

**THE IMPACT OF THE AGING POPULATION ON THE SUSTAINABILITY OF
PUBLIC FINANCES**

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Abstract

Significant demographic changes have been observed in most countries of the world in recent decades. The aging phenomenon of the population leads to significant changes in the age structure of the workforce. These changes will probably have profound influences on economic activity, both internally and internationally. However, due to the size of public pension and health spending, the net impact of these changes will lead to an increase in government spending that implies a decline in public economies, as long as fiscal policies remain unchanged. Another concern at global level is that the aging of the population can lead to a reduction of savings in the

private environment, which, in turn, leads to a reduction of investments and real production and thus convergence is affected. The aging of the population represents a long-term challenge at the level of the European states in the light of the fiscal pressure on the social insurance system and implicitly of the convergence indicators - the budget deficit and the public debt. This paper aims to identify the factors that significantly influence the risk of poverty after retirement age and the impact on the convergence process using a panel date analysis.

Keywords: economic convergence, aging population, sustainability of public finances, labour market

JEL Classification: R11, E60, H20

1. Introduction and literature review

In the last decades, in most countries around the world, significant demographic changes have been observed. At the level of the European Union countries, the phenomenon of population aging leads to significant changes in the age structure of the workforce. These changes will have profound effects on the economic activity, and implicitly on the convergence of the Member States. A key element that is emphasized in this context is the impact of the aging population and its effects on the sustainability of the state budget. Given that population incomes and consumption are taxed differently in each state, demographic changes also have different tax implications on budget revenues.

The aging of the population will put pressure on public sector pensions and on health expenditures, but on the other hand, it will reduce government spending on other sectors, such as education and research innovation. However, due to the size of public pension and health spending, the net impact of these changes will lead to an increase in government expenditures that implies a decline in public economies, as long as fiscal policies remain unchanged.

Another concern at the global level is that the aging of the population can lead to a reduction of savings in the private environment, which, in turn, leads to a reduction of investments and real production. Saving for retirement is considered the most important saving reason for a household. During its life cycle, the household accumulates wealth during the active life, consuming less than the available income. During retirement, the household uses the accumulated wealth to finance its consumption. Therefore, households save during their working lives to maintain the same standards of life after the retirement age. The generalized life cycle hypothesis states that the saving rate of households depends on the age of the household. The

prediction of the life cycle model is that the aging phenomenon of the population can significantly influence the private saving, in the sense of diminishing it.

This article aims to identify the factors that significantly influence the poverty risk after the retirement age. The poverty risk was taken as an indicator from the Eurostat database and reflects the ability of the incomes collected by the population after the retirement age to ensure the same standard of living after this threshold. The poverty risk is considered an indicator used to measure the achievement of one of the objectives set at the European level through the Europe 2020 Agenda.

The decision makers are concerned about the impact that the aging population will have on the financial security of households. The concern is mainly focused on the most vulnerable groups, namely: women, people with low education and poor people. Lyons et. al. (2018) analyzed five fundamental indicators of financial security for countries with diverse aging populations, OECD and non-OECD countries. The results of the study indicate a general aging tendency of the population. Vulnerable groups are the most affected by this aging process, especially those living in developing countries. Elderly groups living in countries where the aging process is advanced are inclined towards saving, regardless of the OECD status. The study also shows that the financial security in developing countries is affected by public spending and other age-related security indicators. Financial inclusion and technological use are two such indicators and have a significant impact on financial security. The factors analyzed in this study could play an important role in promoting saving in order to improve the well-being of people who have reached the retirement age. The study focuses on the groups of vulnerable people: women, those with low education and the poor. These groups, in developing countries, were excluded from the financial markets. The factors used include: the general saving tendency, the specific saving for the elderly, the saving for unexpected situations and the source of the income for emergencies. Governments may need to adopt various strategies to encourage vulnerable groups to attach greater importance to financial security at the retirement age. They will need to create access for these people to programs that encourage savings to make them aware of the importance of this aspect. A notable result of this study is that the macro-indicators analyzed have far more significant effects in the developed countries. The population living in these countries is less inclined towards saving, even if the percentage of financial inclusion is high. The population in these countries tends to rely more on family and friends than on personal savings, perhaps because of the fact that in these countries the public pension systems and other placements for social security are under improvement.

Caia and Stoyanov (2016) analyze the impact of population aging on international trade. The authors start from the idea that human skills are age dependent, and the aging of the population leads to a decrease in the demand for labor and to the increase in the price of labor endowed with the necessary skills. Therefore, the industries in which the workers are younger, are more efficient and productive, so the countries with a younger workforce are more productive and more competitive than the countries with an older population. The study was based on a sample of 82 exporting countries, 135 importing countries and 76 industries, from 1962-2000.

Prammer analyzed the impact of the aging population on budget revenues from income tax and social security contributions in Austria. The analysis focuses only on aging and takes into account three scenarios. The study concludes that the aging of the population leads to a decrease in the income per capita and the contributions to state social insurance by up to 10%. In this study, the author uses estimated increases in pensions and real wages that are taken into account for assessing the impact of the aging population. Also, pension expenses are projected from information specific to the age category from the data available in the literature. In order to design the income tax and the social security contributions for pensions and salaries, the study estimates new elasticities of tax revenues by using quantified regression, and applies them to pensions and salaries income. The analysis shows that the aging population really puts pressure on the state income from the income tax and on the contributions to social insurance. As pensioners face a lower tax burden, the average income tax and social insurance payments to the state would be about 10% lower for the age structure in the year 2060, compared to the current level. Depending on the demographic scenario used, this could lead to overall losses of state revenues, despite population growth.

The European Institute of Romania (2011) published a strategy and policy study on the analysis of social policies in the European Union and the impact of population aging on public pension systems. One of the themes addressed in this paper is the analysis of the factors of influence for an adequate and sustainable pension system. The issue from which this study started is related to the aging phenomenon of the population, which plays out by the dramatic decrease in the number of older people on the labor market, which threatens the sustainability of the public social insurance systems. The hypothesis of this study is that an adequate pension system must ensure after the retirement age the same living standards that a person had during the active life. The authors sought to identify the factors that influence the sustainability and adequacy of the public pension systems at the European Union level, including in the analysis 27 Member States over a period of 20 years, respectively the time period between 1990 and 2010.

For the analysis, a VAR model was used to identify the factors that significantly influence the aggregate replacement rate and the poverty risk after retirement, which represent two indicators that illustrate the sustainability of a pension system. It has been identified that there is a positive relationship between the employment rate and poverty risk, and a negative relationship between the employment rate and the replacement rate.

Fougère and Mérette (1999) study the issue of population aging through a study based on a 45-year econometric analysis of the population of Canada, which sought to identify the factors that may influence the tendency to save of the population. The results indicate that the public sector deficit is in direct relation to the private saving, namely an increase of the public deficit will make the population to save more. Inflation also influences private saving to some extent. An interesting correlation is that identified between the dependency rate and the saving rate. The results indicate that this rate is an important variable in establishing long-term trends in the inclination towards saving. Therefore, the expected increase in the dependency ratio, in the context of population aging, will lead to a significant decrease in personal savings. The estimates made in this analysis show that, by 2050, the direct effect of aging can contribute to reducing the private saving rate by up to 50%.

Kluge (2013) analyzes the impact of population aging on tax policies in Germany. This paper focuses on how to allocate government revenues and how these allocations impact the aging phenomenon. The results of the study show that the social security system, together with its four pillars, health, pensions, unemployment and care, will face an unbalanced budget because the contributions to the state social insurance will decrease, due to the reduction of the number of active people on the labor market. In this context, it will be necessary to fund public budgets and to adopt measures and policies that combat the negative effects of the increasingly present phenomenon of population aging.

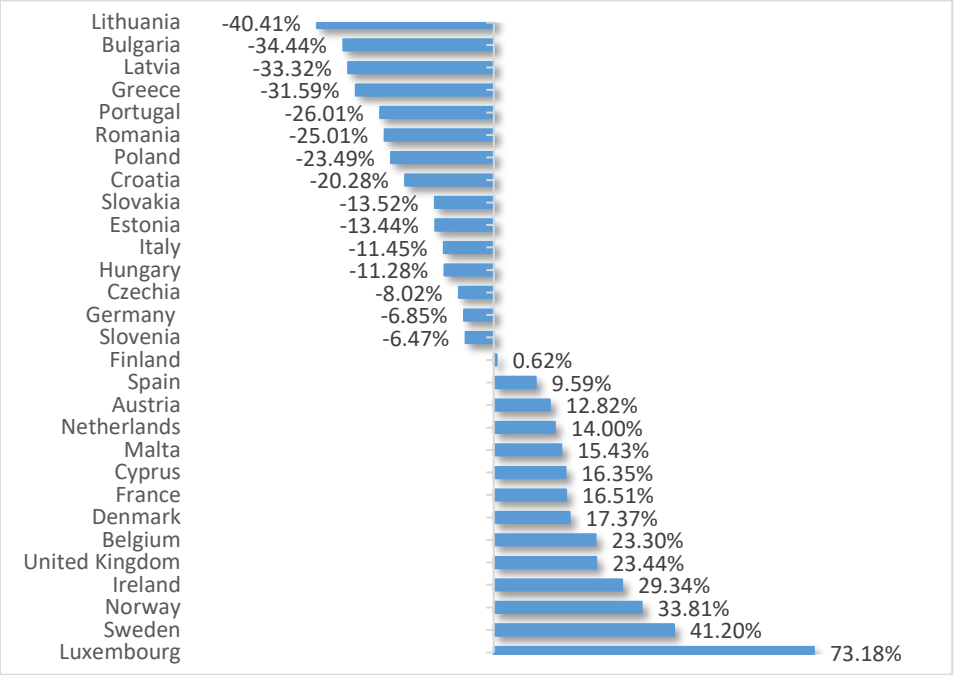
Starting from the demographic changes in the population structure at the level of the member states of the European Union, Kluge et al. (2019) have published an article that wants, on the one hand, to estimate the impact that the massive aging phenomenon of the population will have on the sustainability of public finances, and on the other hand, its implications on the potential transfer flows between the countries of the European Union. The study starts from the hypothesis of increasing the average life expectancy among Europeans and from the existence of migration within the European space. The results of the study are estimated individually for each scenario, namely the fiscal impact of population aging in each Member State, respectively the impact on transfers within an integrated union. The results show that there are countries that will face large gaps between the contributions and taxes collected and the benefits paid in the form of

pensions and allowances. On average, these gaps are expected to reach about 8% by 2030, and 16% by 2050. The countries most affected are countries such as Slovenia, Slovakia, Romania, where the gaps are estimated to reach about 25-30%, while in the Western European countries these disparities, according to estimates, will not exceed 10%. The second scenario is based on the idea that the countries where the fertility rate is higher and the budget is more sustainable should support the countries where the situation is more delicate. This hypothesis is formulated in the context in which all countries would increase their tax rates to 16% by 2050. Under these assumptions, countries such as Finland, Denmark, France or Belgium would generate surpluses that would result in a participation in a common European Union fund of about 4%. On the other hand, in countries such as Slovakia, Spain, Greece, where fertility is much lower, the budget would not become sustainable even after the tax increase. This shows the usefulness of transfers between European Union member countries, because these disadvantaged countries could benefit from the 4% surplus that the richer countries have. But the question remains, why should high fertility countries long-term support low fertility countries? One possible argument would be that, with the free movement of citizens in the European space, poorly developed countries will suffer from the emigration of young and well-prepared workforce to countries characterized by economic prosperity, an action that will improve the demographic wealth of the latter countries.

2. Descriptive analysis

Regarding the demographic situation at the level of the European Union, it is observed that the trend is slightly upward. If around 400 million people lived in the European area in 1960, this number has now increased to 515 million, and by 2080 it is estimated that the population of the European Union will reach approximately 519 million people. At the level of Romania, in 1960 a number of 18.3 million people was registered, while around the 1990s the population of Romania reached a historical maximum of 23.2 million. After this period, the population of our country followed a downward trend, currently totaling 19.2 million inhabitants. Romania is not the only country affected by demographic changes, but all the Member States of the European Union. But a decrease of the population is not estimated in all the states, as is the case of Romania. As we can see in figure 1, the population of Romania is expected to decrease by 25% by 2080, compared to the current population, but there are states where the decline will be much more drastic, for example Lithuania, Bulgaria or Greece. On the other hand, there are countries where the population growth is estimated to be up to 70% compared to the current population, as in the case of Luxembourg, but also states where the population does not undergo significant changes compared to the current situation, as is the case with Finland.

Figure 1. Change in the population in 2080 compared to 2019 at the European Union level

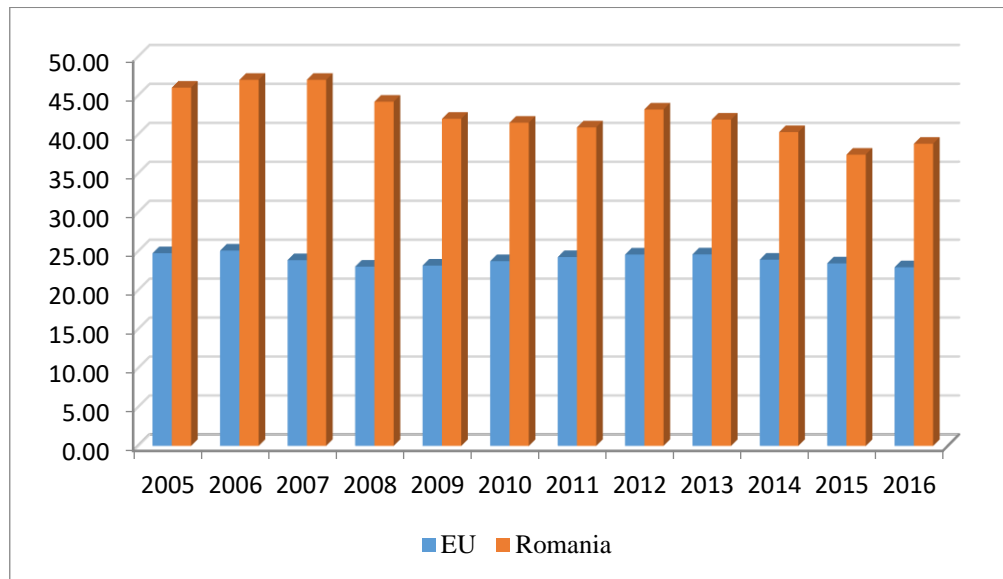


Source: data from Eurostat, 2019

The current study is based on the general global trend in recent years regarding the population aging. The research is based on an econometric study with Panel data.

The risk of poverty for the elderly is somewhat constant at the level of the European Union, during the analyzed period, having a variation between 22.92% registered in 2016 and 25.08% in 2006 (Figure 2). Although, according to the decreasing tendency that this variable has had since 2007, there were increases in the period after the crisis, the same trend was resumed after 2013 when the effects of the economic crisis began to disappear. The percentage of people at risk of poverty varies substantially between the EU Member States, from 11.5% in Iceland to 61.3% in Bulgaria in 2006. Fluctuations in Romania are higher, and the risk of poverty is almost double compared to the European Union average. The highest values were recorded in 2006 and 2007, and the general trend until 2016 was that of decreasing, with a small exception between 2010-2011, when the effects of the crisis led to an increase in the risk of poverty, but not for a long time.

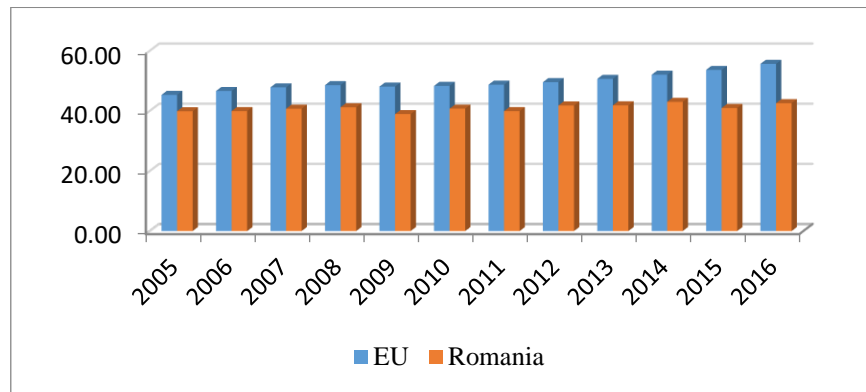
Figure 2. Evolution of poverty risk for people over 65 years of age (%)



Source: data from Eurostat, 2019

At the level of the European Union, the general tendency is to increase the employment rate of people aged between 55-64. The evolution recorded during the analyzed period is about 10% (Figure 3). There are also significant variations between the Member States included in the analysis in the case of this variable. The highest level of employment of people of the analyzed age category was recorded by Iceland in 2006, reaching a level of 87.01% of the employment rate. At the opposite pole, in 2005, in Poland only 27.78% of the population aged 55-64 was employed. Romania is less than 10pp below the European Union average. During the analyzed period there were also periods of inflection from year to year, but as a general trend, the employment rate increased from 39.86% in 2005 to 42.53% in 2016. However, the target level of 50% imposed by the European Union was not reached in the case of Romania.

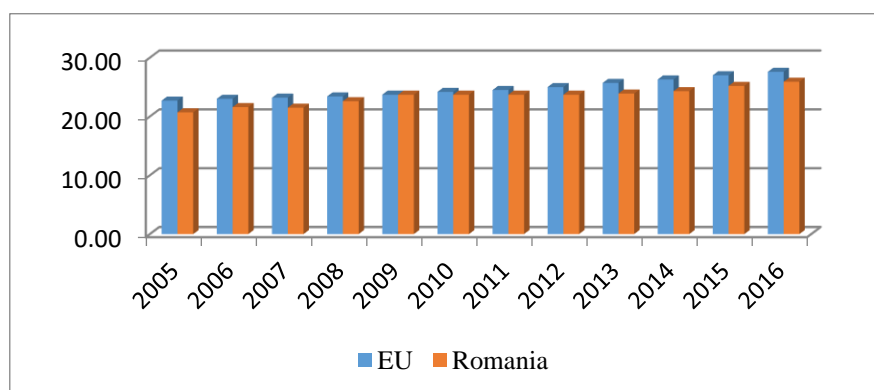
Figure 3. Evolution of the employment rate of the population aged 55-64 years (%)



Source: data from Eurostat, 2019

The dependency rate shows a constant evolution at the level of the European Union during the period 2005-2016, with an increase of about 5% during this period. It is noted that Romania has values very close to the European Union average (Figure 4). Two of the reasons leading to the increase of this indicator are the decrease of fertility and the increase of life expectancy in the population of the whole European Union. Numerous recent studies indicate that the dependency rate will double by the 2060s. The discrepancies between the values of the dependency rate at the European Union level are not very significant, meaning the lowest level was recorded by Ireland in 2008 (15.65%), and the highest level of the indicator was registered by Italy in 2016 (34.27%).

Figure 4. The evolution of the dependency rate of the elderly (%)

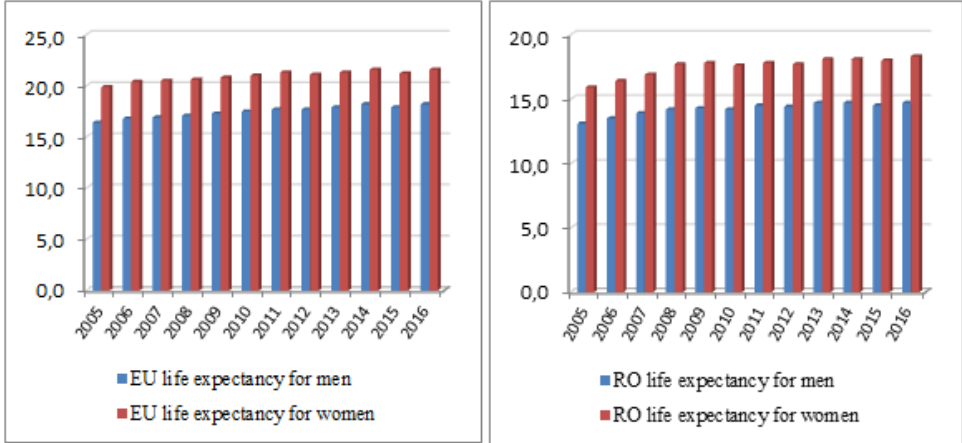


Source: data from Eurostat, 2019

Life expectancy for people aged 65 and over has a constant and increasing evolution at the European Union level, both for men and women (from 15.8 to 17.6 years for men and from 19.3

to 21.1 years for women). According to the data available and illustrated in Figure 5, it is observed that men live, on average, about 3 years less than women.

Figure 5. Evolution of life expectancy over 65 years (European Union average and Romania)

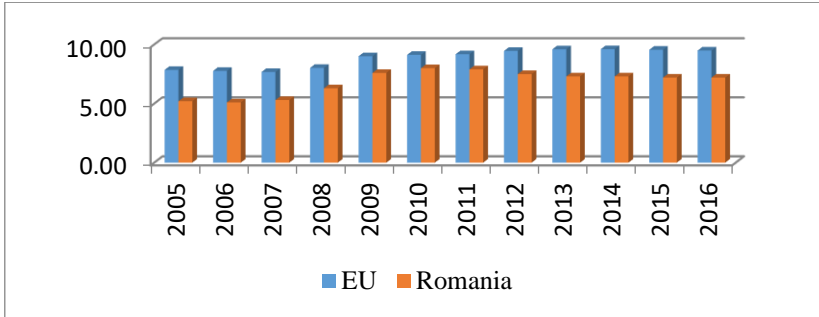


Source: data from Eurostat, 2019

The same constant-rising trend was also observed in Romania between 2005-2016, but the life expectancy was about 3 years lower than the European average in the same time frame. It increased from 13.4 to 14.7 years among men and from 16.1 to 18.3 years among women. According to a report published by the European Commission in 2008, the life expectancy of people aged 65 will increase, by 2060, by 5.4 years for men and 5.2 years for women, respectively.

Both at the level of the European Union and in Romania, the share of public spending with care in GDP increased by about 2% in 2016 compared to 2005. According to the estimates made by the European Commission, the future evolution of these expenditures is expected to be an upward evolution. mainly due to increased pensions and medical expenses. (Figure 6)

Figure 6. Evolution of the expenses with the care of the elderly (%)



Source: data from Eurostat, 2019

3. Methodology and econometric analysis

The analysis targeted the 28 countries of the European Union for which financial information was collected in the period 2005-2017. The source of the data was the Eurostat database. The variables used in the analysis are indicators that fall under two main objectives that the European Union imposes in order to coordinate the pension systems, namely, to maintain adequate and sustainable pensions.

The dependent variable in this model is the poverty risk for people over 65 (*risk_pov_65*). This is an indicator of the *adequate pensions* objective and measures the possibility of the state to ensure at the population level the maintenance of reasonable living standards after the retirement age. The independent variables are the employment rate of the population aged 55-64 (*empl_55-64*), the dependency ratio (*dep_ratio*), the life expectancy for people aged 65 years - men and women (*life_exp_m_65/life_exp_f_65*), expenses for the care of the elderly (*exp_elderly*).

For the empirical analysis and the Panel type estimation of the equations the Eviews 7 program was used. Within the Panel type equations the autocorrelation and heteroscedasticity are implicit features. The Eviews program provides the selection of the *Cross Section Weights* option to eliminate their impact, and thus, the degree of confidence associated with the results of a model, increases.

Considering that the stationarity of the time series is a very important aspect which has an influence on the validity of the obtained results, the stationarity of the time series included in the model was verified before the actual estimation. In order to decide whether a series is stationary or not, two tests were used, both in the *intercept* and in the *trend&intercept* versions.

The two estimated equations are:

1.
$$\text{risk_pov_65}_{it} = \alpha_0 + \beta_1 d(\text{empl_55-64 } (-1))_{it} + \beta_2 d(\text{empl_55-64 } (-1))_{it} + \beta_3 \text{exp_elderly}_{it} + \beta_4 \text{life_exp_m_65}_{it} + \varepsilon_{it}$$
2.
$$\text{risk_pov_65}_{it} = \alpha_0 + \beta_1 d(\text{empl_55-64 } (-1))_{it} + \beta_2 d(\text{empl_55-64 } (-1))_{it} + \beta_3 \text{exp_elderly}_{it} + \beta_4 \text{life_exp_f_65}_{it} + \varepsilon_{it}$$

Analyzing the obtained results (Table 1), we can observe that the change of the dependency rate of the elderly significantly and positively influences the poverty risk in the population over 65 years of age. A very important aspect to point out is that the past modification of this variable has an impact on the present poverty risk. In other words, when the dependency rate changes in

one year, the risk of poverty for the age group over 65 changes in the same sense, but in the following year, so it is a persistent indicator over time. This influence makes sense from the economic point of view, thus, the higher the number of pensioners compared to the number of taxpayers, the greater the threat to the sustainability of the pension system, and maintaining the same living standards even after the retirement age becomes more difficult or even impossible. Therefore, in order to achieve the two objectives set by the European Union, namely, *adequate and sustainable pensions*, it is necessary to take measures leading to the reduction of the dependency rate. It is important that these measures be effective, in the context in which the *baby-boom* generation begins to approach the legal retirement age, and this phenomenon leads to a change in the sense of increasing the dependency rate of the elderly.

Table 1. Estimation results

	Equation 1 - male	Equation 2 - female
	Coefficient [Prob]	Coefficient [Prob]
d(dep_ratio (-1))	1,062250 [0,0414]	1,518559 [0,0082]
d(empl_55-64 (-1))	- 0,309431 [0,0104]	- 0,296384 [0,0273]
exp_elderly	0,712497 [0,0000]	0,544637 [0,0000]
life_exp_m_65	- 2,787825 [0,0000]	-
life_exp_f_65	-	- 2,969007 [0,0000]
R-Square	0,65773	0,511117
R-Square Adjusted	0,652926	0,504255

Source: own processing

Another indicator with a significant influence on the poverty risk of people over the age of 65 is the employment rate in the population aged 55-64. As in the case of the previously analyzed variable, the employment rate is a persistent variable over time, and the change of this variable in one year leads to the change in the risk of poverty in the following year. In other words, the greater the change in the number of employed people in the 55-64 age group increases from year to year, the lower the risk of poverty over the age of 65, so maintaining living standards after the retirement age becomes easier. This relationship of influence also makes economic sense. Various countries in the European Union have already taken measures to help increase the

employment rate, adopting reforms that reduce access to early retirement schemes, but also by providing incentives to encourage the employment of older people and extend the working life.

If the dependency relationships above were in line with the expectations, the positive correlation between the costs of care for the elderly and the risk of poverty is unexpected, but still statistically significant. If, at the first analysis of this variable, we are tempted to say that an increase in these expenditures would lead to a reduction of the risk of poverty, the results obtained in the analyzed models contradict this hypothesis. If we look more closely at this relationship, it has an economic meaning from the following perspectives: on the one hand, from the budgetary point of view, an increase of these expenses may mean an increase of contributions and taxes at the population level, and on the other hand, collecting additional income may discourage work, and this aspect may also have an influence on the variables analyzed above. Therefore, an increase in the costs of caring for the elderly leads to a higher risk of poverty for people over the age of 65. In an analysis carried out at the European Union level, although expenditures were estimated to increase in most Member States, the level of pensioners' income was estimated to increase only for part of the Member States.

The average life expectancy, both for men and women, has a statistically negative and significant influence on the risk of poverty. This correlation validates expectations and makes economic sense. The higher the average life expectancy, the lower the risk of poverty in the elderly population. Given that life expectancy has increased in recent years at the European Union level, this evolution contributes to meeting the objectives set for the sustainability and adequacy of pensions. At the European Union level, the ratio of active life to pension duration is on average 50%, with significant variations between the Member States (37% in Latvia and 61% in Luxembourg). Therefore, correlating the retirement age with life expectancy is a lever that counteracts the negative effects of the population aging. Considering that a longer life means a longer period in the professional-active life in order to finance the pension systems, we can conclude that this aspect is an argument for increasing the retirement age, with major implications on the sustainability of the pension systems. The correlation of the retirement age with life expectancy is one of the recommendations of the European Commission with a view to reforming and modernizing the pension systems.

4. Conclusions

The European Union has imposed two major objectives that will be the basis for the adoption of any measures with influence on the pension systems, by the Member States. These two

objectives aim at the sustainability and adequacy of pensions so that they provide the population with decent living standards after the end of their professional life.

Using an econometric data-type analysis, we aimed to identify the factors of influence on the risk of poverty for people over 65 years of age. It is basically an attempt to analyze whether the income that a person obtains after his retirement age allows him/her to have the same living standards that he/she had during the active life. The results obtained attest that the employment rate among the elderly represents an important factor of influence, along with the dependency rate. Basically, the more the population stays employed for a longer period of time, the lower the risk of poverty in old age. Also, a high dependency rate leads to a greater risk of poverty. This is the reason why most of the policies adopted at the European level aim to keep as many people as possible and for as long as possible active on the labor market. Because in this way the sustainability of the pension system and its ability to provide adequate pensions are ensured. Another factor that has an impact on the risk of poverty is life expectancy. According to the results, an increase in life expectancy leads to a reduction in the risk of poverty. This result is validated by the economic theory in the sense that a longer life implies a longer period of activity. At the European level, in the context of increasing life expectancy, some Member States have increased the retirement age. Last but not least, it has been found that an increase in the expenses for caring for the elderly has the effect of increasing the risk of poverty after the retirement age. This situation was experienced by several Member States, where although an increase in these expenditures was estimated, the level of the available income among pensioners was lower. In addition to the fact that these additional incomes discourage work, in order to be sustained, there is a need for an additional source of income at the state level, which will in turn put pressure on the population incomes.

Therefore, the real challenge of states around the world is to adopt well-weighed measures and policies, so that their effects are reflected according to expectations in the economic reality. The main directions of action should be aimed at encouraging the active life and the birth rate.

Acknowledgement

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