Pensioners Versus Employees in Romania: A Regional Study

Georgiana Cristina Toma (Rosu), PhD
Gabriela Tuchilus, PhD
The Bucharest University Academy of Economic Studies, Romania

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Abstract

Romania may become overwhelmed by its ageing population in the future. One of the worrying issues is the falling support rate, which shows the relationship between the working population who is paying taxes and the non-working population, aged 65 years or over (the pensioners). This paper has a regional focus, this ratio and some of the factors influencing it (fertility rate, immigration or life expectancy) being studied in different regions of Romania between 1996 to 2017. Forecasts by 2060 highlight that pensioners-employees ratio will increase over time if no legislative reforms are designed to increase the social security budget (and implicitly the pension system). The findings indicate that an increase in fertility rate and immigration will contribute to better support of pensioners. Since many people migrate to developed countries, Romania is not attracting immigrants to improve its labor force. Hence, a measure to redress the demographic decline and support the pensioners could be the increase in the rate of fertility, which could be sustained by the initiation and implementation of pronatalist policies, the increase in the economic status of the family. Among the results, it is also highlighted that an increase in life expectancy will deter the support because the ageing population will grow. As a result, it is necessary to explore and to implement measures to balance the country's social security budget having as target the old-age population.

Keywords: Employees, Forecasting, Panel Data Analysis, Pensioners, Pensions

1. Introduction

Nowadays, pension systems all over the world are under pressure due to the many challenges faced because of the ageing population. To mitigate this issue, governments not only adopted security measures, they are continuously interested in reforming the social security system to make it

suitable to the current needs. Questions regarding the sustainability of the pension system in Romania came somehow late into the picture (2007-2008) when the system was transformed into a multi-pillar system to ensure its sustainability. Currently, our country has a system based on three pillars, the first one being mandatory, controlled by the state, and is based on the principle of intergenerational and contributory solidarity. This means that the social contributions paid by employees are used to pay the pensions of the people who benefit from a public pension. Since January 2008, the second pillar became mandatory for persons under 35 years and voluntary for those aged between 35 and 45.

Contrary to the first pillar, this one is privately administered and it consists of a percentage of an individual's social contribution (e.g., 2% in 2008) which is transferred to the fund – a defined contribution scheme.

Last but not the least, the third pillar —also privately administered, but voluntarily— is composed of individual participation distinct from classical social insurance contributions. Contributions to this pillar are deductible from income tax, but it is only up to a limit of 400 euros per year. Thus, this is with the individual contribution rate being limited at 15% of the gross wage. Out of these three categories, in Romania there exist another segment – special pensions – which are designated for certain groups such as aeronautical personnel, parliamentary civil servants, diplomatic and consular staff, staff of the Constitutional Court, the Court of Accounts, judges and prosecutors, etc.

The focus of this paper is on the first pillar, public pensions, which allows women to retire at 60 years and 10 months and the men at 65. It also helps them to receive a pension if they have contributed over a certain period of time (the minimum contribution period is 15 years, and the complete contribution period is 30 years and 10 months for women, 35 years for men).

According to the National Institute of Statistics in 2018, 5,019,585 people were receiving public pensions, with the average pension being 1030 lei. The number of working people was 5,553,908. The ratio between these two categories are very close, and it has raised concerns regarding pension sustainability.

When reviewing the results available on Eurostat Database, the at-risk-of-poverty rate for pensioners in Romania (the share of pensioners with an equalized disposable income below the at-risk-of-poverty threshold) is 16.4 %, up from 2016 when it was 15.9. The EU average for 2016 was 13.8 %.

A study made by European Commission rings the alarm saying that, in 2050, the number of pensioners in Romania will be 6.6 million and the number of working people will be 6.26 million. However, this is within a total population of 16.4 million.

The pension system in Romania has been and continues to be subject to several factors, including unemployment, the decrease in fertility rates, and

the migration phenomenon, which are causing imbalances with negative effects.

The current paper is organized as follows: the first section introduces the motivation of this research, followed by a review of existing works of literatures on pension systems subject and models to analyze them. The third section presents the current situation of Romania's public pension system, focusing on the relation between the working population who is contributing and the pensioners in different regions of the country.

Further, several factors which may impact the support rate (pensioners vs. employees) were introduced — immigration, fertility rate, and the average life expectancy. Based on the data available for each of them, basic assumptions for the future were made by projecting the available data until 2060. The same factors are used afterward in an econometric model to analyze in which way they are influencing the ratio between pensioners and employees in Romania. Section four presents the results under the baseline hypothesis, while the last section presents the conclusions.

2. Literature Review

Based on the literature, it is evident that pension systems across Europe are confronted with several issues nowadays, raising a lot of questions in terms of sustainability for the future. Many of the issues are demographic: increased life expectancy combined with declining birth rates, and the migration of a significant part of the working population towards other states which results in a reduction of the number of employees **(Floristeanu, 2013).** Migration phenomenon implied a reduction of public pension benefit levels and government expenditure on pension and it has affected the expansion of private pensions, say a study made using error correction models (ECMs) with cross-country time-series data on European countries from 1981 to 2009 (**Han, 2013**). More than that, the countries with Bismarckian pension systems (middle income favor an earning-related system) have experienced greater pressure on public pension systems than other countries.

The 2008 economic crisis also had an impact on the European pension systems leading the countries to reinvent their strategies. Finland, France, Ireland, Italy, Poland, Slovenia, Sweden, and the UK embraced similar strategies in response to the crisis. After introducing anti-cyclical measures in 2009-2010, in the next years, they tried to improve the financial viability of pensions by adopting some austerity measures such as: revised indexation, an increase in the retirement age, or a stricter link between contributions and benefits (**Natali and Stamati, 2013**). Upon studying the case of Latvia compared to the other EU countries, **Dundre (2013)** highlighted the need to reduce poverty and social exclusion is essential in all East-European social models. The government should regulate and support the basic elements -

pensions, health and long-term care, social protection of the poor and the disabled, and tax redistribution. By ensuring an acceptable level of income replaceability, the risk of poverty among older people is minimized, but this ability is missing from the East-European countries.

Other researchers focused on specific pension reforms. To study their impact, **Jaime-Castillo (2013)** took into consideration three pension policy reforms, namely: raising donations, raising the age of retirement, and allowing a free choice between public and private pension plans. By using multilevel models, an analysis has been carried out to understand how individual attachment to different solidarity principles (universalistic, conservative, liberal and familistic) affects attitudes toward pension system reforms while controlling for institutional factors. The empirical results sustain that these principles have a significant influence on individual preferences. For example, individuals who adhere to universalistic or conservative principles are more in favor of increasing contributions to maintain the level of pensions, whereas they oppose a postponement of retirement age. At the opposite pole, those who adhere to liberal or familistic principles are against increasing contributions and they prefer extending retirement age.

As far as the pension system sustainability over time is also concerned in Romania, many pieces of research focused on this topic. **Bodogai and Cutler (2014)** studied the pension and health insurance systems and the system of social welfare services in Romania and identified the major bottlenecks: too few public services, insufficient budget funds, insufficient collaboration between public and private services, and frequently overlapping services.

The recent reforms adopted by the Romanian government on the unitary system of pensions did not come with benefits for all the pensioners. **Nuta, Zaman, and Nuta (2016)** analyzed their implications at both national and regional level as well as the differences and similarities across counties with respect to nominal and real average benefits received by pensioners. The study concludes that the new pension law increased the average benefit for high pensions, while low benefits remained the same as they were before the reform. In most countries on a regional level, the average real pension (indexed by the cost of living) is above the nominal one.

To evaluate the pension domain in Romania it is absolutely necessary to study the evolution on certain indicators. Focusing on the evolution of pensioners and pensions, **Anghelache and Diaconu (2016)** found many differences between the counties: the lowest level of state social insurance pensions is recorded in Giurgiu, Ialomita, Botosani and Bistrita, while the highest level of the state social insurance pension is registered in Bucharest, Hunedoara, Brasov, Cluj, and Prahova.

The evolution of several indicators such as the number of pensioners, total and by category, early retirement, the ratio between the number of pensioners and the number of employees, the average pension, the evolution of pensions, and the pensioners' structure was also closely studied. The results obtained by **Anghelache, Manole, Popovici and Stanciu (2016)** are confirming the cruel reality: there are still people who have pensions of several tens or hundreds of thousands of lei for which, given the deepening of the crisis and the lack of financial resources, even an increase of 100% mean nothing. However, the amount of the monthly allowance increased compared to all previous years, but when looking deeper into the average monthly pension of pensioners, the analysis shows that the increase in the benefits was almost insignificant considering the population consumption price index, which was higher than the level of pension growth.

An evaluation of the pension domain will also allow the estimation of pension income that employees will receive after retirement. The continuous increase of the ageing population will affect the pension income in the next 20-30 years, as higher pensions are provided by more substantial pension funds. Searching for alternatives to this issue, **Robu, Cismasu and Sandu (2013)** investigated the effect of the degree of concentration of the private pension market in Romania on the amount of pension income using a simulation technique targeted to agents. After analyzing the data for the Romanian pension market, the replacement rates of the pension salary (the ratio between the pension income for the first ten years of pension and the earnings of the ten years preceding the retirement age) of pension funds of different sizes do not differ considerably. The pension fund with the size of the dimension larger than the distribution gives the participants a rate of replacement of the pension salary by 8.99%, and the pension fund with the size below the size distribution gives the participants 8.44% retirement salary replacement rate.

Considering the demographic changes registered in Romania over time, **Sala (2018)** performed a projection of their possible direction up to 2080 and applied ARMA model on the available data from 2010-2015, highlighting the economic consequences on government spending. Forecast results showed that the population would reach 14.5 million in 2080, coming with a decrease in the working population, and a rise of old-age population, which will have adverse effects on social security systems and the public pension as a percentage of GDP.

Mortality rate, fertility rate, and migration rate are critical factors that affect the social security system in Romania. Upon building different scenarios and projecting the data for 2010-2060, **Panzaru (2015)** revealed that migration is the only solution for labor shortages over the next 50 years. According to estimates, the workforce (employees) should be supplemented

by 2060 annually with a total of 200,000 to 500,000 immigrants, which seems to be nearly impossible in Romania under the current conditions.

Recently, **Anghel and Anghelache (2018)** carried out a monthly, quarterly, and annually analysis of the evolution of the number of pensioners and pensions in Romania, considering the decreasing workforce due to lower population which is reaching the legal age of being able to work and the increase in the number of pensioners. The natural movement of the population is also analyzed on a structural fund, discussing the pyramid of the ages, showing an elderly population in Romania.

3. Data and Methodology

In this section, the current situation of Romania's public pension system is analyzed and presented based on the latest data Thus, thus is with the most significant focus being on the pensioners versus the employees relationship. Hence, the analysis starts from analyzing several indicators such as immigration, fertility rate and the average life expectancy, and their impact on the support rate (pensioners vs. employees) and continues by projecting the data until 2060. These factors are used afterward in an econometric model to analyze how they are influencing the ratio between pensioners and employees in Romania.

3.1. Data

Regional data[1] for Romania was collected from 1996 through 2017 from the National Institute of Statistics - Romania (NIS). The variables collected are as follows:

- The average number of state social security pensioners (NMP) is determined by adding up the number of existing pensioners in the payment each month, relative to the number of months in the reference period. It represents the sum of social security pensioners, recipients of social-type pension, and IOVR[2];
- The average number of employees (NMS) represents a simple arithmetic average, resulting from the sum of the daily employees' salaries (excluding those whose work contract/service), including weekly rest, legal holidays, and other non-working days divided by the total number of calendar days;

[1] Data was collected for the eight regions of Romania: North-West, North-East, South-Est, South-Muntenia, West, Central, South-West Oltenia and last but not least the Bucharest-Ilfov.
[2] IOVR (invalids, veterans and war widows) pensions are granted to invalids and accidents at war, the survivors of the dead or missing in the war, as well as to the survivors of former invalids who are invalids and injured by war and are established according to the provisions of Law no. 49/1999 regarding IOVR pensions.

- The number of immigrants (IMT) are people who immigrate to Romania. Immigration is the action by which a person gives up residence in the territory of another state and establishes his domicile in a different state;
- The total population in working age (POP) is the population after domicile by gender on January 1 of the reference year, which represents the number of persons with Romanian citizenship and domicile on the territory of Romania, delimited by administrative-territorial criteria;
- The fertility rate (RF) is the number of live births per year for the females aged 15-49 from 1 July of the current year and is expressed in the number of live births per 1,000 fertile women in Romania (15 - 49 years);
- The average life expectancy (DVT) refers to the average number of years a newborn has to live if it lives the rest of the life in terms of age-related mortality during the reference period.

To understand the current situation Romania is confronted with in supporting the high number of pensioners, the following variables were calculated:

- Pensioners - Employees ratio (P_S): This is the ratio between the average number of pensioners and the average number of employees, calculated as NMP/NMS.
- The ratio between the number of permanent immigrants and the working-age population (IMT_POP), calculated as IMT/POP.

Descriptive statistics were analyzed (for details see **Table 1**) to have a feel of the dataset used in the econometric model and to answer the question: What does the sample convey? This preliminary test for engaging regression analysis says whether the sample is normally distributed and provides information on measures of central tendency (mean and mode) of dispersion (standard deviation) of normality-kurtosis (measures the degree of sharpness) and of skewness (measures the degree of symmetry). The mean value indicated the average value for each variable (for the P_S this average value is 0.9, for RF is 36.97, for IMT_POP is 0.0009, and for DVT is 72.6). The minimum and the maximum value just indicates the lowest and the highest value for each variable, while the standard deviation shows the deviation from the sample mean.

The results for normality tests show that P_S has a normal skewness (because it has 0 skew, the distribution is symmetric around its mean) and platykurtic (negative kurtosis because $2.17<3$). The RF also has a normal skewness and leptokurtic (positive kurtosis because $4.73>3$). The IMT_POP has a long right-tail (positive skewness, the value of 3.91) and leptokurtic (positive kurtosis because $20.45>3$). The DVT has a long left-tail (negative skewness the value of -0.01) and platykurtic (negative kurtosis because $2.03<3$).

Table 1. Descriptive Statistics

	P_S [number of persons]	RF [%]	IMT_POP [number of persons]	DVT [years]
Mean	0.981925	36.97216	0.000900	72.60608
Maximum	1.456400	51.80000	0.010984	77.56000
Minimum	0.520100	24.30000	0.0000263	68.08000
Std. Dev.	0.241788	4.834279	0.001613	2.385965
Skewness	0.048542	0.139832	3.910389	-0.019997
Kurtosis	2.172754	4.732090	20.45533	2.034101
Observations	176	176	176	176

Source: Authors'compilation

With the help of the FORECAST.ETC function from EXCEL, future values (for P_S, RF, IMM, and DVT for 43 years) were predicted based on the AAA version of the Exponential Triple Smoothing (ETC) algorithm using historical data (from 1996 to 2017). To facilitate the comparison between current and projected data, the average of the 1996-2017 period was used. For this comparison, the forecast year, namely 2060 is in discussion vs. the average of the 1996-2017 period. According to **Table 2,** the projected pensioner-employee ratio will increase by 1.60 from 1.15 (mean of the 1996-2017 period) to 2.72 in 2060 for the North-East Region, followed by the South-West Oltenia region with an increase of 1.38 from 1.14 in the period 1996-2017 to 2.52 in 2060. A higher increase in this forecasted ratio was also recorded in the South-East region (1.21) and South-Muntenia region (1.12). The Central region, the West region, and North-West region were registered a sub-unitary increase of this projected ratio by 0.69, 0.36, and respectively 0.34 from the period that the data was collected until 2060. Opposite to all these results for the Bucharest Ilfov region, the same projected ratio will decrease by 0.56 from 0.66 in the period 1996-2017 to 0.10 in 2060.

The increase of the pensioner-employee ratio confirms that the North-East region and the South-West Oltenia region of Romania, being less economically developed than the Bucharest-Ilfov region-capital of the country, will see an increase in the pensioner-employee ratio over time if no legislative reforms aimed at improving the social security budget (and implicitly the pension system). The decrease of this ratio in Bucharest-Ilfov region shows that the capital of the country is an economically developed region with numerous employment opportunities, thus increasing the contributions to the social insurance budget.

Table 2. Forecast of pensioner-employee ratio

Regions		**Years**									
Realistic scenario											
	Mean of 1996-2017 period	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**2055**	**2060**	**Change**
North-West	0.97	0.93	0.98	1.02	1.07	1.12	1.17	1.22	1.26	1.31	0.34
Central	0.89	0.95	1.03	1.11	1.19	1.27	1.35	1.43	1.51	1.58	0.69
North-East	1.15	1.37	1.54	1.72	1.89	2.06	2.23	2.40	2.58	2.75	1.60
South-East	0.95	1.16	1.28	1.41	1.53	1.66	1.79	1.91	2.04	2.16	1.21
South-Muntenia	1.22	1.33	1.46	1.59	1.71	1.84	1.97	2.09	2.22	2.34	1.12
Bucharest-Ilfov	0.66	0.50	0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10	-0.56
South-West Oltenia	1.14	1.34	1.49	1.63	1.78	1.93	2.08	2.23	2.38	2.52	1.38
West	0.88	0.89	0.93	0.97	1.02	1.06	1.11	1.15	1.19	1.24	0.36

Source: Authors' computation using NIS data and Microsoft Excel 2016

Another important factor which impacts supporting the pensioners (by employees who are paying taxes) is the fertility rate.

Table 3 presents the forecasted fertility rates with five years intervals starting with 2020 until 2060. Based on the estimation, the rate will increase until 2060 by 41.03 percentage points from 31.17% (the mean of the 1996-2017 period) to 43.63% in 2060 for Bucharest-Ilfov region. A small increase was registered for the predicted fertility rate and the Central region (5.10% from 38.53% in the average of the 1996-2017 period to 43.63%) in 2060 but also for the West region of 0.16% from 33.73% in the average of the 1996-2017 period to 33.89% in 2060. For the rest of the regions, the forecast showed a decrease in fertility. Hence, the highest decline in the predicted fertility rate will be recorded in the North West region (31.99% from 44.30% between 1996-2017 to 12.31% in 2060), followed by 17.33% from 37.28% (the mean of 1996-2017 period) to 19.55% in 2060 in South-Muntenia region, by 16.72% (from 35.78% to 19.06%) for the South-West Oltenia region, and by 13.46 % (from 36.20% to 22.74%) for the South-East region. In the North-West region, the projected fertility rate will decrease by 2.72 percentage points from 38.76% to 36.04%.

Declining fertility rates in almost all the regions can be explained by the demographic changes that have occurred in recent years and that have negatively influenced the social security system (and implicitly the pension system). Emphasizing the woman as well as her participation on the labor market, the high costs of child raising, the large-scale migration phenomenon, as well as stress, are the main factors leading to a decrease in fertility rate in the future.

Table 3. Forecast of fertility rate

Regions		**Years**									
Realistic scenario											
	Mean of 1996-2017 period	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**2055**	**2060**	**Change**
North-West	38.76	39.60	39.16	38.71	38.27	38.82	37.38	36.93	36.49	36.04	-2.72
Central	38.53	39.65	40.15	40.64	41.14	41.64	42.13	42.63	43.13	43.63	5.10
North-East	44.30	37.04	33.95	30.86	27.77	24.68	21.58	18.49	15.40	12.31	-31.99
South-East	36.20	32.78	31.52	30.27	29.01	27.76	26.50	25.25	23.99	22.74	-13.46
South-Muntenia	37.28	32.85	31.24	29.62	28.01	26.40	24.79	23.17	21.56	19.95	-17.33
Bucharest -Ilfov	31.17	41.53	45.36	49.20	53.03	56.86	60.70	64.53	68.37	72.20	41.03
South-West Oltenia	35.78	31.56	30.00	28.44	26.87	25.31	23.75	22.18	20.62	19.06	-16.72
West	33.73	35.00	34.86	34.72	34.58	34.44	34.31	34.17	34.03	33.89	0.16

Source: Authors' computation using NIS data and Microsoft Excel 2016

Immigration is another important indicator that has a significant influence on pension system sustainability. Thus, according to **Table 4,** the forecast for this factor indicates that the number of immigrants will increase by 53,614 persons (from 6,227 persons in 1996-2017 period to 59,841 persons in 2060) in North-East region, followed by Bucharest-Ilfov region where this projected indicator will increase by 17,040 persons from 4,139 persons in 1996-2017 to 21,179 persons in 2060. In the other regions (the South-East and the South-Muntenia), the projected immigrants will increase by 13,673 persons (from 998 persons in 1996-2017 to 14,671 persons in 2060) and respectively by 2,620 persons (from 366 persons to 2,986 persons). An increase in the projected number of immigrants of over 1,000 persons will be registered in the Central region and North-West region until 2060. The lowest increase will be in West region (namely 606 immigrants in 2060 - from 645 persons in the 1996-2017 period to 1,251 persons in 2060) and South-West Oltenia (830 persons from 239 in the 1996-2017 period to 1,069 persons in 2060).

With the integration of Romania into the EU, an entire process of opening up the labor market has taken place. This process has contributed to an even more significant demographic decline. Even if the exact number of immigrants and emigrants is known, the migration problem remains open due to the high dynamics of this phenomenon.

Table 4. Forecast of immigrants

Regions		**Years**									
Realistic scenario											
	Mean of 1996-2017 period	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**2055**	**2060**	**Change**
North-West	842	1359	1452	1546	1639	1732	1826	1919	2012	2106	1264
Center	662	1239	1354	1468	1583	1697	1812	1927	2041	2156	1494
North-East	6227	20607	25511	30416	35320	40224	45129	50033	54937	59841	53614
South-East	998	3369	4782	6194	7607	9020	10433	11846	13258	14671	13673
South-Muntenia	366	999	1247	1496	1744	1993	2241	2490	2738	2986	2620
Bucharest-Ilfov	4139	13208	14204	15200	16197	17193	18190	19186	20183	21179	17040
South-West Oltenia	239	433	513	592	671	751	830	910	989	1069	830
West	645	1044	1070	1096	1122	1148	1173	1199	1225	1251	606

Source: Authors' computation using NIS data and Microsoft Excel 2016

The last but not the least indicator used in the forecasting analysis is the average life expectancy. The trends of this indicator are presented in **Table 5**, which shows that it will increase by almost the same value for both North West region (20.47 years from 71.90 years in the 1996-2017 period to 92.37 years in 2060) and West region (20.46 years from 72.09 in the 1996-2017 period to 92.55 years in 2060). In the other five regions, the projected indicator will increase with more than 15 years between 2060 and the average of the 1996-2017 period (Bucharest-Ilfov - by 19.92 years, the Central region - by 18.03 years, South-Muntenia - by 17.80 years, North-East region-by 17.42 years, and South-West Oltenia region - by 16.98 years). The lowest increase (5.51 years) between 2060 and the mean of the 1996-2017 period will be registered in the South-East region.

The forecasts highlights that in Romania, there is an increase in life expectancy, but the growing number of older people involves the intensive use of social services. For this reason, it is necessary to implement measures for the Romanian population aimed at balancing the country's social security budget. Active ageing is a means of redressing the ageing phenomenon of the population, the contribution of the elderly to the labor market, improving long-term care services, and increasing social and political participation of older people's groups.

Table 5. Forecast of the average life expectancy

Regions		**Years**									
Realistic scenario											
	Mean of 1996-2017 period	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**2055**	**2060**	**Change**
North-West	71.90	77.00	78.92	80.84	82.77	84.69	86.61	88.53	90.45	92.37	20.47
Central	73.02	77.30	79.02	80.74	82.45	84.17	85.89	87.61	89.33	91.05	18.03
North-East	72.46	76.83	78.46	80.09	81.72	83.36	84.99	86.62	88.25	89.88	17.42
South-East	72.26	75.35	76.65	75.96	76.26	76.56	76.86	77.16	77.47	77.77	5.51
South-Muntenia	72.26	76.69	78.36	80.04	81.71	83.38	85.05	86.72	88.39	90.06	17.80
Bucharest-Ilfov	74.48	79.51	81.37	83.23	85.09	86.95	88.81	90.68	92.54	94.40	19.92
South-West Oltenia	72.39	76.62	78.21	79.81	81.40	82.99	84.59	86.18	87.78	89.37	16.98
West	72.09	77.30	79.21	81.11	83.02	84.92	86.83	88.74	90.64	92.55	20.46

Source: Authors' computation using NIS data and Microsoft Excel 2016

3.2. Methodology

The following working hypotheses were defined with the purpose to be checked in the econometric model further defined.

H1: The increase in the fertility rate leads to a decrease in the ratio between the average number of pensioners and the average number of employees;

H2: The increase in the ratio between immigrants and the respective population leads to a decrease in the ratio between the average number of pensioners and the average number of employees;

H3: The increase in average life expectancy leads to an increase in the ratio between the average number of pensioners and the average number of employees.

The dependent variable in the models is P_S, while the independent variables consist of RF, DVT, and IMT_POP.

The methodology used in the further analysis is a basic one with classical statistical analysis and panel data. To reduce the possibility of heteroskedasticity in models, the logarithm for each variable was used. However, the heteroskedasticity test performed for all variables using unbalanced data (probability p (obs * R-square) <0.05) indicated the presence of heteroskedasticity in our models. The stationarity of the series was checked using the Panel Unit Root Tests (Levin, Lin & Chu, Im, Pesaran and Shin W-stat, ADF-Fisher and PP-Fisher). The majority results of the summary of the methods indicate that the series are stationary. For example, according to the results obtained from Levin, Lin & Chu method, the series that are stationary (prob <0.05) are: LOG (P_S), LOG (RF), and LOG (DVT). The only one that became stationary with the first difference is D (IMT_POP) (see **Appendix 1**).

To correct the heteroskedasticity, the Random and Fixed Effect models were defined using white cross section estimators because they are robust to contemporary heteroskedasticity.

The econometric analysis is performed using E-Views 10.0 software. To estimate both the models for cross-sectional data, the following equation was used:

$$LOG(P\_S) = \alpha + \beta_1 LOG(RF) + \beta_2 D(IMT\_POP) + \beta_3 LOG(DVT) + \varepsilon \qquad (1)$$

where α is the intercept of the model, β_1, β_2 and β_3 are the coefficients of the variable that shows the change of P_S due to the variation of the unit of the independent variables, and ε is the model error term.

4. Results

This section presents the results obtained from the econometric analysis performed using panel data from 1996 through 2017. Therefore, **Table 6** presents the results obtained when estimating the Model with Fixed Effect and white cross-section. The variables from equation (1) which are statistically significant at the 5% level are RF, and DVT, while IMT_POP is statistically significant at the 10% level.

IMT_POP has an impact on P_S (p = 0.0530), having a coefficient of -14.883 reported by the model. The negative sign checks the **H2** hypothesis: an increase of IMT_POP implies a decrease P_S. So, when IMT_POP increases by 1% P_S decreases by 14.883%.

The fertility rate variable is also statistically significant (p = 0.0000) with a negative coefficient of -1.176. Considering this significant variable at the level of 10%, when the fertility rate increases by 1%, P_S decreases by 1.176%. Thus, the hypothesis **H1** is also checked: the increase in the fertility rate leads to a decrease of the ratio between the average number of pensioners and the average number of employees.

The results reported in the model indicated that DVT is also statistically significant (p = 0.0001), checking the **H3** hypothesis (coefficient equal to 2.524). In other words, whenever this variable increases by 1%, P_S increases by 2.524%.

The p-value of the model is 0.0% (less than 5%) which means that F-statistic is significant. This shows that the independent variables can influence the dependent variable. 90.15% (the value of R-squared) of variation in P_S can be explained by independent variables RF, IMT_POP, and DVT and the rest of 9.85% variation in P_S can be explained by another independent variables or residuals. The Lag selection was determined by the Akaike Information Criterion (AIC). The lower the AIC value (-2.16) better the model.

Table 6. Fixed-Effect Model with White Cross-Section

Dependent Variable:LOG (P_S)				
Method: Panel Least Squares				
White cross-section standard errors & covariance (d.f. corrected)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-6.613260	2.507979	-2.636888	0.0092
LOG(RF)	-1.176979	0.080885	-14.55124	0.0000
D(IMT_POP)	-14.88313	7.634413	-1.949479	0.0530
LOG(DVT)	2.524558	0.624100	4.045119	0.0001
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.901540	Mean dependent var		-0.029372
Adjusted R-squared	0.895269	S.D. dependent var		0.245426
S.E. of regression	0.079425	Akaike info criterion		-2.164766
Sum squared resid	0.990415	Schwarz criterion		-1.960221
Log likelihood	192.8403	Hannan-Quinn criter.		-2.081752
F-statistic	143.7563	Durbin-Watson stat		0.642579
Prob (F-statistic)	0.000000			

Source: Developed by the authors using NIS data and E-Views software

5. Conclusions

The present research is analyzing the current situation of Romania's public pension system. The focus is on the relation between the working population who is contributing and the pensioners in different regions of the country. The future direction (until 2060) of the pensioners-employees ratio was studied closely, and the results report an increase in all the regions, except Bucharest-Ilfov. A low ratio means more people are employed than being pensioners, and the declining ratio in Bucharest-Ilfov region can be explained by the fact that the capital is more developed with numerous employment opportunities, a higher employment rate, thus higher contributions to the social insurance budget.

Several factors which could impact the support rate (pensioners vs. employees) were introduced in the analysis: immigration, fertility rate, and the average life expectancy. Their trend was studied by projecting the available data (1996-2017) until 2060. The forecasts show declining fertility rates in many Romanian regions (North-West, North-East, South-East, South-Muntenia, South-West Oltenia), which can be explained by the demographic changes that have occurred in recent years. Other factors are women's participation in the labor market, the high costs of child raising, the large-scale migration phenomenon, as well as stress. However, in the Bucharest-Ilfov, Central and West regions, the results indicated an increase in the predicted fertility rate. These regions are economically developed, which leads to the

assertion that the differences in fertility are due to socio-cultural factors rather than economic or political factors.

When talking about immigrants, an increase in the number of persons moving to Romania will raise the chances to improve the employment rate. This translates to a decrease in the support ratio. When looking at the current and forecasted data, it can be observed that there is a slight increase, which will not change the current situation. With the adherence to EU, the labor market was opened, but this contributed to an even greater demographic decline as people choose to leave Romania for better perspectives in other countries.

In all regions in Romania, it is registered that an increase in life expectancy, and this growing number of older people, will involve the intensive use of social services.

Immigration, fertility rate, and the average life expectancy are used afterward in an econometric model to analyze in which way they are influencing the ratio between pensioners and employees in Romania.

The empirical results from the tested econometric model indicated that an increase in fertility rate and immigration would contribute to better support of pensioners, while an increase in life expectancy will deter the support because the ageing population will grow. Since attracting more immigrants is hard nowadays, as many people migrate to developed countries, a measure to redress this demographic decline and sustain the pensioners could be the increase in the rate of fertility. This could lead to the initiation and implementation of pronatalist policies and the improvement in the economic status of the family. These measures are already implemented in European countries (e.g., Sweden). Also, it is necessary to explore and implement measures to balance the country's social security budget having as target the old-age population.

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Appendix 1: Stationarity Tests

Null Hypothesis: Unit root (common unit root process)
Series: LOG(P_S)
Date: 06/16/19 Time: 17:07
Sample: 1996 2017
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 160
Cross-sections included: 8

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-5.41052	0.0000

** Probabilities are computed assuming asymptotic normality

Intermediate results on LOG(P_S)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
1	-0.26290	0.0020	0.0058	1	1	2.0	20
2	-0.19154	0.0010	0.0048	1	1	2.0	20
3	-0.14856	0.0013	0.0062	1	1	2.0	20
4	-0.15256	0.0010	0.0063	1	1	2.0	20
5	-0.20532	0.0010	0.0068	1	1	2.0	20
6	-0.10327	0.0055	0.0065	1	1	2.0	20
7	-0.19486	0.0010	0.0062	1	1	2.0	20
8	-0.37491	0.0012	0.0066	1	1	2.0	20

	Coefficient	t-Stat	SE Reg	mu*	sig*	Obs
Pooled	-0.19402	-8.915	1.025	-0.554	0.919	160

Null Hypothesis: Unit root (common unit root process)
Series: LOG(RF)
Date: 06/16/19 Time: 16:47
Sample: 1996 2017
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 160
Cross-sections included: 8

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-2.52765	0.0057

** Probabilities are computed assuming asymptotic normality

Intermediate results on LOG(RF)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
1	-0.52413	0.0010	0.0009	1	1	5.0	20
2	-0.52821	0.0008	0.0002	1	1	10.0	20
3	-0.16633	0.0027	0.0009	1	1	5.0	20
4	-0.31857	0.0012	0.0002	1	1	12.0	20
5	-0.21887	0.0009	0.0002	1	1	10.0	20
6	-0.05229	0.0017	0.0020	1	1	0.0	20
7	-0.14682	0.0010	0.0009	1	1	4.0	20
8	-0.51526	0.0008	0.0013	1	1	2.0	20

	Coefficient	t-Stat	SE Reg	mu*	sig*	Obs
Pooled	-0.16949	-4.580	1.053	-0.554	0.919	160

Null Hypothesis: Unit root (common unit root process)
Series: D(IMT_POP)
Date: 06/16/19 Time: 17:02
Sample: 1996 2017
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 152
Cross-sections included: 8

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-2.78577	0.0027

** Probabilities are computed assuming asymptotic normality

Intermediate results on D(IMT_POP)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
1	-1.90992	1.E-07	2.E-08	1	1	19.0	19
2	-1.05127	9.E-09	1.E-08	1	1	4.0	19
3	-1.49590	3.E-06	9.E-07	1	1	16.0	19
4	-1.36622	5.E-08	2.E-08	1	1	10.0	19
5	-0.93809	2.E-09	2.E-09	1	1	2.0	19
6	-0.97795	2.E-06	2.E-06	1	1	3.0	19
7	-0.92663	1.E-09	7.E-10	1	1	10.0	19
8	-0.68328	9.E-09	2.E-08	1	1	0.0	19

	Coefficient	t-Stat	SE Reg	mu*	sig*	Obs
Pooled	-1.04496	-9.841	1.040	-0.554	0.919	152

Null Hypothesis: Unit root (common unit root process)
Series: LOG(DVT)
Date: 06/16/19 Time: 16:50
Sample: 1996 2017
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 160
Cross-sections included: 8

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-3.97048	0.0000

** Probabilities are computed assuming asymptotic normality

Intermediate results on LOG(DVT)

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
1	-0.02493	1.E-05	1.E-05	1	1	3.0	20
2	-0.03024	1.E-05	2.E-05	1	1	2.0	20
3	-0.05866	1.E-05	2.E-05	1	1	2.0	20
4	-0.04791	8.E-06	1.E-05	1	1	0.0	20
5	-0.06134	1.E-05	3.E-05	1	1	1.0	20
6	-0.05742	1.E-05	2.E-05	1	1	0.0	20
7	-0.03956	1.E-05	2.E-05	1	1	3.0	20
8	-0.04654	2.E-05	2.E-05	1	1	0.0	20

	Coefficient	t-Stat	SE Reg	mu*	sig*	Obs
Pooled	-0.04556	-4.668	1.005	-0.554	0.919	160

Source: Developed by the authors in E-Views software using NIS data