THE ASSESSMENT OF THE CHANGES AND THE EFFICIENCY OF THE HUNGARIAN PENSION SYSTEM IN COMPARISON TO OTHER EUROPEAN UNION MEMBER STATES

THESES OF A DOCTORAL (PhD) DISSERTATION

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Gödöllő

2024

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1. PRELIMINARIES OF THE PROJECT AND AIMS

Building an efficient and sustainable pension system is one of the most important economic and social policy challenges in these days. Changing demographic and economic trends justify the review and, if necessary, the restructuring and reform of existing pension systems not only in Hungary, but also in Europe and even worldwide. There are a number of well-functioning forms and elements of existing pension systems, but simply transposing them into domestic practice could create new problems. The aim of economic and social policy should be to develop a Hungarian pension system that can guarantee its long-term viability and sustainability in the Hungarian economic, social and political context. This is in the interests of both the individual and the society. The requirements for an optimal pension system can be formulated in the following way: first, it responds continuously and automatically to demographic and economic changes. Secondly, it has a positive (feedback) effect on demographic and labour market trends. Thirdly, its operation does not impose a significant additional burden on public finances. Fourthly, it ensures a fair pension and, finally, its long-term viability is based on broad social and political consensus. There is no socio-economic arrangement that fits everyone and on which all political sides have the same views. I have based my thesis on the available objective data, relying on economic and methodological information, trying to relegate political dimensions into the background.

The rationale for my choice of topic goes back to 2008. I first started studying the efficiency of the Hungarian private pension fund system as a student of economics. The research work at that time resulted in an OTDK (National University Research Contest) thesis and a degree thesis. During my doctoral studies, my original aim was to study the private pension sector, but due to the systemic changes that have occurred in the meantime, I have expanded my previous research on private pension funds and focused my thesis on the state old-age pension system. Pension expenditure is the largest single item of public expenditure in all EU Member States. The sustainability of the pension system, therefore, has a crucial impact on the medium and long-term position of public finances. Although Hungary's pension expenditure as a share of GDP is below the EU average, the rapidly changing macro-environment calls for increased resilience and the system's political exposure and internal inequities and injustices require transformation. A possible reform of the pension system should be designed in a way that it serves sustainability in a stable and long-term perspective. The policy responses of the past quarter of a century have shown that constant change, establishing, restructuring and eventually abolishing schemes lead to unpredictability and loss of confidence, which greatly undermines efficiency. Within social sciences, the study of pension systems involves the (sub-)fields of economics (in particular economic policy and financial policy),

sociology (in particular demography and social policy) and political science (in particular public policy).

My research aim is complex. In the literature review, I am mapping the development and evolution of the Hungarian pension system. In doing so, I am reviewing the relevant national and international literature. I will reconcile diverging views on theoretical issues and illustrate the processes by secondary analysis of existing statistical data, supporting or refuting individual claims. The empirical analysis of the thesis aims at a comparative analysis of the efficiency of the Hungarian private pension system, the sustainability of the Hungarian public pension system and the pension systems in the EU member states. In the course of my investigation, I seek to answer the question of causality, i.e., which are the dependent and independent variables that make the pension system of one member state efficient and another's unsustainable. I am examining the possibilities of adapting the results to Hungarian conditions and through this I am trying to formulate proposals for a possible transformation of the Hungarian pension system.

The present thesis aims to verify or contradict the following hypotheses:

H1: The low efficiency of the private pension system is due to regulatory issues and the unfavourable economic environment.
H2: The drastic reduction of social insurance tax paid by employees has undermined the long-term sustainability of the Pension Insurance Fund.
H3: The final shift to price indexation over the period under review has reduced pension expenditure as a share of GDP, but the increase in the age limit, eliminating disability pensions from the Insurance Pension Fund, and the abolition of early retirement have also contributed to the reduction.
H4: It is assumed that there is a correlation between GDP per capita and pension expenditure as a share of GDP, and that the evolution of the average pension correlates with the evolution of GDP per capita.
H5: It is assumed that the changes in the employment rate correlate with those of pension expenditure per GDP and that the changes in the average wage correlate with those in the average pension.
H6: It is assumed that the retirement age is related to life expectancy at birth and to further life expectancy at age 65.
H7: It is assumed that the retirement age is related to the changes of the replacement rate.
H8: It is assumed that the clustering of pension systems in the European Union by structure reflects the clustering by economic development and the efficiency of pension systems.

Chart 1 summarises the research aims, the hypotheses and the research methods applied.

Chart 1: The summary of the research aims, the hypotheses and the research methods applied.

Aims	Hypotheses	Methods
C1: The development and evolution of the Hungarian pension system. C2: Efficiency analysis of the Hungarian private pension system.	H1: The low efficiency of the private pension system is due to regulatory issues and the unfavourable economic environment.	reviewing secondary literature content analysis secondary reasearch
C3: Sustainability analysis of the Hungarian public pension system.	H2: The drastic reduction of social insurance tax paid by employees has undermined the long-term sustainability of the Pension Insurance Fund.	calculating correlation and linear regression
	H3: The final transition to price indexation over the period under review has reduced pension expenditure as a share of GDP, but the increase in the age limit, eliminating disability pensions from the Insurance Pension Fund and the abolition of early retirement have also contributed to the reduction.	
C4: Efficiency, sustainability and comparative analysis of pension systems in the European Union	H4: It is assumed that there is a correlation between GDP per capita and pension expenditure as a share of GDP, and that the evolution of the average pension correlates with the evolution of GDP per capita.	calculating correlation and linear regression
	H5: It is assumed that the changes in the employment rate correlate with those of pension expenditure per GDP and that the changes in the average wage correlate with those in the average pension.	
	H6: It is assumed that the retirement age is related to life expectancy at birth and to further life expectancy at age 65.	
	H7: It is assumed that the retirement age is related to the changes of the replacement rate.	
	H8: It is assumed that the clustering of pension systems in the European Union by structure reflects the clustering by economic development and the efficiency of pension systems.	cluster analysis

Source: the author's own editing

2. MATERIAL AND METHOD

In my empirical research, I used descriptive statistical methods to analyse the efficiency and sustainability of Hungarian and EU pension systems. The database of my secondary research was built up primarily from publicly available data and reports of the Hungarian Central Statistical Office (KSH), the Hungarian National Bank (MNB), the State Financial Supervisory Authority (PSZÁF), Eurostat and the European Commission, and, secondarily, from relevant legislation and data published by private pension funds. In a secondary analysis of the existing data, time series, comparative and correlation analyses were carried out. Multivariate statistical procedures were performed using the computer statistical software Jamovi version 2.3, and the results were visualized graphically using the spreadsheet software of Microsoft Excel 2016.

The data collection for my statistical analysis is complete for both the Hungarian and the European Union surveys. Therefore, it is not a sample and, accordingly, the significance test is irrelevant, since I did not analyse a sample but the complete database.

To examine the efficiency of the private pension fund system, which is the first sub-chapter of my research, I conducted a secondary analysis of the data provided by the Hungarian National Bank, the State Financial Supervisory Authority, the Hungarian Central Statistical Office and the individual funds, using descriptive statistics. The results obtained were also illustrated by graphical representations. In the second part, I examined the sustainability of the Hungarian pension system by looking at the revenues and expenditures of the Pension Insurance Fund (and thus its balance) between 1998 and 2022, the economic and demographic factors affecting them, and the measures affecting the pension system. I have built my database from publicly available data from the Hungarian Central Statistical Office, the budget laws of the years concerned and relevant legislation. The availability of the data is complicated by the fact that pension statistics are not accessible or only accessible with some difficulty since the abolition of the National Pension Payment Department (Országos Nyugdíjfolyósító Főosztály) in 2016. Before calculating the model based on linear regression for the purpose of my research, I used Spearman correlation to test for the existence of a relationship between the factors.

Spearman correlation provides information on the existence, direction and strength of a relationship between non-parametric variables, but does not examine causal relationships (Szűcs 2002). The correlation coefficient (r), which expresses the closeness of the relationship, can take a value between -1 and 1, with the following meaning:

- $0 < |r| < 0{,}25$: none,
- $0{,}25 < |r| < 0{,}5$: weak to medium
- $0{,}75 < |r|$: strong
- $|r| = 1$: function-like, that is, there is a deterministic relationship between the factors.

The sign of the correlation coefficient indicates the direction of the relationship:

- if positive, then the relationship between the factors is direct and the points lie along a line of increasing slope,
- if negative, the relationship between the factors is inverse and the points lie along a line of decreasing slope.

I wanted to test the validity of my preliminary hypothesis on the income and expenditure side by means of linear regression model calculations. Linear regression allows the exploration of cause and effect relationships between two or more factors. It allows us to pinpoint the strength with which the independent variables are able to determine the dependent or target variable, and also to find out which variable influences which variable in which direction and to what extent (Szűcs 2002). The prerequisite for a linear regression model is that the multi-collinearity between the factors is low (VIF<10), i.e., that there should not be any too close correlation between two or more variables. If the multi-collinearity statistic for a factor shows a close correlation, it is excluded from the calculation. Another prerequisite for my linear regression model was that the residual errors (residual terms) were uncorrelated. To check this, I performed the Durbin-Watson test with an acceptable value of d≈2 (Hunyadi-Vita 2008). I also paid attention to the value of the determination coefficient. The explanatory power of my models is high (R^2>50%), i.e., the independent variables included in the model explain the variance of the dependent variable with high goodness of fit. I also illustrated the evolution of the relationship between the factors with a graphical representation.

Analysing the efficiency and sustainability of pension systems in the European Union, I built my database from publicly available Eurostat data relevant to pension systems for the longest available period. I looked for the existence of relationships between factors such as employment, GDP per capita, the trends in pension expenditure as a share of GDP, average wage and average pension levels, replacement rates, dependency rates, retirement ages, the age centre of the time of retirement, life expectancy at birth, and life expectancy at the age of 65. The relationship between the factors was tested using Pearson correlation tests.

The Pearson correlation test measures the existence, strength and direction of the relationship between two or more parametric quantitative criteria and provides an answer to the question whether the relationship between factors (X) and (Y) can

be explained by factor effect and not by chance (Szűcs 2002). The correlation coefficient (r) describing the relationship is interpreted in the same way as the Spearman correlation. Since my query covers all 27 member states, the results obtained are for the whole community, the significance test is irrelevant. The advantage of a database from a single source (Eurostat) is that it is reliable, stable and its data are comparable: we can be sure that the data provider meant the same thing by the indicator and used the same methodology for all the data. Therefore, if some data were not available for a given year or country, I did not replace them from other databases for consistency reasons, but rather narrowed down the period under analysis or excluded the country from the analysis.

In the last part of my empirical research, I analysed pension systems in the European Union using cluster analysis. My aim was to cluster sovereign pension systems in the European Union, despite their diversity, according to certain common characteristics, and to identify valuable conclusions and adaptable solutions for domestic application. Cluster analysis facilitates the reduction-based treatment and interpretation of data collected in scientific research (Babbie 2008). It groups data under study according to the similarity or distance between elements, aiming to maximise the similarity (i.e., minimise the distance) within a cluster and, at the same time, maximise the difference (i.e., maximise the distance) between the clusters (Szűcs 2002). In cluster analysis, the number of groups formed is not known in advance. It is up to the researcher to define what is meant by similarity and distance, i.e., what decision function is used when separating or merging groups (Obádovics 2009). The clustering hierarchy used in my study first considers each element as a separate cluster and gradually reduces the number of groups by merging the two closest (most similar) groups. To measure the distances between clusters, I used the simple Euclidean distance function. In the abstraction process, I used a clustering of 4, 5, 6 and 7 clusters, from I decided to select the result of 5 clusters that best describes the set of similar and dissimilar elements.

By cluster analysis of pension systems in the European Union, I wanted to examine the structures operating in each country using the grouping tool. The data source for the paradigmatic characteristics of pension systems (e.g., funding principle, number and nature of pillars, indexation, built-in automatisms) is *The 2021 Ageing Report* of the European Commission (2021a), while the parametric data (e.g., retirement age, contribution rate, replacement rate) are partly taken from Eurostat's publicly available database and partly from *The 2021 Ageing Report*. It was my research decision to rely exclusively on EU data sources for data collection, and if data reporting was incomplete in some cases, I did not substitute it from other sources, e.g., that of OECD, taking the consistency criterion into consideration.

Some indicators, and hence the results calculated from them, are subject to comments and limitations. A brief description of the anomalies in the employment statistics is necessary to complete the analysis. According to the methodology of the Hungarian Central Statistical Office, employment data include persons working in the domestic primary labour market, people employed in public works and people working abroad with Hungarian residence being in paid employment for at least 1 hour in the week preceding the week of the survey, or individuals who had a job but were temporarily absent from work (e.g., because of sickness, holidays, including maternity leave).

Since 2021, a person receiving childcare benefit and being permanently absent from work (previously considered inactive or unemployed) has also been considered as employed. Although this modification results in a significant improvement in women's employment data, it is misleading for pension calculations, as various forms of childcare benefits are subject to pension contributions but exempt from social insurance tax.

The number of employees working abroad but having residence in Hungary is similarly misleading, as they and their employers do not pay taxes and contributions in Hungary.

Finally, foreigners working in Hungary through temporary employment agencies may also distort the picture, since if the company does not pay a wage to the worker but subcontracts the work to the temporary agency, it does not pay taxes and contributions, on the one hand, and, on the other hand, the cost of such labour is not reflected in the value of the Gross Domestic Product.

It should also be mentioned that the evolution of the employment rate is reported differently by the Hungarian Central Statistical Office than by Eurostat. Therefore, in my linear regression model based solely on Hungarian economic data, I used the Hungarian Central Statistical Office's data, but in my comparative analysis with the European Union I used Eurostat data.

Two important comments should be made about the statistics on average wages and average pensions. First, the Hungarian average wage data do not include enterprises with fewer than 5 employees. Secondly, average wages and average pensions are of limited use under certain circumstances in illustrating average working-age and old-age income conditions. If the distribution of the data between the lowest and the highest is very uneven (as is the case in Hungary, for example, where few people receive very high wages/pensions and many very low ones), the median (middle value) is a better proxy for the average than the arithmetic mean. The median divides the set into two equal parts, and represents the value from which the number of smaller and larger data is equal. The difference is illustrated by the following Central Statistical Office data (which show the most recent figures available): while in 2020 the average gross wage

was HUF 403,600, the median wage was HUF 320,582. While the average old-age pension in January 2023 is HUF 208,168, the median pension is only HUF 184,725. In my empirical research, I used the average wage and the average pension because Eurostat does not have a separate median data set (Eurostat support confirmed this at my request).

Eurostat uses the following methodology for the replacement rate:

$$aggregated\ replacement\ rate = \frac{gross\ median\ pension\ of\ the\ age\ cluster\ 65-74\ years}{gross\ median\ income\ of\ the\ age\ cluster\ 50-59\ years}$$

(which excludes other social benefits), i.e., the higher the replacement rate, the higher the proportion of median gross income received towards the end of working life that pensioners (aged 65-74) receive on average (gross, median). In the data transmission, we can only know the ratio, and not the two indicators that determine it (median gross pension and median gross income), so we cannot even indirectly resolve the problem of average wages and average pensions mentioned earlier.

3. RESULTS AND DISCUSSION

3.1 The efficiency analysis of the Hungarian private pension fund system

I have looked at the efficiency and sustainability of the Hungarian private pension system from its creation in 1998 through the liquidation of the sector to the present day. In particular, I have analysed in detail the private pension market (players, number of members, assets), as well as the fee charges, cost structure and profitability of the funds. I have examined the investment policies adopted by market participants, the portfolios they have built up and the returns they have achieved. In particular, the mandatory optional portfolio scheme is discussed, followed by the discussion of its abolition.

The number of members of private pension funds had been steadily increasing since its launch in 1998, largely due to its mandatory nature, but the number of voluntary members was also significant. Growth only stopped in 2002, when new entrants were no longer required to join. By 2010, the number of private pension fund members had exceeded three million, representing 84% of all employees. Private pension fund assets grew steadily at 34-40% per year, in line with the number of members. There was only one year in the given period (2008) when assets declined, but this was followed by a rapid rebound from 2009 onwards. The fall in assets was driven by the negative returns resulting from the global financial crisis that unfolded in 2008, severely affecting the Hungarian private pension fund system that had just introduced an optional portfolio scheme.

The private pension fund market started with 38 players, which gradually decreased over the years due to mergers and acquisitions. In terms of founding background, funds belonging to large banking or insurance groups were able to become dominant. After the creation of private pension funds in 1998, market power balance was soon established. The five largest market players in terms of both member numbers and assets under management were the private pension funds of OTP, Aegon, ING, Allianz and AXA. Competition between funds in the market did not increase, despite dynamic growth in membership, due to low financial interest and financial awareness among fund members, short-term return seeking, and a lack of cost transparency.

One of the key factors contributing to the negative perception of private pension fund performance was the high level of fee charges, also by international standards. The costs of building up the institutional and infrastructural base after the start-up period declined significantly away from the time of establishment, so in the long run, management fees became the determining factor, which varied significantly depending on the founding background. Insurance and bank-based funds charged more than twice as much in management fees as their employer-

based counterparts. This is due to the fact that in the case of the former, the management activity was carried out by an organisation in the founder's stakeholder, being replaced only once in the history of the funds. In contrast, the lower management fees of the employer-based funds are explained by the lower level of start-up costs, thus the fees of the trustees, selected through a competitive tender process, only included the actual management costs. Therefore, there was no market competition in asset management to minimise costs. However, the legal provisions have capped these rates since 2007: in 0.9 % of the assets under management in 2007 and in 0.8 % in 2008.

For the majority of private pension funds, the arising costs, and hence profitability, are very difficult to estimate. This is because part of the administrative, marketing and acquisition costs, accounting for the majority of the operating costs, are not incurred directly by the funds but by the subsidiaries of the founding group, which are typically active in the provision of fund services. The erosion of cost transparency had in itself hampered the development of competition in the market by making it difficult to compare the efficiency of the funds.

When examining the efficiency of the domestic private pension fund sector, the biggest change in the trends of each year can be observed in the area of private pension fund portfolios. The investment policy in the early years was characterised by a conservative approach, risk aversion and a neglect of alternative investments. Low diversity portfolios mainly included Hungarian government bonds. The reasons for the dominance of government bonds are the rules governing the composition of the portfolios, the short-term yield demand and the significant fluctuations in stock market prices. All this led to low returns by international standards. **The high proportion of government bonds in portfolios and the simple investment composition, therefore, hindered the efficient operation of funds by limiting the level of fund returns available and thus the expected value of pensions from the funds in the longer term.**

As private pension funds held an increasing share of the domestic intermediated assets, the efficient functioning of the segment was also of key importance for the stability of the domestic financial system. This led to the introduction of the optional portfolio scheme. The aim of the scheme was to allow members to choose between three mandatory portfolios according to their individual preferences, risk tolerance and years to retirement, so that they could actively participate in the shaping of their future pension. The system was extended to the entire membership, while at the same time creating transparency and interoperability. The legal framework made it compulsory to introduce a unit-of-account record-keeping system from 1 January 2009. The funds published the exchange rate of the units of account on their websites on a daily basis, thus providing continuous and explicit information.

It is important to note the unfortunate coincidence of the introduction of the optional portfolio scheme with the adverse economic environment. The stock market, after years of steady rise, fell sharply exactly when the scheme was introduced. It is important, however, to distinguish between virtual and realised losses and to emphasise the long-term perspective for pension savings.

So the system needed transformation and improvement but it need not have been abolished. A new system can always contain errors. However, when these are detected, it is not a question of eliminating the system, but of fine-tuning the regulation. This was also the case for private pension funds. **Critics of the fully funded pillar regard the low level of returns and the high level of charges as a failure of the system. But a closer look reveals that these failures were in fact due to regulatory errors and bad timing.**

The figures do not justify the reasons cited by the government at that time when it dismantled the private pension scheme. More than ten years on, it can be argued that the liquidation of the sector was motivated by the need to channel the accumulated wealth and future contributions to the public budget, both to escape the excessive deficit procedure and to deliver the promised tax cuts. In effect, long-term objectives were sacrificed on the altar of short-term political interests.

3.2 Assessing the sustainability of the Hungarian pension system

I analyse the sustainability of the Hungarian public pension system using descriptive statistics, correlation and linear regression. My analysis covers the period from the beginning of the three-pillar pension system, 1998, to 2022. In my model I have included the revenues and expenditures of the Pension Insurance Fund and the economic and demographic factors affecting them, as well as the measures affecting the pension system.

The analysis of the revenue side of the Pension Insurance Fund led to the conclusion that both the contribution rate and the employment rate increase revenues as a share of GDP, but that the contribution rate has a decisive effect (the influence of the employment rate is negligible compared to the contribution rate). The causal relationship between the two factors can be described by the double regression in Figure 1:
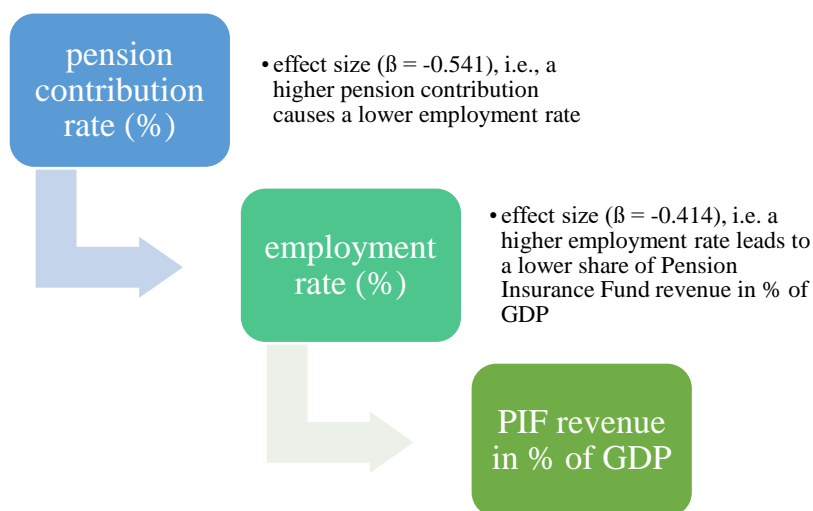
Figure 1.: Hierarchical relationship between the pension contribution rate, the employment rate and the Pension Insurance Fund's revenue as a share of GDP
Source: the author's own editing

The results of the double regression analysis also showed causality: the reduction in pension contributions led to an increase in the employment rate, which, in turn, had a negative impact on revenues as a share of GDP (increasing employment increased GDP more than pension fund revenues). In the next part of my analysis, I have included the legislative changes in the model calculation that alter the revenues of the Insurance Pension Fund. The results show that the negative impact of the reduction in contributions could not be offset by the revenue-increasing measures taken since then (redirection of private pension contributions into the state budget, abolition of the contribution ceiling and increase in the retirement age). The analysis suggests that the long-term sustainability of the Pension Insurance Fund requires an increase in contributions (including the share paid by employers) and their stabilisation to ensure predictability.

The expenditure of the Pension Insurance Fund as a percentage of GDP remained stable (between 7.67% and 8.05%) after the introduction of the private pension scheme. The significant and steady increase in expenditure is due to the negative impact of the introduction of the 13th month pension (2002) and the financial crisis (2008) on the labour market and the economy, which was further exacerbated by the retirement of the first "Ratkó generation" (baby boom generation in Hungary) starting in 2010 (Figure 2). The private pension scheme could have alleviated the burden on the Pension Insurance Fund in the long run if part of the benefits had already been paid from it. To reduce pension expenditure, which accounts for more than 10 percent of the GDP, the government had to take significant measures such as raising the retirement age, eliminating disability pensions from the Pension Insurance Fund, abolishing early retirement and regulating price

indexation by law. As a result, the expenditure of the Pension Insurance Fund had fallen to 7.26% of GDP by 2022.
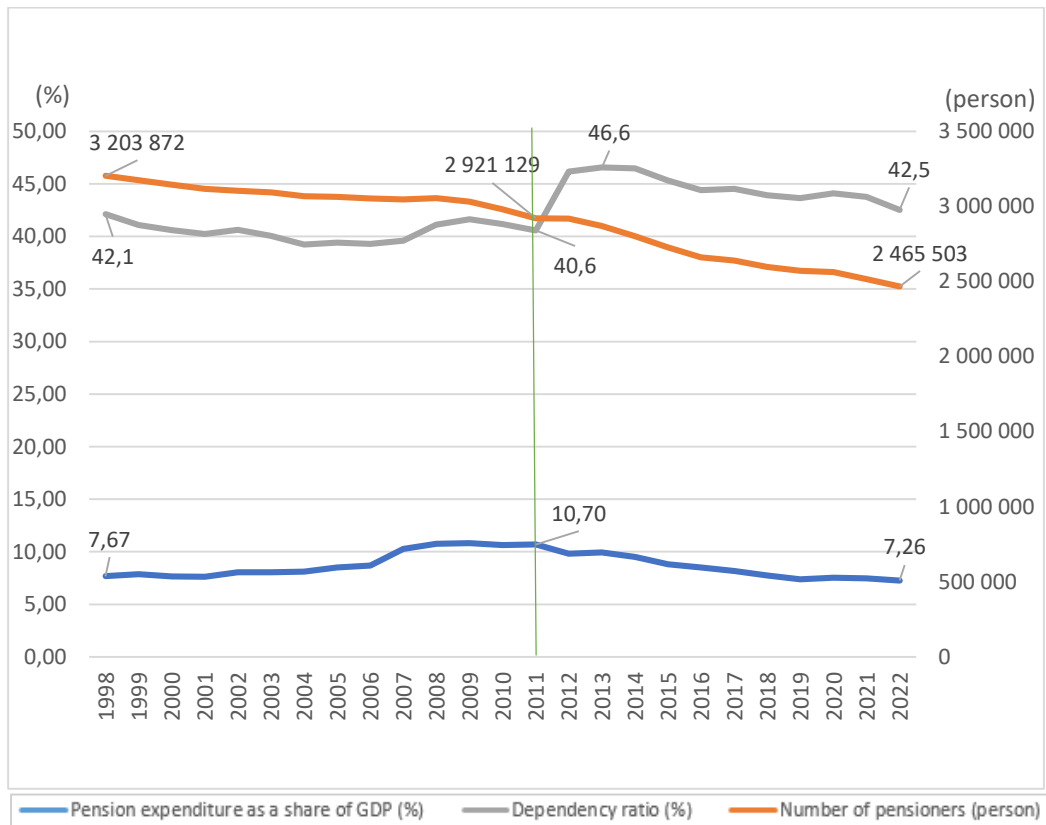

Figure 2: Trends in the number of pensioners, dependency ratio and pension expenditure as a share of GDP (1998-2022)
Source: the author's own calculation based on Central Statistical Office data

I then used a linear regression model to determine how and to what extent these factors and measures have affected pension expenditure over the past 25 years. The strongest and only negative (i.e., expenditure-reducing) effect is due to the changes after 2011 (retirement age increase, introduction of price indexation, abolition of early retirement, eliminating disability pensions from the Private Insurance Fund, the introduction of "Women40" [early retirement for women after 40 years of service]). Although these changes included the introduction of "Women40", which in itself has, of course, increased pension expenditure, the overall effect is strongly negative when combined with the other measures. The impact of the other independent variables is positive, i.e., they increase pension expenditure as a share of GDP. The largest expenditure-increasing effect is due to the increase in the dependency ratio, followed by the phasing out of the progressive reduction in the case of high wages, and the payment of the 13th month pension. The shift to price indexation has reduced pension expenditure but has led

to a parallel decline in the real value of pensions (Figure 3). The gap between earnings and pensions was smallest during the wage indexation period (1998-1999), opened slightly during the years of Swiss indexation (2000-2008) and the years of growth-linked mixed indexation (2009-2011), and then stagnated, but has been widening steadily since the introduction of pure price indexation in 2012. It can be concluded that Swiss indexation could have slightly cushioned the downward pressure of the significant real wage increases over the period under review.
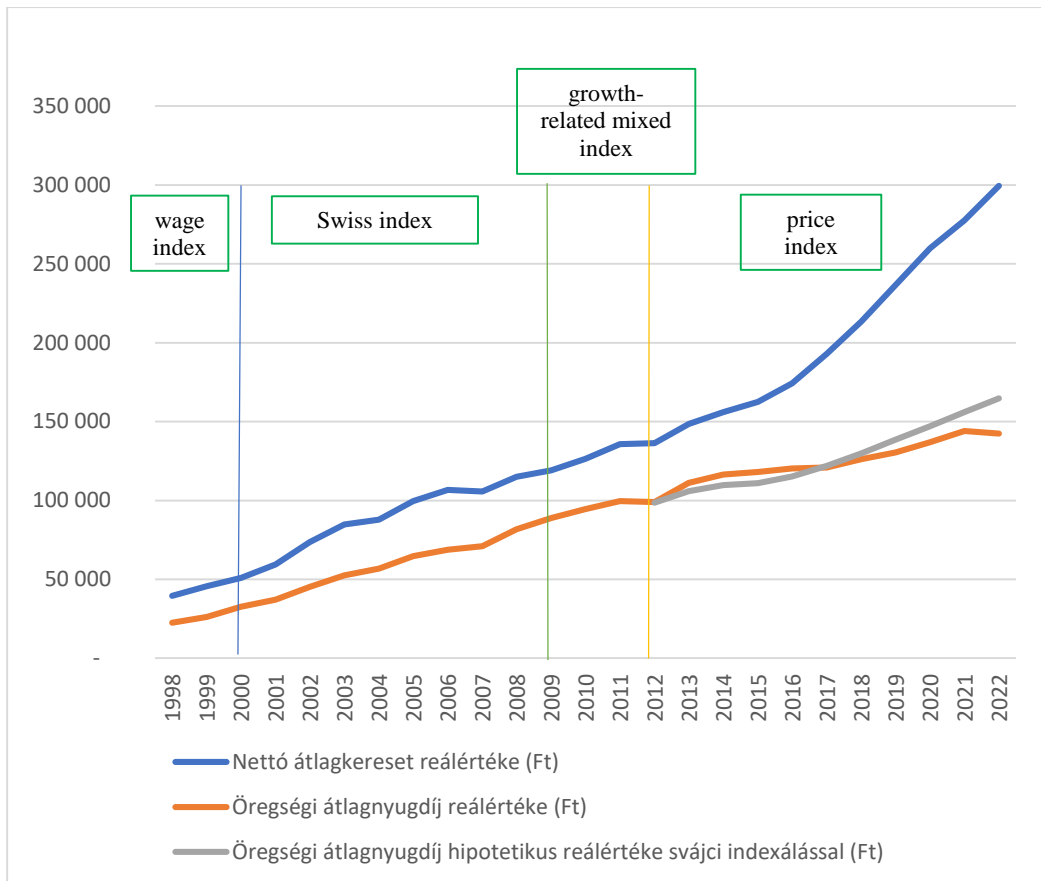

Figure 3: Evolution of net average earnings, average old-age pension and real value of a hypothetical (Swiss indexed) average pension (1998-2022)
Source: the author's own calculation

Every year when real wages increase, the standard of living of those with earnings rises, but pensioners no longer benefit from this increase in the standard of living due to price indexation. So what has undoubtedly improved the sustainability of the pension system at the macro level, for individuals is a major breach of the fairness criterion at the micro level. In addition, the current practice of price indexation has three other anomalies: firstly, it is based on an estimate, secondly,

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it only takes effect from the year following the year in which the pension is determined and, thirdly, it is uniform, i.e., it increases the lowest and highest pensions by the same scale, which leads to a fragmentation of the pensioner population.

The valorisation applied in the pension calculation results in similar inequities. Since the valorisation is based on average net earnings, those with pensions determined in a year with a higher valorisation factor than the previous year are significantly better off. The starting amount of Hungarian pensions is therefore influenced – and this is unique by international comparison – not only by the length of service and lifetime earnings, but also by the year of retirement in a significant way. Apart from valorisation, the gap between earlier and later pensions is further widened by the abolition of the contribution cap and the introduction of flat income tax, which will lead to a further widening of the gap between retirement pensions reflecting the already existing gaps in the active age. A possible pension reform should address these inequities without delay.

3.3 Assessing the efficiency and sustainability of pension systems in the European Union

Sovereign pension systems in the EU member states are diverse. EU legislation does not seek to unify national pension systems. However, deepening economic integration requires the formulation of Community recommendations and objectives to harmonise and coordinate pension systems so that the application of different national rules does not disadvantage EU citizens working abroad. Some of the challenges facing pension systems are similar in all member states, irrespective of the economic, social and political situation in each country. Therefore, the solutions to these challenges may be similar, and we can draw on the experience of countries that are more advanced in reforming their pension systems to help us formulate our own responses.

Analysing the performance of pension systems in the EU member states and the factors affecting it, I used correlation and regression analysis. I sought to find out what determines the efficiency and sustainability of the pension system of a country. Which countries could serve as a model for Hungary and what makes them exemplary? In my analysis, I put forward four hypotheses. I illustrated the results with tables and graphs. The graphical analysis also provides the opportunity to detect groups of countries (old and newly acceded member states; Visegrad Four, Baltic and Scandinavian countries; Northern, Western, Southern, Central and Eastern Europe).

The results suggest that **there is a weak to medium relationship between economic development expressed in GDP per capita and pension expenditure as a share of GDP, but that there is a correlation between GDP per capita and the level of average pensions, which also indicates the efficiency of the**

pension system. Member states with high productivity can operate their pension systems efficiently in the long run. If productivity is high and employment is high, a pension system can be sustainable with lower contribution rates. In itself, high employment, as in the case of Hungary, erodes the sustainability of the pension system by applying lower contribution rates.

In Hungary, the intensive employment policy of the past period has led to virtually full employment, so it is hardly possible to activate new labour from within the country without rethinking migration policy. The model of a competitive state with downward competition, lower wages, taxes and contributions must be replaced by an economic system based on higher value-added and higher productivity enterprises, which, according to the results obtained, would also contribute to the sustainability of the pension system. This, although it is beyond the scope of this thesis, would call for a repositioning of Hungary's role in global supply chains, a different approach to investment in human capital in education and health, active wage policies and a rethinking of tax policy.

The European Union's recommendation on the retirement age for both sexes is 65, and the age limit should be continuously adjusted. Accordingly, all member states have raised (or are planning to raise) the age limit, and 11 of them have already introduced age automaticity (the Netherlands, Finland, Denmark, Cyprus, Estonia, Italy, Portugal, the Czech Republic, Spain, Greece, the Netherlands, Poland, and the Czech Republic) and three (Sweden, Slovakia and Bulgaria) are planning to do so. Thus, the link between retirement age and life expectancy at birth and life expectancy at age 65 is increasingly getting stronger.

The European Union's concept of pensions places great emphasis on adequacy, alongside sustainability and modernisation. Both the *2010 Green Paper* and the *2021 Green Paper* on ageing set out the expectation that the pension systems of member states should provide all pensioners with an adequate income that can prevent poverty in senior age, should adequately replace income from work and should reflect solidarity between and within generations. I examined whether there is a link between replacement rates and the retirement age. The results show that, while in 2010 there was a weak to negative correlation between the two variables, this relationship has weakened over time and is now practically non-existent. In 2022, the average retirement age in EU-27 has risen to over 64, with 12 countries applying lower ages and 15 countries (including Hungary) applying higher ages. The average replacement rate is 50%, with a lower median pension/median salary ratio in 12 countries, the same in one country (Finland) and a higher ratio in 14 countries (including Hungary). The groups that emerged in previous calculations (old/new member states, clustering by economic development, co-movement of Nordic, Baltic and Visegrad countries) cannot be identified in this examination.

3.4 Assessing pension systems in the European Union using cluster analysis

To analyse the paradigmatic and parametric characteristics of pension systems in the European Union, I used cluster analysis. I seek to answer the question of what kind of clusters can be set up if structures are examined independently of economic and demographic indicators, and to what extent these clusters reflect the groups that emerged from the analysis of the efficiency and sustainability of EU pension systems. In the abstraction process, I used a clustering of 4, 5, 6 and 7 clusters, from which I decided to select the result of 5 clusters that best captures the multiplicity of similar and dissimilar elements (Figure 4).

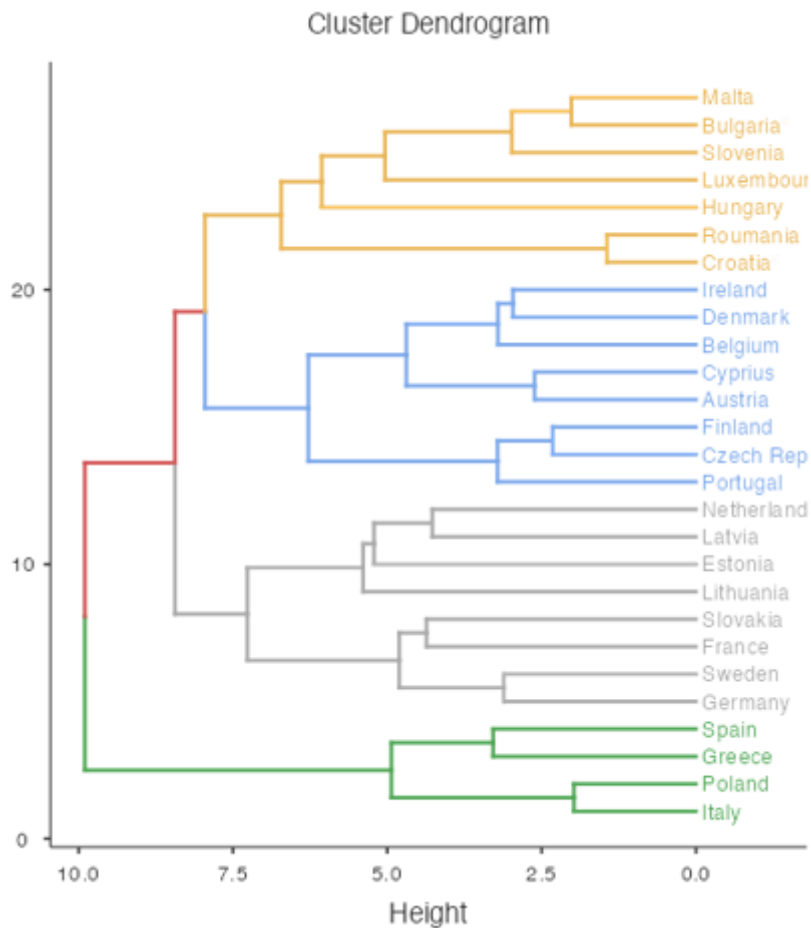Figure 4.: The clusters of the pension systems of the European Union
Source: the author's own calculation

The main findings of the cluster analysis are the following. **The pension systems of all EU Member States are based on several pillars, but in practice there are huge differences in the role and weight of the pillars. While the state pension pillar plays the most important (almost exclusive) role in retirement**

pension in Hungary, in the Nordic and Western member states it is a combination of state, employer and individual roles. Fairness is supported by wage or mixed indexation, which can be interpreted as an unwillingness to forego a fair increase in the level of benefits for senior citizens in order to ensure the long-term sustainability of the system.

More and more member states are seeking to use automatic mechanisms to make their pension systems more sustainable and flexible. More than half of the member states (16) have already introduced some form of automatic mechanism that can help to restore the imbalance by automatically changing a system parameter in a flexible way, without political interference. Such automatisms can apply to the retirement age, the registration of acquired rights and the determination of benefits. There are also models of how several mechanisms can operate in parallel.

Pension insurance funds can be divided into three groups in terms of financing and insurance principle: 1: autonomous financial fund with compulsory budgetary supplement, 2: autonomous financial fund without compulsory budgetary supplement, 3: non-autonomous financial fund. Only two countries belong to the latter category: Hungary and Lithuania. In Hungary, the introduction of the social insurance tax in 2012 partially abolished the autonomous financial fund, and the introduction of the social security contribution in July 2020 did it entirely. In Lithuania, a similar process has been taking place since 2019, with the reform of the social insurance tax and income tax, which made the Pension Insurance Fund part of the central budget. The other member states have an autonomous financial Pension Insurance Fund, with any shortfall being compensated by the central budget, except in three countries (Sweden, Latvia and Luxembourg).

The funding system of the mandatory state pension scheme based on a notional defined contribution (NDC) and a financial defined contribution (FDC) was first introduced by Sweden and then by Latvia. Later, NDC was introduced by Italy and Poland. The Swedish system is based on the principle that the future pension of current contributors is determined solely by the amount accumulated in the nominal and actual individual accounts and the remaining life expectancy at birth. In this way, the amount of the pension is independent from both the length of service and the moment of retirement. The dual fairness of the system is manifested as a higher pension for those who have paid more contributions and those who have continued to pay them (and vice versa). This is achieved by taking into account the life expectancy of the person concerned (as opposed to, for example, the Hungarian practice). The sustainable functioning of the system is provided by the accumulated reserve, the inheritance profit and the balancing mechanism. Under this mechanism, if payments exceed contributions in a given year, the wage index is reduced in proportion to the ratio of expenditure to income (as was the case between 2010 and 2018). Through automatism, the lost benefits

of the more difficult economic years are compensated by indexing the better economic years above the wage index.

The level of pension contributions (taxes) and the way the burden is shared between the employer and the employee varies considerably between member states. The EU average is 22.34% of gross wages, as compared to 19.31% in Hungary, three percentage points lower. In most countries (sixteen), employees pay the higher contributions, in five countries they pay the same amount, while in six countries employee contributions are higher (Hungary, Romania, Croatia, Slovenia, the Netherlands, Lithuania). In terms of the overall burden, we observe that the southern member states and France have above average contribution rates, while the developed welfare states of the North and West manage their pension systems with average or below average contribution rates. This (again) highlights the role of productivity and average wages. **Where productivity is high and wages are consequently high, a lower contribution rate is sufficient.** Conversely, in countries with lower productivity and wages, higher contributions are needed to finance the pension system.

The contribution rate is, of course, also determined by the "promise" of the pension scheme, which is best expressed by the replacement rate. Countries with a higher ratio of median pension to median salary are likely to have a higher contribution rate. The replacement rate and the indexation method used also have a decisive influence on the trends of payments as a share of GDP. **The reform of the Swedish pension system is also a pioneer in this respect: it has shifted from a defined benefit (DB) to a defined contribution (DC) paradigm, reversing the direction of dependency:** it does not adjust a contribution to the (promised) payment but adjusts the payment to the contribution. In doing so, it has created a system-building paradigm out of long-term, stable, predictable operation, alongside improved sustainability.

Transparency and clarity of the finance of the mandatory public pension pillar is also ensured by the introduction of a points system, based on a German model, in a growing number of countries (e.g., France, Slovakia, Estonia and Lithuania). The system is transparent and comprehensible for all, and thus proportionate and fair, without leading to disparities and fragmentation. It is sustainable, with automatic rebalancing mechanisms to ensure that the balance is restored in the event of an imbalance between income and expenditure, yet fair. (The pension point should not be lower than in the previous period. If the balance requires a lower value, it is charged against the increase in the next period.) It is also flexible (rewards and penalises retirement beyond or below the age limit with bonuses and penalties), acknowledges child-rearing, higher education and other non-contributory periods. It provides a pension promise (DB), which is defined by contribution (DC) and relatively independent of politics (thanks to built-in

automatism). Together, these fulfil the EU expectations (that the pension system should be sustainable, adequate and modern).

The results of the cluster analysis partly reflect the results of the efficiency analysis of pension systems based on economic indicators. **Member states with a balanced efficiency performance (Sweden, Germany and France) and Slovakia have been clustered together, which is a promising sign for the future of the Slovakian pension system.**

The co-movement of the **three Baltic states** (Estonia, Latvia and Lithuania) can also be detected, which are grouped together with the Netherlands. This cluster is the most similar to the previous group of advanced pension systems, the only difference being the lower than average replacement rate.

The cluster analysis grouped **the southern member states (Spain, Italy, Greece) and Poland** together. What they have in common is a much higher than average replacement rate, which leads to high pension expenditure as a share of GDP and requires higher than average pension contributions. As all four member states are obliged to supplement their pension fund deficits from the central budget, they have all recently **switched to price indexation and introduced automatic mechanisms** (individual accounts and retirement ages linked to life expectancy) to improve medium and long-term sustainability.

Hungary, Slovenia, Romania, Bulgaria, Bulgaria, Croatia, Malta and Luxembourg are in the same group. The latter was placed in the same cluster as the other member states that joined after 2004 because its pension paradigm is defined benefit (DB) and uses mixed indexation, as do the other group members (except for Hungary). The lower than average replacement rate of these member states leads to lower than average pension expenditure as a share of GDP, except for Luxembourg, where the highest replacement rate in the EU provides for exceptionally high pensions (after Denmark, Luxembourg has the highest average pension), but this does not result in a high expenditure ratio due to the also exceptionally high GDP. Other similarities between the Central Eastern European group members are that the pension reforms of the 2000s were all based on the World Bank recommendation, following the Hungarian 1998 reform, and were largely modelled on it (as in Poland and Slovakia). Multi-pillar systems were established. The mandatory private pension pillar, however, was shaken everywhere after the 2008 crisis, and was eventually abolished in Hungary. People's capacity/propensity for self-care here is low, partly due to low wages and insufficient financial awareness, partly to shaken confidence.

4. CONCLUSIONS AND PROPOSALS

Looking at the efficiency of the Hungarian pension system, and in particular the private pension fund system, it can be concluded that it is under severe pressure in the short term and faces sustainability problems in the medium and long term. These can only partly be traced back to its multi-stage development, and are more likely to be explained by the continuous interventions in the post-communist period, mostly driven by short-term political interests. Frequent changes have led to unpredictability and loss of confidence.

The injustices and problems of the current system only increase intergenerational tensions and pressure on the budget. This makes it all the more urgent to take the necessary measures. **In the case of pension systems, the emphasis on the long term is essential. A system can only be sustainable in the long run if it has been developed through intensive, in-depth professional debate and adopted by a broad social and political consensus.**

A sustainable pension system means that it organically develops and maintains its internal balance in a stable (long-term) way, so that no generation has to pay higher contributions or receive lower benefits than the previous one, that it provides all age groups with a nearly equal life-time revenue and that it does not impose a significant additional burden on the budget. To achieve this, measures are needed on both the revenue and expenditure side.

Based on the literature review and empirical research of my thesis, my main proposal for the future of the pension system is to clarify the principle of funding, i.e., **to restore the system of an autonomous financial fund**. It would create clarity and transparency regarding the revenues and expenditures of the system, avoiding the dependence on the current budget law to decide on the source and level of the pension fund's revenues and the financing of its possible deficit. In addition, if an autonomous financial fund has a surplus, this surplus should be a reserve of the fund and should not be transferred to the central budget. In the event of a deficit, there are two possibilities: if there is a statutory provision for a compulsory budgetary supplement, the amount of the benefit may not be reduced (this is the case in most EU member states); if there is no compulsory budgetary supplement, the consequence is that the amount of the benefit may be reduced, or if it is not reduced, the shortfall is charged to the increase in subsequent years. It is no coincidence that this solution is used by few member states.

On the revenue side, **there is a need to increase and then stabilise the contributions (taxes) paid by employers** for long-term sustainability and predictability. Recent data show that the reduction in the social insurance tax rate (from 27% [in 2012] to 13% [in 2022]) has added to employment growth but has had a negative impact on pension revenue as a share of GDP, as rising

employment has boosted GDP more than pension revenue (precisely because of the low contribution rate for employers). This has put the pension system on an unsustainable path already in the medium term.

Another problem with the reduction in social insurance tax is that it has reversed the burden-sharing ratios. Whereas at the beginning of the period under review, employers paid 79% of contributions and employees did only 21%, this ratio is now reversed: employees pay 59% and employers do 41%. In developed Northern and Western European Union member states, the contribution rates are reversed, and in some cases equal.

In order to guarantee the insurance principle in a clear and unambiguous way, the social insurance tax should be re-converted into a type of contribution. This would make it clear once again that the payment of a contribution entitles the person concerned to direct consideration (an allowance), which is an inalienable acquired right.

On the expenditure side, the economically irrational 13th month pension should be abolished, as well as the programme "Women40" (see later on the issue of the flexible age limit). The 13th month benefit is a short-term, politically motivated measure, not based on contributions, which widens the gaps in pensioner society by giving everyone the equivalent of their own one month's benefit. The resources freed up by the elimination of an extra month's expenditure could be used to address the situation of the poorest pensioners from an equity perspective.

For the balance of the Insurance Pension Fund to be stable, additional conditions are needed. One of the basic conditions for a modern and transparent pension system is the **creation of individual accounts**. This can be done by introducing nominal individual accounts (Swedish model) or a points system (German model). Individual accounts create transparency and clarity (as opposed to the current over-complicated Hungarian system), which both contributes to transparency and motivates the parties concerned. Whether introduced on the Swedish or German model, the system would have two other positive benefits. Firstly, it would eliminate one of the major injustices of the Hungarian pension system, namely that the moment of retirement has a decisive impact not only on the amount of the initial pension but also on the living standard during the remaining years of retirement. Secondly, it would reverse the direction of dependency, and would **shift from a defined benefit (DB) to a defined contribution (DC) paradigm,** so it would not have to adjust the contribution to the payment (promises) but would adjust the payment to the contribution.

The criterion for transparency is continuous (annual) **information**, which would show in detail the entitlements acquired and accrued. If the current pension

paradigm is maintained, the minimum step towards transparency could be to make the **scaling factor linear**.

To increase the flexibility of our pension system, the currently rigid retirement age could be relaxed by a statutory age range, in which early retirement would modify the amount of the old-age benefit by a reasonable deduction, and with an appropriate bonus for continued service. A retirement age thus made flexible would give individuals the freedom to decide for themselves when to end their active careers, and would render the economically irrational, gender-discriminatory institution of "Women40" redundant.

The **current retirement age** (65 years for both sexes) is in line with the EU recommendation and an increase is not justified on the basis of life expectancy at birth and at 65 years (life expectancy at birth in Hungary: 72.2 years [male], 78.7 years [female], EU average: 77.5 years [male], 83.2 years [female]). However, **a possible pension reform could provide a good opportunity to incorporate age automatism, which could increase the resilience of the pension system to external effects.**

I am proposing several measures to **increase the fairness of our pension system**:

- On the one hand, the **reintroduction of the contribution cap**, which would lead to a short term loss of contribution revenue, but would pay off in the long term by not having to pay (too) high pensions. The upper limit of the ceiling could be set at twice (on the German model) or three times the current average wage.
- **To mitigate the differences arising from indexation**, I propose a progressive increase, the continuous maintenance of the range limits, automatism of increase within a range, and more frequent pension increases.
- Furthermore, the correction of the disproportionately low pensions resulting from the previous contribution cap and progressive reduction in the case of high wages, which was **left unfinished** in 2009, should be implemented without delay to address the injustices of the current pension system. The budgetary burden resulting from the differentiated pension increase and the pension correction could be covered by the increased employer pension contribution.
- The **reintroduction of progressive income tax** would be fairer not only for pensioners but also for those with an income. This should be understood as genuine progressivity, not as benefits and exemptions for certain social groups built into the flat income tax system. **If this is not possible for political reasons, then the issue of progressive reduction in the case of high wages should be reconsidered in order to increase the fairness of the pension system**.

A modern, sustainable and up-to-date pension system is built **on several pillars**, in which both individuals and employers have a stake, in addition to the role of the state. The **zero pillar** of this multi-pillar pension system could be a **tax-financed basic pension**, modelled on the Western (Swedish, Dutch or Finnish) system, the justification for which in Hungary is the large number of people with insufficient length of service and/or too low career earnings. The amount of the basic pension could be fixed by law at the current pensioner minimum subsistence level, and the qualifying condition could be nationality or length of habitual residence. The source of funding could be the budget surplus from progressive income tax.

In a multi-pillar pension system, **the role of employers** (currently completely absent) and **self-support** (which is currently marginal) **should be strengthened**. A first step could be to maintain the level of the tax refund for self-support in pension savings and to support employer contributions to voluntary pension funds. If an employers' pension pillar were to be established, I would propose the introduction of an automatic entry scheme for new entrants to the labour market.

The **reduction of the political exposure** of the pension system, in addition to the above (autonomous financial fund, enforcement of the insurance principle, built-in automatisms), could be increased by setting up an **independent pension expert committee**, whose task would be to monitor the pension system on a continuous basis, collect, communicate and analyse statistical data. It would report annually to Parliament on its work and proposals.

Finally, my more complex proposals, which are more difficult to implement and require **close cooperation with complementary policies**, are as follows. In addition to the necessary increase in the contribution rate, as mentioned above, **active wage policies** and the **increase of productivity** can boost the revenues of the pension system, in the context of full employment today. In the case of the former, it is worth noting that the average wage in Hungary is below the level that productivity would justify in EU comparison. In the latter case, the financing and support of education, research, development and innovation should be reconsidered in the light of the fact that higher contributions from workers who are able to produce higher added value can finance higher pension expenditure in an ageing society.

All in all, **a change in economic policy approach** is necessary, which would also bring about the increasing sustainability of the pension system. The economic policy of the 2010s, based on low wages and low tax burdens, led to almost full employment, but failed to increase, and in recent years even reduced, Hungary's competitiveness, and has now become a clear barrier to further development. The modernization of pension systems through automatisms includes flexible resilience. By this I mean that it reasonably prepares for foreseeable demographic changes (a longer active life period due to the increase in life expectancy, and a

longer learning career due to the decrease in childbearing, or more time spent working, or a higher amount of self-care) and, partly automatically, through complementary policies compensates for the loss of revenues from fewer contributors.

Chart 2: The summary of the results of hypothesis testing

The summary of the results of hypothesis testing	
H1: The low efficiency of the private pension system is due to regulatory issues and the unfavourable economic environment.	✓
H2: The drastic reduction of social contribution tax paid by employees has undermined the long-term sustainability of the Pension Insurance Fund.	✓
H3: The final transition to price indexation over the period under review has reduced pension expenditure as a share of GDP, but the increase in the age limit, the outsourcing of disability pensions and the abolition of early retirement have also contributed to the reduction.	✓
H4: It is assumed that there is a correlation between GDP per capita and pension expenditure as a share of GDP, and that the evolution of the average pension correlates with the evolution of GDP per capita.	✓
H5: It is assumed that the changes in the employment rate correlate with those of pension expenditure per GDP and that the changes in the average wage correlate with those in the average pension.	✓
H6: It is assumed that the retirement age is related to life expectancy at birth and to further life expectancy at age 65.	✓
H7: It is assumed that the retirement age is related to the changes of the replacement rate.	x
H8: It is assumed that the clustering of pension systems in the European Union by structure reflects the clustering by economic development and the efficiency of pension systems.	Partly

Source: the author's own editing

5. NEW AND ORIGINAL RESULTS

Based on my research, the following new and innovative results can be established. On the one hand, these can supplement the knowledge available so far about the efficiency of the Hungarian pension system, and on the other hand, they can serve as a basis for the necessary reform of the pension system.

1. The low level of efficiency of the Hungarian private pension fund system can be traced primarily to regulatory reasons, and secondarily to unfavourable financial and economic tendencies.

The dominance of government bonds characteristic of private pension fund portfolios can be traced back to the short-term yield measurement, the ensuing risk-avoiding behaviour, and the large fluctuations of the domestic and international stock markets at the time of their establishment, between 1998-2001. The achieved returns were, therefore, basically determined by the government bond yields. Taking the higher fee burden at the start and the changes in the price levels typical of the era into account, it is understandable why the funds could not achieve (high) positive real returns. The speed of market competition was also hindered by the reduction of cost transparency, as it made it difficult to compare funds in terms of efficiency. The portfolio system made it possible to manage the pension assets of new entrants into the labour market, those in the middle of their active years and those about to retire with a differentiated investment policy. The timing of the optional portfolio system, which was introduced as an option from 2007 and then mandatorily from 2009, was not favourable either, as it increased the share of private fund portfolios at the exact time when the 2008 global financial crisis caused severe price drops on the domestic and international stock exchanges. However, when evaluating the returns on retirement savings, one needs to take a long-term view and distinguish between virtual and real losses. In the case of Hungary, the short-term virtual yield losses were the basis of the misleading communication that led to the undermining of trust in the system and ultimately to the liquidation of the private pension fund sector. **More than ten years on, it can be argued that the liquidation of the sector was motivated by the need to channel the accumulated wealth and future contributions back to the public budget, both to escape the excessive deficit procedure and to implement the promised tax cuts.** This is supported by the fact that the private pension fund assets did not appear in the income of the Pension Insurance Fund, which was then still operating as an independent financial fund, neither in the year of liquidation of the system nor later.

2. The drastic reduction of the social insurance tax paid by employers worsened the long-term sustainability of the Pension Insurance Fund.

Based on the data series of the Pension Insurance Fund's income going back a quarter of a century, it can be stated that the reduction of the social insurance tax (from 27% [in 2012] to 13% [in 2022]) contributed to the expansion of employment, which, in turn, had a negative effect on the pension revenues as a share of GDP, since growing employment increased GDP to a greater extent than it did pension fund revenues (precisely because of the low contribution rate for employers). On the one hand, the reduction of the social contribution tax reversed the burden-sharing ratios: at the beginning of the period under examination, employers paid 79% of contributions, and employees did only 21%, but by now this ratio has been reversed: employees pay 59% and employers do 41%. On the other hand, it has set the pension system on an unsustainable path even in the medium run.

3. The final shift to price indexation has reduced the value of pension expenditures as a share of GDP in the examined period and has led to social fragmentation.

The introduction of price indexation in 2012 improved the sustainability of the pension system at a macro level, but at a micro level, it has greatly violated the criterion of fairness for individuals. In years when the increase in net earnings exceeds the increase in the permanent price level, the living standards of those with earnings increase, but pensioners can no longer benefit from this increase in living standards due to pure price indexation. It can be concluded that the significant rise in real wages measured in the examined period led to a decline in the purchasing power of pensions compared to the purchasing power of earnings. Mixed indexing could have mitigated this disconnection. The current practice of price indexation also carries additional anomalies (a uniform increase based on an estimate, which only comes into effect from the year following the year of pension is determined), which leads to a widening gap in the pensioner society. Variance of pensions has significantly increased.

4. There is a weak to moderate relationship between economic development expressed as GDP per capita and pension expenditures as a share of GDP. However, a correlation can be observed between GDP per capita and the level of the average pension, which also points to the efficiency of the pension system.

From the point of view of economic development, the member states of the European Union can be divided into two groups: only old member states have a higher GDP per capita value than the average, while the newly joined countries and the Southern countries are below the average. As regards pension expenses, it must be observed that it is not true that economic development determines how much a country spends on pensions in proportion to GDP, because among the

more developed countries, Ireland and Luxembourg have below average pension expenses, while among the less developed ones, the Mediterranean countries have above average pension expenses. If we examine this together with the strong correlation between the average pension and GDP per capita, three categories can be defined regarding the efficiency of pension systems: low efficiency (e.g., the Visegrad and Baltic countries), good efficiency (e.g., Germany, Austria, Finland) and exceptionally high efficiency (e.g., Sweden, the Netherlands and Denmark). Based on this analysis, the Hungarian pension system is also low in efficiency, which calls for a comprehensive reform.

5. High employment has a positive effect on the balance of the pension system, but if coupled with low productivity and/or a low contribution rate, in itself is not enough for the long-term sustainability of the system.

The comparative analysis of the pension systems of the European Union, through correlation and regression calculations, has showed that **both employment and productivity influence pension expenditures as a share of GDP, but productivity has more than twice as strong an impact as employment.** The effect of both independent variables is negative, i.e., higher employment leads to lower pension expenditures as a share of GDP, as does higher productivity. The time series analysis has proved that **member states with high productivity can operate their pension systems efficiently in the long term.** If, in addition to high productivity, employment is also high, the pension system can be maintained even with lower contribution rates. High employment in itself, as in the case of Hungary, erodes the sustainability of the pension system by applying lower contribution rates.

6. An efficient and modern pension system is based on a multi-pillar, individual account register, and its long-term sustainability is facilitated by built-in automatisms, making short-term and frequent interventions unnecessary.

No single pension system can simultaneously meet independent and different expectations (such as sustainability, high replacement rate, fairness, appropriate indexation, solidarity between and within generations, efficient investment of capital, etc.), because one expectation may come to the fore at the expense of the other. The solution may be a real multi-pillar system, which is supported by the empirical studies of my thesis. By comparing the results of the European Union pension system efficiency analysis with the cluster analysis of the structure of pension systems, we can conclude that the characteristics of an efficient and long-term sustainable pension system are as follows: It is based on several pillars, in which, in addition to the state's role, the employer and the employee are equally interested. One of the prerequisites for the creation of individual interests is the introduction of individual account records, which makes the performance and the

acquired rights by the individual transparent and clear, both at the micro and macro level. Long-term sustainability is ensured by automatisms that flexibly adapt to economic and demographic changes with the help of built-in algorithms, without the need for short-term political intervention to restore balance. The unaltered parameters of pension systems increase trust in the system, which also improves efficiency.

6. PUBLICATIONS PERTAINING TO THE FIELD OF THE DISSERTATION

Journal article in a foreign language academic journal:

1. *Dora Havay – Jeno Konecsny (2011)*: The relationship between risk and return in the light of the Hungarian private pension system's performance. International Journal of Economics and Finance Studies, Vol. 3, No. 1, 2011. The Social Sciences Research Society, ISSN: 1309-8055. 65-73. pp.

2. *Dora Havay – Daniel Beres – Peter Kalmar (2010)*: The impact of the crisis on the Hungarian private pension system. Journal of International Scientific Publications, Economy & Business, Volume 4. ISSN: 1313-2555, 342-347. pp.

Journal article in a Hungarian academic journal in Hungarian:

1. *Havay Dóra Anna (2023)*: Pénzügyi kultúra: Egy felmérés eredményei a Nyíregyházi Egyetemen [Financial culture: Results of a survey at Nyíregyháza University]. Acta Nyiregyhasiensis 8. Ezerarcú tudomány a régió szolgálatában. Nyíregyházi Egyetem Kiadó, Nyíregyháza, ISBN: 978-615-603-260-7. 114-129. pp.

Articles published in conference proceedings in a foreign language:

1. *Peter Kalmar – Dora Havay – Daniel Beres (2009)*: The examination of risk premiums. Challenges for analysis of the economy, the businesses and social progresses International Scientific Conference, University of Szeged, 19-21 November, 2009. Abstract Book ISBN: 978-963-88468-3-9. 146 p.

2. *Dora Havay – Daniel Beres – Peter Kalmar (2010)*: The impact of the crisis on the private pension system of individual countries, 6th International Conference For Young Researchers, Szent István University, Gödöllő, Hungary, 4-6 October, 2010, ISBN: 978-963-269-193-0. 102-109. pp.

Articles published in conference proceedings in Hungarian:

1. *Havay Dóra Anna (2024, forthcoming)*: Pénzügyi kultúra vizsgálata egyetemi hallgatók körében [The examination of financial culture among university students]. Életmód és Egészségszociológiai Interdiszciplináris kutatások IV. Debreceni Egyetem Egészségügyi Kara, Nyíregyháza (tanulmánykötet).

2. *Havay Dóra Anna (2022)*: Pénzügyi kultúra vizsgálata egyetemi hallgatók körében [The examination of financial culture among university students]. XIV. Nemzetközi Doktorandusz és Posztdoktori Konferencia (absztraktkötet). 153. p.

3. *Havay Dóra – Konecsny Jenő (2011)*: Nyugdíjrendszerek az Európai Unióban [Pension systems in the European Union]. Változó környezet – innovatív stratégiák, Nemzetközi Tudományos Konferencia, Nyugat-magyarországi Egyetem Közgazdaságtudományi Kar, Sopron, 2011. november 2. ISBN: 978-963-9883-87-1.

4. *Havay Dóra – Konecsny Jenő (2010)*: A magyar magánnyugdíjpénztárak választható portfóliós rendszerének teljesítménye [The performance of the optional portfolio system of Hungarian private pension funds]. Hitel, világ, stádium, Nemzetközi Tudományos Konferencia, Nyugat-magyarországi Egyetem Közgazdaságtudományi Kar, Sopron, 2010. november 3. ISBN: 978-963-9883-73-4. 1-15. pp.

MTMT közlemény és idéző összefoglaló táblázat				
Havay Dóra Anna adatai (2023.11.22)				
Közlemény típusok	Száma		Hivatkozások 1	
Tudományos közlemények	Összes	Részletezve	Független	Összes
I. Tudományos folyóiratcikk	7	---	---	---
külföldi kiadású szakfolyóiratban idegen nyelven	---	5	0	0
külföldi kiadású szakfolyóiratban magyar nyelven	---	0	0	0
hazai kiadású szakfolyóiratban idegen nyelven	---	1	0	0
hazai kiadású szakfolyóiratban magyar nyelven	---	1	0	0
II. Könyvek	0	---	---	---
a) Könyv, szerzőként	0	---	---	---
idegen nyelvű	---	0	0	0
magyar nyelvű	---	0	0	0
b) Könyv, szerkesztőként2	0	---	---	---
idegen nyelvű	---	0	---	---
magyar nyelvű	---	0	---	---
III. Könyvrészlet	3	---	---	---
idegen nyelvű	---	0	0	0
magyar nyelvű	---	3	0	5
IV. Konferenciaközlemény folyóiratban vagy konferenciakötetben	6	---	---	---
idegen nyelvű	---	3	0	0
magyar nyelvű	---	3	0	0
Közlemények összesen (I.-IV.)	16	---	0	5
Absztrakt3	2	---	0	0
Kutatási adat	0		0	0
További tudományos művek4	1	---	0	0
Összes tudományos közlemény	19	---	0	5
Hirsch index5	1	---	---	---

Oktatási művek	0	---	---	---
Felsőoktatási művek	0	---	---	---
Felsőoktatási tankönyv idegen nyelvű	---	0	0	0
Felsőoktatási tankönyv magyar nyelvű	---	0	0	0
Felsőoktatási tankönyv része idegen nyelven	---	0	0	0
Felsőoktatási tankönyv része magyar nyelven	---	0	0	0
Oktatási anyag	0	---	0	0
Oltalmi formák	0	---	0	0
Alkotás	0	---	0	0
Ismeretterjesztő művek	0	---	---	---
Folyóiratcikk		0	0	0
Könyvek	---	0	0	0
További ismeretterjesztő művek	---	0	0	0
Közérdekű vagy nem besorolt művek6	0	---	0	0
További közlemények7	1		0	0
Egyéb szerzőség8	0	---	0	0
Idézők szerkesztett művekre	---	---	0	0
Idézők disszertációban, egyéb típusban	---	---	0	0
Összes közlemény és összes idézőik	20	---	0	5