

The evolution of private pensions in Romania and the impact on pensioners

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Abstract. In this research, the authors focused on analysing the development of the private pension system in Romania, Pillar II and Pillar III, which has a significant effect on pensioners' standard of living and health. A series of statistical-econometric methods and models were considered, such as dynamic analysis, comparative analysis from one period of time to another or between variables, the spectral analysis method, based on which the determinants of the evolution of the private pension system in Romania were highlighted and some conclusions were outlined accompanied by some useful suggestions for the future approach to this issue. It was also considered interesting to analyse the intensity of fluctuations that characterize the analysed data series and it was observed that there are influencing factors that have a seasonal nature such as the incomes obtained by active people, who work in some branches of the national economy characterized by seasonality, such as agriculture or some sub-branches of services, such as tourism, HoReCa. The study also involved the analysis of average yearly income levels of active population in Romania and those in EU member states given that are correlated with the level of pensions and also represent an essential factor that influences the standard of living both during professional activity and at retirement age.

Keywords: private pensions, salaries, pensioners, developments, economy.

JEL classification: C10, H50, J30

1. Introduction

The research on the system of private pension in Romania and the impact on the elderly started from the fact that in recent decades, Romania has been facing a profound demographic transition, which is characterized firstly, due to a decrease in the birth rate, and secondly, due to an accelerated growth in the proportion of older individuals within the population. Thus, this phenomenon of population aging represents a serious problem, which has significant effects on both pensions and public health.

According to data taken from authorized bodies, Romania is facing a sharp phenomenon of population aging. Practically in Romania, more than 19% of the population is aged 65 and over, and the percentage is increasing. At the same time, the birth rate is decreasing, and the migration of the young workforce to other countries that offer attractive conditions to them accentuates this imbalance. In other words, there is an imbalance between the active population, which contributes to the pension budget, and the number of pensioners, in the sense that in 2024, according to statisticians, approximately 1.2 employees support 1 pensioner, which puts great pressure on Pillar I, the public pension. Consequently, in this research, attention was focused on the evolution of the mandatory private pension system in the Romanian pension system, Pillar II, which was introduced in 2008 as part of the reform that had the objective of ensuring the pension system's sustainability under the conditions of the aging population and the pressure on the public budget, and the evolution of optional private pensions in the

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Romanian pension system, Pillar III, which practically represents a form of voluntary savings, intended to supplement income at retirement age, alongside the public pension Pillar I and Pillar II.

Another sensitive aspect is related to the level of pensions in Romania, in the sense that according to data from the National House of Public Pensions, the average pension in Romania in 2024 was approximately 2,289 lei, while the minimum basket for a decent standard of living was estimated at 3,972 lei according to the Friedrich Ebert Foundation and Sydex Romania. These discrepancies between the level of pensions and the real costs of living generate an increased degree of vulnerability among the elderly, with particular emphasis on rural areas. Of course, the level of pensions is correlated with the level of salaries and in this sense the analysis of the level of salaries in Romania and at the European level was taken into account. Also, another indicator considered in this research is the aggregate replacement rate for pensions in Romania and at the EU member state level.

In the same vein, elderly people are the most vulnerable to chronic diseases and social isolation, and the Romanian healthcare system is not sufficiently adapted to the needs of this category. Access to specialized medical services and home care for the elderly is limited, underfunded or non-existent in many regions.

2. Literature review

An interesting issue related to the level of pensions and the situation of the elderly is the increase in retirement ages, in conjunction with the growing life expectancy at retirement age, which represents a challenge for pension policies. In this regard, a series of researches have taken this issue into account. Thus, the policies of some countries that have introduced automatic indexation of retirement ages to life expectancy were taken into account, namely Portugal and Denmark. In order to be able to make a forecast in this regard, some statistical-econometric methods were used, based on which it was concluded that retirement ages are expected to increase substantially in the coming decades, especially if a constant retirement period is targeted. Also, the results of retirement age policies may have substantial deviations, and the distributional issues that arise with the increase in the socio-economic gap in life expectancy remain uncertain (Ayuso et al. 2021).

The problem of population aging, combined with the negative effects of the crises faced by European countries, threatens the sustainability of public pension systems. Thus, voluntary private pensions represent the most feasible alternative to supplement the minimum offered by social security systems, and Rey-Ares et al. (2018) consider an analysis based on the existence of four different “social models” in Europe, namely, continental, Mediterranean, Nordic and transitional, highlighting the fact that the investment decision is influenced by age, household income and wealth, level of education, professional status, health condition and long-term planning perspectives.

On the other hand, public pension systems have been considered, which must respond to the problem of population aging. Thus, using a mechanism based on Markov chains, an attempt has been made to adapt the private pension plan to meet the need for long-term care without increasing the total cost of contributions (De La Peña JI. et al., 2022).

Other studies consider the factors that influence the creation of a welfare state, and in this regard, Lithuania has been considered, where it was found that pension funds help to carry out a large part of the social security tasks and also contribute to the creation of social and financial well-being (Slavickiene, 2009).

Robertson-Rose (2019) considers how employees react to workplace pension schemes, fixed-term employment has a negative impact on retirement savings, both in terms of the type of scheme chosen and the level of savings. On the other hand, positive effects were represented by the proactive approach of the employer in providing benefits and encouragement from older colleagues.

Foster (2017) raises the issue of pension participation of young people aged between eighteen and thirty, noting that there are a number of factors that result in low levels of savings, such as lack of knowledge about pensions, lack of trust in investors and a poor view of the pension system. He also believes that additional options and more flexible forms of saving should be explored, which could be more attractive to young people.

The issue of evaluating the performance of pension funds on the markets is also addressed, highlighting the efficiency of companies' investment strategies on the specific pension fund market and the fact that legislative changes that mainly concern riskier funds have an important influence on the investment strategies of private Pillar II funds (Mitkova & Mlynarovic, 2021).

Wu and Gong (2023) are concerned with the new private pension scheme established in China, which represents an important supplement in terms of social security, in the context of an aging population. Thus, the factors that affect the intention to purchase the private pension scheme were analysed using an integrated conceptual model. The research results indicated that the factors that have a positive impact on purchase intention are social influence, effort expectation, performance expectation, secondary benefits, and convenience.

Vanatta (2023) analyses the factors that influenced the transformation of investments in public employee pensions in the United States into private securities during the period 1945-1974, highlighting that one factor was the emphasis on professional management and maximum financial returns. Another factor was the balancing of pension returns with public infrastructure, with a view to maximizing employee benefits by obtaining maximum returns in financial markets. Last but not least, public officials hired private asset managers to undertake new investment strategies.

Chen et al. (2016) considers the reduction of risks in pensions through both funded private pensions and public debt, highlighting that shocks can be mitigated by optimal management of public debt and pension contributions.

St. Clair and Martinez Guzman (2018) are concerned with the factors that have led governments to intervene in pension reform given the volatility of contributions. It is highlighted that deficits are the main cause of increases in pension expenditure, which leads to reform proposals. As a result, increases in pension costs do not generally occur simultaneously with investment deficits due to stabilization policies, which postpone unfunded debts.

Vogel et al. (2017) considers demographic changes that vary in industrialized and developing countries, and endogenous human capital formation and a higher retirement age significantly affect population well-being.

Aslan (2023) is interested in the activity of fund managers and pension intermediaries involved in the private pension system in Turkey, which are especially important for private pensions, as their actions can lead to economic losses and also threaten the future economic well-being of participants.

An interesting analysis is the study of the loss of investor confidence in financial markets, analysing in this regard the number of pension plans purchased in the years after the financial crisis that began in 2008. The analysis considers Riester pension plans, the most dynamic private pension scheme in Germany, and the results highlight the fact that the crisis period did not have a shock effect, but a linear negative effect. Also, time-varying factors such as life stages increase the probability of purchasing a Riester pension plan, while socio-economic status decreases it (Brandt et al., 2024).

Bravo et al. (2021), using some adaptive Bayesian models, make estimates of the life expectancy gap using mortality data over a period of 58 years, and the projections were generated until 2050 for the 42 countries considered, highlighting the fact that the life expectancy gap is positive and significant for almost all countries and years studied, and the intensity of intergenerational subsidy rates can be considerable, leading to the conclusion that a reduction in pension benefits or a gradual decrease in the annual pension indexation rate can have beneficial effects. On the other hand, Collins M.L. (2020) makes a study using data for Ireland, which looks at tax breaks to support retirement savings, highlighting the fact that the current structure of welfare tax supports significantly favors men over women. Thus, nominal contribution levels are higher among men and, consequently, men are more likely to contribute actively to pension savings. The result of the study highlights the gender gap in terms of income up to retirement age and implicitly in terms of pensions. Doctrinal L (2023) is concerned with assessing how the expansion of private pensions will affect the evolution of income inequality among retirees, analysing in this regard the sources of income in the period 1986-2018 in nine European countries. The public-private pension mix was taken into account and it was observed that higher shares of private pensions in pension income have a substantial effect of increasing inequality.

Egrican and Kayhan (2022) conducted a study on the evolution of some indicators of efficiency and liquidity of capital markets using data at the level of Turkey, in the period following the introduction

of voluntary private pension funds (Pillar III) in 2003. A positive association was found between the development of these funds and the dynamics of the capital market. Results suggest that the active participation of private pension funds in financial markets can contribute both to the increase of the institutional investor base and to the expansion and stabilization of capital markets, which leads to the development of more efficient and liquid trading conditions. Therefore, the reform of the pension system in Turkey, by including voluntary components, had positive implications on financial development, strengthening the role of capital markets as a source of long-term financing for the real economy.

Jenkins et al. (2023) are concerned with institutional costs and fiscal efficiency in private pension systems, making a comparison between Turkey and Canada in this regard. The institutional arrangements in Turkey are compared with two private defined contribution pension schemes in Canada, where participants can invest in bank-insured government securities instead of direct government bonds. Thus, a key aspect of the Canadian model is that banks do not charge management fees for pension accounts holding these guaranteed securities, which contributes to greater investment efficiency, while in Turkey the system suffers from a significant loss of investment capital of over 20% of the value of government bonds held by pension funds being eroded by management costs. This generates not only economic inefficiency but also a net additional fiscal cost for the Turkish treasury. This comparison highlights the importance of institutional and fiscal design in optimizing the performance of pension systems and reducing unnecessary losses of public and private resources.

Gebesoglu et al. (2023) investigate the effect of private pension contributions on saving rates in 25 selected OECD countries for the period 2001–2019, finding that, on the one hand, increases in short-term interest rates tend to increase saving rates for countries with lower saving rates, while on the other hand, interest rates do not significantly affect saving rates in the groups of countries with the highest saving rates. It was also found that countries with the lowest saving rates tend to be influenced by increases in GDP per capita, and the saving rate decreases as the age dependency ratio increases.

Gonzales and Fernández (2024) conduct a multidimensional analysis of participation in individual and occupational pension plans in ten European countries. Based on data from the Health, Ageing and Retirement Survey, conducted in ten European countries, the participation of workers in individual and occupational pension schemes was investigated, focusing on six socio-demographic dimensions, such as gender, education level, age, social class, income and risk preference. The results highlight that participation rates are significantly higher among workers far from retirement age, those in upper-level service occupations and high-income earners. No significant differences were identified in terms of participation based on gender, education level and risk aversion. However, detailed analysis reveals that people with higher education are more likely to participate in individual pension schemes. These findings suggest that participation in supplementary pension schemes is influenced by structural and economic factors, such as occupational status and income, rather than by individual or attitudinal traits. This aspect may have important implications for public policies aimed at expanding participation in private pensions in a more equitable manner.

Holzner et al. (2022) consider the impact of pension systems on macroeconomic volatility, the analysis being based on a panel data set for 35 OECD member countries, covering the period 1980–2018 and using econometric estimators to capture the dynamic relationships between the variables investigated. It was found that in terms of public pension spending, they have a stabilizing effect, reducing consumption volatility and contributing to the reduction of overall macroeconomic volatility. In terms of benefits paid by private pension funds, they do not have a significant impact on macroeconomic volatility, suggesting a limited role for them in absorbing shocks. Also, the effect of pension fund assets is conditioned by the level of economic development, in the sense that in less developed countries, these assets contribute to reducing the volatility of investments per capita, suggesting a stabilizing role, while in developed economies, an opposite effect was observed, with an increase in investment volatility, possibly reflecting greater exposure to financial markets and their volatility. These results highlight the importance of the institutional and economic context in assessing the role of pension systems in macroeconomic stability and can contribute to the substantiation of public policies adapted to the stage of development of each economy.

Colomeischi and Iancu (2018) are concerned with the role of private pensions, which is particularly important, making in this regard a series of forecasts regarding future developments under

different hypotheses of the economic and social context, in order to identify and highlight the pressures on pension systems.

Joubert and Todd (2024) analysed the 2008 reform of the Chilean pension system, given its effects on gender inequality and poverty in retirement. The study's findings indicate that three policy features introduced by the 2008 reform contribute significantly to reducing the gender gap in pensions, namely the extension of eligibility for the guaranteed minimum pension, the granting of a pension bonus per child born to women, and the equalization of the retirement age between women and men. On the other hand, the reform involves a fiscal cost that is twice that of the old system, which raises questions about its long-term financial sustainability, especially in a context of demographic ageing and budgetary pressures. In other words, the institutional design of the pension system plays a key role in correcting structural inequalities and ensuring an adequate income in old age, but social efficiency must be balanced with fiscal responsibility.

Kim et al. (2022) are concerned with private pensions and the investment behavior of older people in the US, analysing in this regard the impact of the income structure of older households on aggregate stock purchases, using data from the Flow of Funds Accounts and the Survey of Consumer Finances. The results of this study show that income from private pensions of older households is positively correlated with aggregate stock purchases, having a stronger and statistically significant effect compared to other forms of retirement income, such as Social Security and traditional public pensions. This relationship suggests that private pension beneficiaries, especially older and relatively wealthy investors, are one of the main forces driving demand for stocks among American households. Therefore, the variable on private pension payments reflects not only higher levels of disposable income, but also lower risk aversion compared to other older investors. This behavior can be explained by the sense of financial security induced by private pensions, which allows for a more aggressive portfolio allocation towards risky assets. Consequently, these findings highlight the essential role of the design of the private pension system in shaping the financial behavior of the older generation and in the dynamics of capital markets.

Mastrogiacomo et al. (2023) analysed the displacement effect of mandatory saving in occupational pension schemes on household net worth in the Netherlands, focusing on institutional differences between different occupational categories. Thus, in the Dutch context, most salaried workers participate in a mandatory occupational pension scheme. In parallel, most self-employed workers are fully responsible for their own retirement savings, in addition to the basic public pension, but a small proportion, less than 10%, are required to contribute to pension funds. This institutional configuration creates natural variation in the degree of mandatory saving, allowing for the differential estimation of the displacement effect across different occupational groups. Therefore, in order to obtain robust estimates and control for unobserved characteristics that correlate with occupational choice, the effects within each group were analysed separately. To correct for possible endogeneity and specification errors in the OLS estimates, an econometric approach based on instrumental variables and estimating effects differentially by occupation was used, and the results confirm the existence of a significant displacement effect, with considerable variations between employees and the self-employed, suggesting that the institutional design of occupational pension participation influences private saving behavior in a structural manner.

Meral and Dilek (2023) are concerned with the impact of minors' participation in the private pension system in Turkey on total assets, given the regulation adopted in 2021 by the Turkish authorities, which allows the participation of persons under 18 years of age in the private pension system, with the aim of expanding the coverage rate and stimulating long-term saving from an early age. Although this measure led to an increase in the number of participants in the short term, its effects on long-term asset accumulation remain unclear. Using a univariate time series analysis method, which uses historical data on asset size, net annual contributions, growth rates and returns recorded between 2003 and 2021, a long-term, 10-year projection was outlined, which suggests that the assets accumulated by participants under 18 years of age will represent approximately 7% of total pension fund assets and that this age group will contribute 22% of total annual contributions. These findings indicate a significant potential for early participation in the system, with important implications for the sustainability and deepening of the private pension market in Turkey, as stimulating long-term savings remains a public policy priority.

Mfoutou and Xie (2023) aim to assess the solvency and persistence of performance of private and public defined benefit pension plans in the Republic of Congo, given the specific challenges of emerging markets in terms of financial sustainability and administrative efficiency. Thus, the analysis is based on annual data for the period 2011–2020, using a combination of quantitative methodologies. The study examines variable funding rates and excess returns of funds to test the persistence and predictive nature of past performance, with the results indicating a lack of both sustainable solvency and persistence of performance among DBPP funds in the Republic of Congo. In other words, the performances recorded in one year are not repeatable or predictive of the following year. Thus, the past performance and the degree of funding of these funds do not provide reliable information for anticipating future performance, which calls into question the robustness and long-term sustainability of these schemes.

Park and Song (2024) investigate the evolution of corporate pension fund returns in the US through private equity (PE) investments, focusing on the determinants of asset allocation and the implications for the risk and return of pension portfolios. For the analysis, data extracted from the annual statements of listed companies are used, which provide details on the structure of pension funds' assets, and the relationship between the below-expected performance of pension funds in one year and subsequent changes in PE allocation is examined. It was found that pension funds significantly increase their PE allocation after recording below-expected returns, and the trend is more pronounced in the case of sponsor companies that are financially constrained and have underfunded pension plans. Increased PE allocation does not lead to a significant increase in the total return of pension funds, but has positive effects on reducing return volatility and tracking error relative to expected returns. These results suggest that investments in PE represent a strategy of diversification of perceived risk and stabilization of relative performance for pension funds, rather than a strategy of maximizing absolute return.

On the other hand, Adascalitei (2017) considers the pension system reforms in two of the countries that later joined the European Union, namely Bulgaria and Romania, highlighting the fact that in Romania the pension system was financed through relatively high contribution rates, with a small funded component, while in the case of Bulgaria it was financed through low contribution rates and a larger private pillar. It also highlights the fact that reforms regarding the pension system depend on temporary political agreements between national and international actors and on legislative adjustments made by governments during the election period. A similar theme was addressed by Ampovska et al. (2022), who considered the transition from single-pillar to multi-pillar pension systems in North Macedonia and Russia.

Dumiter et al. (2021) are concerned with the importance of saving for retirement and the fact that private pension funds have grown in recent decades and are attracting significant volumes of capital. They used a series of econometric methods, such as pooled data regression models and highlighted the fact that the interest rate on deposits is correlated with the value of income obtained by the population, the inflation rate and the investment strategies of private pension funds.

Sahlia et al. (2020) conduct an econometric analysis based on data series for Pillar II of private pensions, highlighting the fact that the change in the size of total net assets held in Pillar II is influenced by the rate of return of this fund.

Following the specialized study on the private pension system at national, European and global levels, it can be concluded that all these studies, although they had concrete objectives, which the researchers achieved and raised a series of alarm signals, there are a number of aspects that are quite difficult to quantify, analyse, forecast and why not anticipate, such as life expectancy, capital market returns, tax policies, social behaviors, risk distribution and many others.

3. Methodology and data

From a methodological perspective, for the study of the pension system in Romania and the impact on pensioners, several specific techniques and methods of statistical-econometric analysis were taken into account. First, the research of the specialized literature was taken into account to identify the gaps in this research direction, on which this research was founded. Subsequently, after identifying the

specific variables and processing the data series, a series of analyses were carried out, such as the comparative analysis of different approaches and perspectives on the pension system in Romania.

The study involves dynamic analysis, comparative analysis from one period of time to another and the use of statistical-econometric methods and models, such as spectral analysis, in order to draw future evolution perspectives for the variables considered, which characterize the socio-economic phenomenon in question.

Regarding the data sources used in this analysis, they are taken from authorized bodies such as the National Institute of Statistics, the Financial Supervisory Authority and Eurostat.

The Romanian pension system is structured on three pillars, in accordance with the World Bank recommendations on diversifying income sources for retirees. This architecture aims to ensure the long-term sustainability of the social protection system in a demographic context characterized by population aging and labor migration. In the paper, the authors' attention was focused on the private pension system, and the main characteristics of the private pension system Pillar II and Pillar III are briefly presented in Table 1.

Table 1. Main characteristics of the private pension system Pillar II and Pillar III

Feature	Pillar II	Pillar III
Mandatory or voluntary	Mandatory	Voluntary
Sources of funding	Part of CAS (state)	Individual contributions
Tax deductibility	No	Yes (up to 400 Ron/month)
Administration	Private, regulated by FSA	Private, regulated by FSA
Access to fund	Upon retirement	At age 60 or in special cases

Source: Financial Supervisory Authority (<https://www.asfromania.ro>).

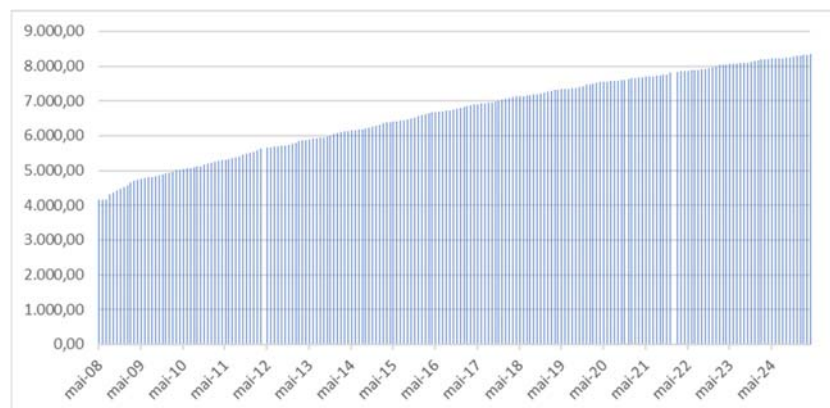
Of course, the paper is accompanied by a series of graphs, which are intended to facilitate the understanding of the dynamic evolution of the macroeconomic indicators considered.

4. Research results and comments

The private pension system Pillar II and Pillar III represent essential components of a sustainable and equitable pension system in Romania. These pension systems can bring additional financial security to future retirees and in this regard, they will be further analysed one by one. Thus, Figure 1 presents the evolution of the number of participants in Pillar II during the period 2008-2025.

The implementation of Pillar II in 2008 marked an important stage in the reform of the pension system in Romania, providing an additional savings mechanism for future retirees. Throughout the period under investigation 2008–2025, the number of participants increased significantly, practically doubling, with an absolute increase of approximately 4.184 million people and an average annual growth rate of approximately 4.3%.

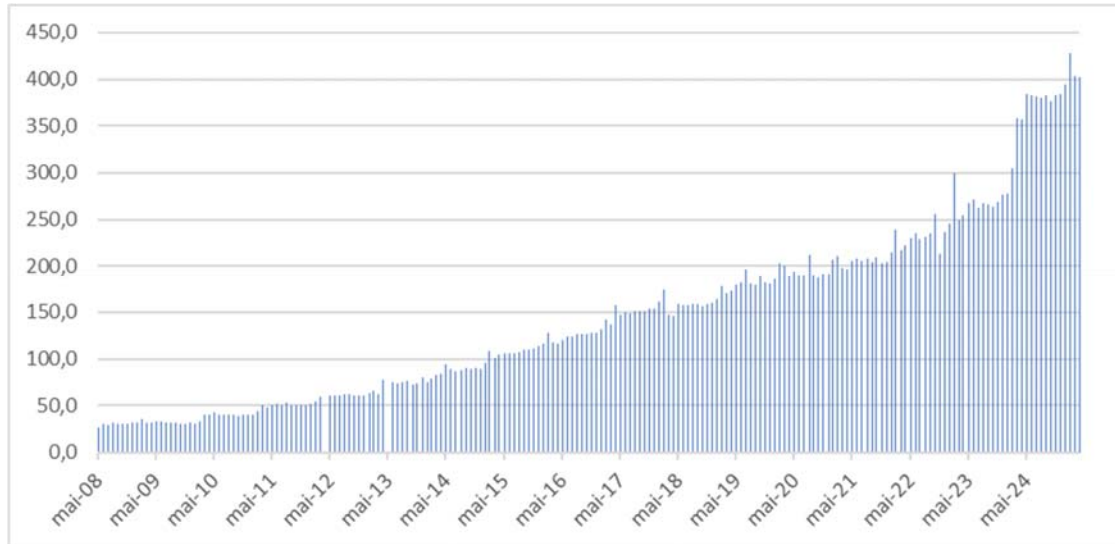
Figure 1. Pillar II: Participants - thousand persons



Source: National Institute of Statistics (<https://insse.ro/cms/ro>). Data processed by the authors.

Figure 2 shows the evolution of the average contribution per participant during the period 2008-2025. A major trend in the development of Pillar II is the increase in the value of the average monthly contribution per participant. This evolution is determined both by the increase in the average gross salary and by the changes in the percentage of the contribution redirected from social insurance (CAS) to Pillar II.

Figure 2. Pillar II Average monthly contribution/member with contribution paid in the current month - Ron/participant



Source: National Institute of Statistics (<https://insse.ro/cms/ro>). Data processed by the authors.

Analysing the dynamics in the period between 2008 and 2025, the average monthly contribution increased by more than 13 times. This increase is due to the increase in the average gross salary against the background of economic growth and wage policies and the increase in the quotas allocated to Pillar II, although there were periods of stagnation. In 2008, the contribution to Pillar II was 2% of CAS, and will gradually increase, reaching 4.75% of gross income in 2025.

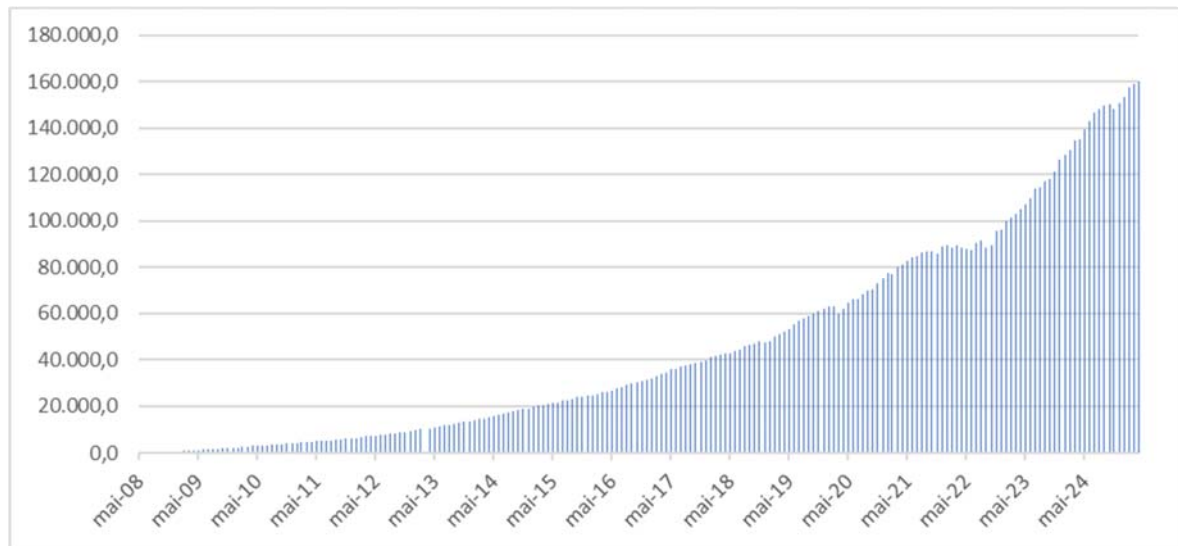
From an economic point of view, the funds accumulated by participants are significantly higher, thus contributing to the capitalization of the system and to more relevant investment returns. Also, fund managers are managing increasingly larger amounts, which offers access to more sophisticated investments and lower costs per participant. From the state's perspective, the increase in these contributions implies a greater transfer of financial responsibility to the private sector, which has implications for the sustainability of Pillar I.

Figure 3 shows the evolution of net assets during the period 2008-2025. The net asset value (NAV) represents the total funds accumulated and invested in the individual accounts of participants under Pillar II. This is a key indicator of the performance and maturity of the privately managed pension system.

Between 2008 and 2025, the net asset value increased approximately 1,863 times, from 86 million lei to over 160 billion lei. This evolution is determined in particular by the increase in the number of participants (from 4.16 million to over 8.3 million), the increase in the average monthly contribution (from 30 lei to 400 lei/participant) and the positive returns obtained by the funds, despite the volatility of the financial markets (average annual returns around 5–8% in most years). The evolution is exponential and is visible after 2015, when the average contribution value increased significantly. Thus, the Second Pillar of Pensions has become one of the largest institutional investors in Romania, holding significant percentages of government bond issues and significant shares in publicly traded companies.

Significant accumulations of private capital contribute to the development of financial markets, but also raise the need for efficient, transparent and predictable regulation.

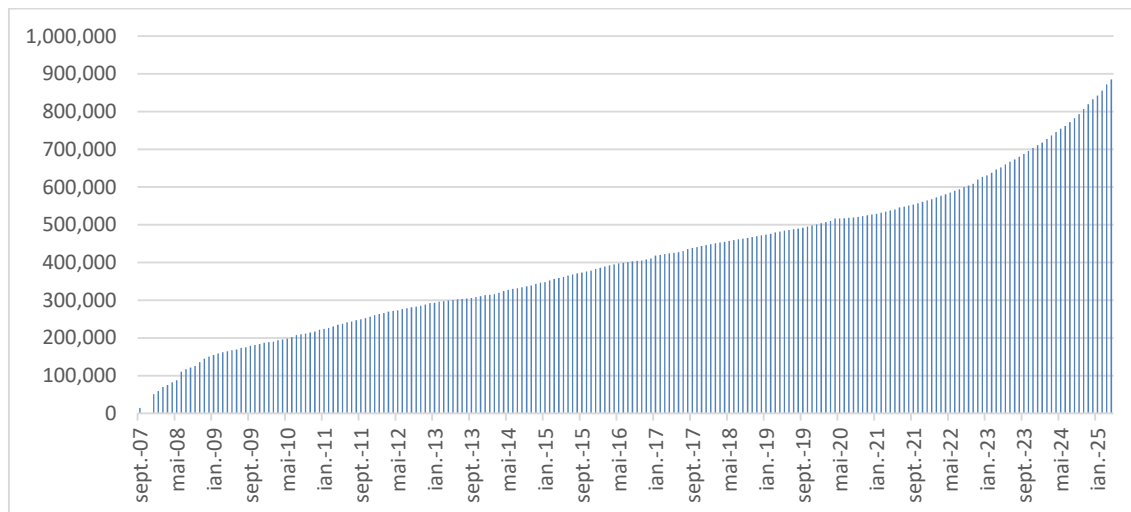
Figure 3. Pillar II net assets of private pension funds - Millions RON



Source: National Institute of Statistics (<https://insse.ro/cms/ro>). Data processed by the authors.

Figure 4 shows the evolution of the number of participants in the Third Pillar during the period 2007-2025.

Figure 4: Pillar III Members - persons



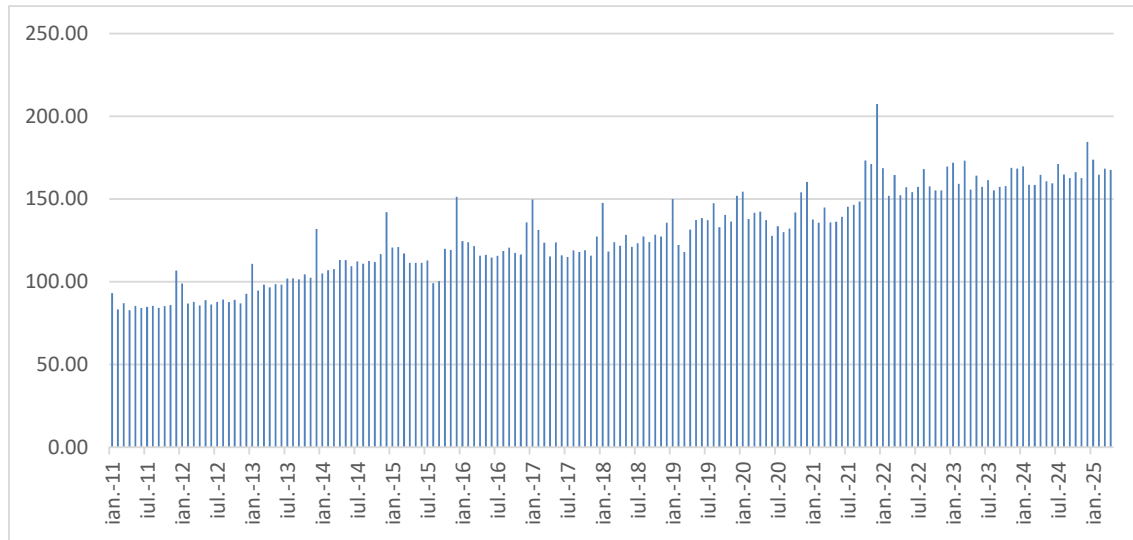
Source: National Institute of Statistics (<https://insse.ro/cms/ro>). Data processed by the authors.

Pillar III, introduced in Romania in 2007, is the voluntary component of the pension system, offering participants the opportunity to save additionally for the post-active period. Unlike Pillar II, participation is not mandatory, which makes the dynamics of this segment directly reflect the degree of financial awareness and the attractiveness of tax incentives.

Between 2007 and 2008, the system experienced an exponential growth, more than 10 times, but then the pace slowed down, increasing by approximately 6 times by 2025, reaching a number of 885 thousand participants.

Figure 5 shows the evolution of the average contribution per participant to Pillar III during the period 2011-2025.

Figure 5. Pillar III Average monthly contribution/member with contribution paid in the current month - Ron/participant

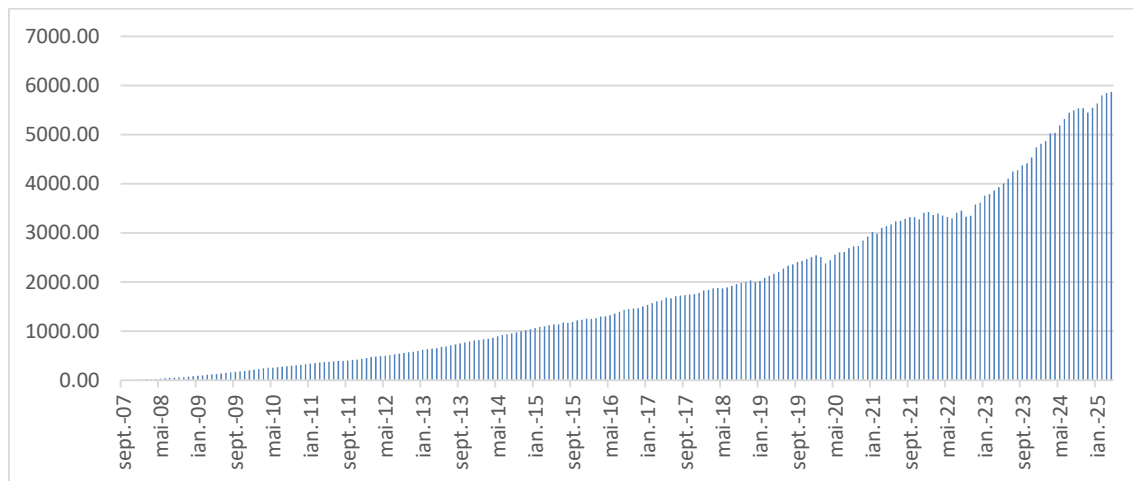


Source: National Institute of Statistics (<https://insse.ro/cms/ro>). Data processed by the authors.

The average contribution of 167 lei is below the maximum deductible level (400 lei), which indicates a significant untapped potential. The slow growth can be explained by the low level of financial education, fiscal uncertainties in certain periods and the competition of other forms of saving, such as bank deposits, real estate, direct investments. Throughout the analysed period, the evolution of this indicator was fluctuating, which raises some questions that we will address further.

Figure 6 presents the evolution of Net Assets during the period 2007-2025.

Figure 6. Pillar III Net assets - millions RON



Source: National Institute of Statistics (<https://insse.ro/cms/ro>). Data processed by the authors.

Net asset value (NAV) represents the total funds accumulated and invested in the individual accounts of Pillar III participants. It reflects not only the numerical participation, but also the value of contributions, the duration of contributions and the return obtained by the funds. Between 2007 and 2025, the net asset value increased by more than 419 times. The remarkable growth in the first (2007-2008) year of 500% was a sign of a solid start supported by promotional campaigns and employer involvement.

The subsequent pace was moderate but constant, as existing participants accumulated capital and new contributors were gradually attracted to the system. Despite the voluntary nature of Pillar III, the net asset value increased steadily, indicating a high level of trust in private management and positive performance of the funds (investment returns of 4–6% per year on average).

The comparative study of the indicators considered between the two private pension funds Pillar II and Pillar III in 2025 is briefly presented in Table 2.

Table 2. Comparison of Pillar II vs. Pillar III (2025)

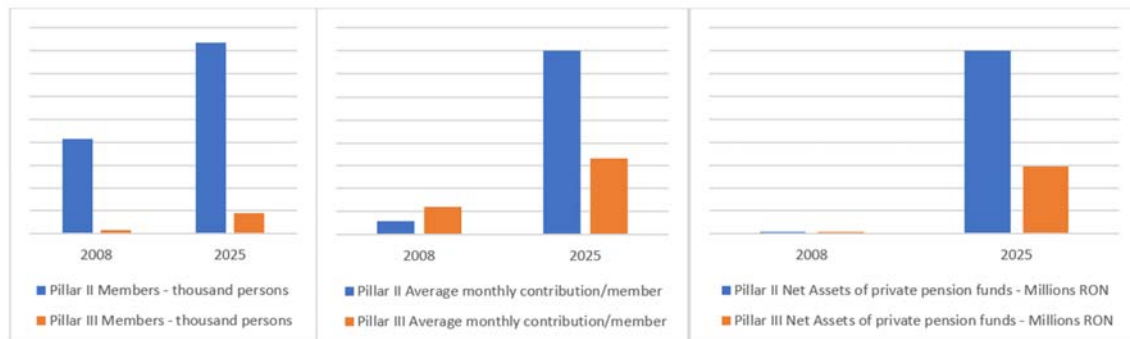
Indicator	Pillar II	Pillar III
Estimated NPV (million Ron)	160,226 million Ron	5,870 million Ron
Number of participants	~8.34 million	~885 thousand
Average contribution/month	400 Ron	167 Ron

Source: National Institute of Statistics (<https://insse.ro/cms/ro>). Data processed by the authors.

According to the data presented in Table 2, it results that in 2025 Pillar II manages a significantly larger volume of assets than Pillar III, over 27 times. This major difference can be explained by the mandatory nature of Pillar II and the much larger number of participants. Also, in terms of the number of participants, Pillar II covers a significant part of the active population (through the mandatory nature of membership), while Pillar III is voluntary and has a lower penetration. This aspect indicates that Romanians are still reluctant or insufficiently informed about optional pensions, purchasing power is quite low or the fiscal incentives for Pillar III were not sufficient to significantly increase participation. Regarding monthly contributions, they are higher in Pillar II because they are established as a percentage of the gross salary (4.75%) and are automatically withheld by the employer, and in the case of Pillar III, contributions are voluntary and reflect the personal decision of the participants, being significantly lower, which will negatively influence the pension accrued at the end if they do not increase over time.

Figure 7 presents the situation regarding the two pension funds from the date of establishment and at the date of this analysis.

Figure 7. Comparison of Pillar II vs. Pillar III (2008/2025)



Source: National Institute of Statistics (<https://insse.ro/cms/ro>). Data processed by the authors.

Interpreting the results, we find that the number of people contributing to Pillar II increased considerably in the analysed period compared to the number of people contributing to Pillar III pensions. Significant increases were recorded in both the value of the average contribution per participant and the value of the Net Asset for both private pension funds.

The evolution of the indicators analysed in the period under study is oscillatory and, in this sense, the issue under study will be approached using the spectral method. Thus, regarding the fluctuating nature of economic evolution, we identify different oscillations in terms of their amplitude and frequency, but also oscillations characterized by a longer or shorter propagation period.

Of course, the analysis of the specific components of time series (trend, seasonality, etc.) is a complex one, which takes into account a series of influencing factors, which if we discuss in the long term for establishing the trend can be economic growth, inflation, etc. If we discuss seasonality, this

implies periodic, regular fluctuations, which are related to recurring phenomena such as seasons, holidays, production cycles, etc. In the same vein, cyclicity is characterized by irregular fluctuations in duration and amplitude such as economic crises. Of course, there is also an irregular component generated by those unexpected shocks, statistical noise or some exceptional events.

In order to analyse the oscillatory evolution of the average contribution per participant to private pension funds Pillar III, the spectral analysis method will be used, a method that takes into account the possibility of approximating an oscillation using as a basis a Fourier series, which is given by the relationship:

$$f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} (a_n \cos nx + b_n \sin nx) \quad (1)$$

where: a_0, a_n, b_n are the Euler-Fourier coefficients of the function $f(x)$
 n is the angular frequency given by the relationship:

$$n = f \frac{2\pi}{T} \quad (2)$$

where: f = frequency

T = duration of the analysed interval

Substituting the frequency given by equation (2) into (1) we arrive at the following form:

$$y_t = \frac{a_0}{2} + \sum_{f=1}^p \left(a_f \cos \frac{2\pi}{T} ft + b_f \sin \frac{2\pi}{T} ft \right) + u_t \quad (3)$$

where: a_0, a_f, b_f represents the coefficients

T represents the number of time units

f represents the initially set frequency

t has values in the range $[1, T]$

Similar to the least squares method, we are interested in determining the parameters \hat{a}_f, \hat{b}_f , we aim to minimize the integral:

$$\frac{1}{2\pi} \int_0^{2\pi} [f(t) - y_n(t)]^2 dt \quad (4)$$

Thus, we will determine the Euler Fourier coefficients:

$$\hat{a}_f = \frac{2}{T} \sum_{t=1}^T y_t \cos \frac{2\pi}{T} ft \quad (5)$$

$$\hat{b}_f = \frac{2}{T} \sum_{t=1}^T y_t \sin \frac{2\pi}{T} ft \quad (6)$$

$$\hat{a}_0 = \frac{\sum y_t}{T} \quad (7)$$

Based on the coefficients determined using relations (5) – (7), the amplitude can be calculated:

$$A_f = \sqrt{\hat{a}_f^2 + \hat{b}_f^2} \quad (8)$$

The power of the spectrum is influenced by the intensity of the dispersion of the harmonic components considered and can be calculated with the relationship:

$$\hat{p}_f = \frac{1}{2\pi} \left[a \operatorname{cov}_0 + 2 \sum_{k=1}^{T-1} a \operatorname{cov}_{(k)} \cos \frac{2\pi}{T} fk \right] \quad (9)$$

where: $0 \leq \left(\frac{2\pi}{T}\right) \leq \pi$; $f = \frac{1}{T} i$ and $0 \leq f \leq 0,5$

In order to quantify oscillations with significant intensities, it is necessary to determine the density, which can be calculated with the relationship:

$$d_{(f)} = \frac{\hat{p}_f}{\hat{\sigma}_f} = 2 \left[1 + 2 \sum_{k=1}^{\infty} r_k \cos 2\pi \cdot fk \right] \quad (10)$$

where: $0 \leq f \leq \frac{1}{2}$, and r_k represents the autocorrelation coefficient

We therefore have a directly proportional relationship between amplitude and period, given by the relationship:

$$A = \sqrt{\frac{2 \cdot V_p}{T}} \quad (11)$$

where: A = amplitude

V_p = periodogram value

T = the number of time units of the series (number of months)

Following the presented statistical-econometric model, the collected and processed data were analysed, and the results of the spectral analysis are concentrated in Table 3.

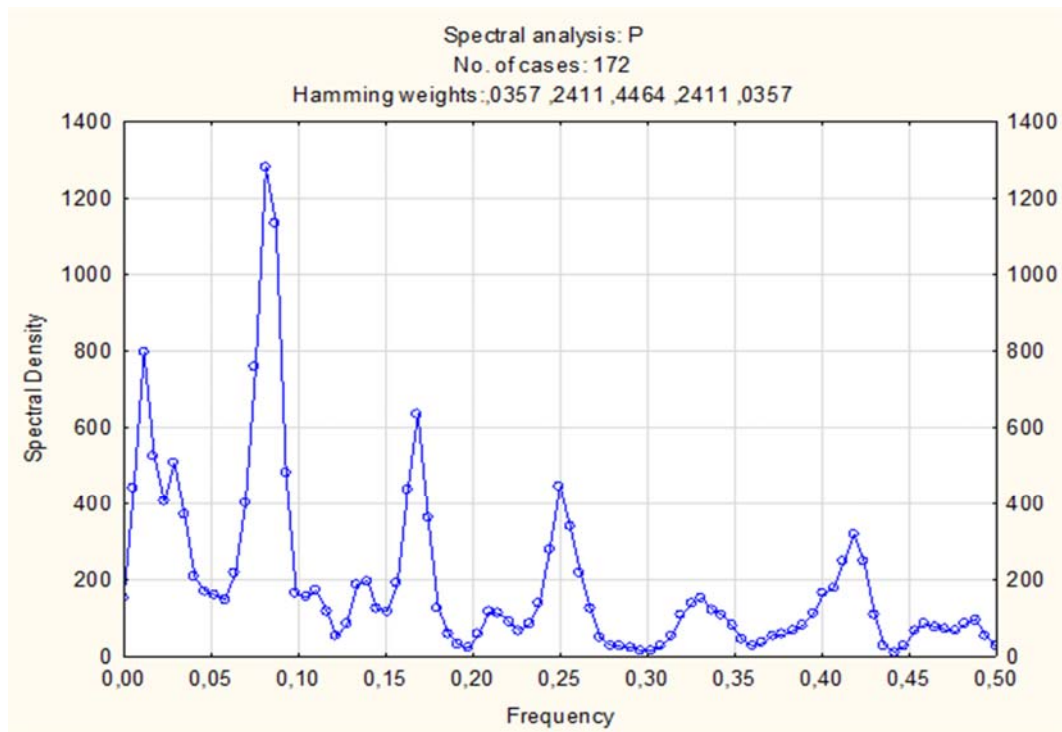
Table 3. Spectral analysis results
Spectral analysis: P No. of cases: 172 Largest Periodog. values

	Frequency	Period	Cosine - Coeffs	Sine - Coeffs	Periodogram	Density
14	0,081395	12,28571	1,01750	-4,56862	1884,056	1280,924
2	0,011628	86,00000	-3,94314	-2,14021	1731,083	798,380
15	0,087209	11,46667	-1,10575	3,99435	1477,269	1137,333
29	0,168605	5,93103	3,70478	1,17123	1298,355	635,527
43	0,250000	4,00000	1,20603	-2,95010	873,554	445,347
5	0,029070	34,40000	3,06467	0,00259	807,729	506,564
12	0,069767	14,33333	1,65338	1,91983	552,069	399,779
72	0,418605	2,38889	1,88039	-1,22895	433,971	317,229
4	0,023256	43,00000	1,20101	1,43843	301,990	403,880
45	0,261628	3,82222	1,70279	0,77871	301,507	217,171

Source: National Institute of Statistics (<https://insse.ro/cms/ro>). Data processed by the authors.

According to the aforementioned module, Figure 8 was generated, which includes the spectral density values reported to the oscillation frequency.

Figure 8. Spectral density versus frequency



Source: National Institute of Statistics (<https://insse.ro/cms/ro>). Data processed by the authors.

It is observed that the most important oscillation occurs at twelve months, and the next at eighty-six months. Also, significant oscillations occur at eleven months, six months and four months. Since there are frequencies with high amplitude for periods shorter than one year (in our case, eleven months, six months and four months), we are indicated by the presence of seasonality in terms of the contribution of individuals to the private pension fund pillar III.

The presence of a trend in the time series is indicated by the high amplitude values (as shown by the periodogram in Table 3, column six) associated with frequencies close to zero.

Because the amplitudes corresponding to periods longer than one year are relatively small (with the sole exception of the eighty-six-month period), I conclude that there is no clear evidence to confirm the presence of cyclicity.

The seasonal nature of the average contribution per participant to Pillar III private pension funds is correlated with the seasonal nature of the activities carried out in Romania, such as agricultural activities or some services such as tourism. People who work in these branches of the national economy have significant incomes in certain periods of the year and consequently have the opportunity to increase the amounts invested in private pension funds.

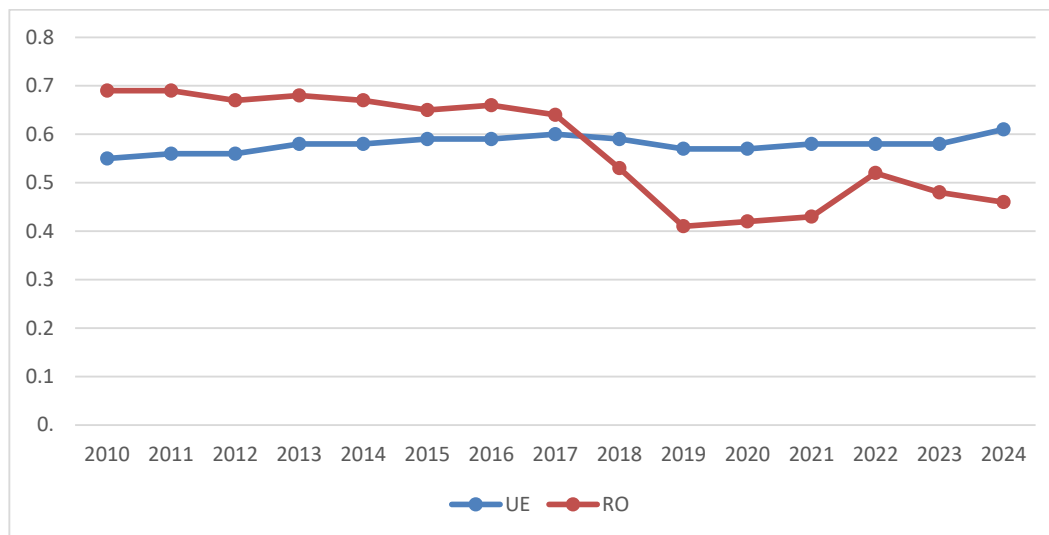
Similarly, the oscillatory developments of the number of participants in Pillar III private pensions and the value of the net asset were analysed. It was found that due to the large amplitudes recorded for periods longer than one year, these developments are characterized by cyclicity, an aspect directly related to the cyclicity of economic evolution at the national level.

In order to deepen the study regarding the causes of this seasonal and cyclical evolution of the macroeconomic indicators considered, the aggregate replacement rate for pensions in Romania and at the European level was analysed.

The aggregate pension replacement rate is defined as the ratio of median gross individual pensions of the age group 65-74 years to median gross individual incomes of the age group 50-59 years, excluding other social benefits. The indicator is based on EU-SILC, i.e. statistics on income, social inclusion and living conditions.

Figure 9 shows the evolution of the aggregate pension replacement rate in the period 2010-2024 in Romania and the average at the EU level.

Figure 9. Aggregate pension replacement rate in Romania and the EU (%)



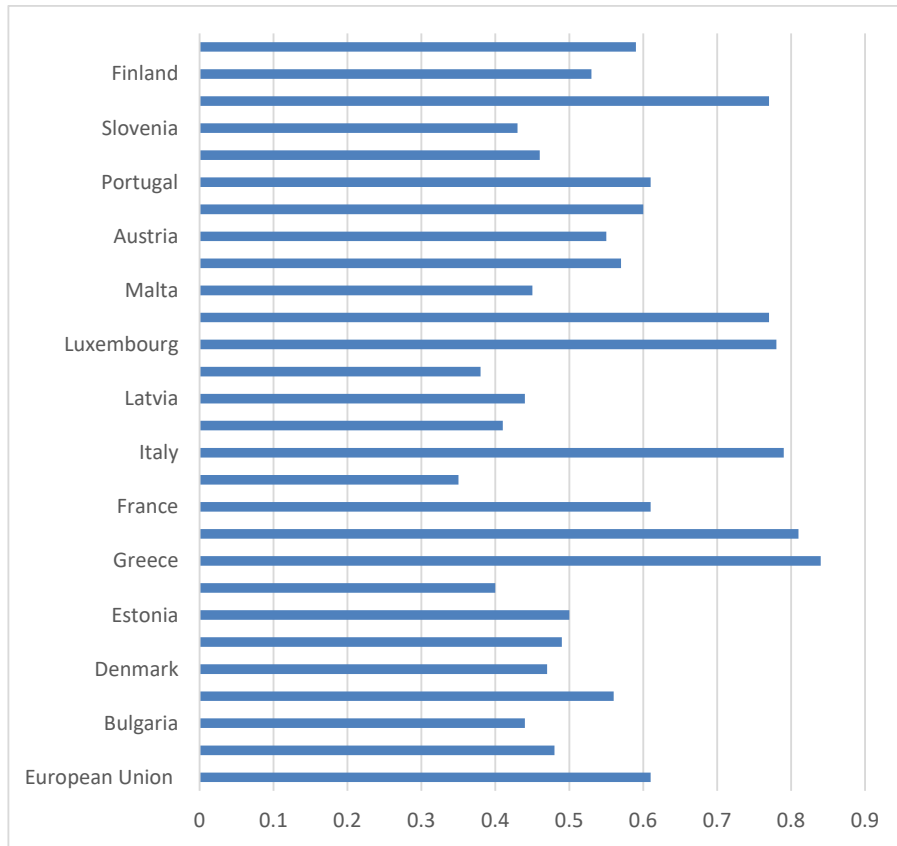
Source: Eurostat (<https://ec.europa.eu/eurostat/data/database>). Data processed by the authors.

It is noted that the average aggregate replacement rate for pensions at the European Union level recorded small fluctuations during the period 2010-2024, being close to 60% during this period. As for the aggregate replacement rate for pensions in Romania, the evolution was in a slight decrease until 2017, the period in which it was higher than the European Union average, after which the indicator recorded significant increases until 2019, followed by a slight recovery, and then decreased, being significantly lower in 2024 compared to the European Union average, namely 46%.

Figure 10 presents the level recorded by the aggregate replacement rate for pensions at the level of the European Union member states in 2024. It is noted that Romania is among the countries that register the lowest levels of the studied indicator, along with countries such as Slovenia, Malta, Croatia.

In contrast, countries such as Slovakia, Italy, Spain, Greece contribute to raising the average at the European Union level, as they have the highest aggregate replacement rates for pensions, with values around 80%. Of course, a factor that influences the evolution of the analysed indicators is the average income of active people.

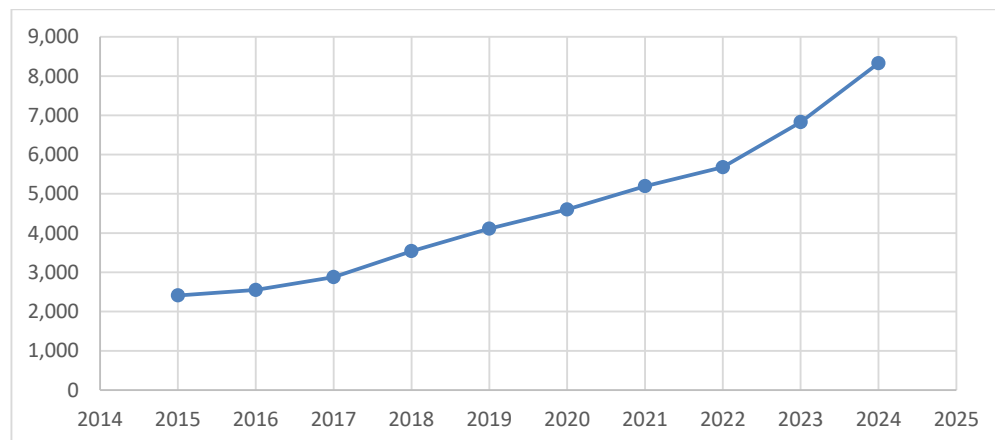
Figure 10. Aggregate pension replacement rate across EU Member States (%)



Source: Eurostat (<https://ec.europa.eu/eurostat/data/database>). Data processed by the authors.

Thus, Figure 11 presents the evolution of the average annual income of active people in Romania during the period 2015-2024.

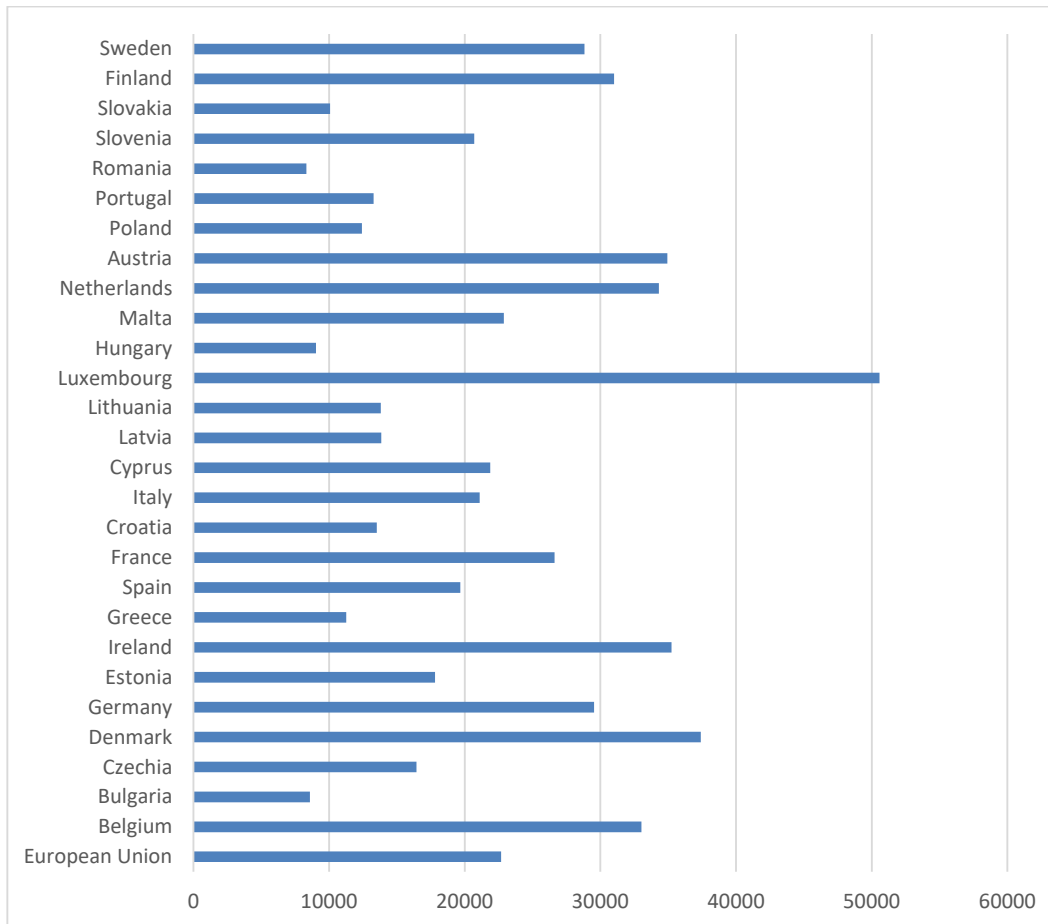
Figure 11. Average annual income in Romania



Source: Eurostat (<https://ec.europa.eu/eurostat/data/database>). Data processed by the authors.

The average annual income of active people in Romania increased significantly during the analysed period, reaching 8,327 euros in 2024. However, the average annual income of active people in Romania is much lower than the European Union average, which is 22,684 euros. In order to be able to comparatively analyse the situation of the average annual income of active people at the level of the European Union member states in 2024, Figure 12 was generated.

Figure 12. Average annual income of active people in the European Union member states in 2024 (Euro – PPS)



Source: Eurostat (<https://ec.europa.eu/eurostat/data/database>). Data processed by the authors.

It is noted that Romania, Slovakia, Hungary and Bulgaria record the lowest average annual incomes, below the threshold of 10,000 euros. Developed countries record incomes three times higher, which has a direct effect on the level of pensions, because they correlate with income.

5. Conclusion

The research undertaken in this paper leads to some conclusions. Thus, interpreting the results of the study, it results in the need for a reform of the public pension system by recalibrating the retirement age and stimulating the III Pillar of pensions. Also, encouraging the active economic participation of the elderly through part-time employment policies and expanding the network of social and medical services by creating community centres and home care could improve the situation of the elderly. At the same time, stimulating the birth rate and combating migration through family policies, tax incentives and investments in infrastructure for young people could have positive effects regarding the situation of the elderly.

The implementation of Pillar II and Pillar III contributes to the diversification of post-activity income sources and reduces the pressure on the public pension budget. However, the performance of these pillars depends on factors such as the stability of the legislative framework, the degree of financial education of the population, the efficiency of private administrators and, last but not least, transparency in asset management.

For a future sustainable reform of the pension system, it is essential to strengthen these pillars, including by stimulating active participation in Pillar III and maintaining the operational independence of Pillar II.

The increase in the number of participants in Pillar III pensions is systematic, but slower than in the case of Pillar II, an aspect that is due to both the voluntary and uneven nature of the contributions, and the level of wages of active persons.

The evolution of the average monthly contribution in Pillar II between 2008 and 2025 reflects the consolidation of the system and its financial maturation. If in the initial phase the contributions were symbolic, in 2025 they reach levels comparable to the real contributions in some Western European systems, strengthening the premises for sustainable and significant supplementary pensions in the future.

The evolution of net assets in Pillar II reflects not only the accumulation of private capital, but also the constant confidence of the participants and the performance of the system. From an experimental structure in 2008, Pillar II became a strategic component of the financial and social protection system in Romania in 2025.

The evolution of the average contribution in Pillar III indicates a positive trend, but still suboptimal compared to the legal and economic potential. In order to strengthen this pillar, a more active involvement of employers and a national financial education campaign are necessary, highlighting the real benefits of voluntary savings for retirement.

Although much smaller than Pillar II in absolute volume, Pillar III has developed constantly, reaching a net asset of almost 6 billion lei in 2025. This evolution confirms that a culture of voluntary savings for retirement is taking shape in Romania, supported by tax incentives and better financial education.

A coherent long-term government strategy, transparency, tax incentives and financial education are essential to ensure the sustainability and attractiveness of Pillars II and III.

By increasing the trust and active involvement of the population and employers, the objective of Romania having a robust, diversified pension system capable of providing adequate income at retirement age can be achieved.

In order to stimulate participation in the Third Pillar of pensions, an important role is played by fiscal policies, which can propose, in addition to deductions, some non-refundable tax credits with a certain percentage of the annual contribution. Also, increasing the deductible ceilings could stimulate the population's contribution to the Third Pillar of pensions. On the other hand, employers should also consider granting incentives that involve additional deductions from profit tax for collective contributions to the Third Pillar or exemptions from payroll tax and social contributions for the employer's contribution up to the established ceiling and why not fiscal bonuses for commercial companies that exceed a certain percentage of the total number of employees participating in the Third Pillar pension fund.

Authors' contribution: *Introduction, S.V.I., A.M.P.; Literature review, S.V.I., A.M.P.; Methodology and data, S.V.I., A.M.P.; Research results and comments, S.V.I., A.M.P.; Conclusion, S.V.I., A.M.P.*

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