State Financial Inclusion Policy as a Driver of Modernization of the Pension System of Ukraine

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Abstract: The article considers the policy of state financial inclusion as a driver of modernization of the pension system of Ukraine. A systematic approach to the regulation of state financial inclusion policy and its indicators has been developed. It is substantiated that financial inclusion in the system analysis of the state pension system is a platform of the general theory of systems, includes a number of interconnected components of the open financial system from the standpoint of allocation of budgetary resources to social needs. It is proved that the systemic approaches to the use of the methodological paradigm of financial inclusion in the pension system focuses on various aspects of the budget financing process. Models of pension systems and methods of the World Bank according to the levels of pension provision are presented. The directions of financial inclusion in the state pension system in the context of "state – business – society" and the scheme of optimization of state financing of social programs of the pension system are given. The size of pensioners by types and size of pensions in the regions of Ukraine, the coefficient of replacement of lost income in Europe is analyzed. The total current pension expenditures from GDP in European countries are estimated. The scheme of actuarial calculations of pension provision in the state financial inclusion of the pension system for short-, medium- and long-term periods is proposed.

1. INTRODUCTION

In the context of globalization challenges, the current development of the world community is extremely dynamic, which in some countries forms the stabilizers of the pension system, and in others – provoke negative trends in economic growth and social protection. In Ukraine, due to the lack of state social standards for raising wages and slowing down the work of pension regulators, there are trends that lead to a decrease in the capitalization of financial resources (up to 3% per year), which in turn reduces social protection and benefits pensions to meet physiological standards. In the conditions of transformation of the pension system of Ukraine, significant problems are associated with the disproportion in the distribution of national wealth, the shadowing of the economy and corruption, the slowdown and ineffectiveness of pension reforms (Karabin et al., 2021;

Nurtazina et al., 2018). Together, these factors determine a significant level of stratification of the population in terms of income and form complex processes of social protection, including the population's despair in the future. As a result, Ukraine currently takes one of the last places in Europe in terms of living standards. Therefore, one of the important levers to solve these problems is to develop a state policy of financial inclusion as a driver of transformation of the pension system, which is a unifying component of the financial system and which, according to scientifically sound theoretical constructions and practical mechanisms, should help solve them (Sultanbayeva et al., 2013; Sheryazdanova et al., 2020).

The state policy of financial inclusion is able to reduce disparities in the distribution of income, increase the country's real capacity for financial and social needs of the population in the formation of new changes in society (Komilova et al., 2020; Berdykulova et al., 2021). Expanding access of ordinary citizens and businesses to financial resources through financial technologies, regardless of income, age, place of residence or type of activity, which in combination with trust in government regulators and levers of the financial system

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are stimulating factors to reduce the shadow economy, increase financial stability projects, and, as a consequence, increase the level of state influence on the safe level of the pension system (Karshalova et al., 2017; Prokopenko et al., 2020).

Scientists such as H. Aaron (1966), N. Barr (2002), G. Bonoli (2003), A. Chlon-Dominczak (2002), P. Cornelisse, P. Kees (2002), M. Ferrara (1996), P. Johnson (1999) have made a significant contribution to the development of financial science, in particular social protection and mechanisms for ensuring the stable development of the pension system. Such scientists as G. Bonoli, T. Shinkawa, K. Anderson (2005), C. Arza (2006), H. Aspegren, J. Duran, M. Masselink (2019), E. Bakirtzi, P. Schoukens, D. Pieters (2010), N. Barr, P. Diamond (2009), L. Bertalanffy (1950), M. Bielecki (2016), D. Bloom, R. McKinnon (2013), G. Bonoli (2003) have formed a new basis of science on the state pension policy, which determines the financial dominance of the pension system and the optimal ratio between the real financial resources of the state and the potential of the population for their well-being. At the same time, there is a need to develop qualitatively new methodological approaches to the formation and use of budgetary resources in pension systems, introduction of optimal technological schemes of socio-economic development and social support through the state policy of financial inclusion.

The priority of our study is to form a systematic approach to the regulation of the state financial inclusion policy and its indicators that provide the optimal model for financing pension benefits and social needs of the disabled, given the modernized hierarchy of the pension system and its efficiency in allocating budget resources.

2. MATERIALS AND METHODS

Every civilized state pursues a policy of financial inclusion aimed at creating an effective pension system, improving the welfare of the population, supporting low-income citizens, preventing social upheaval in society. The policy of financial inclusion as a driver of systemic changes in the pension system occupies a prominent place in the social and socio-political life of the state, financial and budgetary system, covers all segments of the population and affects the macro-economic performance of the country. The policy of the state financial inclusion in the pension system is a promising object of systematic research, because with the development of society, the requirements for pensions for the disabled population and the satisfaction of their social needs is growing every year and is systemic in nature.

The system approach is a methodology of scientific research of financial inclusion policy in the study of complex organized subsystems − types of pension system. Systematic research allows to substantiate the diagnostic tools of financial inclusion as a reality that has special properties and requires the use of special research tools that have not been previously studied and were considered to go beyond philosophical science (Diamond, 2011).

The system approach is based on a comprehensive understanding of the importance and interdependence of factors, a comprehensive study of the phenomena to identify priorities

for optimizing the basic parameters of the subsystems of the pension system. At the same time, financial inclusion in the system analysis of the state pension system is a platform for general systems theory, includes a number of interconnected components of the open financial system from the standpoint of allocation of budgetary resources to social needs. This analysis significantly expands the knowledge of reality, as it focuses on finding specific mechanisms of integrity and complete systematization of links between the outlined subsystems, allows dissecting the inclusiveness of the modernized pension system to study its properties, structure and functions.

General systems theory examines the relationships and interrelationships between the parts of a system that are "integral" and that, according to the principle of systematicity, are the basis of scientific and practical prognostic processes. It is a means of long-term planning and modeling of various options and possible consequences of the development (Holzmann et al., 2008). Accordingly, state financial inclusion in the pension system is a complex organized system object that allows understanding the rational distribution of budgetary resources and the conditions of operation of pensions in the short, medium and long term. From this position the modernization of the pension system in the context of financial transformation of the economy involves the introduction of social programs, which are determined by quantitative and qualitative parameters of the state, the way they are financed by the state. This criterion distinguishes the models of pension systems among themselves (Table **1**).

It should be noted that the World Bank has proposed five levels of pensions: Level 0 – social pensions and benefits are financed from tax revenues; Level 1 – distributive, in which payments are made through compulsory insurance; Level 2 – mandatory accumulative, when payments are financed by the accumulated funds in the accounts of autonomous (non-state) pension funds or insurance companies; 3rd level – accumulative voluntary; Level 4 – informal family support (Stiglitz and Orszag, 1999; Croitoru, 2012; Croitoru, 2015). The classification of pensions according to the methodology of the World Bank is presented in Table **2**.

The emergence of the need for financial inclusion in the modernization process of the pension system is determined by the need to form an inclusive financial institution with new features to identify shortcomings and transform the existing institution into a new hierarchical structure within the legal field (laws and regulations), (Raj and John, 2013; Wong, 2015).

A systematic approach to the use of the methodological paradigm of financial inclusion in the pension system focuses on various aspects of the budget financing process, and thus reflects the conceptual platform for the development of pensions. The philosophy of diagnosis of pension provision, as a process of changing the functioning of any object has internal components that are directly perceived, in the relationship and external dependencies. This allows to transform the hierarchical structure of the pension system into a set of financial resources interconnected by the elements of dependence of pension provision and pension insurance (Johnson, 1999), by new forms of innovations connected by internal and external links to maintain (systemic) quality of meeting

Table 1. Models of Pension Systems.

Types of Models	Concept (Doctrine). Type of Social Policy	Method of State Funding of Social Programs. Income Redistribution Policy	Countries of Implementation
Anglo-Saxon or Anglo-American	Liberal (neoliberal) Institutional	Small social assistance programs; the criterion of efficiency plays a decisive role	USA, Canada, Great Britain, Ireland, Australia, New Zealand
European (Franco-German)	Social market economy (conservative-corporate) Program	Highly developed system of the state and private social insurance. Development of the socio-economic system both in the interests of economic growth and in the interests of social policy.	Germany, France, Austria, Italy, the Netherlands, Belgium, Switzerland
Scandinavian	Egalitarianism (social democratic) Structural	Developed social insurance system; social goals take precedence over economic ones	Sweden, Norway, Finland
East Asian	Liberalism (paternalism) Institutional	Low costs of maintaining the status of "welfare state"; significant social role of corporations; highly developed private insurance systems (health and pension)	Japan, South Korea, Hong Kong, Singapore

Source: compiled by the author according to data (Myles and Pierson, 2001; Holzmann et al., 2008; Holzmann, 2013).

Table 2. Pension Provision in Accordance with the Methodology of The World Bank By Levels.

Levels of Pension Provision	Calculation of Contributions and Payments	Notes
Level 0 (social pensions)	Payments are set by the state and financed from taxes	Almost 80 countries
1st level (distribution system)	Defined payments	Mandatory state pension insurance system has been introduced in many countries
2nd and 3rd levels (saving scheme)	Defined payments	Mandatory (Level 2) in Australia, the Netherlands, Chile, and a number of Eastern European countries. Ordinary-private. Mostly voluntary (level 3)
4th level (non-financial support)	Fixed contributions	Ordinary voluntary (3rd level) and private
		Informal family support

Source: compiled by the author according to data support (Stiglitz and Orszag, 1999; Croitoru, 2012; Croitoru, 2015).

the social needs of the population (Maurizio et al., 2015; Komilova, 2021).

The special typification of the models of pension systems embodies the progressive, purposeful action of pension facilities, which is associated with their structural and functional renewal, improvement, growth, transformation into qualitatively new socio-economic effects. They embody the institutional structure of the pension provision through, first, material support of individuals in case of reaching the statutory age, disability, loss of breadwinner; secondly, adaptation to the external factors of a dynamically developing society; thirdly, the study of internal problems inherent in the modern functioning socio-economic infrastructure, in particular demographic problems (reduction of the working population and increasing the burden on the pension system) (Malyshko, 2020; Kornilova et al., 2022).

The solution of these socially significant tasks is comprehensive under the condition of an effectively built system of budget financing, which guarantees the satisfaction of social needs of the population through social programs, taking into account the "principle of organizational continuity" (Lyndiuk, 2010). The following conclusion follows from this principle: any system naturally reflects the properties and changes in the environment that cause changes in the system, and vice versa.

According to its institutional content, the pension system is the most difficult object of the state financial inclusion for a number of objective and subjective reasons, including the diversity and variety of types of pension benefits, as well as the long period of their implementation. In addition, the policy of financial inclusion in the pension system is to create an effective pension mechanism and the formation of a renewed stable functioning institution with socially oriented
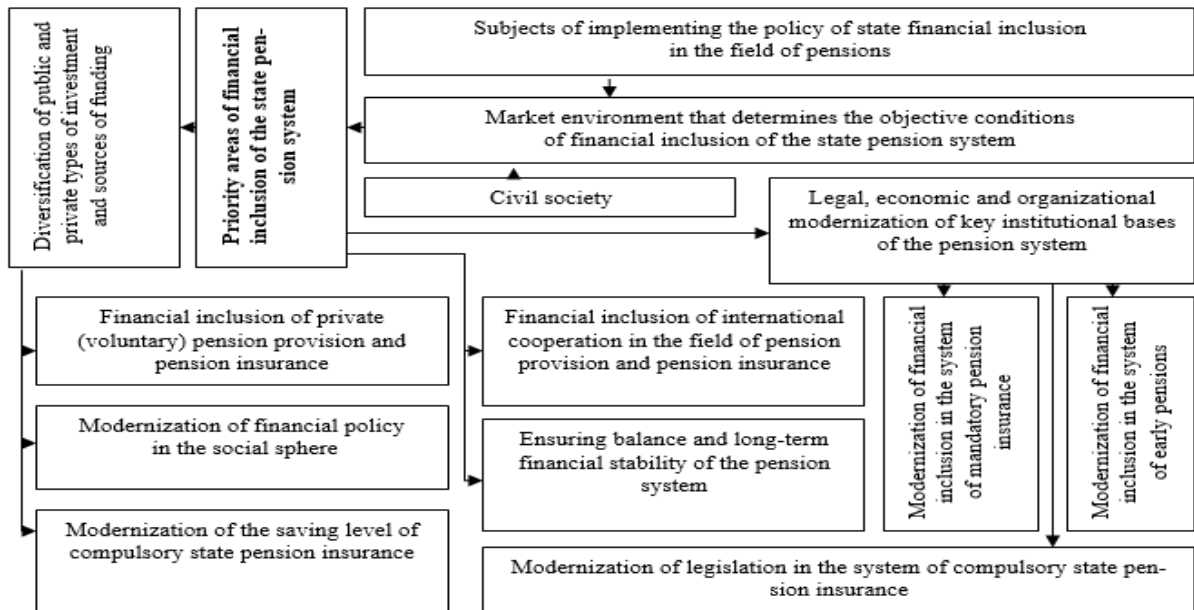
Fig. (1). Directions of financial inclusion in the state pension system in the context of "state – business – society".

Source: developed by the authors to data (Ferrara, 1996; Stiglitz and Orszag, 1999).

personalization and motivational coherence, according to the new quality of social standards, without destroying the existing system (Sultanbayeva, 2013). Inclusiveness of the pension system, which will meet and in the long run ahead of public needs, is possible only through the implementation of comprehensive measures of organizational, institutional, legal, technological and resource nature.

In view of this, the policy of the state financial inclusion in the pension system embodies a set of consistent comprehensive, multilevel financial transformations aimed at legal, economic and organizational modernization of key institutional foundations of the pension system, qualitative renewal of existing state-private partnerships in the direction of "state – business – society", and ensuring the implementation of the mechanism of pension provision for citizens (Fig. **1**).

Financial inclusiveness of the pension system in the state allows comprehensive and rational use of its hierarchy in a multilevel financial structure to carefully analyze a set of factors that determine the interdependence of the formation and distribution of financial flows to obtain results aimed at modernizing the "principle of external complementarity" (Bydyk, 2018), which means that financial resources for pensions may not be sufficient to implement social programs, which must be supplemented by external financial resources in the pension system, including social pensions.

However, this shortcoming can be eliminated by including a "black box" in the chain of financial support of social programs in the pension system. The principle of the "black box" involves the introduction of cyber technologies designed to develop a strategy for pension provision of social programs and enable the implementation of financial inclusion of pension insurance in the hierarchical structure of the pension system. According to this principle, there is an objective need for external state intervention in the modernization of the pension system, attracting additional financial

reserves, which will provide proper financial services for social needs and financial services for pension recipients. Therefore, an important driver of the modernization of the pension system is the development of diagnostic tools for financial inclusion of the pension system, which allows to determine the multidisciplinary nature of the financing system, the level of funding for social programs by volume and category of recipients and the dependence of the amount of funding for social programs on the level of the development of pension insurance in the country.

Diagnostic tools for optimizing the financing of social programs of the pension system are based on a number of methods with a logical descriptive process formed using the Pareto economic-mathematical model (Pareto optimization method) (Aleksandrova and Sobolenko, 2014). Pareto economic and mathematical model allows to calculate the optimal amount of financial resources of pension provision, which in a certain period of time is directed to the social needs of the population through pension insurance. This is achieved through the number of taxpayers (large, medium and small businesses) and the wages of their employees, which is aimed at improving the lives of vulnerable groups, if other sections of the population in need of appropriate social support do not express dissatisfaction (Krasnov et al., 2020).

Thus, the optimal level of inclusiveness of financial support of social programs of the pension system will be achieved. By means of modeling of actuarial calculations the corresponding target function of financing of social programs of the pension system where in the numerator and denominator there are linear functions, which are also named pseudo-functions, is developed. The model also has linear constraints and unknowns that need to be considered. These two pseudo-functions correspond in this case to two groups – donors and recipients of budget funding. The solution of this
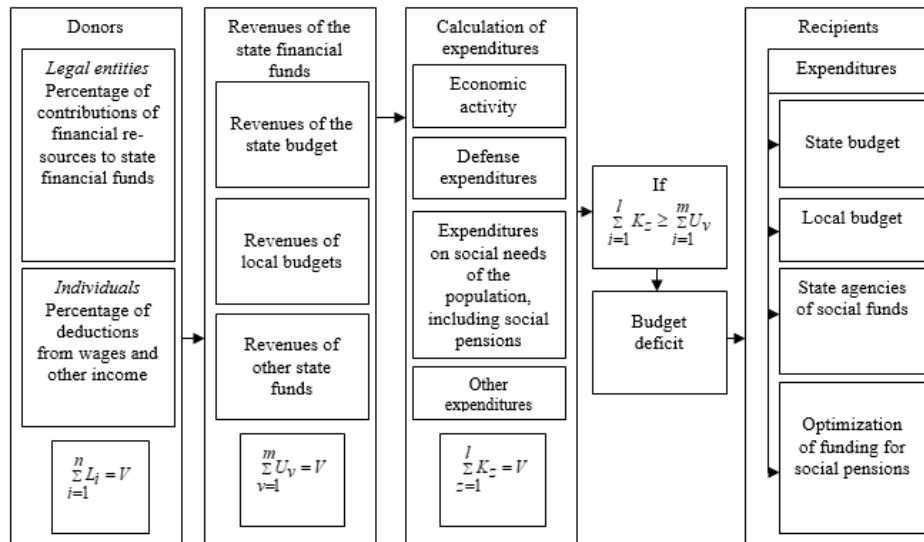
Fig. (2). Scheme Of Optimization Of State Funding For Social Programs Of The Pension System.

Note: V – total financial resources; L – financial resources of donors; U – income of state financial funds; K – expenditures of state financial funds; m – number of participants; i, j, z – relevant entities and volumes in the process of formation and payment of funds for social pensions; N, K, A > 0.
Source: developed by the authors to data (Myles and Pierson, 2001; Aleksandrova and Sobolenko, 2014).

problem is possible by the method of linear programming. In this case, the model has the form (Aleksandrova and Sobolenko, 2014):

$$F = \frac{Q_0 + \sum_{i=1}^{n} Q_0 x_1}{V_1 + \sum_{i=1}^{m} V_1 x_1} \rightarrow min(max) \tag{1}$$

where, – flows (in percentage or absolute value); Q_0 – donors who provide financial resources; V_i – recipients who receive financial resources; x_i – restrictions on financial resources; *min*– minimization of the model (relative to donors); *max*– maximization of the model (relative to recipients).

Financial support of social programs of the pension system is an important condition for the formation of a hierarchical structure of budget or social funds. This condition is due, first, to the development and approval of the necessary regulatory framework for pension provision and pension insurance; second, accounting for current and projected recipients in terms of administrative units and population groups; third, the formation of standards for the implementation of social pensions at the European level, taking into account physiological needs and their gradual approximation to the level of real social protection; fourth, compliance with the mechanism of accounting for recipients, the procedure for the correctness of social pensions; fifth, the specification of social assistance measures, taking into account the economic conditions under which the number of recipients of pension benefits is reduced, indexation of social pensions as a result of changes in the recipient's living condition and inflation rate; sixth, increasing the cost of financial services to which the social program of the pension system is directed (Dovgal et al., 2017; Shebanina et al., 2021). We should note that the financial support of social programs of the pension system provides the introduction of tax incentives for small and medium-sized businesses to modernize public funding for pen-

sions, taking into account financial resources directed to preferential social pensions (Fig. **2**).

In the process of forming these financial resources, we obtain the standard equation (2) (Aleksandrova and Sobolenko, 2014):

$$G_m \leq G_0 \leq G_b, \tag{2}$$

where, G_0 – the optimal amount of public financial resources for preferential social pensions within the social program of the pension system; G_m – the minimum amount of state financial resources for preferential social pensions within the social program of the pension system; G_b – the maximum amount of financial resources provided for pension benefits and social needs of the population from state financial funds for the current year, within the social program of the pension system.

At the same time, the minimum amount of the state financial resources directed to preferential social pensions within the social program of the pension system (G_m) is calculated by formula (3) (Aleksandrova and Sobolenko, 2014):

$$G_f \leq G_m \leq G_v, \tag{3}$$

where, G_f – the amount of social pension, which provides a minimum physiological need for the recipient; G_v – conditionally acceptable norm of social pension, which should be not less than the level of social needs of the recipient in foreign countries, which is higher in the level of economic and social development in each third of EU member states.

The proposed scheme of the optimization of state funding for social programs of the pension system (Fig. **2**) is a guideline of the methodological approach to the development of its diagnostic tools, which takes into account the social orientation of public financial inclusion in pensions for vulnerable groups and is based on sound principles of optimizing social
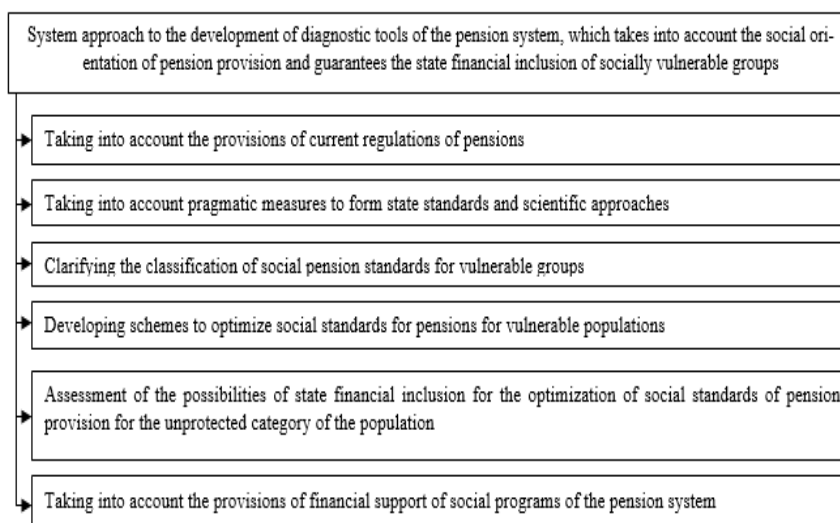
Fig. (3). The Structure Of A Systematic Approach To The Development Of Diagnostic Tools For The Pension System, Which Takes Into Account The Social Orientation Of Pensions And Guarantees Public Financial Inclusion Of Socially Vulnerable Groups.

Source: developed by the authors.

pensions. Using the provisions of this approach will contribute to the implementation of a more rational state policy of the country to modernize the hierarchy of the structure of the pension system and the effectiveness of state standards in the allocation of budgetary resources for social needs. At the same time, state standards will allow regulating the inclusive mechanism of pension provision (i.e., ensuring the redistribution of part of GDP) for guaranteed financing of social needs of the population not below the physiological minimum.

The main components of the proposed systemic approach based on sound principles of the optimization of social pensions are presented in Fig. (**3**).

It should be noted that in order to overcome the problems of budget financing of the pension system and the introduction of optimal pension provision for the socially vulnerable population, the state financial inclusion should be aimed at the introduction of international social standards. At the same time, the multi-structural pension system should provide financial relations capable of acting as a generator of interconnection and interdependence of state financial institutions to meet social needs and guarantees for pension benefits of citizens with a minimum lag of mobilized insurance contributions to improve the economic well-being of socially disabled categories of the population, their adapted properties to changes in the external and internal environment.
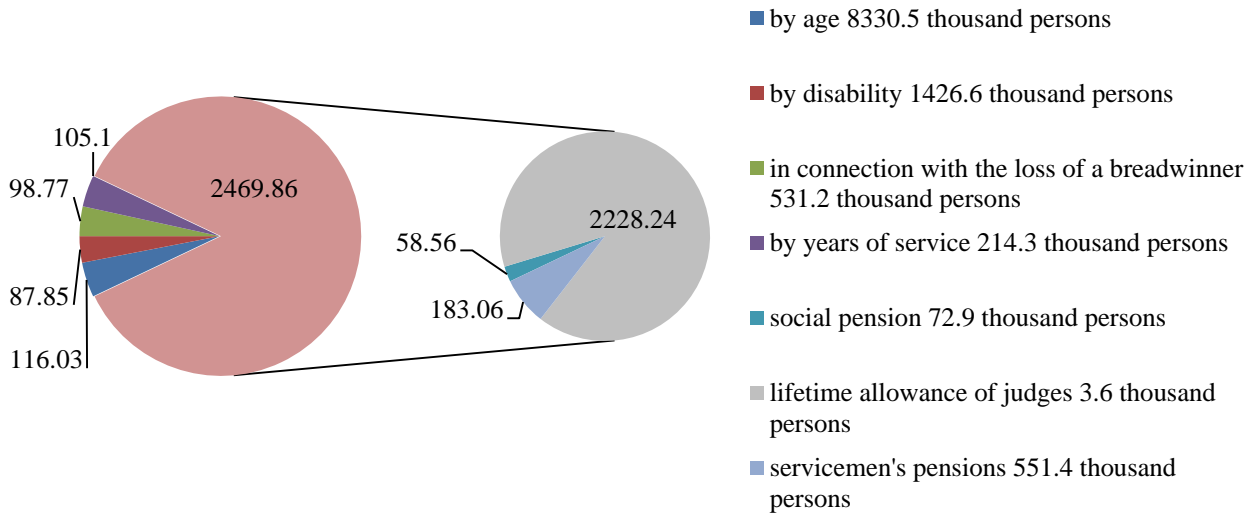
3. RESULTS AND DISCUSSION

The effectiveness of Ukraine's pension system is manifested in its balance and long-term financial stability, creating conditions for ensuring a decent standard of living for citizens who have reached retirement age. At the same time, the country's priority is to meet the social needs of retirees, providing public policy of financial inclusion, which includes a system of indicators that characterize the state and development of pensions and pension insurance as part of the socio-economic system. They include:

integrated indicator of the standard of living of pensioners (formed from indicators characterizing its implementation: the ratio of the average pension with the subsistence level for persons who lost their ability to work; replacement rate, which is defined as the percentage of average pension and salary);

integrated indicator of the fiscal burden on the insured person (formed from indicators: the value of the basic tariff of the Single Social Contribution (SSC), the ratio of own revenues of the Pension Fund of Ukraine, taking into account the share of paid SSC allocated to compulsory state pension insurance, to GDP);
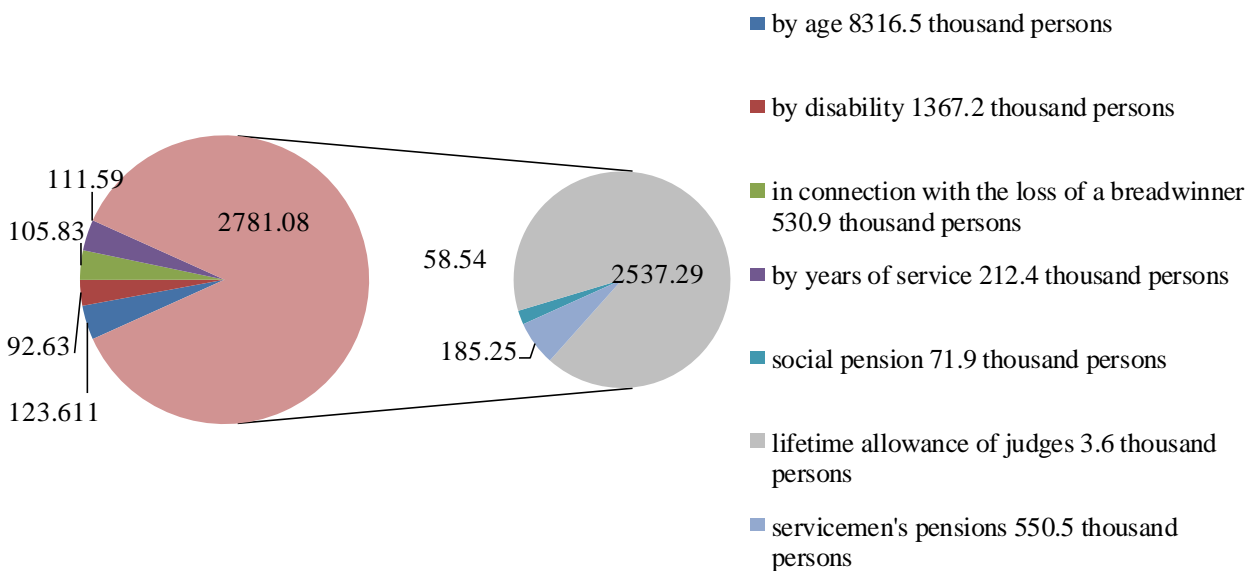
integrated indicator of the efficiency of the pension system (characterizes the ratio of total expenditures on pensions to GDP and is formed from the demographic burden ratio (defined as the ratio of pensioners and employed population), the potential support ratio (defined as the number of people of working age) (from 15 to 64 years) per person aged 65 years and older) and average life expectancy at birth); integrated indicator of the efficiency of the pension system for the insurer (characterizes the life expectancy after reaching retirement age; the amount of surplus or deficit of the insurer's budget, including the Pension Fund of Ukraine, both short-term and long-term; the ratio of insured persons per recipient of pension).

The indicator of the effectiveness of the state financial inclusion of the pension system for the insured person is the level of pension provision after retirement, which in Ukraine is considered only relative to the average pension to the subsistence level for people who have lost their ability to work. Thus, in 2014, the subsistence level for persons who lost their ability to work was 31.10 EUR, the average pension payment was – 51.85 EUR (166.7%); in 2015 – 35.22 EUR and 55.72 EUR respectively (158.2%); in 2016 – 40.89 and 59.94 EUR respectively (146.6%); in 2017 – 45.01 and 81.29 EUR respectively (180.6%); in 2018 – 49.09 and 86.75 EUR respectively (176.7%); in 2019 – 53.71 and

Legend:
- by age 8330.5 thousand persons
- by disability 1426.6 thousand persons
- in connection with the loss of a breadwinner 531.2 thousand persons
- by years of service 214.3 thousand persons
- social pension 72.9 thousand persons
- lifetime allowance of judges 3.6 thousand persons
- servicemen's pensions 551.4 thousand persons

Fig. (4). The Amount Of Pensioners By Type And Amount Of Pensions In Ukraine For 2020, EUR.

Source: built by the authors according to data (Report on…, 2020).

Legend:
- by age 8316.5 thousand persons
- by disability 1367.2 thousand persons
- in connection with the loss of a breadwinner 530.9 thousand persons
- by years of service 212.4 thousand persons
- social pension 71.9 thousand persons
- lifetime allowance of judges 3.6 thousand persons
- servicemen's pensions 550.5 thousand persons

Fig. (5). The amount of Pensioners by type and amount of pensions in Ukraine for 01.10.2021, EUR.

Source: built by the authors according to data (Report on…, 2020).

101.08 EUR respectively (188.2 %); in 2020 – 58.00 and 126.03 EUR respectively (217.3%); in 2021 – 63.41 and 128.39 EUR respectively (202.5%) (Report on…, 2020).

The size of pensioners by type and size of pensions in Ukraine for 2020-2021 is shown in Fig. (**4**, **5**).

The average size of the assigned pension payment in the regions of Ukraine for 2020-2021 is shown in Fig. (**6**, **7**).

The share of pensioners in the amount of assigned monthly pensions in their total number in Ukraine for 2020-2021 is shown in Fig. (**8**, **9**).

The ratio of the average pension payment to the subsistence level for people who have lost their ability to work gives every reason to believe that the standard of living of pensioners in Ukraine remains extremely low. The amount of pension benefits does not guarantee them a sufficient level of financial security, i.e. from the point of view of the insured person; the pension system is not effective (Buletsa et al., 2019). In developed countries, the subsistence level of a pensioner is used as a target, which reflects the adequacy of the amount of pension benefits for non-insurance pension schemes, where benefits are universal.
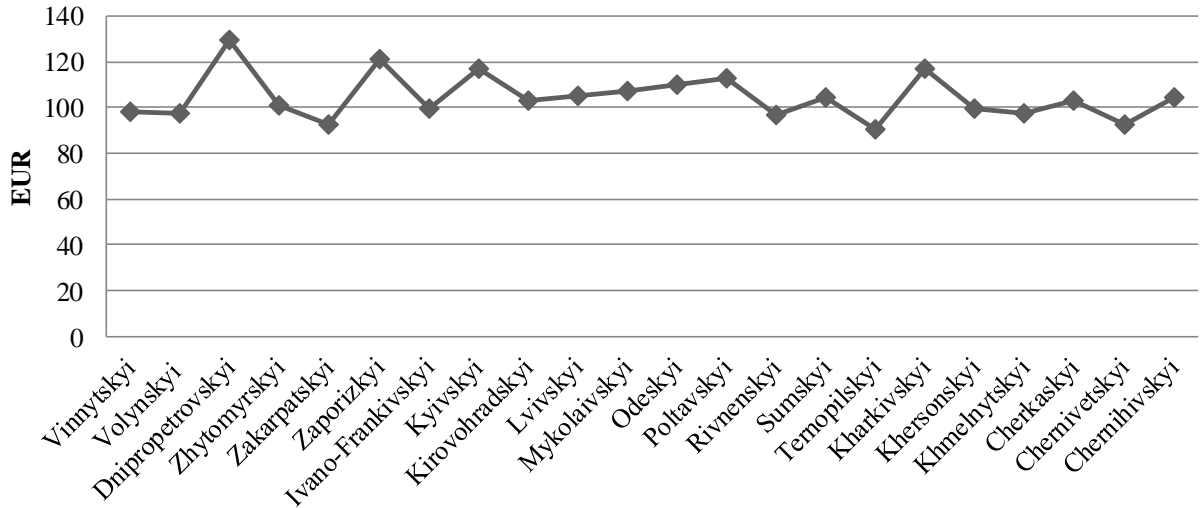
Fig. (6). The Average Size Of The Assigned Pension Payment In The Regions Of Ukraine For 2020, EUR.

Source: built by the authors according to data (Report on…, 2020).
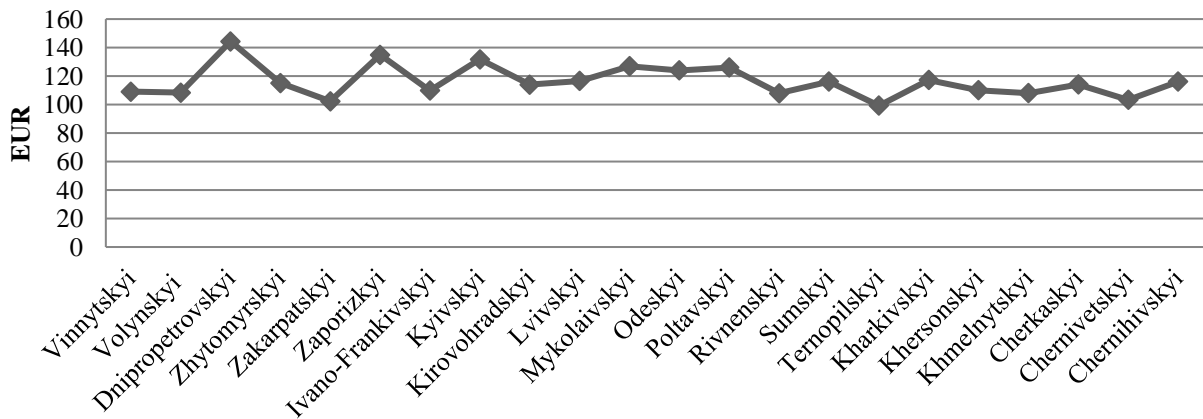

Fig. (7). The Average Size Of The Assigned Pension Payment In The Regions Of Ukraine For 01.10.2021, EUR.

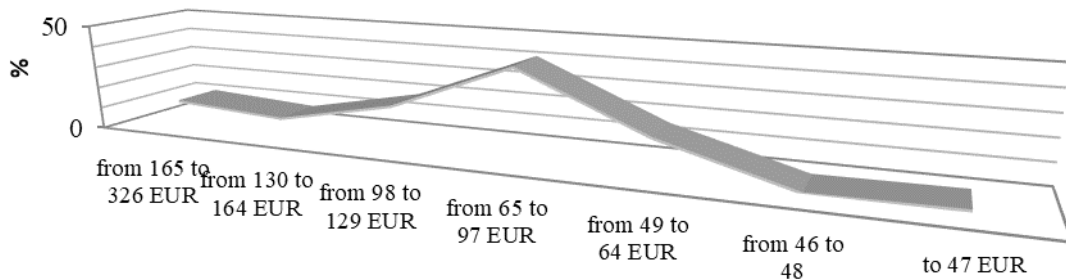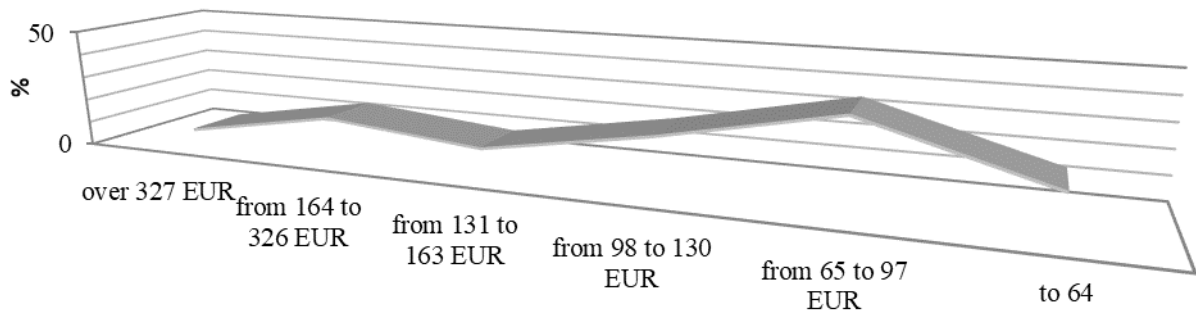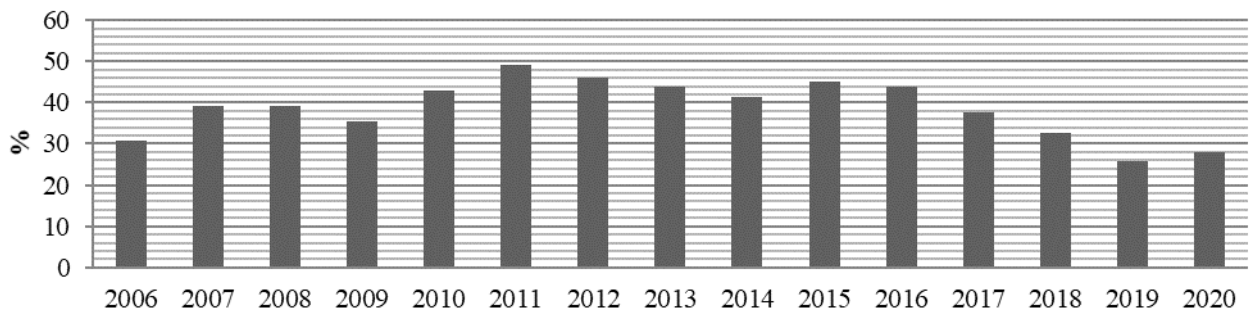Source: built by the authors according to data (Report on…, 2020).

Fig. (8). The Share Of Pensioners In The Amount Of Assigned Monthly Pensions In Their Total Number In Ukraine For 2020, %.

Source: built by the authors according to data (Report on…, 2020).

Fig. (9). The Share Of Pensioners In The Amount Of Assigned Monthly Pensions In Their Total Number In Ukraine For 01.10.2021, %.

Source: built by the authors according to data (Report on…, 2020).

Fig. (10). Dynamics Of The Pension Replacement Ratio Of Lost Income In Ukraine For 2006-2020, %.

Source: built by the authors according to data (Report on…, 2020).

In the countries of the world the indicator of efficiency of insurance pension systems is the substitution coefficient which characterizes a standard of living of pensioners concerning average standard of living of the worker and in the international pension system characterizes a level of pension provision (Pensions at…, 2019; World Population…, 2019; Pensions at…, 2021). Global pension models take into account the value of this indicator not less than 40% of the amount of previous income, with thirty years of insurance experience of a working person. States that have ratified the European Social Security Code (European Social…, 1964), apply higher substitution rates: for old-age and survivors' pensions – 45%; in relation to the disability insurance pension – 50% of earnings that the employee had before retirement.

Fig. (**10**) presents the dynamics of the pension replacement ratio of lost income in Ukraine for the period of 2006-2020.

The lowest figure was in 2006 – 30.9 %, the highest – in 2011 – 49%, after which gradual decline began, and in 2018 it was already 32.8%, in 2019 p. – 25.7 %, in 2020 p. – 27.9%. In addition, the decrease in the replacement rate indicates the existence of demographic disparities in the population structure, which is manifested in the growth of the number of retirees while reducing the working age population. Ukraine has a low level of pensions compared to Europe and the world. In European countries, the amount of compulsory, voluntary and personal insurance provides pension replacement at the level of 60-80% for 70-80% of pensioners. The

average substitution rate is 58%. Only in Ireland it is 35%, in in Latvia, Lithuania and Croatia – 40% (Fig. **11**).

The level of fiscal burden is an indicator of the effectiveness of financial inclusion of the pension system for the insured person. In Ukraine, this indicator is mostly characterized by the value of the basic tariff of the Single Social Contribution (SSC).

The reduction of the SSC rate from 37.17 to 22% in 2016 had a negative impact on the financial inclusion of the solidarity system and increased the dependence of the PFC budget on allocations from the state budget.

The ratio of PFC own revenues, including the part of paid SSCs allocated to compulsory state pension insurance to GDP, also reflects the level of fiscal burden on employers. In 2014, this indicator amounted to 8.6%, due to the decrease in the SDR rate, it was in 2015 – 4.7%, since 2016 due to the increase in the minimum wage it increased and in 2021 amounted to 6.1% (Fig. **12**).

One of the indicators that characterize the effectiveness of financial inclusion of the pension system as part of the macroeconomic system of the state should be considered the scale of funds allocated to pensions – the ratio of total expenditures on pensions to GDP. Thus, in Ukraine, pension expenditures as a percentage of GDP have fallen sharply since 2011, due to pension reform and the adoption of laws aimed at reducing pension costs. It should be noted that in the countries of the world 8-10% of GDP is considered to be
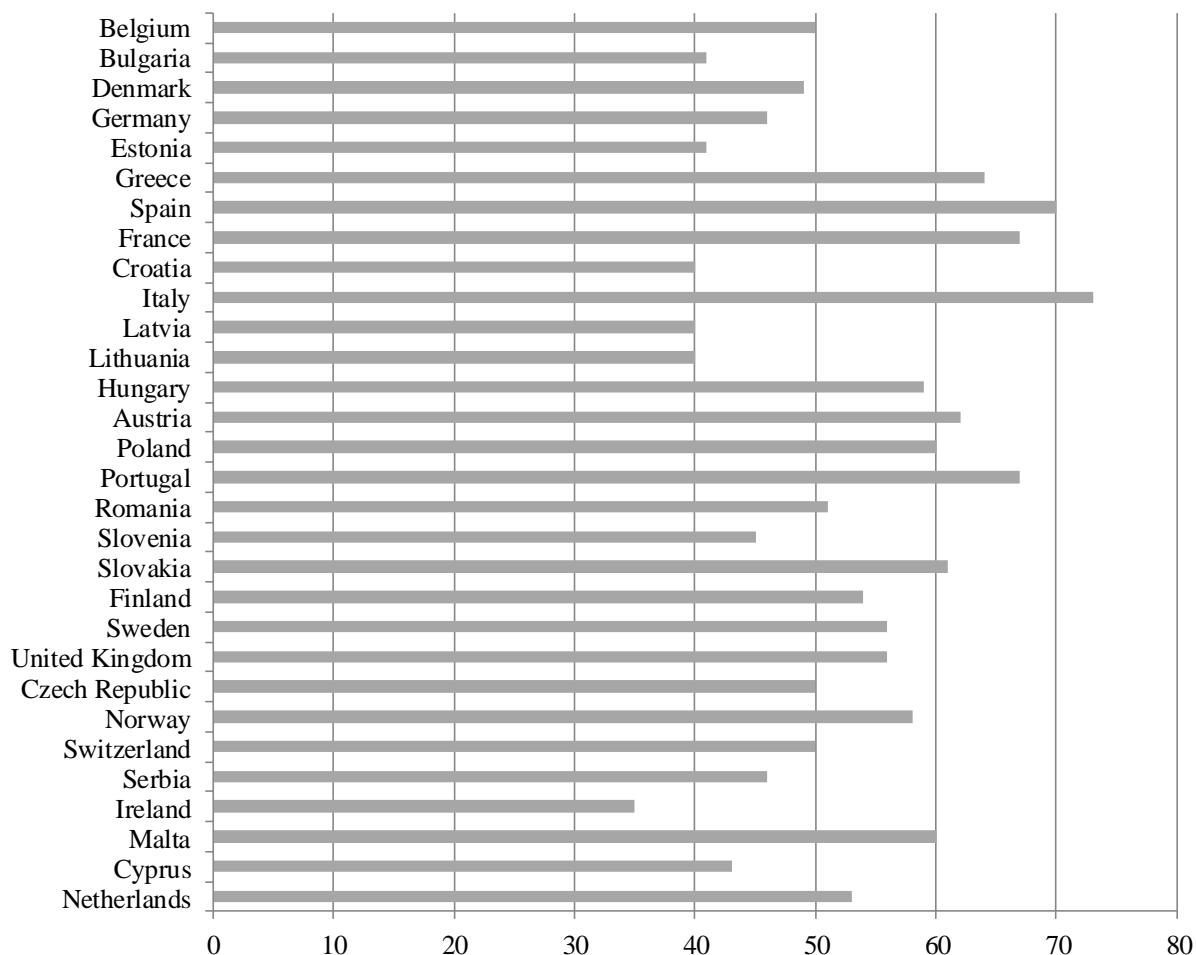
Fig. (11). Total Replacement Rate (Excluding Other Social Assistance) In European Countries In 2020, %.

Source: built by the authors according to data (Pensions at…, 2021).

an acceptable level of the share of pension payments in GDP. Thus, if in 2010 the share of PFC expenditures in GDP was equal to 17.7%, then in 2020 – 10.1%, i.e. this indicator is close to the world level (Fig. **13**).

The demographic burden, defined as the ratio of pensioners to the employed population, decreased from 15.0 in 2014 to 1.39 in 2020. According to world experience, the most acceptable demographic situation is when the ratio of the working population and not employed in the labor process is 2.5:1. An aging population and a corresponding increase in pension and social spending will undoubtedly affect economic growth.

The relationship "income – life expectancy" confirms the assumption that the level of economic development, which determines the standard of living of the population, significantly affects life expectancy (Levandy and Shlykovoi, 2018; Komilova et al., 2021). Thus, in 2020, the age group from 25 to 64 years accounted for more than half of Europe's population. Forecasts indicate that by 2050 the share of people aged 25 to 64 will be lower 50%. Globally, in 2020, approximately 9% of people are aged 65 and older.

According to forecasts, the share of elderly people in the world will reach almost 12% in 2030, 16% – in 2050 and and may reach almost 23% by 2100. According to the forecast, by 2050, every fourth person in Europe may be 65 years old or older. Population aging will have a global impact on the potential support rate, which is defined as the number of people of working age (from 25 to 64 years) per person aged 65 years and older. In 2020 in Europe it was equal to three (World Population…, 2019).

In Ukraine, due to the increase in the number of elderly people and the reduction of the working population, the potential support ratio decreased from 4.6 in 2014 to до 4.0 – in 2019. Therefore, raising the retirement age seems to be the simplest tool to provide reducing the number of recipients of pensions, the costs of the pension system and increasing revenues from the payment of SSC. It should be noted that the aging of the population creates much less problems where the dependence of older people on social transfers is insignificant, as most of the social assistance comes to them from the younger generations (Komilova et al., 2019; Ketners and Petersone, 2021).
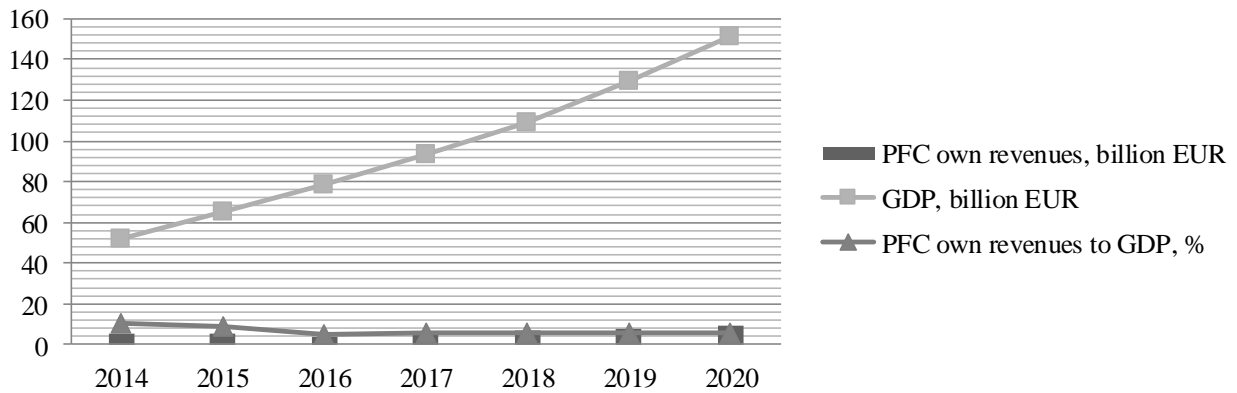
Fig. (12). Ratio of the amount of own revenues of the pension fund of ukraine, taking into account the part of the paid single contribution to the obligatory state social insurance, divided into the obligatory state pension insurance to the GDP for 2014-2020, %.

Source: built by the authors according to data (Report on…, 2020).
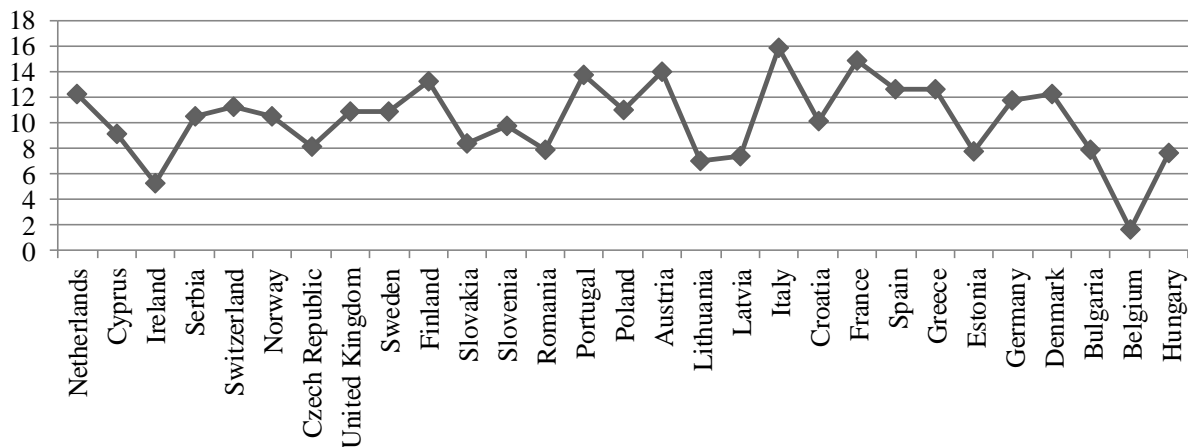
**Fig. (13).** Total current pension expenditures (% of GDP) In european countries In 2020, %.

Source: built by the authors according to data (Pensions at…, 2021).

Solidarity systems reinforce the effects of the institutional trap that most countries with similar economies find themselves in. The distributive element increases the economic dependence of retirees and turns this dependence into a deep-rooted social norm. Solidarity systems have taught citizens to consider the main source of self-sufficiency not in their own savings, but in pension benefits provided by the state (Shebanin et al., 2022). If the retirement age for women and men is raised to 65 years (the current norm in the EU), the number of retirees will be reduced by 1-1.5 million people compared to the status quo scenario, and pension expenditures will be reduced by 1-1.3% of GDP. The employment rate of men of retirement age is slightly higher than that of women. Thus, in 2020, the employment of women aged 60-70 years was 12.3% of the total population of the corresponding age, the employment of men – 16.7% (Tkachenko, 2015).

The average life expectancy after retirement in OECD countries for men is 17.8 years at the average retirement age 65.4 years, for women – 22.5 years at the average retirement age 63.7 years. For example, in Switzerland it is 18.8 years for men (retirement age – 66.4 years), for women – 22.6 (retirement age – 65 years); in Norway – for men –18.0 (retirement age 66 years), for women –22.8 (retirement age – 63.7 years); in Sweden – for men – 18.0 (retirement age – 66.4 years), for women – 21.3 (retirement age – 65.4 years); in Finland – for men – 19.1 (retirement age – 64.3 years), for women – 23.5 (retirement age – 63.4 years); in Estonia – for men – 15.4 (retirement age – 65.5 years), for women – 20.1 (retirement age – 65.7 years) (Pensions at…, 2019).

The formation of the policy of state financial inclusion in the pension system is impossible without taking into account all the factors of economic and social nature that affect its functioning, the interaction of basic elements and institutions. Given that forecasting a large number of elements of the financial support of the pension system and their relationships both within the system and in the external context has some difficulties, so they were grouped into appropriate blocks of a comprehensive mechanism of state financial inclusion policy for its sustainable and effective operation in the allocation of budgetary resources.
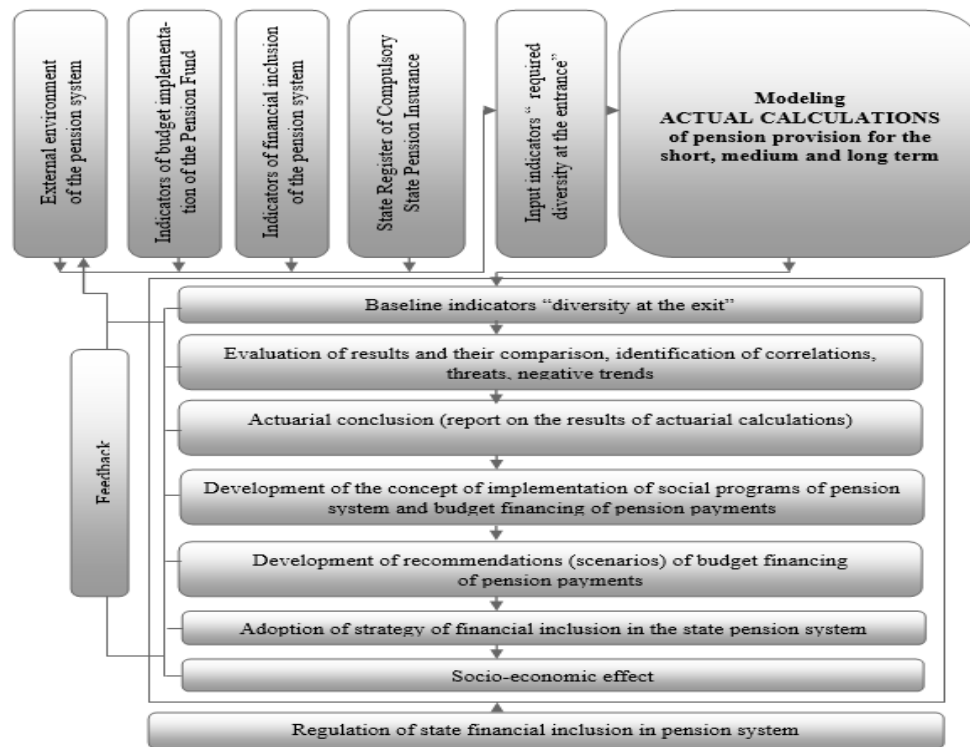
Fig. (14). Scheme of actuarial calculations of pension provision in the state financial inclusion of the pension system for the short-, medium- and long-term period.

Source: built by the authors to data (Tolubiak, 2011; Zubchenko and Mishura, 2018).

This mechanism should be implemented through actuarial modeling of pensions, which allows adjusting the parameters of demographic trends in the structure of changes in population groups; interactions between employment systems, migration, labor market, wage system, other income systems and pension insurance (Fig. **14**).

Creating an actuarial model for calculating indicators of financial inclusion of the pension system requires assessment and forecast of economic (GDP, wages, inflation, economic growth, unemployment, profitability, etc.), demographic (fertility, disability, mortality, migration, etc.), fiscal (taxation, number of SSC payers, size of SSC rate and proportions of its distribution on pension insurance, level of solvency of insurers in terms of payment of compulsory insurance payments and reimbursement to the Pension Fund) and social (employment, number of insured persons, retirement age, average monthly pension, number of pensioners, etc.) indicators (Beknazarov et al., 2020).

Actuarial calculations provide an opportunity to assess the prospects and parameters of long-term financing of pension benefits and social needs of the population in the country based on highly effective methods to identify and prevent the impact of negative factors of pension provision. Development of an actuarial model of the pension system as a whole, determining the directions of its operation require high-quality input information, which should give a comprehensive description of the process of budget expenditures to finance pensions for the disabled, requires clear regulation of optimization and balancing parameters of systemic change effects in the state.

4. CONCLUSIONS

The formation of a systematic approach to the regulation of the state policy of financial inclusion and its indicators makes it possible to ensure the optimal model of financing pension payments and the social needs of the disabled. A significant role in this is played by the modernized hierarchy of the pension system and its efficiency in the distribution of budget funds. Thus, improving the financial balance of the country's pension systems should lead not only to parametric but also to institutional changes. These changes occur due to the creation of voluntary savings systems or the development of additional non-state pension savings. The improvement is also affected by the change in the principle of calculation, namely, the amount of the pension should be calculated based on established payments and defined contributions. If this link is in the general system of pension payments at the individual level, the contributions must be fixed in nominal terms, according to the contractual obligations between the pension fund and the depositor.

The policy of state financial inclusion should stimulate the functionality of the constituent subsystems of the pension system and be aimed at aligning the institutional framework of pension provision. To effectively perform these functions, it is necessary to create objective conditions for the pension system – macroeconomic and demographic. In addition, the creation of an optimal personalized relationship of contributions to the single pension system will create the conditions for the diversified distribution of budgetary resources to in-

sured persons, given the annual decrease in the productive population.

There is no universal model of financial inclusion of the pension system, the mechanism of which met the needs of any country and was applied. Financial inclusion of the pension system in different countries has its drawbacks and advantages. According to the experience of European countries, in order to increase the level of pensions, it is necessary to carry out the simultaneous development of solidarity and accumulative levels. A multilevel hierarchy of the structure of the pension system, combining solidarity and accumulative principles, reduces the risks inherent in each of the levels through their diversification, levelling the loss of budgetary resources due to the disproportionate distribution of regional tax revenues to the budget and accumulation of funds to replace the Pension Fund's revenues and their lack.

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