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Towards the Financial Sustainability of Public Pension Insurance Systems

Introduction

In the following study, the author attempts to explain why the issue of financial stability of pension insurance is also an issue of key importance for public finances and their stability. Repeated attempts to improve pension insurance models and systems have been met with increasing social dissatisfaction expressed in protests, demonstrations and even riots in the countries where such reforms are undertaken.

Almost no country is free of the problems the funding of public pension insurance brings about, and all countries stricken with such problems share a common feature; the system of the old-age benefits to citizens in all of them is based on the pay-as-you-go model of pension insurance originating in the nineteenth century, hard though it may be to explain why the scheme remains the core solution for social security of citizens after they have reached retirement age. In Poland, as in many other countries, the largest public fund, second only to the state budget, is the Social Insurance Fund, and the bulk of its resources (more than half) are earmarked for pension purposes. The management of the resources is, as mentioned above, based on the pay-as-you-go scheme, established over 130 years ago, which is now viewed as rather archaic from an economic point of view. Any attempt to interfere with the system's solutions results in social dissatisfaction while creating further problems for public finances. At the same time, the failure to resolve the problems poses the threat of bankruptcy to pension insurance systems. In the worst-case scenario, it could actually result in the collapse of the state budgets. Even the short remarks above clearly indicate that the issues the author raises actually deserve some scholarly reflection. To achieve this research goal, the author used historical, comparative and statistical research methods.

1. The (shortest) history of pension insurance

Chancellor Otto von Bismarck established what was called common pension insurance (*Sozialversicherung*[1]) in 1889, and this is most often referred to as the date of its introduction in Europe. This simplified form of security, or old-age benefit, as it should actually be called, was supposed to provide certain resources to persons having lost the capacity to earn money due to their age and thus secure them (or, in the event of their death) their families. A hundred years ago, at the request of the World Bank, a report on providing the elderly with decent retirement benefits, the financial viability of the pension system, and the model of the legal and financial structure of pension insurance was developed and published. The conclusions formulated in the report were so alarming that it was entitled 'Averting the Old Age Crisis. Policies to Protect the Old and Promote Growth'[2]).[3]

That very old age in question, or rather the prolonged average life span, including the retirement age entitling one to receive benefits, in the late twentieth and early twenty-first centuries, became a source of the crisis for the existing pension systems in Europe; as it happens, they have not changed much since their start.

Under the state-guaranteed pension system established by Bismarck, all insured workers who reached the age of 65 were covered. Funding the pension system was based on resources brought in, as contributions, by employees. Oftentimes they were employed between 16 and 65 years of age, but their average life expectancy at that time was merely 54 years. This model was simply bound to succeed, and from the economic point of view it was a kind of a perpetual motion machine (*perpetuum mobile*).

Pension benefits for people who acquired the right to them upon reaching the statutory retirement age, were paid from the insurance fund coming from contributions paid by employees. This, in simple terms, is what the pay-as-you-go model consists of – the working generation makes contributions that supply the fund from which retirement benefits are paid to members of the generation that has completed its working career.

As regards Great Britain, in November, 1942, Sir William Beveridge produced to the House of Commons the report on 'Social Insurance and Allied Services' (The Beveridge Report[4]). Despite popular belief, Beveridge is not the father of the British pension system, but just the author of said report. However, it was on the basis of the Beveridge Report that the Beveridge Plan was introduced by Winston Churchill's government in Great Britain. Pension insurance was supplemented with the additional element: of social security for unemployed people, which was most criticized by those who re-

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[1] M. Kozłowski, *Emerytalna wojna pokoleń* [*Intergenerational Pension Conflict*], https://zielonalinia.gov.pl/-/emerytalna-wojna-pokolen-6554 [accessed: 2022.10.12].
[2] *Averting The Old Age Crisis. Policies to Protect the Old and Promote Growth*, Oxford 1994.
[3] For a broader discussion see: T. Sowiński, *Finanse ubezpieczeń emerytalnych* [*Pension Insurance Finance*], Warszawa 2009, pp. 326–328.
[4] W. Beveridge, *Social Insurance and Allied Services*, Report by Sir William Beveridge, Presented to Parliament by Command of His Majesty, November 1942, London.

ceived any benefits thanks to them, which they probably would not have received without their introduction. Beveridge should definitely be praised rather than blamed for his plan.

Bismarck does not necessarily deserve recognition for the reasons that stood behind the establishment of pension insurance. This was not done upon a sudden impulse of heart and mind, nor as a statesman's deed, but rather cynically, with a view to achieving immediate political goals;[5] he was set on liquidating the system after just a couple of years because, as he himself admitted, it was nothing more than a hoax. Nothing of the sort happened, though, and the pension model based on the pay-as-you-go principle survived for much more than a century and remains, without economic reason, the basis of a majority of modern pension schemes in Europe.

The social insurance system was not established in Poland until the interwar period after the country regained independence in 1918. Independent Poland, reborn after 123 years of harsh foreign rule, took over the insurance systems of the powers that had partitioned it at the end of the eighteenth century. Regardless, the Polish system was one of the first social insurance systems established in Europe and elsewhere.

The legislation that completed work done over many years that was unambiguously recognised as a great success and an achievement of the Second Republic (as pre-war Poland was referred to) was the Act of 28 March 1933 on Social Insurance,[6] known as the Consolidation Act.[7] It established a new order in integrated common social insurance as of 1933 in the form of a unified organisational system, albeit one that included five separate funds.[8] At that time, this, was definitely the world's best social insurance system. From the point of view presented in this paper, it is also essential to note that it included a most precisely elaborated pay-as-you-go pension insurance model, which perhaps only another Polish model of the same kind, developed and implemented by the country in 1987, could match. Limitations of space do not allow for providing a justification to these evaluative statements, the author, nevertheless, does undertake this task in other articles.[9]

It is usually not creative zeal or the intention to develop a perfect model to ensure stable, acceptable pension insurance rules that lies behind efforts made to develop such systems. Instead, the politicians, academics and experts involved fight over the correctness of their proposals but the dispute is actually futile since neither the pay-as-you-go model, preferred by the social security law, or the capital model, presented most often by economists, has any chance of success. Neither of the proposals

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[5] O. von Bismarck, *Collected Works*, vol. 9, Berlin 1924–1935, pp. 195 and 196.
[6] The Social Insurance Act of 28 March, 1933, Journal of Laws, No. 51, item 396.
[7] T. Sowiński, *Finanse ubezpieczeń emerytalnych…*, p. 77.
[8] More on the funds of contemporary social insurance system see: Z. Ofiarski, *Prawo finansowe* [*Financial Law*], 2nd ed., Warszawa 2010, pp. 420–429.
[9] For instance: T. Sowiński, *Podmiotowa koncepcja zabezpieczenia emerytalnego. Studium prawno-finansowe* [*Person-Based Concept of Pension Security*], Warszawa 2019, p. 259; *idem, In Search for a Model of State Pension Insurance Financially Viable and Independent of the Central Budget* [in:] *The Financial Law Towards Challenges of the XXI Century*, eds. P. Mrkývka, J. Gliniecka, E. Tomášková, E. Juchniewicz, T. Sowiński, M. Radvan, Gdańsk–Brno 2020.

is able to provide funds for paying retirement benefits to people how have acquired the rights to them (see Fig. 1) now, much less in the future, when all the phenomena adversely influencing the coherence and solvency of the pension model are bound to affect it much more.

2. The square of opposition of pension insurance
based on the pay-as-you-go model

A broader discussion of the square of opposition for pension insurance based on the pay-as-you-go model is available in other studies by the author.[10] The current study is concerned first of all, with the conclusions drawn from the logical consequence of the assumptions of the pay-as-you-go pension insurance model and the capital model.

The idea of the determinants of the pay-as-you-go model of pension insurance boils down to four indicators arranged to form two opposing pairs:

1A. long periods of professional activity;

1B. retirement period;

2A. high contributions to the pension system;

2B. small pension benefits.

A precondition for the success of this model is the additional fifth indicator of the replacement rate, which is in this particular case generated by the birth rate.

The intrinsic logic of the square of opposition concerning the pay-as-you-go pension model is that a change in of any of the indicators generates the need to modify another or even all the other indicators to maintain the model's status quo.

period of professional activity

size of pension
contributions

generational
substitution
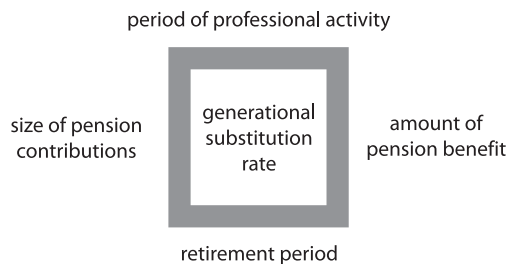rate

amount of
pension benefit

retirement period

Fig. 1. Square of opposition of a pension insurance system based on the pay-as-you-go model

Source: author's own elaboration.

Where there is no will to change pension models, there is always a last element inextricably linked to the funding of the pay-as-you-go model of pension insurance,

10   T. Sowiński, *W poszukiwaniu wydolnego finansowo modelu emerytalnego* [*Searching for a Financial-ly Sustainable Pension Insurance Model*] [in:] *Z zagadnień zabezpieczenia społecznego* [*From the Issues of Social Security*], ed. A. Wypych-Żywicka, Gdańsk 2019; *idem*, *Podmiotowa koncepcja…*, p. 259.

namely the injection of public funds, usually from state budgets. However, such actions endanger fiscal sustainability in the long run.

However, taking into account that since for at least two generations all these indicators have changed many times, obviously in the spirit of 'optimisation', improving the system and maintaining solidarity of the insured, any room for manoeuvre has, in practical terms, been reduced to nil and any subsequent changes require sophisticated acrobatics to justify them, although reasons for changes, regardless of their justifications, are always the same: the lack of financial resources in the existing pay-as-you-go pension model for the payment of benefits to people who have already reached retirement age and are entitled to pensions.[11]

It should be noted here clearly that the introduction of the capital model, which is proposed by many, especially economists, as a solution to the financial problems faced by the pay-as-you-go model, is actually not a solution at all. The consequences of the square of opposition of pay-as-you-go pension insurance model also apply fully to the capital model, which is supposed to be launched as a universal one; save for organisational and legal changes, this change is meaningless from the point of view of its financial resources! The general indicators remain the same. The only difference lies in the organisation of the model, meaning a transition from multiplicity in unity (the pay-as-you-go model) to unity in multiplicity (the capital model). However, in the search for new models (or at least a concept of a pension security organisation that would be capable of bearing the burden of public finance needs, not to mention meeting social expectations), the inertia of those responsible for public pension systems is unacceptable.

3. Analysis of data and forecasts regarding pension insurance finances

This part of the study presents and analyses selected forecasts concerning revenues and spending of the Pension Fund (Polish: FUS) until 2060 and 2080, as well as the development of the population of those insured until 2080 and even 2100.

The FUS17 model was developed following the rules of actuarial science and is a long-term forecasting model based on historical data and input parameters that predicts the revenues and spending of FUS resources until 2080.[12]

The author assumes that if neither history nor logic can provide arguments for the urgent development of a new pension model that can withstand the economic situation and prove to be financially efficient, then it is the branch of knowledge firmly based on statistical data, such as mathematics, that one cannot argue with. However, it cannot be ruled out that supporters of the pay-as-you-go model and the so-called idea of solidarity of the insured may prove resistant to these arguments as well.

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[11] T. Sowiński, *W poszukiwaniu…*, pp. 92–94.

[12] *Forecast revenues and spending of the Pension Fund until 2080*, Department of Statistics and Actuarial Forecasts, ZUS [Social Insurance Agency], Warsaw 2019, pp. 5–7.

The statistical data presented here (see Fig. 2) were developed assuming the estimator of the mean sample value as the expected value of normal distribution based on a specific sample of the population providing an assessment of the parameter in the study presented.[13]
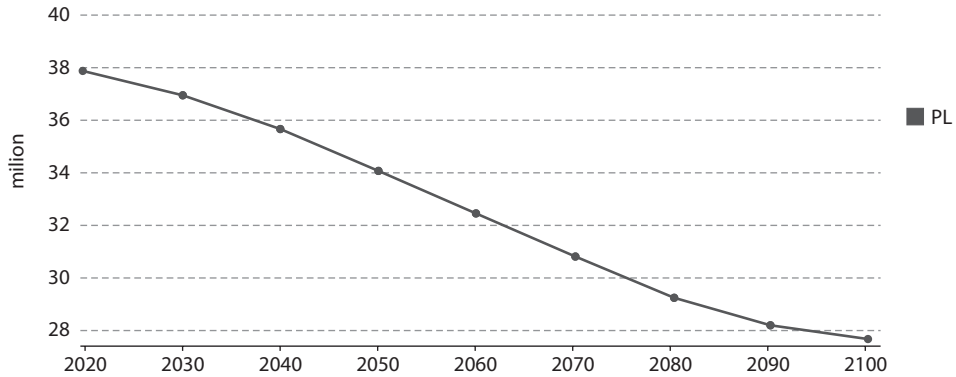
Fig. 2. Poland population forecast until 2100

Source: Eurostat.

For the sake of data completeness and comparison, a similar forecast is provided for the European Union population (see Fig. 3).
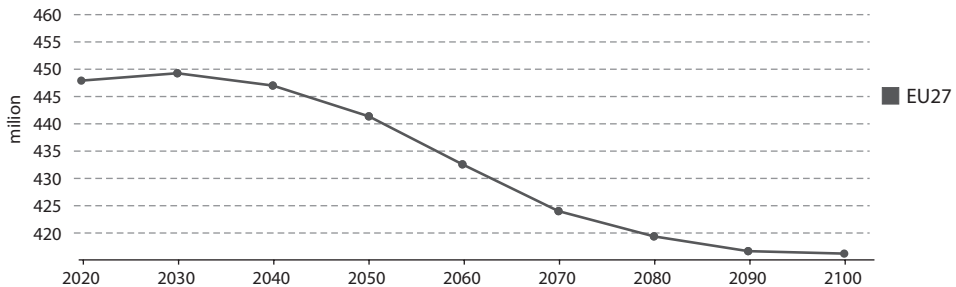
Fig. 3. European Union population forecast until 2100

Source: Eurostat.

In both graphs (Figs. 2 and 3) a clear downward trend in the population of citizens of both Poland and the European Union is notable. In the EU, it takes place after a slight

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[13]   The number of persons active in the labour market were calculated based on the numbers of those working and the unemployment rates provided by the Macroeconomic Policy Department of the Minister of Finance. *Ibid.*, pp. 9–10.

increase in the population around 2040, but in the following years the numbers drop dynamically. For pension insurance resources and public finances this means rapidly growing problems in balancing pension funds and the need to support them. This can be done either from budgetary funds or through changes in the structure of the logical square of the pay-as-you-go pension insurance. It is also possible to combine both options to mitigate the easily predictable consequences of these occurrences. These would include, firstly, problems with balancing state budgets and public finances, and, secondly, possible, or rather certain, as previous experience shows, social unrest. The forecast population size in the 2020–2080 period is likely to decrease in a way that will dramatically change the financial situation of the pension funds,[14] which will translate into disastrous effects for the finances of pay-as-you-go pension insurance model upon which is organized the majority of pension systems in European countries. A drop in the number of insured, accompanied by a simultaneous rise in the number of people receiving pension benefits will, in practical terms, result in the insolvency of pension systems based on the pay-as-you-go principle.

Tab. 1. Population by economic age group (in thousands) as at the end of the year – definitions of economic age groups in the 2015–2060 period

Economic age group	Year						Notes
	2015	2020	2030	2040	2050	2060	
Total population	38 490	38 346	37 403	36 108	34 696	33 126	–
Pre-working age	6 959	6 954	6 233	5 561	5 499	5 230	–
Working age	24 020	22 818	21 569	19 976	17 427	16 029	−7 991
Post-working age	7 511	8 573	9 610	10 570	11 769	11 867	+4 356
Notes	–	–	–	–	–	Difference in millions	12 347

Source: *EUROPOP 2013, Demographic Forecast*, Eurostat 2015; calculations provided by the author.

The following conclusions were drawn from the analysis of the figures in Table 1:
1. the total population data presented reveals that the population in 2060 will be smaller than that in 2015 by 5,364,000;
2. the number of working-age people will decrease by 7,991,000 in this period;
3. the number of post-working age people will increase by 4,356,000;
4. the total population difference between these two groups (2 and 3, above) indicates that the changes in the proportion affecting the replacement rate will be 12,347,000 people. Thus, these relations will deteriorate in a way that radically changes the financial situation of pension funds;

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[14] More on the funds of contemporary social insurance system see: Z. Ofiarski, *Prawo finansowe…*, pp. 420–429.

5. the number of people of pre-working age will also decrease significantly, meaning that this trend will continue.

A reflection of the demographic situation in the period analyzed, which is extended to cover the 2020–2050–2080 span, are the age pyramids that present the entire population of the selected years differently and reveal, when compared with each other, the aforementioned demographic trends.[15] Their analysis and comparison shows the advent of a successive decline in the population that will result in a certain stability and the lack of extended and, consequently (after some 40 to 50 years) reduced periods of population growth, i.e., demographic booms and busts. While a situation like this will result in greater predictability of the financial needs of pension systems and their capacity in the periods in question, no change will occur in the decreasing trend of the replacement ratio since there are no periodical ups or downs in it. This will also result, especially in the first years of the period analyzed, in certain significant discrepancies in the replacement rate and, consequently, also in the resources generated for pension funds compared to those needed for paying benefits to those entitled to them; this is bound to be a significant problem for the financial capacity of the pension systems.

According to Fig. 4, population trends in Poland and the European Union as a whole are similar, and are both unfavourable. When taking into account the operation of the
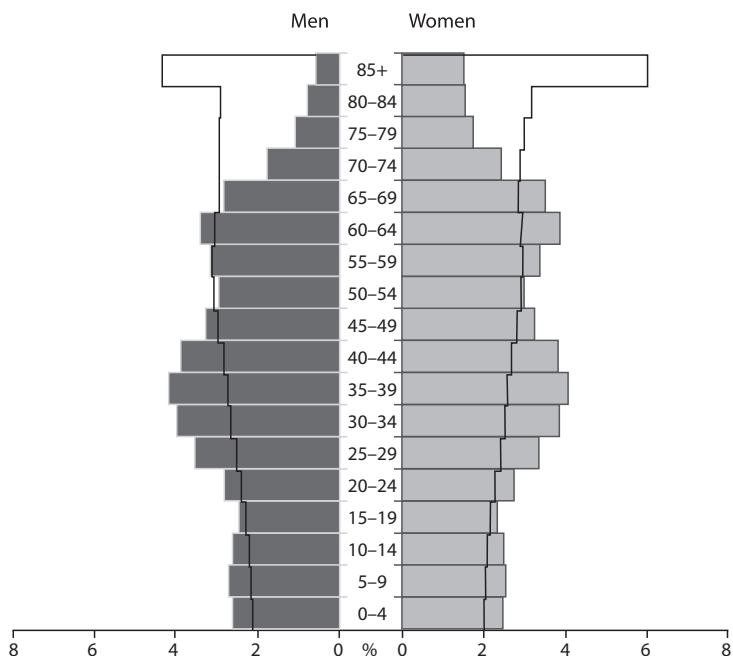

Fig. 4. Sex and age structure in 2019 and 2100

Chart (grey colour) – sex and age structure in 2019, black lines – sex and age structure in 2100.

Source: Eurostat.

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[15]   *Demographic Forecast of the Ministry of Finance* [in:] *Forecast…*, p. 17.

square of opposition of the pay-as-you-go pension model, they clearly demonstrate the need to immediately implement remedial actions aimed at maintaining the solvency of pension insurance funds or at least reducing their insolvency.

The data above should be supplemented with an age pyramid showing the difference in the state of the population of citizens of the EU between 2019 and 2100.

Thus, it is necessary to specify the data that have been analysed thus far to identify future problems and threats to European society more precisely and to prepare for them.

The following conclusions can be drawn from the contents of Table 2:
1. the cumulative natural population change in the period analysed is approximately – 125,333,700, which is the difference between the number of births and deaths;
2. the total population change in this period is −27,273,600;
3. cumulative net migration is +98,060,000;
4. Table 2 reveals that despite the decrease in population of 125,333,700, the actual decrease in the European population is only 27,273,600 because of an unprecedented influx of migrants of about 100 million. Only conclusion 1 is indisputable, as it confirms all other data presented in this study. Conclusions 2 and 3, which are mutually interdependent, are rather unlikely. It is difficult to justify the magnitude of migration in conclusion 3, also if deliberately inspired.[16] Irrespective of doubts, even if the migration assumptions are correct, the population of European Union citizens will still decrease by 27,273,600 or about 7%, which is a fairly significant number. Should migration not reach the predicted level, then the population difference would be 125,333,700 (28.06%, or almost one-third of the initial number of 446,735,300). This number, as far as sustainable pension insurance funding is considered, has to be viewed as one that creates an entirely different situation, requiring a new approach to current problems and calls for solutions other than the existing ones.

When analysing the medium and long-term forecasts of the populations of Polish and European Union citizens, the expected proceeds from contributions to the insurance system, and the forecast amounts of resources necessary to pay benefits from pension funds, assessments made must take into account the perspective measured not in years but in several decades, which exceeds the lifespan of the insured by two generations. This perspective is often neglected by decision-makers who attempt to improve the pay-as-you-go models in a majority of countries. Instead of implementing long-term measures, they prefer short-term fixes, or they address emerging problems as they occur, and even if theoretical assumptions for the future are made, they are rarely supported by forecasts such as those presented in this study.

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[16] Even if the data should prove to be accurate, there remains a question as to what kinds of migrants can be expected in these numbers and how many of them would join the ranks of those working and paying insurance premiums (I am not talking about taxes and other public levies here), increasing the layer of professionally active people and improving the replacement rate, and how many would join the ranks of people in need of care and social assistance, increasing social expenditures of the budgets of individual countries, without replenishing the resources of pension funds.

Tab. 2. Numbers of current and estimated future populations of European countries and estimated births, deaths and migration in the 2022–2100 period

Demographic balance, 1 January 2022–2100 (thousands)

Country	Population	Cumulative births	Cumulative deaths	Cumulative natural population change	Cumulation net migration	Total population change	Projected population
	1 January 2022	2022–2099					1 January 2100
EU	446 735.3	291 262.3	416 595.9	−125 333.7	98 060.0	−27 273.6	419 461.7
Belgium	11 617.6	8 975.7	10 540.0	−1 564.2	2 502.6	938.4	12 556.1
Bulgaria	6 838.9	3 693.1	6 633.6	−2 940.6	1 173.6	−7 767.0	5 072.1
Czechia	10 516.7	7 808.9	9 885.6	−2 076.7	2 205.7	129.0	10 645.7
Denmark	5 873.4	4 538.3	5 376.5	−838.2	1 090.8	252.6	6 126.1
Germany	83 237.1	58 027.4	78 538.7	−20 511.4	21 391.6	880.2	84 117.3
Estonia	1 331.8	925.2	1 294.8	−369.6	327.1	−42.5	1 289.5
Ireland	5 060.0	4 361.8	4 666.6	−304.8	1 116.2	811.4	5 871.4
Greece	10 459.8	5 017.2	9 246.4	−4 229.1	1 052.0	−3 177.1	7 282.5
Spain	47 432.9	27 417.7	46 032.3	−18 614.6	16 303.2	−2 311.4	45 121.4
France	67 871.9	52 842.6	60 065.6	−7 223.0	7 393.9	170.9	68 042.8
Croatia	3 862.3	1 949.4	3 606.7	−1 657.4	617.7	−1 039.7	2 822.7
Italy	59 030.1	29 905.1	57 526.3	−27 621.2	18 785.6	−8 835.6	50 194.5
Cyprus	904.7	695.6	774.7	−79.1	182.2	103.1	1 007.7
Latvia	1 875.8	903.1	1 654.6	−751.4	41.6	−709.8	1 165.8
Lithuania	2 806.0	1 279.1	2 664.6	−1 385.5	355.2	−1 030.3	1 775.7

Luxembourg	645.4	627.1	675.1	−48.0	399.8	351.8	997.3
Hungary	9 689.0	6 600.5	9 212.5	−2 612.0	1 977.1	−634.9	9 054.1
Malta	521.0	422.4	618.3	−195.9	434.0	238.1	759.1
Netherlands	17 590.7	13 277.2	16 226.6	−2 949.4	3 669.1	719.7	18 310.4
Austria	8 978.9	6 289.3	8 485.6	−2 196.2	2 794.0	597.8	9 576.6
Poland	37 654.2	21 008.5	34 373.8	−13 365.4	5 227.1	−8 138.2	29 516.0
Portugal	10 352.0	5 753.5	9 818.2	−4 064.7	2 693.8	−1 371.0	8 981.1
Romania	19 042.5	11 428.2	16 999.9	−5 571.7	1 138.8	−4 432.9	14 609.5
Slovenia	2 107.2	1 335.1	1 977.0	−641.9	485.5	−156.4	1 950.8
Slovakia	5 434.7	3 397.2	4 922.5	−1 525.3	643.0	−882.2	4 552.4
Finland	5 548.2	3 268.8	5 137.9	−1 869.1	1 105.6	−763.5	4 784.9
Sweden	10 452.3	9 514.2	9 641.4	−127.2	2953.1	2 825.9	13 278.2
Iceland	376.2	422.6	389.5	33.1	215.4	248.6	624.5
Norway	5 425.3	4 328.7	5 059.0	−730.3	2 036.6	1 306.2	6 731.6
Switzerland	8 738.8	6 609.4	8 097.5	−1 488.1	2 853.6	1 365.5	10 104.3

Source: Eurostat.

The author has used four sources of data in this paper.[17] Similar data and results are available from institutions like the World Bank, the Council of Europe or from virtually any country where data is kept by bodies and organisations responsible for pension insurance. It is rather telling that the results obtained by such institutions are very similar, which strongly suggests that data from all these sources are correct.

All this definitely corroborates the view presented above that pay-as-you-go pension insurance, while archaic, cannot actually be reformed. It is essential that a new model is established to secure citizens' social status with regard to pension benefits. Meanwhile, the option to divert from public pension security in its current form (or even entirely) must not be ruled out.

Given the magnitude and significance of the phenomena and conclusions discussed above, they are worth examining more closely, and the same holds true for the replacement ratio.[18] This coefficient also provides us with an idea of how realistic it is to secure financial resources for the payment of retirement benefits from contributions. This is especially apparent when reading the ratio individually, in the version of how many working people and their contributions are needed to cover the retirement benefit of a single person.

For this purpose, the author also mentions the replacement rate in Table 3 below.

Tab. 3. Number of insured persons in relation to the number of pensioners whose benefits are paid from the pension fund in 2020–2080 (in thousands)

Year	Number of insured	Replacement ratio	Number of pensioners
2020	15 964	2.53	6 320
2021	15 992	2.47	6 469
2022	15 978	2.42	6 613
2023	15 957	2.36	6 757
2024	15 870	2.30	6 889
2025	15 773	2.25	7 003
2026	15 659	2.21	7 082
2027	15 552	2.18	7 150
2028	15 466	2.14	7 214
2029	15 391	2.12	7 274
2030	15 315	2.09	7 332
2035	14 827	1.94	7 660

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[17]   Eurostat (EU), the Main Statistical Office (Poland – GUS), Department of Statistics and Actuarial Forecasts of Social Insurance Agency (Poland – ZUS) and the Demographic Forecast of the Ministry of Finance of the Republic of Poland.

[18]   The ratio of the number of insured who pay contributions to the number of retirees, i.e. the people who have reached retirement age and can claim retirement benefits, is the replacement ratio, or the number resulting from the division of the numbers mentioned previously. To simplify the problem, the coefficient illustrates, inter alia, how many people work and pay insurance contributions to the pension insurance fund from which pension benefits are paid to those who have already acquired the right to pensions.

2040	14 207	1.74	8 149
2045	13 639	1.56	8 731
2050	13 097	1.43	9 175
2055	12 553	1.34	9 341
2060	12 097	1.31	9 228
2065	11 802	1.33	8 879
2070	11 559	1.35	8 534
2075	11 331	1.37	8 242
2080	11 116	1.39	7 978

Source: author's own elaboration based on: *Forecast revenues and spending of the Pension Fund until 2080*, Department of Statistics and Actuarial Forecasts, ZUS [Social Insurance Agency], Warsaw 2019, pp. 43 and 44.

The following conclusions can be drawn from the data in Table 3:
1. the number of insured in the 2020–2080 period will gradually decrease from 15,964,000 to 11,116,000, which is by 4,848,000 people in the period analysed;
2. the number of pensioners whose benefits are paid from the pension fund in the 2020–2080 period will gradually increase from 6,320,000 in 2020 to 9,341,000 in 2055, when it will start to decline to 7,978,000 by 2080;
3. the replacement ratio from the level that is definitely insufficient to build a pension fund capable of covering retirement benefits in 2020 of 2.53, which will decrease to 1.31 in 2060 (definitely the toughest year), and then reach a slightly higher value in 2080 of 1.39, although this is still about three times smaller than the size that could possibly ensure the solvency of the pay-as-you-go pension model;
4. the average replacement ratio throughout the period will be 1.44 (1.4371), meaning that one retirement benefit will be financed by less than one and a half insurance premiums;
5. during the time of the greatest increase in the number of the recipients of retirement benefits, the number of people paying insurance contributions will continue to decrease. As a result, the 2040–2070 period is expected to be the hardest period financially for the finances of the Social Insurance Fund and the State Social Insurance Agency (ZUS). The state will likely have to find a source of additional income to supplement the pension fund.

As a consequence of the proportions described above and the comparison of income from contributions and the pension fund's expenditures, further forecasts regarding the capacity of the pension fund and its annual balance must be taken into account.

Tab. 4. Pension fund's annual balance and capacity in the 2020–2080 period

Year	Annual balance of the pension fund (PLN millions)	Pension fund capacity (%)
2020	−45 975	74
2021	−49 321	73
2022	−52 581	72
2023	−55 621	72
2024	−58 442	71
2025	−60 928	71
2026	−62 630	71
2027	−63 508	71
2028	−63 820	72
2029	−63 786	72
2030	−63 528	73
2035	−61 307	76
2040	−63 577	77
2045	−68 361	77
2050	−72 550	77
2055	−71 968	79
2060	−65 528	81
2065	−50 461	86
2070	−37 252	90
2075	−32 062	92
2080	−30 935	93

Source: author's own elaboration based on: *Forecast revenues and spending of the Pension Fund until 2080*, Department of Statistics and Actuarial Forecasts, ZUS [Social Insurance Agency], Warsaw 2019, pp. 31 and 41.

The figures in Table 4 present, albeit differently, the same realities as those presented in Table 3. Whether these figures are in percentages or financial terms, they complement one another and confirm the trends revealed by both forecasts, while underscoring the following:
1. the permanent gap between the income and the expenditure of the pension fund will be as high as 29% in the most problematic period of 2024–2027;
2. the fact that almost a third of funds for retirement benefits in that period will have to come from sources other than the monies the pension fund collects from contributions and their derivatives;
3. conclusions from items 1 and 2 above predict the absolute insolvency of the pay-as-you-go pension insurance model;
4. the gradual, albeit slight, improvement in the efficiency of the pension fund that is forecast to occur in the next few years will never reach a level sufficient to fully

finance the pension benefits payable to persons who can claim them in the period under review;

5. the data in Table 3 fully confirm the figures and conclusions from Table 2, and they indicate, in specific amounts, the shortages of funds for paying retirement benefits in given years;

6. the pension fund deficit is about PLN 70 billion for most of the 2045–2065 period, which exceeds the 2022 state budget deficit;

7. a rough calculation of the level of inadequate funds for the period analysed reveals that the State Treasury of the Republic of Poland and Polish society will incur losses of about PLN 3 trillion!

In addition to the conclusions above, it should also be mentioned that subsidising the pension fund over such a long time and in such large amounts is bound to drain the state's financial resources, which will most likely significantly increase its debt. This will have negative consequences since the poor financial condition of the state will in practical terms hamper its development for decades. If subsidies to the pension fund are approximately 20–29% for about 35 to 40 years (2020–2055), this will be comparable to several years of the state's income. This situation can be best described by quoting the title of a monograph on the current model of pension insurance, *Emerytalna katastrofa*.[19] It should be added that the disaster will be a true catastrophe for the state's finances above all, and it will cripple the country's further development.

It must also be noted that data similar to the figures presented for Poland in Tables 3 and 4, are available for all European Union countries. Considering that their pension security models and systems all draw from the basic version of Bismarck's *Sozialversicherung*, which has been modified many times over 130 years, a virtually universal pan-European search for new solutions of the problem discussed in this article is required. No sustainable public finance system can be operated without the finances of pension security being balanced, and this is not possible if pension solutions from the nineteenth century, or the the mid-twentieth century, at best, are still in use in most countries.

The statistical data and forecasts presented above seem to illustrate well the performance, or rather complete non-performance, of pension insurance finance resulting from the application of the pay-as-you-go model. It is noteworthy that these conclusions were formulated before the Covid-19 pandemic and Russia's brutal assault on independent Ukraine, and the aftermath of the former disaster and the continuance of the latter disaster have further added to the conditions described in this article.

Losses of PLN 3 trillion over the next 60 years are equal to six state budgets (at the current level of PLN 492 billion in 2022). This is not simply an astronomical amount, but one that will absolutely disrupt public finances, the state and society.

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[19]   R. Gwiazdowski, *Emerytalna katastrofa* [*The Pension Disaster*], Poznań 2012.

Conclusions

In the Act of 4 February 2022,[20] the total tax and non-tax revenues of the state budget in 2022 was PLN 491,936,950,000. The state budget deficit as of 31 December 2022 was supposed to be no more than PLN 29,900,000,000. According to Table 4, the lowest deficit resulting from the annual balance of the pension fund in the 2020–2080 period will be approximately PLN 30,935,000,000 in the final year of the study, which is 2080. For most of the 2025–2065 period, the deficit of the pension fund will range from PLN 60.928 to PLN 72.550 billion each year, which is over twice the amount of the state budget deficit in 2022. The Budget Act for 2023 provides for a deficit of approximately PLN 68 billion. This means that in the aftermath of the crisis, including the national recovery plan after the two-year period of the Covid-19 pandemic and the effects of the war in Ukraine, that, in this rather extraordinary period, the budget will have a deficit that next, in the 2025–2065 period will, on average, be exceeded by the balance of the pension insurance fund almost every year. Therefore, the Polish state has to deal with two budget deficits annually – that provided for in the Budget Act, and that generated by the pension fund, that has been insolvent for a long time or rather, putting it vividly, but not academically, since forever,[21] which is thanks to – let us not hesitate to say so – the pay-as-you-go pension model.

Thus, an unprecedented situation can occur, with an imbalance striking not only the pension fund, but also public finances. Such a two-pronged problem would be much more difficult to cope with, and would result in insufficient financial resources in the two largest public funds – the pension fund and the state budget. The consequences of this could be disastrous. Hardly can any guarantees of sustainable pension finance can be discussed if hidden public debt consists mainly of insurance contributions of the insured who have not yet acquired the right to retirement benefits are brought into the pension system and indexed. Even assuming that an entirely new pension model is developed that is not based on the pay-as-you-go scheme and is resilient to demographic problems, the great challenge of the repayment of debt would still have to be faced to secure the sustainability of pension insurance finances. It is just the debt that that lies behind the desire to permanently improve the pay-as-you-go public pension insurance model that functions in many countries since decision-makers wrongly believe it to be only way in which funds for repayment can be collected.

Unfortunately, sustainability, or rather the inability to attain sustainability, is not only a problem of the Polish pay-as-you-go model of pension insurance described in this study. As throughout the current study, these problems should be viewed against the entire European Union and most European countries where the pay-as-you-go pension insurance model is in use or at least in partial use. Therefore, conclusions regarding the Polish model should be treated as applicable to the majority of public

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[20] The Budget Act 2022 of 17 December, 2021, Journal of Laws 2022, item 207.
[21] Over the last 60 years, a positive balance of the pension fund was achieved only once (in 1987).

pension insurance systems on the European continent. What is more, in many countries the problems are even much more acute and harder to solve than those in Poland.

Undoubtedly, the challenge of developing a new model of pension security seems to be one of the most, if not the most urgent issues, if we consider the changing realities of social, economic and political life and the desire to maintain, or rather return pension insurance to financial sustainability in sustainable public finances.

Why attaining sustainability requires developing a new model of pension insurance is proven in the current study in all the aspects touched on in the discussion. To all those who still hesitate, fearing, among other things, the high costs of changing the pension system, especially funding in the the transitional period, let me point out that maintaining and tolerating the functioning of the pay-as-you-go model in pension insurance keeps generating ever greater costs and increases public debt, both open and hidden. Additionally, the costs of supporting and maintaining the old system, as the statistical part of this study indicates, can over time exceed the costs of changing the system, of introducing a new pension model and of financing the transition period.

Decision makers are afraid of the social reaction to changes and stubbornly improve and modify the pay-as-you-go model, and they are convinced that such moves are simpler and more readily accepted by society. In contrast to them, the author of this study believes that taking citizens seriously, making things clear and presenting an attractive proposal to the public will prove to be a better, more acceptable solution. As unjustified and harmful as their beliefs may be, perhaps the so-called experts think that empowering people to decide how to prepare themselves for retirement is not within the capabilities of average citizens. Maybe the theory is simply supposed to ensure a good life for the experts themselves?

Deregulation, resignation, coerced citizen pensions (although as discussions reveal there are *quot capita, tot sensus* in that respect), or maybe a change of model? There are many possibilities to proceed further in this regard. The basis, however, is a person-oriented, serious approach to the interested parties whom the public pension system is supposed to serve.

Therefore, we should strive to balance the finances of public pension insurance, and as there are many ways to achieve this, it is time to finally make a decision and choose one of them, because next to financial resources, time is a phenomenon characterized by the greatest deficit.

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Summary

Tomasz Sowiński

Towards the Financial Sustainability of Public Pension Insurance Systems

The following study is composed of an introduction, three main parts (historical, logical and statistical) and conclusions. This structure allows the author to explain why the issue of the financial sustainability of pension insurance is a matter of crucial importance for public finance. In most countries the systems of old-age benefits for citizens is based on the pay-as-you-go model of pension insurance from the nineteenth century. It is hard to explain why the scheme remains the core solution for the social security of citizens after they have reached retirement age. The management of resources is, as mentioned above, based on the pay-as-you-go scheme that was established over 130 years ago and is now viewed as archaic from an economic point of view. Any attempt to interfere with system solutions results in social dissatisfaction while creating further problems for public finances. At the same time, the failure to resolve these problems threatens to bankrupt pension insurance systems. In the worst-case scenario, it could actually result in the collapse of state budgets. These are the problems that inspired the author to conduct the study.

Keywords: social insurance, pension security, public finances, contribution.

Streszczenie

Tomasz Sowiński

Ku zrównoważeniu finansów publicznych ubezpieczeń emerytalnych

Niniejsze opracowanie składa się ze wstępu oraz trzech części: historycznej, logicznej i statystycznej, a także z wniosków. Daje to możliwość próby odpowiedzi na pytanie – dlaczego zrównoważenie finansów ubezpieczeń emerytalnych ma kluczowe znaczenie dla finansów publicznych? W większości państw podstawą zabezpieczenia emerytalnego obywateli jest pochodzący z XIX w. model repartycyjny ubezpieczeń emerytalnych. Nie da się racjonalnie uzasadnić, dlaczego jest on nadal podstawową formą mającą zapewnić bezpieczeństwo socjalne obywateli po osiągnięciu wieku emerytalnego. Gospodarowanie wspomnianymi środkami funduszu emerytalnego opiera się w praktyce na archaicznej, wprowadzonej ponad 130 lat temu metodzie repartycyjnej. Każdorazowa próba ingerencji w rozwiązania systemu powoduje z jednej strony społeczne niezadowolenie, a z drugiej kolejne problemy finansów publicznych. Natomiast brak ich rozwiązania grozi bankructwem systemu ubezpieczeń emerytalnych, a w niesprzyjających okolicznościach może grozić nawet bankructwem budżetu państwa. Są to problemy, które zainspirowały autora do badań zawartych w artykule.

Słowa kluczowe: ubezpieczenie społeczne, zabezpieczenie emerytalne, finanse publiczne, składka.