







# Demographic Changes and Pension System in Croatia

Denis Buterin<sup>1</sup> , Bojana Olgić Draženović<sup>2</sup>  , and Vesna Buterin<sup>2</sup> 

<sup>1</sup> The Polytechnic of Rijeka, Trpimirova 2, Rijeka, Croatia

<sup>2</sup> Faculty of Economics and Business, University of Rijeka, I. Filipovića 4, Rijeka, Croatia  
bojana.olgic.drazenovic@efri.hr

**Abstract.** Since the beginning of the transition period, the pension system in Croatia has been subject to review and numerous reforms have been implemented. Nevertheless, the sustainability of the pension system and insufficient pension revenues remain the fundamental problems of the Croatian pension system. Therefore, it seemed reasonable to examine the causes and possible solutions that could mitigate the devastating effects of unfavorable demographic trends, limited budgetary resources, and lack of recognition of the need for independent savings for the elderly. The paper proposes measures that can be taken to reduce the pressure on the state budget for the payment of pensions based on an active employment program, as well as measures aimed at increasing participation in voluntary pension savings to counteract the negative effects of population aging, promote demographic renewal, and achieve a possible increase in retirement income.

**Keywords:** Demography changes · Croatian pension system · Age dependency ratio

## 1 Introduction

The problems of the Croatian pension system, which have their origin in demographic trends, are financial sustainability and low adequacy of income in old age. The issue of the system's sustainability primarily concerns the first pillar of the pension system, since almost 50% of the financial resources from the state budget are provided by an increasing public debt. On the other hand, the adequacy of pensions is related to the pay-as-you-go system and capitalized savings. This problem can be addressed in several ways: by strengthening productivity and the duration of employment, but also by improving the functioning and regulation of mandatory pension funds and by encouraging the population to save in voluntary pension funds [32]. The research question is therefore how to improve the first pillar by maximizing employment, i.e., by providing incentives to promote longer working lives for women and men. We will also address the issue of improving funded savings in a voluntary pension system. The performance of the second pillar of pensions and the safeguarding of second pillar funds against the harmful effects of inflation and other macroeconomic shocks are not the subject of the studies in this paper.

Previous research on the Croatian pension system has focused mainly on the issue of the investment structure of the mandatory and voluntary pension funds and the returns achieved, as well as on the problem of financing the first pillar or intergenerational solidarity. The contribution of this work is to present available solutions to mitigate the negative consequences of population aging in order to promote demographic renewal and a possible increase in pension income.

The article is organized as follows. After the introduction, Sect. 2 provides a brief review of the relevant literature, while Sect. 3 describes the design of Croatian pension systems and addresses the main issues related to system adequacy and sustainability. Section 4 provides recommendations and guidelines for improving the pension system in terms of key issues. Finally, concluding remarks are outlined in the last section.

## 2 Literature Review

Regardless of the number of published papers and research conducted, it seems that there is currently no consensus on whether the pension system stimulates economic growth or whether it is an obstacle to economic growth [10]. For example, [7] argues that government intergenerational transfers have no real effect on economic growth [13] argue that allocations for the pension system are negative for growth but that allocations for the unemployed have a positive effect on growth [42] compare unemployment in Europe and the United States at the end of the last century and conclude that higher benefits are directly related to rising unemployment [40] conclude similarly, arguing that differences in the level of social security lead to significant differences in employment and wages [2] argues that social security systems are an obstacle to economic growth because they have a discouraging effect on private savings and investment and because their financing imposes an additional burden on employees and employers. That the social security system negatively affects private savings was established by [24] based on a survey of American households. [28] found that taking money from younger generations and transferring it to older people significantly reduced savings and private investment in the United States.

On the other hand, [8] and [2] conclude that the social system stimulates economic growth through investment in education. In addition, [52] finds that even a social security system financed by an income tax can stimulate economic growth. [38] find that in the long run there is a strong two-way link between social transfers and economic growth and that government social spending is one of the growth factors. That the social security system has significant short-term effects on economic growth, especially in times of crisis, is confirmed by a study conducted by [26] studying OECD countries in the period from 1980 to 2005. According to that study a 1% increase in social spending leads to a 0.1% increase in GDP with a one-year shift.

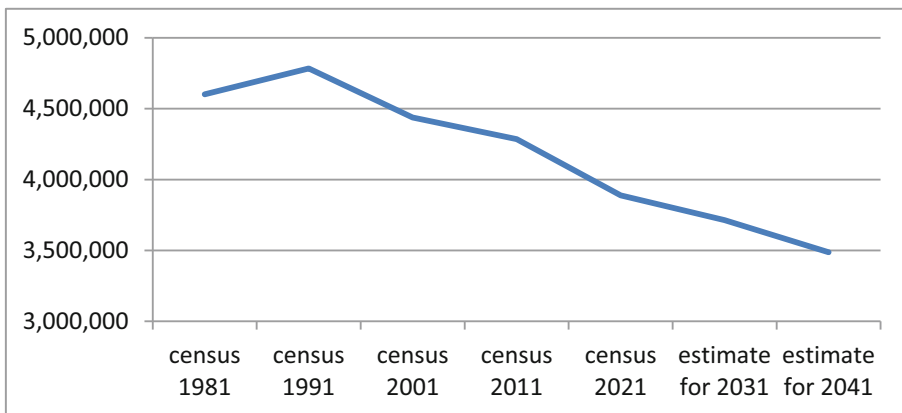
The first studies analyzing the impact of the fiscal variable on economic growth were conducted by [5, 6] who found a significant negative correlation with growth [25] investigated the relationship between economic growth and state size, and their results suggest a negative relationship between total public expenditure as a share of GDP and growth [39] conclude that a ten percent increase in tax rates leads to a half percent drop in the growth rate and believe that the slowdown in growth can be partly explained by

an increase in the overall tax burden. Although they are aware that the aging of the population and the related pressures on public finances through the pension system limit the space for reducing the overall burden, they believe that direct taxes limit growth more than indirect taxes [3] believes that all taxes, except lump sums, have a distortive effect that can cause negative consequences for growth [23] shows that tax-driven distortion is negatively correlated with growth. As early as the first half of the twentieth century, [49] believed that tax policy should distort consumer behavior as little as possible, so in this sense he mentions differentiated taxation of consumption.

[41] believe that increasing the rate of direct taxes reduces the growth rate [48] also found a significant negative correlation between income tax and growth rate [37] argue that income tax and property tax are distortive taxes that negatively affect growth rates while consumption taxes are non-distortive taxes that do not reduce growth [57] finds that the tax structure in which the share of income tax grows negatively affects growth [4] argues that increasing income taxes while reducing consumption taxes and property taxes reduces growth in the long run [60] finds that in the case of income tax and profit tax, it is not possible to determine exactly which of them has a greater negative impact on economic growth [41] identifies the detrimental impact of income tax increases and social security contributions on long-term growth rates [29] in a sample of former transition countries find that taxes on consumption and property have no impact on growth but find extremely negative and statistically significant effects of social security contributions on economic growth in these countries in the short and long term.

### 3 Demographic Trends and Population Aging in Croatia

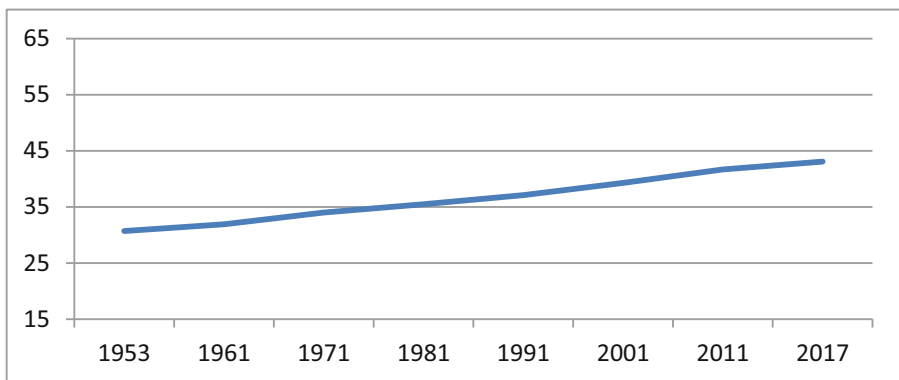
The analysis of the age structure of the population shows that the aging process will continue in Croatia, i.e. the process of increasing the share of the population aged 65 and over, and that the depopulation process will continue. Population projections are important for shaping macroeconomic policy and for developing social, pension and



**Fig. 1.** Population trends and estimates in Croatia Source: [23, 26]; and author's calculations according to [1].

other long-term strategies, so it is very important to know what to expect in the future. Population trends in Croatia, as well as estimates for the future are shown in Chart 1 (Fig. 1).

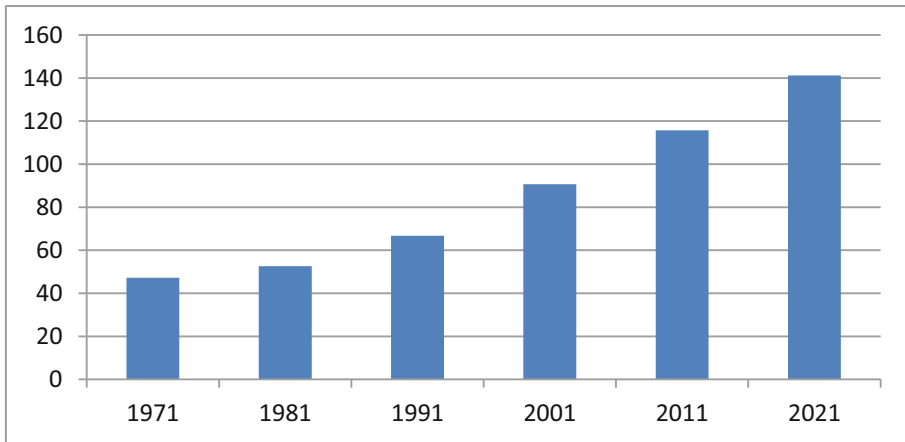
According to estimates [1], if population policy does not change significantly and does not lead to an increase in birth rates, the population will certainly decrease and age in the coming decades. In the period from the end of World War II to 1991, Croatia was characterized by positive natural population movements and a negative migration balance which, although it had the effect of reducing population growth, was not large enough to lead to zero or negative population growth. In the period from 1991 to 2001, due to the war and the significantly worsened overall economic situation in the country, the negative migration balance became the dominant factor in the reduction of the total population, i.e. the total depopulation. Although the actual size of the emigrant contingent is unknown, there are estimates that about 1.2 million people emigrated permanently from Croatia by 1991, and another 0.5 million from 1991 to 2001 [14]. Such a large migration loss undoubtedly had a markedly adverse effect on the current demographic development of Croatia. Since 1998, the rates of natural increase have been constantly negative and with a tendency to grow in a negative direction [17], so that from then until today there has been an increasing natural decrease in population. With such an unfavourable demographic situation, the continuation of the negative migration component has been particularly pronounced in recent years. The emigration of the young, able-bodied population is an additional unfavourable factor for increasing fertility and natural increase. These facts indicate that in Croatia in the process of population reproduction there is a negative population momentum intensified by the continuation of changes in age structure, which induces a further increase in natural population decline [12, 55] (Fig. 2).



**Fig. 2.** Movement of the average age of the population in Croatia Source: Author's calculations according to [23–27].

The movement of the average age shows that the average life expectancy has been growing for more than half a century and that the process of population aging in Croatia has actually been going on for a long time. Depopulation is destructive in nature: the longer it lasts, the more it weakens the demographic strength of the country in which it occurs, and since demographic processes develop slowly, it takes at least one generation

to fully see all their effects [30]. They are very often fully understood *post festum*, that is, only when they become a thing of the past. According to [43], with the continuation of current fertility rates and even without the impact of migration, in 2031 the average age of the population will be some very high 47.5 years. The current average age of the population of 43.1 years ranks Croatia among the countries with the oldest population in Europe, such as Finland or Sweden [44]. The data on the aging index, which is calculated as the number of old people per hundred young people, speaks in favour of that (Fig. 3).



**Fig. 3.** Croatian population aging index Source: Author's calculations according to [23, 25].

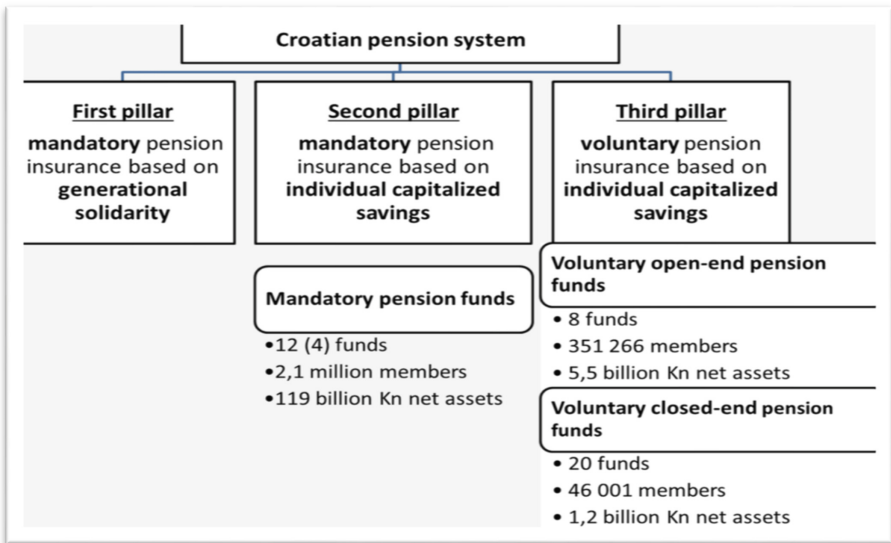
The process of population aging in Croatia began in the second half of the twentieth century. Namely, already in 1971, there were 47.2 old people per 100 young people, and the index 40 is the threshold by which it is considered that the population of a certain area is entering the aging process. By 2021, the situation had deteriorated dramatically, with 141.2 elderly people per 100 young people. Observing the age structure of the population, the future continuation of such trends can be clearly seen. Today, Croatia is one of those countries where the population has not been renewed for several decades, it is decreasing in total and in certain generations. Most developed European countries record similar demographic trends and can be said to be in the post-transition stage of population development, i.e. in various stages of the second demographic transition characterized by a decrease in the total fertility rate from a low positive rate to a level that no longer ensures population renewal [35]. According to formal, demographic and statistical criteria, Croatia belongs to this group, but due to its significantly lower level of economic, institutional and overall development than developed European countries in post-transition, it is doubtful for Croatia whether it can be considered in the post-transition stage or in a kind stages of quasi-post-transition [9, 56]. Croatia is in a less favorable demographic position than other countries in this group because low birth rates, fertility and natural increase were achieved in conditions of low economic development, which encourages emigration of vital population and permanently negatively affects its reproductive potential [15].

## 4 Croatian Pension System

### 4.1 Structure and Context

The Croatian pension system was reformed on January 1, 1999, introducing a three pillar pension system:

- First pillar or mandatory basic pension insurance based on generational solidarity (pay-as-you-go system),
- Second pillar involves private mandatory pension funds based on individual capitalized savings,
- Third pillar refers to private voluntary pension funds based on individual capitalized savings (Fig. 4).



**Fig. 4.** Structure of pension system in Croatia in 2021. Source: [59]

The first pillar of the Croatian pension system is the public pension system, which provides benefits linked to previous wages and to the length of individual working years. In addition to contributions levied on the insured and due to the decline in contributions caused by the deteriorating demographic situation, the first pillar also relies on government subsidies, which are largely debt-financed [54] argue that implicit debt is gradually transformed into explicit debt in unfunded pensions, leaving the impact on intergenerational distribution essentially unchanged compared to regular pay-as-you-go financing.

The second and third pillars represent individual capitalized savings and were introduced on January 1, 2002, to expand the source of funding, with the goal of achieving greater individual responsibility for one's retirement and ensuring a better standard of living in old age. Workers save in their individual accounts in mandatory and voluntary pension funds, and these financial resources are their personal property and subject to inheritance [46].

The second pillar includes mandatory "defined contribution" pension funds. All mandatory pension funds are managed by one of the four existing management companies established by the few largest banks and insurance companies in Croatia. Each of the management companies offers system participants three sub-funds, depending on their investor profile and risk preferences: Category A (risk seeking), B (moderate type) and C (risk averse). The main problems of pension funds in Croatia are the following [45]:

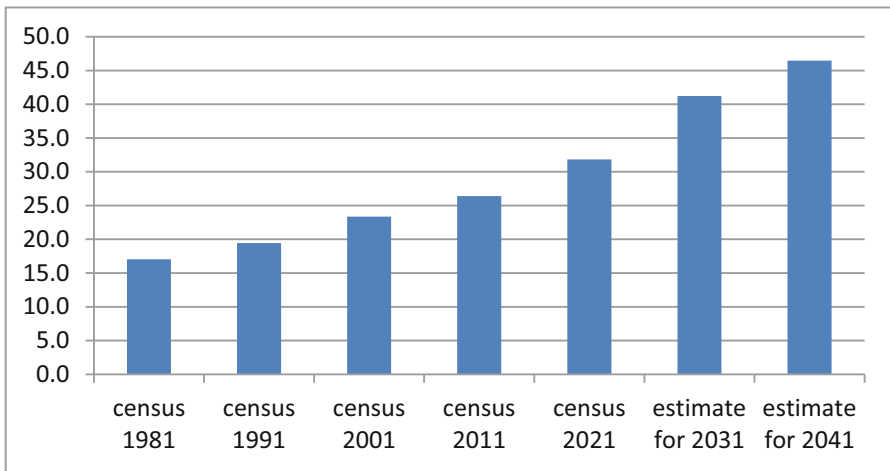
- Their size in relation to the shallow and narrow domestic capital market (disproportion between the large demand for "blue chip" securities and the available listings),
- Ownership and interest relationships between banks and pension fund management companies,
- quantitative and strict regulatory requirements as the only instrument of regulating pension funds,
- lack of diversification of pension fund portfolios,
- high country risk due to the predominant investment of domestic sovereign debt (government bonds),
- insufficient competition (to promote maximization of long-term net returns at acceptable risk levels),
- the problem of transparent measurement of pension fund performance (susceptibility to populism and ad hoc political measures).

The third pillar is a supplementary optional system that includes open-end and closed-end pension funds. Open pension funds are accessible to all residents, while closed pension funds are sponsored by employers, unions, or other professional organizations. Both are based on voluntariness and represents a matter of personal choice with the advantage of financial flexibility (choice of frequency and amount of payments) and control over payments. Furthermore, voluntary retirement saving is the only financial product in Croatia that includes two types of government stimulus: government incentive funds and tax incentives for employers.

The inadequate representation of insured persons and savings in the third pillar is also a major problem. Voluntary pension saving is still underdeveloped in Croatia, and very few people (397267 members at the end of 2021) opt for this form of saving for the third age, especially among low-income workers [46]. This resulted in a very low level of coverage in the third pillar: 24.2% of the working population or only 10.2% of the total population. There is still much room for improvement, especially considering that the total assets managed by voluntary pension funds (HRK 6.7 billion) correspond to less than 3% of the savings and time deposits (in HRK and foreign currency) in Croatian banks in 2021.

## 4.2 Sustainability and Adequacy Issues

The development of Croatian demography has been discouraging in recent decades, with the process of emigration intensifying after Croatia's accession to the EU [31]. One of the most important indicators of population structure used to understand the relative economic burden on the labour force is the old-age dependency ratio. It indicates the share of the inactive population compared to the employed population and is calculated as the ratio between the number of employed persons (aged 15 to 65) and the number of pensioners (over 65) and children (aged zero to 14). Figure 5 shows the evolution of the old-age dependency ratio and estimates of this evolution for the future.

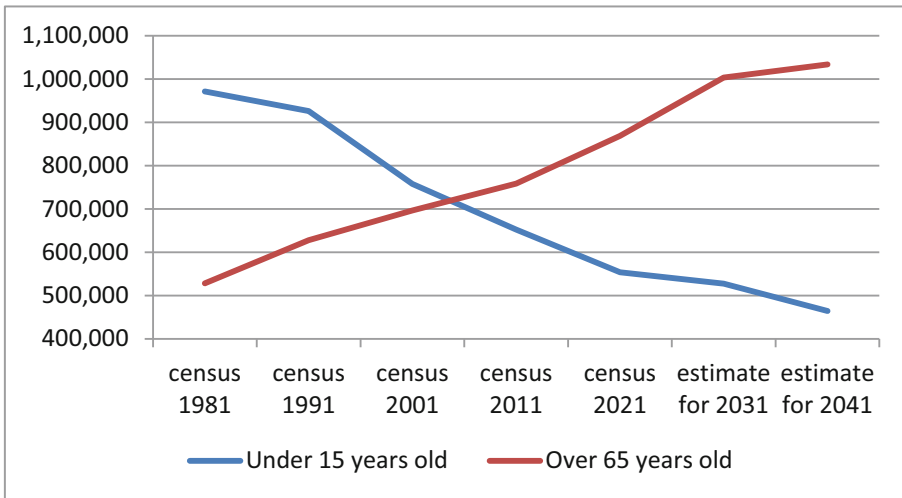


**Fig. 5.** Movement of the age dependency coefficient. Source: Author's calculations according to [23, 27–29]; [1]

The trends and projections presented show that the system is not sustainable due to high age dependency. While in 2011 there were 26.4 working-age persons for every 100 residents, it is estimated that by 2031 the burden on the working population will increase to 42 older persons, while the estimate for 2041 is even more devastating (Fig. 6).

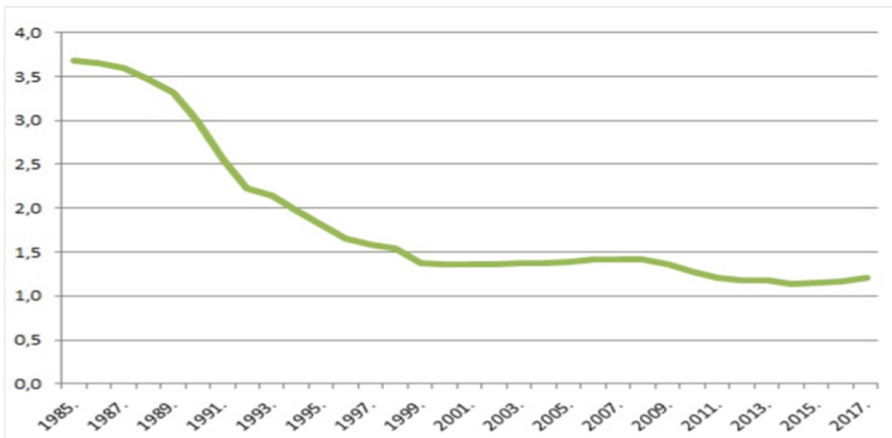
In the 2011 census, for the first time in history, the number of people over 65 exceeded those under 15. Although this is an apparent demographic turning point, it is merely a continuation of long-standing unfavourable demographic trends. As a result, the Croatian population today is characterized by an extremely high age. Projections for the future are worrisome and indicate that a systematic approach to demographic problems is needed in Croatia [10, 11]. The growing disparity between the observed age groups of the population is unsustainable in the long run in demographic, economic and social terms. The solution to this problem lies in the area of long-term and strategic measures to promote the birth rate through specific policies that should influence the creation of favourable conditions for population reproduction. Demographic conditions in Croatia indicate that the financing of pensions through contributions, i.e. in the current form or





**Fig. 6.** Movement and assessment of the population younger than 15 and older than 65 years. Source: Author’s calculations according to [1, 27–29]

in the form in which it was done in the past decades, cannot be sustained for a long time. With the necessary change in approach to birth policy, the effects of which, however, can only be expected in the very long term, a change in the tax structure is needed in the short and medium term to achieve sustainable financing of the Croatian pension system [27] (Fig. 7).

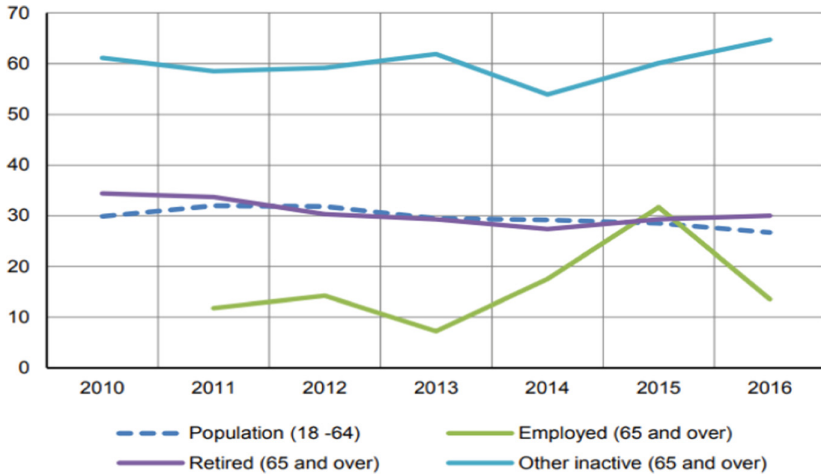


**Fig. 7.** Ratio of insured persons/pension beneficiaries. Source: [17]

In 2022 the ratio of the number of pension beneficiaries and retirees in 2022 has fallen to only 1:1.30. Moreover, the share of pensions in the average salary in Croatia is only 36%, which is among the lowest in Europe (59% on average in 2017). As a result,

the at-risk-of-poverty or exclusion rate for people over 65 in Croatia is one of the highest in the EU. With a rate of 32.6% in 2016, Croatia had the sixth highest at-risk-of-poverty or social exclusion rate in the EU [58].

The first pillar of intergenerational solidarity is heavily dependent on budget transfers. In 2021, only 56% of pension expenditures will be covered by contributions, and 44% will be financed from the state budget [16] (Fig. 8).



**Fig. 8.** At-risk-of-poverty or social exclusion rate in Croatia, 2010–2016 Source: [58]

Employed older people have much lower poverty/social exclusion rates than retirees or younger adults in general. Policies to promote employment in old age clearly have significant potential to reduce poverty and social exclusion among older people [58].

## 5 Proposals for Improving the Croatian Pension System

It is obvious that the first pillar has problems, but it is an extremely important part of the social security system. On the other hand, individual retirement savings are an indispensable instrument for ensuring more adequate income in old age. Therefore, the combination of intergenerational solidarity and individual retirement saving is a complementary way to secure the standard of living in old age.

The empirical findings support the need for a range of policies and approaches to ease the negative effects of demographic change, especially in aging economies. These measures may take the form of active labour market policies or legal reforms that discourage retirement at the earliest possible legal age through penalties or other measures, and discourage employment beyond the age limit through stricter eligibility requirements and incentives [61].

The pension system (First Pillar) should allow the pension system deficit to be managed in the long term under the conditions of an aging population. Population aging need not lead to the financial unsustainability of the first pillar of intergenerational solidarity if labour market and pension reforms are implemented in time. The real value of pensions from the first pillar of intergenerational solidarity is endangered by negative demographic trends. Some of the short-term solutions (but with negative effects in the long run) that are available are government borrowing and increasing pension contributions. In the long run, available solutions can be found in increasing employment and productivity, which would increase the income of the pension system. It is necessary that the growth of productivity and wages is faster than the growth of the number of pensioners. The long-term solution within the system of intergenerational solidarity can only be solved by permanently increasing engagement and labour productivity, reinforced by complementary policies to alleviate the outcomes of population aging.

Some of the recommendations aimed to improve pension system sustainability and adequacy for Croatian pension system are:

- active labour market policies (strong incentives for employing young people and people aged 55 +),
- prolonging longer working lives (emphasis on positive incentives) and reforms that postpone retirement by penalizing and reducing early retirement and imposing stricter eligibility criteria,
- implementing a strong work incentives for employment above the retirement age (post-retirement employment opportunities by subsidizing employers),
- enabling coverage audit and aligning pension provisions for privileged pension groups with the rules of the general scheme,
- implementing a mix of economic policies that promote demographic renewal.

Recommendations for improving capitalized savings in the Croatian pension system are numerous. Mandatory capitalized savings (2nd pillar of the pension system) can be improved by focusing on the possibilities of better portfolio structuring, much more significant investment in shares as well as in foreign capital markets, i.e. by achieving higher returns. In the near future, this focus will replace the effort to preserve value in conditions of uncertainty, high interest rates and inflationary tendencies [33] underlines that coping with challenges posed by population ageing requires pension reforms that ensure better balance between contributions and entitlements, reduce early retirement and raise the pensionable age. But these are not sufficient to compensate for the shrinking working age population.

In order to achieve pension adequacy, longer working lives will have to be accompanied by efforts to increase complementary retirement savings. The present approach of individual voluntary retirement plans in Croatia has resulted in low coverage because of the low income and insufficient contribution rates of participants [46, 47] and [53] identifies low financial literacy, lack of long-term predictable and transparent government policies (predictability, stability and efficiency of pension system), and other unfavorable economic (low income levels) and social factors (lack of investment culture and conservative investors) as the most important factors for the low interest of employees

in voluntary saving in pension funds. It is evident that tax incentives in Croatia, as policy measures to encourage additional pension saving, are an effective but not sufficient condition for a significant increase in voluntary saving. Research findings [34, 50, 51] suggest that in addition to traditional tax incentives and subsidies, effective non-tax spurs are also available, which are primarily targeted at low-income savers who are least interested in saving for the third age. Therefore, one of the best policy approaches to strengthening voluntary retirement savings is auto-enrollment with an opportunity to opt out.

## 6 Conclusion

The negative effects of demographic effects largely explain the difficulties in the functioning of the Croatian pension system. Financially, the system is heavily dependent on transfers from the budget (for the first pension pillar), and the degree of adequacy (adequacy) of pensions is declining, despite numerous measures and adjustments to the system. For all these reasons, a profound change in the functioning of the Croatian pension system is needed. Nevertheless, the first pillar itself is not capable of achieving improvement in adequacy and sustainability under the conditions of population aging. The aging of the population leads to an incompatibility of the first pillar goals of financial sustainability and increasing the adequacy of pensions, unless more emphasis is placed on individual pension saving. A combined pension system (intergenerational and individual capitalised savings) could successfully resolve the conflict between the financial sustainability of the system and the adequacy of pensions. There are a number of possible solutions and policy levers to permanently increase labour productivity and employment opportunities after retirement. A flexible and long-term approach by a number of institutions can mitigate or even reverse the negative effects of demographic trends on the system of intergenerational solidarity in Croatia, and a whole series of measures aimed at improving voluntary pension savings and attracting new members is also necessary.

This research is not without limitations, and further research should be conducted in different directions. Since this article has only addressed the problems and possible solutions for pension funds, future research could be expanded to include detailed proposals for improving the functioning and investment structure of mandatory pension funds. On the other hand, a study could be conducted that focuses only on ways to improve voluntary pension savings.

**Acknowledgment.** This paper has been supported by the University of Rijeka under the projects number uniri-drustv-18-61 and ZIP-UNIRI-130 5-20.

## References

1. Akrap, A.: Demografski slom Hrvatske: Hrvatska do 2051. *Bogoslovska smotra* **85**(3), 855–881 (2015)
2. Atkinson, A.B.: Is the welfare state necessarily an obstacle to economic growth. *Euro. Econ. Rev.* **39**(3–4), 723–730 (1995)

3. Arnold, J.M.: Do Tax Structures Affect Aggregate Economic Growth?, OECD Economics Department Working Papers No. 643 (2008)
4. Arnold, J.M., Brys, B., Heady, C., Johansson, Å., Schweltnus, C., Vartia, L.: Tax policy for economic recovery and growth. *Econ. J.* **121**(550), 59–80 (2011)
5. Barro, R., J.: A cross-country study of growth, saving and government. In: *National Saving and Economic Performance*. Bernheim, B.D.I., Shoven, J.B. (eds). University of Chicago Press, Chicago (1991)
6. Barro, R.J.: Economic growth in a cross section of countries. *Q. J. Econ.* **106**(2), 407–443 (1991a)
7. Barro, R.J.: Are government bonds net wealth?. *J. Polit. Econ.* **82**(6), 1095–1117 (1974)
8. Belletini, G., Ceroni, C.: Social security expenditure and economic growth: an empirical assessment. *Res. Econ.* **54**(3), 249–275 (2000)
9. Buterin, D.: Change in the tax structure of the Republic of Croatia as a precondition for pension system reform. *Zbornik Veleučilišta u Rijeci* **9**(1), 301–314 (2021)
10. Buterin, D.: Model optimalnoga financiranja sustava socijalnoga osiguranja Republike Hrvatske. Doctoral Thesis, Rijeka: University of Rijeka, Faculty of Economics and Business, urn:nbn:hr:192:363531 (2020)
11. Buterin, D., Buterin, V., Suljić Nikolaj, S.: Institutional reform – a necessary condition for health system reform in Croatia. In: Aleksić, A., Ružić, V., Baracska, Z. (eds.) *Economic and Social Development: 65th International Scientific Conference on Economic and Social Development*, pp. 159–171. Varaždin Development and Entrepreneurship Agency; University North; Faculty of Management University of Warsaw; Faculty of Law, Economics and Social Sciences Sale - Mohammed V University in Rabat; Polytechnic of Međimurje in Čakovec (2021)
12. Buterin, V., Mrvčić, M., Fajdetić, B.: Impact of migration and population aging on economic growth in the Republic of Croatia, *Ekonomski vjesnik – Economicviews* **35**(1), 151–164 (2022)
13. Corneo, G., Marquardt, M.: Public pensions, unemployment insurance, and growth. *J. Public Econ.* **75**(2), 293–311 (2000)
14. Čižmić, I., Živić, D.: Vanjske migracije stanovništva Hrvatske – kritički osvrt. In: *Stanovništvo Hrvatske – dosadašnji razvoj i perspektive*. Živić, D. et al. (eds.). Institut društvenih znanosti Ivo Pilar, Zagreb (2005)
15. Črpić, G.: Obrisi hrvatske demografske implozije. In: *Stanovništvo Hrvatske – dosadašnji razvoj i perspektive*. Živić, D. et al. (eds.). Institut društvenih znanosti Ivo Pilar, Zagreb (2005)
16. DZS: Popis '21 (2022). <https://popis2021.hr/>
17. DZS: Statistički ljetopis Republike Hrvatske, Državni zavod za statistiku Republike Hrvatske, Zagreb (2018)
18. DZS: Procjene stanovništva Republike Hrvatske u 2017., Priopćenje Državnog zavoda za statistiku, Zagreb (2017)
19. DZS: Hrvatska u brojkama 2016, Državni zavod za statistiku Republike Hrvatske, Zagreb (2016)
20. DZS: Popis stanovništva 2011 (2011). [https://www.dzs.hr/Hrv/censuses/census2011/census\\_logo.htm](https://www.dzs.hr/Hrv/censuses/census2011/census_logo.htm). Accessed 6 Apr 2022
21. DZS: Popis stanovništva 2001 (2001). <https://www.dzs.hr/Hrv/censuses/Census2001/census.htm>. Accessed 2022/4/6
22. DZS: Statistički ljetopis 1992, Državni zavod za statistiku Republike Hrvatske, Zagreb (1992)
23. Easterly, W.: How much do distortions affect growth. *J. Monet. Econ.* **32**(2), 187–212 (1993)

24. Feldstein, M.: Social security, induced retirement, and aggregate capital accumulation. *J. Polit. Econ.* **82**(5), 905–926 (1974)
25. Fölster, S., Henrekson, M.: Growth effects of government expenditure and taxation in rich countries. *Euro. Econ. Rev.* **45**(8), 1501–1520 (2001)
26. Furceri, D., Zdzienicka, A.: The effects of social spending on economic activity: empirical evidence from a panel of OECD countries. *Fisc. Stud.* **33**(1), 129–152 (2012)
27. Gemmill, N., Kneller, R., Sanz, I.: Fiscal Policy Impacts on Growth in the OECD: Are They Long-Run? University of Nottingham, Mimeo (2006)
28. Gokhale, J., Kotlikoff, L.J., Sabelhaus, J.: Understanding the postwar decline. In: *U.S. Saving Cohort Anal. Brookings Papers Econ. Act.* **27**(1), 315–407 (1996)
29. Grdinić, M., Drezgić, S., Blažić, H.: An empirical analysis of the relationship between tax structures and economic growth in CEE countries. *Ekonomický časopis* **65**(5), 426–447 (2017)
30. Grizelj, M.: Projekcije stanovništva Hrvatske do kraja stoljeća. In: *Stanovništvo Hrvatske – dosadašnji razvoj i perspektive*. Živić, D. et al. (eds.). Institut društvenih znanosti Ivo Pilar, Zagreb (2005)
31. Ivanda, K.: Demografija Hrvatske: stanje, zablude i perspektive. *Političke analize* **8**(31), 10–15 (2017)
32. European Commission: Demographic change in Europe - green paper on ageing. [https://ec.europa.eu/info/law/betterregulation/have-your-say/initiatives/12722-Demographic-change-in-Europe-green-paper-on-ageing\\_en](https://ec.europa.eu/info/law/betterregulation/have-your-say/initiatives/12722-Demographic-change-in-Europe-green-paper-on-ageing_en), Accessed 21 May 2022
33. European Commission: European semester thematic factsheet: Adequacy and sustainability of pensions. [https://ec.europa.eu/info/sites/default/files/file\\_import/european-semester\\_thematic-factsheet\\_adequacy-sustainability-pensions\\_en\\_0.pdf](https://ec.europa.eu/info/sites/default/files/file_import/european-semester_thematic-factsheet_adequacy-sustainability-pensions_en_0.pdf) (2021)
34. Jackson, R.: Voluntary Pensions in Emerging Markets: New Strategies for Meeting the Retirement Security Challenge, Global Aging Institute. <http://www.globalaginginstitute.org/assets/client-assets/common/downloads/publications/2019-Voluntary-Pensions-in-Emerging-Markets-EN.pdf> (2019)
35. Van de Kaa, D.J.: Europe's second demographic transition. *Popul. Bull.* **42**(1), 1–59 (1997)
36. Kaganovich, M., Zilcha, I.: Education, social security and growth. *J. Public Econ.* **71**(2), 289–309 (1997)
37. Kneller, R., Bleaney, M., F., Gemmill, N.: Fiscal policy and growth: evidence from OECD countries. *J. Pub. Econ.* **74**(2), 171–190 (1999)
38. Lee, C.C., Chang, C.P.: Social security expenditures and economic growth: a heterogeneous panel application. *J. Econ. Stud.* **33**(5), 386–404 (2006)
39. Leibfritz, W., Thornton, J., Bibbee, A. Taxation and Economic Performance, OECD Economics Department Working Papers No. 176 (1997)
40. Marimon, R., Zilibotti, F.: Unemployment vs. mismatch of talents: reconsidering unemployment benefits. *Econ. J.* **109**(455), 266–291 (1999)
41. McNabb, K., LeMay-Boucher, P.: Tax Structures, Economic Growth And Development, ICTD Working Paper 22 (2014)
42. Mortensen, D.T., Pissarides, C.A.: unemployment responses to skill-biased technology shocks: the role of labour market policy. *Econ. J.* **109**(455), 242–265 (1999)
43. Mrđen, S.: Projekcije stanovništva Hrvatske do 2031. Godine. In: *Stanovništvo Hrvatske – dosadašnji razvoj i perspektive*. Živić, D. et al. (eds.), Institut društvenih znanosti Ivo Pilar, Zagreb (2005)
44. Nejašmić, I., Toškić, A.: Starenje stanovništva u Hrvatskoj – sadašnje stanje i perspektive. *Hrvatski geografski glasnik* **75**(1), 89–110 (2013)
45. Olgić Draženović, B., Hodžić, S., Maradin, D.: Efficiency of mandatory pension funds: case of Croatia. *South East Euro. J. Econ. Bus.* **14**(2), 82–94 (2019)

46. Olgić Draženović, B., Suljić Nikolaj, S., Togonal, L.: Voluntary pension saving in CEE countries: possibilities for enhancement. In: Lorga da Silva, A., Luic, L.J., Nechad, A. (eds.) *Economic and Social Development 74th International Scientific Conference on Economic and Social Development*, pp. 31–38. Varaždin Development and Entrepreneurship Agency, Varaždin (2021)
47. Olgić Draženović, B.: Voluntary pension funds in Croatia: investment performance and incentives. *DIEM* **6**(1), 127–136 (2021)
48. Plosser, C.I.: The search for growth. In: *Proceedings – Policies for Long-Run Economic Growth*, The Federal Reserve Bank of Kansas City, Jackson Hole (1992)
49. Ramsey, F.P.: A contribution to the theory of taxation. *Econ. J.* **37**, 47–61 (1997)
50. Rudolph, H.: *Building Voluntary Pension Schemes in Emerging Economies*. Policy Research Working Paper 7779, World Bank Group, Washington DC. <https://openknowledge.worldbank.org/handle/10986/24860> (2016)
51. Rutecka-Góra, J., Vostatek, J., Turner, J.A.: Extending pension coverage: tax versus non-tax incentives. *ACTA VŠFS Ekonomicke studie a analyzy* **2**(12), 107–124 (2018)
52. Sánchez-Losada, F.: Growth effects of an unfunded social security system when there is altruism and human capital. *Econ. Lett.* **69**(1), 95–99 (2000)
53. Vukorepa, I.: Lost between sustainability and adequacy: critical analysis of the Croatian pension system's parametric reform. *Revija za socijalnu politiku* **22**(3), 279–308 (2015)
54. Werding, M., Primorac, M.: Old-age provision in transition: the case of Croatia. *J. Pens. Econ. Finance* **17**(4), 576–593 (2018)
55. Wertheimer-Baletić, A.: Determinante reprodukcije stanovništva Hrvatske u drugoj polovici 20. Stoljeća. In: *Stanovništvo Hrvatske – dosadašnji razvoj i perspektive*. Živić, D. et al. (eds.). Institut društvenih znanosti Ivo Pilar, Zagreb (2005)
56. Wertheimer-Baletić, A.: Demografske promjene i globalni demografski procesi u Hrvatskoj u poslijeratnom razdoblju. *Encyclopaedia moderna* **13**(2), 238–351 (1992)
57. Widmalm, F.: Tax structure and growth: are some taxes better than others. *Public Choice* **107**(3–4), 199–219 (2001)
58. World Bank Group: Policy Note: Adequacy of Pensions in Croatia, <https://thedocs.worldbank.org/en/doc/861371604611925086-0080022020/original/22aAdequacyofPensions.pdf> (2019)
59. Hanfa: Statistika, <https://www.hanfa.hr/publications/statistics/>. Accessed 6 May 2022
60. Xing, J.: Does tax structure affect economic growth? Empirical evidence from OECD countries, Oxford University Centre for Business Taxation Working Paper 11/20 (2001)
61. Žokalj, M.: The impact of population aging on public finance in the European Union. *Financ. Theory Pract.* **40**(4), 383–412 (2016)