workers (Yong & Saito, 2012).

The pension systems in Romania and Croatia, are also directly influenced by the aging of the population, largely determined by the increase in the share of people over 65 years of age, amid a rise in life expectancy and declining birth rates (Cristea et al., 2016).

2. Materials and Methods

Based on the demographic shifts that have taken place in Romania over the period from 1960 to 2016, and to correctly assert the likely direction of these changes and the economic consequences on government expenditures, a statistical method of analysis has been employed centered on the Demographic Transition (DT) Model presented by Thompson (1929) for the demographic and the economic aspects.

The analysis allows us to establish the stage which Romania is traversing according to the DT Model, so an accurate assessment of the changes that have occurred can be made. Also, it will allow us to get a better picture of how expenditures related to the demographic process will be influenced over time.

The data on population, birth rates, and death rates have been collected from Eurostat over a period from 1960 to 2016, with projections until 2080.

The date for old-age dependency ratio, pensions, social security expenses has been collected from Eurostat over a time period from 2000 to 2015, with projection made for model accuracy until 2020.

The method applied is the statistical tool focused on analysis of main indicators changes, and ARMA model used to forecast economic variables

3. ROMANIA'S DEMOGRAPHIC TRANSITION

Romania has gone through a series of significant changes between 1960 and 2016 with reverberations that will be felt long into the future.

At the cause of this transformation are the changes in crude birth rates (CBR) and crude death rates (CDR), both shaping the size and structure of the population.

Between 1960 and 2016 (see Figure 2), the population of Romania has grown steadily from 18.3 million in 1960 to a peak of 23.2 million in 1991, afterward suffering a slow, steady decline to 22.4 million in 2001, and 21.1 million in 2007, reaching a level of 19.8 million in 2016.

The crude birth rates (CBR) (see Figure 2) have moved gradually lower in the period from 1960 to 1966, from a high of 19.1 children per 1000 persons to a level of 14.2 children per 1000 persons. In 1967, a sudden spike can be observed in the CBR levels, reaching an all-time a high level of 27 children per 1000 persons.

Followed by a gradual but steady decline with peaks occurring in 1974 with a value of 20.3 children per 1000 persons. In 1983, CBR registered the minimum value of 14.2 children per 1000 persons.

The CBR starting from 1984 began to rise slowly to a peak of 16.7 children per 1000 persons recorded in 1987. After this period, it was followed by a slow and steady decrease until 2016, when it reached an all-time low of 9.6 children per 1000 persons.

A significant milestone was in 1992 (see Figure 2) when the crude birth rate (CBR) was overtaken for the first time by the crude death rate (CDR), marking a significant reversal in the structure and size of Romania's population.
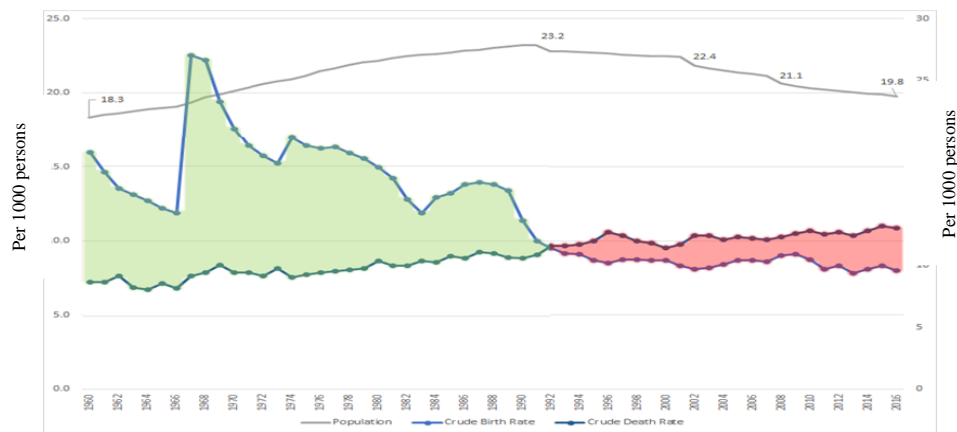

Fig. 2 Changes in crude birth rates (CBR), crude death rates (CDR)
in Romania, population, 1960-2016
Source: Own creation, based on EUROSTAT Data

The crude death rate (CDR) has seen a steady increase in the period afterward, with minor fluctuations, but with a sustainable upward trend.

The lowest level for the CDR was recorded in 1964 with 8.1 deaths per 1000 persons, and the highest level, in 2015, with 13.2 deaths per 1000 persons.

The gap between the crude birth rate (CBR) and the crude death rate (CDR) will continue to widen in the future, showing little signs of reversing.

The population pyramid shows the distribution of the population by gender and by age group. Each item corresponds to the age group in the total population (male and female).

The population pyramid in case of Romania is presented in an overlapping structure, revealing the changes that took place in the population structure by age group between 2001 and 2016 (see Figure 3). The pyramid takes a narrow shape at the bottom in 2001, and has a tendency to become inverted in 2016 due to the baby boomer generations retiring, on the one hand, and from the declining birth rates and increasing death rates, on the other hand.

These baby boomer generations continue to represent an important part of the active old population on the labor market. Firsts of these large groups, which was born for a period of 20-30 years, are now approaching the retirement age.

A noticeable decrease as a result of lower birth rates can be observed (see Figure 3) in the age ranges from 10 to 34 years that have decreased in both cases, for males and females, between 2001 and 2016, giving way to an increase in the range between 35 and 69 years.
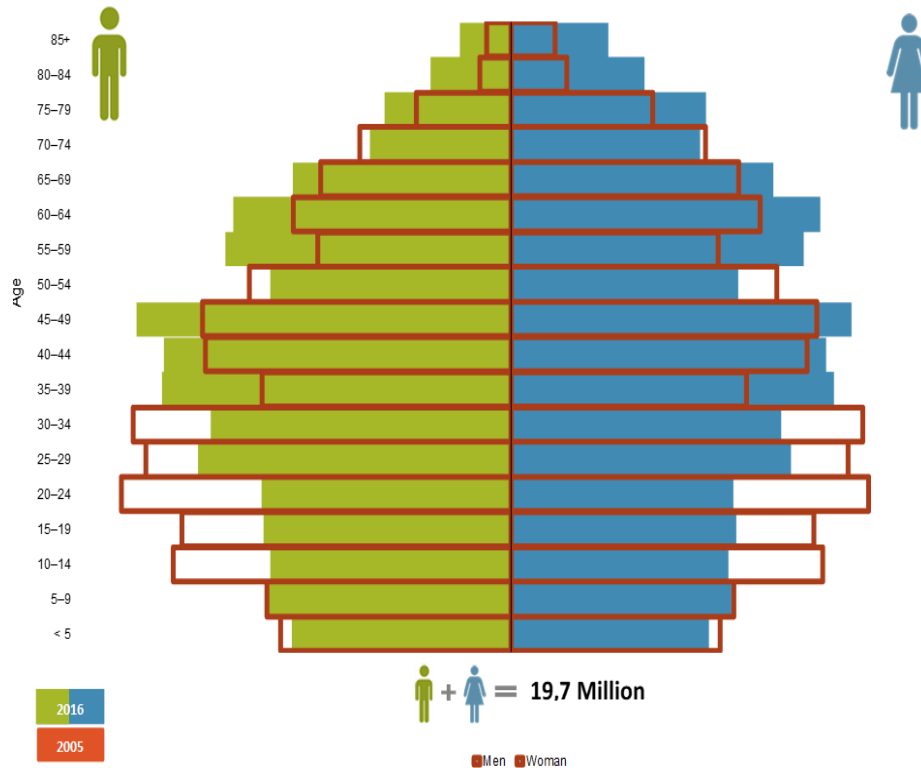

Fig. 3 Population pyramid in Romania, 2005/2016
Source: Own creation, based on EUROSTAT Data

The changes in the structure of Romania's population, as can be seen in Figure 5, are forecast to continue, according to the most recent projections (EUROPOP2015) that were made to cover the period from 2015 to 2080.

Romania's population is forecast to continue its decline from 19.8 million in 2015 to 14.5 million in 2080 (Eurostat, 2017). Similar projections have been made by Gheţău (2007), with forecasts made between 2010 and 2060, where population would continue its downward trend, due to low birth rates, reaching in 2020 the value of 20.7 million, 19.2 million in 2030, 17.3 million in 2040, 15.9 million in 2050, and finally reaching 14.1 million in 2060 (Gheţău, 2007).

Drawing a comparison between the age pyramids from 2016 and 2080 (Figure 4), we can notice that Romania's population will continue to age in the coming decades, the high number of "baby boomers" will continue to move upwards in the age pyramid, increasing the number of the old group.

In 2080, the population pyramid will change its shape to a rectangular shape, shrinking to a great extent in the middle part of the pyramid (ages 40-54).
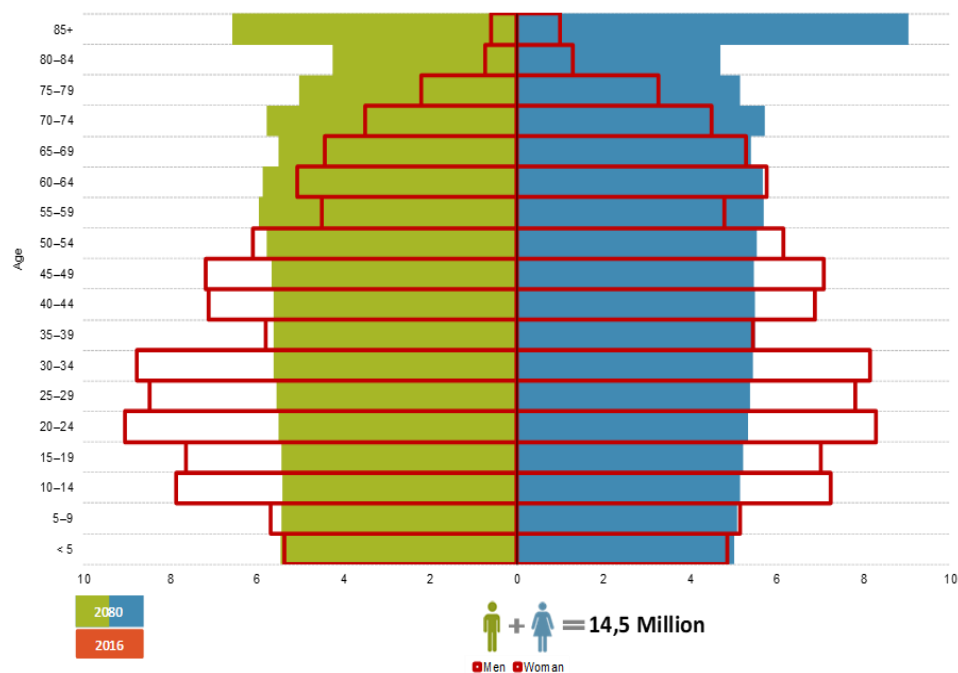

Fig. 4 Population pyramid, Romania, 2016/2080
Source: Own creation, based on EUROSTAT Data

An important aspect of the aging process is the gradual erosion of the working segment of the population that is expected to continue its decline up to 2060 (Figure 5).

The working age group of the population will shrink from 67.1% in 2016, moving slowly to 65.7% in 2020, 63.2% in 2030, reaching 54.1% in 2060, then gradually stabilizing and reaching 55.7% in 2080.
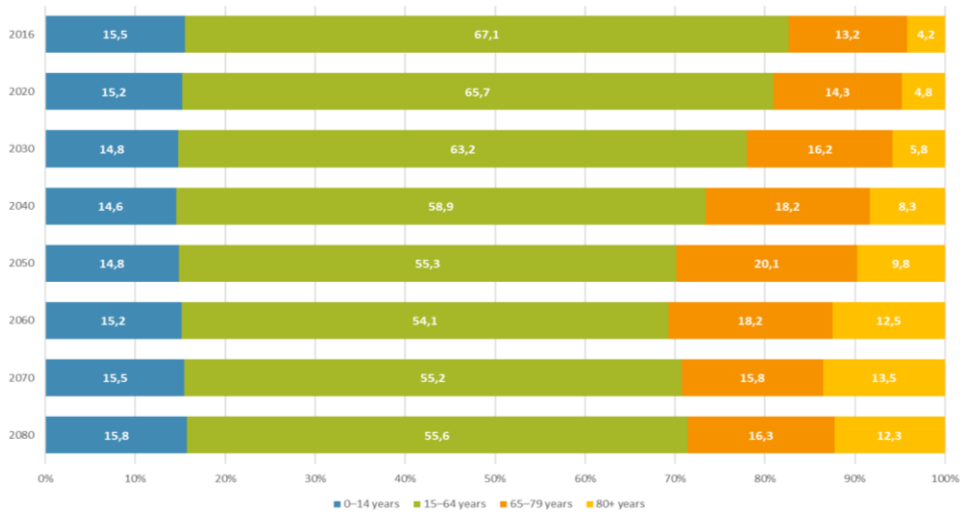
Fig. 5 Population by age groups projections, Romania
Source: Own creation, based on EUROSTAT Data

The age group between 0-14 years will shrink from 15.5 % in 2016, to a minimum of 14.6 % in 2040, gradually returning to the level recorded in 2016 of 15.5 % afterward, to a maximum level of 15.8 % in 2080.

The age groups of 65-79 years and of 80+ years will both grow in size much faster than the previous age groups, reaching 20.1% in 2050 for the 65-79 age group, and 13.5% for the 80+ age group in 2070.

4. THE IMPACT OF DEMOGRAPHIC CHANGES ON THE ECONOMY OF ROMANIA

The demographic transition process will cause a slowing down in growth and an increase in government expenditures, diverting funds from key critical areas of the economy to cover ever increasing social expenditures.
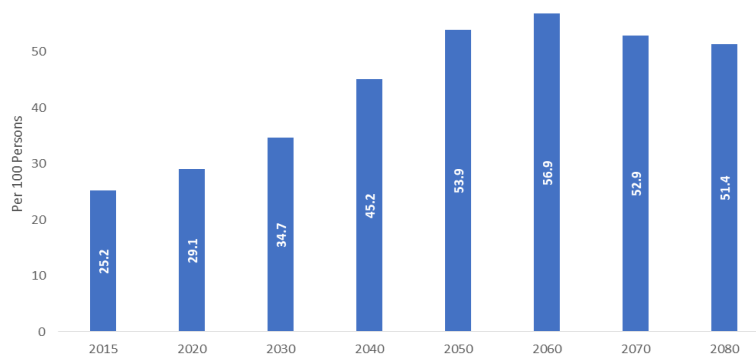

Fig. 6 Old-age dependency ratio projections, Romania
Source: Own creation, based on EUROSTAT Data

The old-age dependency ratio plots the ratio between individuals of 65 and over, generally when they become economically inactive in comparison to individuals between 15 and 64 years of age. As a result of decreasing birth rates and longer life expectancy, the old-age dependency ratio in Romania is projected to continue to increase, from 25.2 elderly per 100 working age individuals in 2015 to a peak of 56.9 in 2060, then gradually moving lower to 51.4 elderly in 2080.
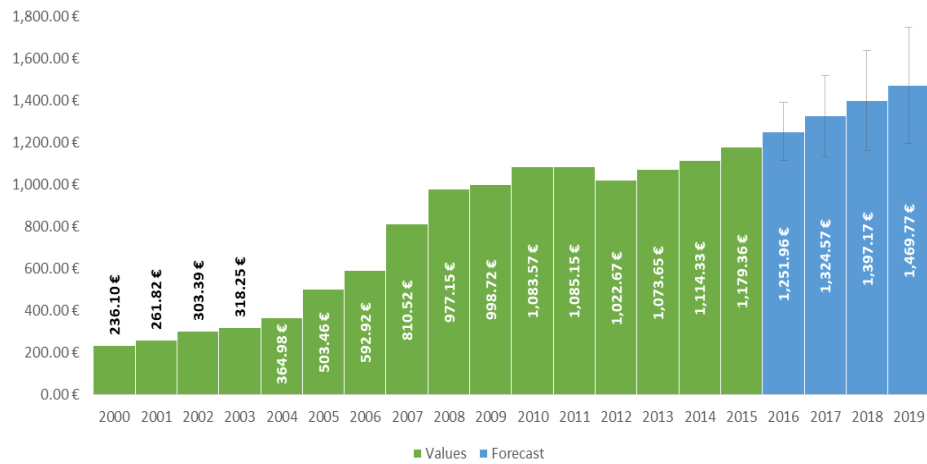

Fig. 7 Total social security expenditures per person, Romania
Source: Own creation, based on EUROSTAT Data, using ARMA model

With a rising elderly cohort, an increase in total social security expenditures per inhabitant will take place. Total social security expenditures which are comprised of social protection benefits, sickness/health care, other expenses and administrative costs have been gradually increasing from 236.1 Euros per inhabitant in 2000 to 592.92 Euros in 2006.

This trend continued, reaching 1083.57 Euros in 2010 and 1179.36 Euros per inhabitant in 2015. Projections from 2016 to 2019 continue to show increasing values, reaching 1251.96 Euros in 2016 and 1469.77 Euros in 2019 per active inhabitant.
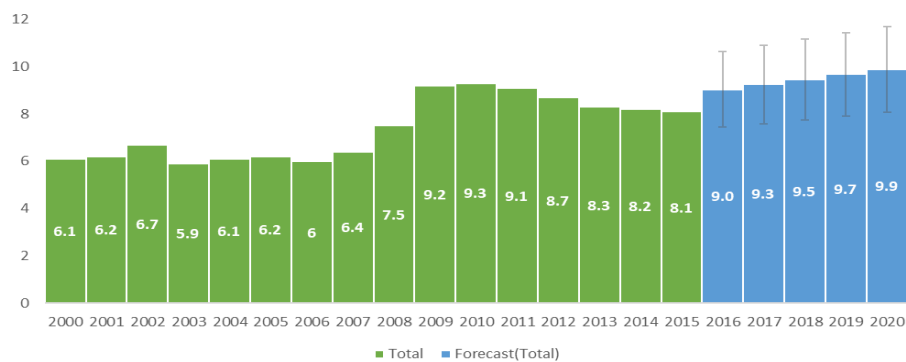

Fig. 8 Pension expenditures as % of GDP, Romania
Source: Own creation, based on EUROSTAT Data, using ARMA model

Pension expenditures, have been slowly rising from 6.1 % of GDP in 2000 to 6.7% of GDP in 2002, and then moving slightly lower to 5.9% of GDP in 2003. After this period, a steady growth of pension expenditures as a percentage in GDP took place, moving from 6.1% in 2004 to a peak of 9.2%.

The projection shows a continuation of this trend, moving from 9.3% of GDP in 2017 to a peak of 9.9% of GDP in 2020 and not showing signs of slowing down.

CONCLUSION

Romania's population is rapidly shrinking, as revealed by the data presented before, this development can be attributed to declining birth rates and the increase in life expectancy.

Analyzing the data, we can say that Romania is in the final stage of the demographic transition model, with low birth rates and low death rates, the effect was not obvious in the last decades since the "baby boomer" generation has contributed in the workforce.

The forecasts show that the population will hit 14.5 million in 2080, with a shrinking working-age segment and an increasing elderly segment of the population.

These developments will have negative effects on the country's already strained social security services which will continue worsening. The public pension as a percentage of GDP will continue to represent an ever-increasing share, raising questions about its sustainability in the not so distant future.

To a great extent, the cohorts of more educated workers that have paid more in contributions, during their working years, due to higher wages and salaries, will contribute to rising expenditures within the public pension system.

Consequently, the pensions they will receive when they retire will be larger. Therefore, an increase in retirement among educated workers is expected to considerably increase government spending on pensions.

These consequences depend to a large extent on the types of retirement policies adopted by governments because some policies can compensate for the problem of increasing the deficit in government budgets.

With the exit of the "baby boomers" that are currently in the process of retiring, an increasing strain will be placed on the country's finances, with a greater need for much careful management and new strategies to ease the pressure on future expenditure.

An obvious solution is to increase the birth rate by subsidies offered to young families, encouraging them to have more children, a further solution is to increase the retirement age of both male and female workers alike, thus delaying the increase in expenditure until more viable solutions can be implemented.

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OPADANJE POPULACIJE U RUMUNIJI I DEMOGRAFSKA BUDUĆNOST: SOCIO-EKONOMSKI ASPEKTI

Kao i većina zemalja širom sveta, zemlje članice EU pate od smanjenja broja stanovnika, zahvaljujući niskoj stopi rađanja i smanjenoj stopi mortaliteta. Rumunsko stanovništvo prolazi kroz niz promena koje će nastaviti da se odvijaju u doglednoj budućnosti. Demografske tranzicije se odvijaju u slučaju svih država članica koje su deo EU-28, sa različitim stepenima intenziteta. Rumunsko stanovništvo se smanjuje i prolazi kroz kontinuirani proces erozije od 1992. godine kada je dostigao dostiglo maksimum od 23.2 miliona. Pod uticajem smanjenja stope nataliteta i smrtnosti, procena je da će se stanovništvo smanjiti od 19.8 miliona u 2015. godini na 14.5 miliona u 2080. godini. Ovaj članak ispituje kako će ove neizbežne promene oblikovati demografsku sliku Rumunije, sa naglaskom na promene tokom vremena prouzrokovane ukupnim brojem stanovnika, stopom nataliteta i očekivanim životnim vekom, viđeno po fazama „Modela demografske tranzicije“ koji je Thomson izneo 1929. godine. Takođe, ovaj rad će se baviti i glavnim ekonomskim posledicama koje nastaju kao rezultat ovih demografskih tranzicija.

Ključne reči: *demografske promene, opadanje broja stanovnika, stopa nataliteta, stopa smrtnosti, ekonomske posledice, troškovi penzija, troškovi socijalne zaštite, ARMA*