

THE IMPACT OF DEMOGRAPHY, INSTITUTIONAL SOLUTIONS AND FISCAL INCENTIVES ON THE LEVEL OF PARTICIPATION AND INVESTMENT EFFICIENCY OF OCCUPATIONAL PENSION SCHEMES IN CENTRAL AND EASTERN EUROPE

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Abstract

Investment efficiency of a pension system depends on economy, demography and capital market in a country. Those determinants were similar for Czechia, Hungary, Poland and Slovakia in the period 2009-2011. On the other hand, they differ in selected institutional factors and in the level of fiscal incentives. Hungary and Poland had systems arranged by employers, but Polish occupational pension schemes enjoyed the smallest fiscal stimulation. Czechia had an individual system, which was significantly financed by employers. Slovakia had a mixed, employer-individual system. Czech subsidies were among the highest in the world and Slovakian ones were very small. The objective is to estimate the influence of fiscal and institutional factors on investment efficiency and risk. The main result shows that the greater the subsidies, the lower the investment efficiency, but the higher the coverage rate. We argue for long term fiscal stimulation of employers that run voluntary occupational schemes. Occupational plans bear higher market risk than individual ones, but they invest in domestic enterprises and economy. Moreover, fiscal stimulation of individual plans redistributes income towards rich employees and financial institutions.

Key words: *occupational pension scheme (OPP) and their systems, financial efficiency, risk measures, institutional, demographic and fiscal factors*

1. INTRODUCTION

Economic and social factors (demography, adopted legal and institutional solutions for public and complementary and supplementary pension systems in a given country, as well as the state of the economy and capital markets) determine the effectiveness of business and the risks of occupational pension schemes. Moreover, these factors do not exist independently but are interrelated. They form a set of conditions that stimulate or inhibit group retention in the workplace. They affect the effectiveness of investment and the risks associated with the operation of occupational pension schemes.

Systemic solutions in pension systems and their developmental conditions in the European Union vary considerably. It can be stated that they are constantly evolving. This variability of the subject of study makes it difficult to conduct comparative analyzes. This does not mean, however, that detailed analyzes based on historical empirical data cannot carry a significant cognitive value also in assessing the state of present and future development of occupational retirement security in Central and Eastern European countries. They make it possible to verify research hypotheses concerning, inter alia, the impact of demography, institutional arrangements and applied economic and fiscal incentives (e.g. tax breaks, state budget subsidies for participants or sponsors of occupational pension schemes, etc.) on the level of participation and investment effects of occupational pension schemes in a selected group of countries. This study has resulted in formulation and verification of the following hypothesis: the more subsidized the system, the higher the rate of participation, but the lower investment efficiency. This is directly derived from the law of decreasing marginal benefits.

In the analyzed period (2009-2011) the most similar demographic, economic and institutional situation regarding pension schemes appeared in Czechia, Poland, Slovakia and Hungary. The four countries selected for comparative analysis differed by important individual institutional and system solutions in force in 2009-2011. In Poland and Hungary there were typical occupational systems, but the Polish one was the least fiscally supported. In Czechia there was an individual system with considerable

employer funding, while in Slovakia there was an individual-occupational one. The Czech subsidies were the highest in the world, and the Slovakian ones were among the lowest.

The goal of the article has been to estimate the effectiveness and investment risk of the systems under study and to assess their dependence on the adopted institutional arrangements - in particular the economic and fiscal incentives for employers (usually initiating the creation of a pension plan in the workplace) and participants of occupational pension schemes.

It turned out that the more the system is subsidized, the less effective the investments, but the higher the rate of participation. Long-term fiscal support for employers voluntarily running occupational plans is encouraged, rather than supporting individual systems. Occupational schemes are at higher market risk than individual programs, but they invest in stocks and stimulate the economy. On the other hand, subsidizing individual plans serves the participants but also redistributes towards large financial institutions and their transactions. Individual plans cause a paradox when affluent people with higher income benefit more from tax reliefs. Supporting the development of occupational plans can be more effective both in microeconomic (corporate) and macroeconomic terms.

Certain social factors (demography, economy, capital markets and institutional framework) determine the effectiveness of business and the risk of the occupational pension schemes under examination. These macro determinants are difficult to control by governments, and even more so by the founders (employers) and the participants (employees) of individual occupational pension schemes. In Europe during the analyzed period (2009-2011) the most similar demographic, economic and institutional situation in regard to pension schemes took place in Czechia, Poland, Slovakia and Hungary. The classification of the macro determinants of risk and the efficiency of pension schemes in European countries can be found in the authors' previous work, which we also cite in the first two sections of this article.

The four countries selected for comparative analysis differed only by single important institutional and system solutions in force in 2009-2011. Thus, we have adopted this historical period as a perspective for the comparative analysis of the countries and the assessment of institutional differences. The Polish OPP system was voluntary for employers and employees, competed with the mandatory capital pension schemes of the OFE (open pension funds), offered a choice of program forms (investment fund, group life insurance with insurance fund, employee pension fund) but exempted from income tax only limited employer contributions (up to 7% of a participant's gross salary) and from capital gains tax only additional employees' contributions (only a few employees paid voluntary contributions to the OPP). The incentive for employers was also supposed to lie in the fact that the basic contribution paid by employers on behalf of employees was exempt from compulsory social security contributions. Thus, it could have been a cheaper option than a wage increase. The Slovakian and Hungarian occupational pension schemes operated under similar conditions with one significant difference: they offered higher tax incentives and the Slovakian system was of individual-occupational nature. In Czechia there was a voluntary individual system with voluntary but popular participation of employers and the world's highest tax and fiscal incentives. Because of a significant involvement of employers in its financing, this system can be called quasi-occupational.

Section Two presents a detailed description of capital pension systems of the surveyed countries, with particular reference to the role of enterprises. The goal of this article has been to estimate the effectiveness and financial risks of occupational pension schemes in selected countries and to evaluate the institutional and fiscal solutions adopted there. The estimation methodology and the comparative analysis of results are presented in Section Three. The differentiation of domestic results is attributed to the influence of fiscal and institutional factors.

2. EFFICIENCY AGAINST RISK IN A PENSION SYSTEM

In literature risk is understood as a variable whose result is given with a certain distribution of probability, i.e. as a measurable uncertainty. As a rule, business performance and its effectiveness are considered to be risky in all types of operations: business (operational), investment or financial. In the

case of a pension scheme or system, we classify risk according to the number of entities bearing it and an impact of individual entities on that risk:

- Systemic risk refers to a general socio-economic situation that determines pension systems and all their actors. The most crucial here are social, demographic, longevity, macroeconomic, fiscal and political determinants;
- Systemic-institutional risk is attributable to entire groups of equal entities of a pension system (a group of financial and pension institutions, both insurers and investment societies, a group of all pension scheme participants, government or government supervisor);
- Specific risk encumbers an individual system operator and depends on its decisions, that is to say, a single financial-pension institution and a participant or participants of its plan.

Different risk classification in pension schemes includes the following types of risk (Barr, Diamond 2014, p. 57-58):

- Economic risk - the impact of unforeseen economic events on future production and price developments (in the macroeconomic sense a pension system is a mechanism for dividing current GDP between the working generation and the generations of pensioners, hence unforeseen changes in prices or the level of production affect the division and, consequently, the material situation of the working generation and the generation of retirees);
- Demographic risk (the impact of the evolution of fertility, mortality and other demographic variables on pension systems' contributions and liabilities);
- Political risk (political uncertainty affecting all pension schemes - both public and supplementary ones, including occupational plans).

N. Barr and P. Diamond also distinguish the following specific risks associated with capital-funded systems:

- Management risk (an effect of incompetence of pension fund managers or embezzlement);
- Investment risk (fluctuations in the value of financial assets accumulated in a pension fund, wrong investment decisions of pension fund managers);
- Longevity risk (individual risk of longevity regarding the insured in those pension schemes where the accumulated assets are not converted into a life annuity, and for those who live longer than expected these assets may become depleted);
- Market risk ("for a given sum of funds accumulated on a pension account, the amount of benefits paid depends on the life expectancy of the insured and the expected rate of return on the assets invested by the insurer").

The most general classification for each type of risk divides them into clean risks when the probable results include a loss or a zero result (Monkiewicz, Gąsioriewicz, 2010, p. 35-36) or speculative risk when positive results are likely. Clean risk includes bankruptcy of a pension system, which refers to surplus liabilities over assets (in capital-funded schemes) or surplus liabilities (registered in the pay-as-you-go pension systems without financial asset coverage), over current pension contributions (from the working generation).

Obviously, the public pension system's surplus over the available system resources is covered by the state budget. The introduction of a defined contribution formula reduces the risk of bankruptcy by limiting liabilities to the level of contributions that form the basis for the creation of pension capital (in a pay-as-you-go pension scheme). The total or partial privatization of pensions, i.e. the transition to a funded pension system (where the working generation collects assets in pension funds, which would in the future serve as a basis for entitlements for that generation), transfers the risk of bankruptcy to beneficiaries along with the investment risk of valuating system assets (Banks, Emmerson 2000). There also appears (in such pay-as-you-go plans as the one introduced in Poland in 1999) a division of the solvency risk of the pension system (or the bankruptcy risk) between the state and the market. In

public capital pension systems "the state does not take over all pension liabilities, but shares them with the private sector" (cf. Chybalski 2013, p. 18).

This can be assessed differently. Undoubtedly, this is contradictory to the idea of state liability for universal pension insurance, but in the event of actual decentralization of entitlements and resources, it should be possible to reduce the specific risk by investing in the development of domestic enterprises. While pay-as-you-go pension schemes are more vulnerable to demographic risk, capital-funded systems are more vulnerable to investment risk. Therefore, the distribution of risk and the mixed, pay-as-you-go financing of pension schemes seem to be a sensible solution. As a matter of fact, in the public funded pension systems the state remains an ultimate guarantor of pension entitlements, but mixed, pay-as-you-go plans make their participants more co-responsible for their own pension insurance (e.g. by deciding on the choice of a pension fund).

From the previous analysis, it can be concluded that in the pay-as-you-go system all specific risk factors for pension schemes are at the same time systemic, because the state assumes all the risk associated with the solvency of the pension system, and the hidden debt associated with future pension obligations due to demographic aging process, will become increasingly difficult to repay in the future.

In capital-funded pension schemes where numerous pension funds accumulate pension assets, there is a specific risk associated with the investment activities of individual funds. Thus, there is higher importance of institutional and fiscal solutions and supervision. These solutions determine the cost of the funded system, in particular the additional administrative and supervisory costs, and its ability to deliver benefits in the form of specific risk compensation. This applies to both publicly funded public pension schemes and supplementary ones, including corporate plans.

A broader description, discussion and classification of the types of pension risk can be found in (Chybalski 2013, p. 15-20, Brzęczek 2012; Rutecka 2012, p. 18). The already mentioned general systemic risk includes the following systematic factors, i.e. macro-determinants, which are also referred to as social risk:

- Demographic trends, including life expectancy (longevity),
- Economic development level and the wealth of society,
- Public finance sector account,
- Political risk,
- Labor market, including unemployment,
- Interest rate and the value of money over time,
- Currency exchange risk,
- Market valuation and asset situation risk.

We have included the following as systemic and institutional risk factors:

- Institutional-legal regulations,
- Fiscal and tax regulations,
- Organization of supervision and central institutions,
- The structure of the financial and pension services market (usually an oligopoly or an officially regulated market in an event of obligatory pension scheme participation).

The specific risk is related to individual entities and is better compensated when the system is diversified and decentralized due to systemic and institutional factors. This risk includes the following factors burdening insurance or investment companies:

- Management risk,
- Business risk, i.e. operational risk,
- Bankruptcy risk,

and the following types of risk faced by the participants of pension schemes:

- Investment risk including valuation, return rate and liquidity risk,
- Financial risk, including the risk of the amount and regularity of service.

3. SELECTION OF COUNTRIES FOR COMPARATIVE ANALYSIS

The aforementioned risk factors of all three classes burden the efficiency of the system including its financial effectiveness. We wanted to study the impact of institutional and fiscal factors on the financial performance of corporate financial institutions. Therefore, the countries selected for comparison were characterized by a possibly similar level of system macro determinants and system-institutional determinants, but differed in the selected factors. A similarity assessment regarding determinants for EU funded pension systems was conducted in our previous work [Brzęczek 2013], where individual countries were grouped, but the diversity in groups was still very high, and the similarity was averaged over all determinants. That is why grouping was modified as to select countries differing by one institutional factor, and as similar as possible regarding the remaining determinants (instead of averaging similarity). Therefore, we initially compare Poland to Czechia, Romania and Slovakia, whose macro determinants are presented in Table 1.

Table 1. Macro determinants of funded pension systems in: Czechia, Poland, Romania, Slovakia and Hungary in 2010

Determinant	Czechia	Poland	Romania	Slovakia	Hungary
Fertility rate	1.43	1.30	1.25	1.40	1.23
Percentage of the working age population	69.90	71.30	70.00	72.00	68.70
GDP per capita (% of EU average in PPS)	80.00	64.00	49.00	73.00	66.00
Unemployment rate	6.70	9.30	7.40	13.60	10.90
Compulsory participation rate	0	54.80	<i>55.00</i>	43.90	45.40
Voluntary participation rate	61.20	1.30	<i>2.90</i>	18.40	18.90
Number of funds per million inhabitants	1.00	0.50	<i>1.00</i>	2.00	7.80
Size of tax reliefs (% GDPB07)	0.10	0.20	no data	0.20	0.10

Source: Based on [Brzęczek 2013], [Eurostat 2013], [OECD 2012, p.105, 227] and [OXERA 2013];
Note: the figures for Romanian in italics were available for 2012 [CSSPP 2013].

Table 2. Institutional and fiscal determinants of selected supplementary pension systems in: Czechia, Poland, Romania, Slovakia and Hungary in 2009-2011

Feature	Czechia	Poland	Romania	Slovakia	Hungary
Name of the national scheme	Doplňkové penzijní spoření	Occupational pension scheme (OPS)	Administrator de fonduri de pensii facultative	Doplňková dochodková spoločnosť	Foglalkoztatói nyugdíj (biztosítás / szolgáltatás)
English name of the scheme	Supplementary pension system with state contribution (SPFS)	Employee Pension Fund	Privately managed optional components	Supplementary retirement pension savings	Employer arranged pension (EAP), IORP
Financial form	fund	fund, insurance	fund	fund	fund, insurance
Manager / Elective by a single participant?	pension society / yes	investment, insurance, employee society / no	investment society / yes	pension society SPAMC ¹ / yes	insurance or employee society / yes
Individual / occupational	individual	occupational	double ²	double ²	occupational
Accession / continuation / financing by the plant	not applicable / not applicable / voluntary	voluntary / voluntary / compulsory	voluntary / voluntary / voluntary	voluntary / voluntary / voluntary	voluntary / voluntary / compulsory
Participation / continuation / funding by the participant	voluntary / voluntary / voluntary	voluntary / voluntary / voluntary	voluntary / voluntary / voluntary	voluntary / voluntary / voluntary	voluntary / voluntary / voluntary
Taxation of phases; other fiscal ³	n/d; government surcharge	T/T/E/E; -	n/d, generally yes	E/E/T/T	n/d

¹ Supplementary Pension Asset Management Company

² According to EIOPA [2013], but as for Slovakia in OECD sources (2012, p.105, 227) and OXERA (2012, p. 248) SPAMC is considered to be a personal system and the PAMC as an occupational one.

³ Taxation of employer / employee / capital gains / periodic benefits: T/T/T/T, and release of a financial stream – E.

Source: based on EIOPA 2013, Insurance Europe 2013, OECD 2012, OXERA 2012.

Institutional and fiscal determinants of the compared systems are presented in Table 2. A supplementary pension scheme is considered occupational if employers voluntarily or forcibly fund employees' contributions. Hence, an individual (personal) insurance plan, with an option of funding by employers, is considered quasi-occupational. This type of a mixed system was present in 2010 in Czechia and Romania. In Czechia there existed a voluntary personal pension scheme where the contribution was primarily funded by the participants but was widely and significantly co-financed by employers and, as a special solution, also by the state budget. The Czech supplementary individual pension scheme involving employers and the state in the financing of contributions is similar to the Polish occupational pension scheme regarding the voluntary participation of the insured and the employers. It is distinguished by high fiscal support from the state budget, whose impact on the financial effectiveness of the system and its risk will be investigated. The employees' obligation to join and continue to cover the insurance usually concerned those of a younger age, while the remaining employees had a choice.

4. METHODOLOGY TO DETERMINE THE EFFICIENCY AND RISKS OF THE SYSTEMS AND RESULTS

Investment effectiveness is measured by the rate of return, and investment risk usually follows the standard deviation of this rate of return. In the case of financial investments the following are determined: the rate of return per unit of risk rate (Sharpe ratio), per unit of capital market risk (Treynor ratio) or regarding market rate of return and market risk (Jensen's index) (Chybalski 2009). We will calculate the rate of return r_t of the occupational pension scheme in the t period on the basis of the aggregate data and the following formula:

$$r_t = \frac{\Delta \text{ net assets - contribution}}{\text{average net assets}},$$

The contribution is understood here as net, i.e. after the deduction of commission fees. The above formula also shows the decomposition of the rate of assets growth:

$$\frac{\text{net assets}_{t+1}}{\text{net assets}_t} = (1+r_t) \left(1 + \frac{\text{contribution}}{\text{average net assets}_t}\right).$$

The geometric mean (complex) annual rate of return over 3 years will be calculated using the following formula:

$$\bar{r} = \sqrt[3]{\prod_{t=1}^3 (1+r_t)} - 1.$$

While the average rate of return assuming continuous capitalization will be calculated using the following formula:

$$\bar{r} = \frac{1}{3} \ln \prod_{t=1}^3 (1+r_t).$$

Input data is presented in Table 3. Based on the data in Table 3 and the formulas given, we have calculated and presented in Table 4 the variables describing financial performance and risk of the analyzed systems. Sharpe and Treynor ratios have not been calculated because they lead to erroneous conclusions when the rate of return on assets is negative or lower than the risk-free rate, as it happened in some of the studied cases.

Table 3. Basic data on occupational pension schemes in the following countries: Czechia, Poland, Slovakia and Hungary in 2008-2011

Variable	Czechia	Poland	Slovakia	Hungary
Net assets '08	191 705	3 607 736	2231013	749 438
Net assets '09	215 872	4 998 236	2 899 531	756 109
Net assets '10	232 426	6 286 101	3 717 848	811 248
Net assets '11	247 605	6 597 700	4 591 370	835 885
Contribution '09	35 583	889 013	no data	91 076
Contribution '10	32 601	974 622	no data	79 506
Contribution '11	32 248	1 072 325	no data	80 552
Number of participants '09	4 395 000	333 544	1 434 870	1 328 414
Number of participants '10	4 528 000	342 489	1 442 058	1 298 094
Number of participants '11	4 566 000	344 643	1 450 705	1 267 284

Currency units: Czechia - million crowns, Poland - thousand PLN, Slovakia - thousand euro, Hungary - million forints.

Source: based on Sebo 2013 and data from experts: Dr. Richard Bense (The Central Bank of Hungary), Liviu Ionescu (CSSPP), Dr. Dariusz Stańko (OECD), Prof. Eng. Jaroslava Vostatka (University of Finance and Administration in Prague). We would like to thank all the experts, also those not mentioned here.

On the other hand, Jensen's alpha requires the market rate of return to exceed the risk-free rate. The condition was fulfilled and therefore we have calculated the Jensen α_i index for the i -th analyzed system using the following formula:

$$\alpha_i = \bar{r}_i - \beta_i(\bar{r}_{mi} - r_{fi}) - r_{fi}$$

where:

\bar{r}_i - the geometric mean rate of return i - of the analyzed pension scheme,

β_i - market risk coefficient for the rate of return of i -th pension scheme, which we have calculated on the basis of correlation with the i -th rates of return for stock index (PAX, WIG, PAX, BUX),

\bar{r}_{mi} - the average market rate of return of the i -th stock index,

r_{fi} - the risk-free interest rate in the i -th country system on the basis of the average annual yield of long-term government bonds according to the Maastricht criterion [Eurostat 2013] (according to the order of countries in the table: 4.14, 5.95, 4.34, 8, 01).

Table 4. Evaluation of the efficiency and financial risk of occupational pension schemes in the following countries: Czechia, Poland, Romania, Slovakia and Hungary in 2009-2011

Variable (%)	Czechia	Poland	Slovakia ¹	Hungary
Return rate '09	-5.60	11.65	0.00	-11.21
Return rate '10	-7.16	5.55	2.54	-3.11
Return rate '11	-7.11	-11.81	-2.29	-6.79
Average compounded rate of return	-6.63	1.30	0.06	-7.10
Average continuously compounded rate of return	-6.86	1.29	0.06	-7.36
Midterm standard deviation	0.72	9.94	1.97	3.31
Factor β (non-nominal)	0.02	0.35	0.05	-0.06
Jensen index	-10.78	-7.83	-4.30	-14.48
Average participation rate of the working-age population	61.34	1.24	28.27	18.92
Average increase in participation rate	1.17	0.02	0.12	-0.45

¹ The rates of return of the Slovakian system were calculated as the weighted average of the net assets of the SPAMC rates accepted after Sebo 2013.

The analysis of the results presented in Table 4 has led us to the following conclusions:

1. The amount of fiscal incentives that diminished according to the order of countries: Czechia, Hungary, Poland, Slovakia [Whitehouse 2006], determine the rate of participation more than investment efficiency. Slovakia is an exception here, but Table 2 suggests that in Slovakia the contributions of employees were not taxed, while in Poland they were. In addition, the Slovakian employer enjoyed voluntary funding, while the Polish one faced compulsion in this regard, if they had decided to run the program.
2. The faster and more subsidized the less effective the pension system is regarding investments. Investment efficiency of the analyzed plans, assessed on the basis of Jensen's alpha, is far below the efficiency of the stock market and government bonds interest rate. Only Polish and Slovakian voluntary occupational pension schemes avoided losses in the period of global economic stagnation.
3. Individual or individual-occupational systems (Czechia and Slovakia) are less burdened by investment risk than occupational ones (see standard deviation in Table 4).
4. In a strict occupational system, the exposure to the stock market risk is higher. The highest, although defensive (below 1), β coefficient was present in the Polish system. It follows that occupational plans invest more in domestic companies. This can be seen by comparing with an individual Czech system whose β coefficient was determined to be closest to zero, i.e. not responding to the economic boom.

5. FINAL CONCLUSIONS

The article compares employers' roles in voluntary supplementary pension systems in Central Europe: Czechia, Poland, Romania, Slovakia and Hungary. As a result of the comparative studies, a great diversity of institutional and fiscal solutions applied in 2009-2011 has been noticed. Poland and Hungary offered typical occupational pension schemes. Slovakia maintained an individual-occupational (quasi-occupational) plan. Czechia and Romania, on the other hand, offered individual plans with the option of financing by employers instead of purely occupational ones. Of this pair Czechia was selected for further analysis, because its system offered the highest level of fiscal

incentives in the world. The in-depth comparison involved evaluating the investment effectiveness and risk of the systems under study and examining their dependence on institutional and fiscal solutions. It should be noted that the social and economic conditions in the group of analyzed countries seemed similar, which allowed us to conduct detailed comparisons.

The study required collecting relevant data from secondary sources, the access to which was possible thanks to the assistance mentioned in the expert text. Thank you once again. In order to assess the investment efficiency, return rates and their averages were determined for 2009-2011. The most useful in this area was the Jensen's index, whose measurements were conducted in relation to specific conditions of individual countries regarding capital markets and interest rates. The investment risk was measured by the standard deviation of the rate of return and the β coefficient of the sensitivity to the stock market risk.

The most important conclusion from our study suggests that empirically verified interdependence actually exists: the more the system is subsidized, the less effective it is, but it attracts a lot of participants. It encourages the use of deferred incentives over time. On the other hand, fiscal incentives are granted to employers who voluntarily establish and control occupational pension schemes. It has also turned out that occupational schemes carry a higher total risk by engaging in the stock market risk and investing in domestic companies. An interesting direction for further research would be sectorial investment flows generated by occupational pension schemes.

Occupational plans are more risky, but they also offer higher rates of return. The Polish system represented a higher average rate of return than the Slovakian one, which in turn was higher than the Czech one. The Hungarian system has not confirmed this rule, but it should be noted that the system was on the eve of dismantling, and already in 2010 the compulsory individual capital system was dismantled there. These events undoubtedly affected the performance of the Budapest Stock Exchange. These dependencies also confirm the readings of the Jensen's Performance Index.

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