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INTRODUCTION

The present country fiche for Croatia is part of the 2024 Ageing Report, which provides long-term projections of the economic and budgetary impact of population ageing at unchanged policy. The 2024 edition is the eighth update and covers the period up to 2070.

This fiche was prepared by Ministry of Labour and Pension System and the Croatian Pension Insurance Institute. The pension projections presented in this fiche incorporate the macroeconomic assumptions and methodologies agreed within the *Ageing Working Group* of the *Economic Policy Committee*. The projections have been peer reviewed by the other Member States and the European Commission within the *Ageing Working Group*. The projections were finalised in the autumn of 2023 and represent the situation of the pension system on 01/12/2023.

Section 1 provides a general overview of the pension system in Croatia. Section 2 describes the demographic and labour market assumptions underlying the pension expenditure projections presented in Section 3, which also discusses the sensitivity scenarios around the baseline. Finally, Section 4 gives an overview of the model used to produce the pension projections, with complementary data provided in the methodological annex.

1. OVERVIEW OF THE PENSION SYSTEM

1.1. Description

The Croatian pension system is based on three pillars:

- Public PAYG scheme (pillar I)
- Mandatory private fully-funded scheme (pillar II)
- Voluntary private fully-funded scheme (pillar III)

The current system is the result of a comprehensive structural reform enacted in 1998. The reform started with thorough changes within the existing public PAYG system in 1999 and continued by introducing mandatory and voluntary private schemes in 2002.

1.1.1. The first pillar: public PAYG scheme

The first pillar is the core pension insurance scheme based on principles of reciprocity and solidarity. It is mandatory for all employees and the self-employed, based on the PAYG principle. It is a point system in which workers earn pension points based on their individual earnings for each year of contributions. The scheme covers the risks of old age, disability (including work-related injury and diseases) and also provides for survivors' rights upon the insured person's or pensioner's death. It is administrated by the Croatian Pension Insurance Institute and financed by employees' and employers' contributions and state budget transfers.¹

In addition to pensions paid according to general regulation on the basis of the Pension Insurance Law (OG 157/2013 and its amendments), the first pillar also provides pensions determined by a number of specific laws that stipulate retirement conditions for specific population categories. In such cases, pension entitlement conditions are generally looser and

¹ The share of state budget transfers in total pension system revenues was 39.5% in 2022 (3.7% of GDP).

benefits higher than those determined under general conditions. Police and military personnel, Members of Parliament, government officials, Constitutional Court judges, Homeland War Veterans, academics, veterans from World War II, workers professionally exposed to asbestos and former political prisoners receive benefits that are determined by special laws. The number of pensioners receiving pension benefits determined by special legislation reached 184,000 or around 15% of all pensioners in 2022. The most important special law is the Law on Homeland War Veterans (Official Gazette no. 121/2017 and its amendments), according to which disability and survivor pensions for around 89,000 pensioners (around 48% of total special categories) and old-age pension for around 41,000 pensioners (around 22% of total special categories) are realised, mostly for veterans from the 1991-1995 Homeland War. These pensioners are relatively young, and their benefits are higher than the average pension. Although a part of these benefits is 'covered' by regular contributions to the public pension scheme for the period spent as employed or self-employed, the other part is approved as merit pension. The Government is obliged to cover cost of additional pension expenditures due to special regulations, which is covered by transfers from the State Budget to the Croatian Pension Insurance Institute.

1.1.2. The second pillar: mandatory private funded scheme

The second pillar is a mandatory fully-funded defined contribution scheme established in 2002. It covers predominantly the risk of old age, but also the risks of disability and death under specified circumstances (if the fund member is older than 55 and the membership is longer than 10 years and if the amount of disability or survivors' pension from two pillars would be higher than the amount from the first pillar only).

Within the second pillar, the accumulation phase is institutionally separated from the pay-out phase and these phases are regulated by separate legislation. In the accumulation phase, mandatory pension funds manage individual accounts of contributors. Pension funds are run by licensed pension fund management companies. At the moment of retirement, the accumulated individual savings are transferred to the private pension insurance company. Benefits are paid in the form of life-long pensions, individual or joint benefits for both spouses, with or without a guaranteed payment period. Currently, there are four mandatory pension funds and two pension insurance companies, which are also responsible for payment of pensions from the third (voluntary) pillar.

Participation in the second pillar is mandatory for all employees and the self-employed born in 1962 and later. At the time of the introduction of the second pillar, in 2002, the insured persons born between 1953 and 1962 were given an option to choose between staying in the one-pillar regime (public PAYG scheme only) or entering the two-pillar regime (participation in both public PAYG scheme and the private second pillar scheme). Persons born before 1953 had to remain insured only in the first pillar.

Total number of members of mandatory pension funds was around 2.2 million at the end of 2022, though these numbers include also those who stopped paying contributions on a regular basis but remained members. Net asset of mandatory pension funds was around 17.5 billion euros at the end of 2022 (26% of GDP).

Calculation of pension benefits in the first pillar (the public PAYG scheme) differs between mono-pillar and two-pillar participants. This difference was the major cause why the combined two-pillar pensions were lower than the mono-pillar pensions for the vast majority of pensioners that retired in the early 2010s. Therefore, in 2011 the pension legislation was amended to

provide the possibility for persons who voluntarily chose for a two-pillar regime (those born between 1953 and 1962) to opt out of that regime at the moment of retirement. In the case of opting out, they would receive their complete pension from the public PAYG scheme based on the rules for those insured in the first pillar only. Their savings accumulated in the second pillar private pension fund are then transferred to the public scheme. According to pension legislation that was in effect until December 2018, those born as of 1963 did not have an option to choose between mono-pillar and combined two-pillar pension benefits. However, the pension regulation amendments that apply since 2019, also allow the cohorts born in 1963 and later to opt out from the 2nd pillar at retirement.

At the end of 2022, around 21% of the retiring two-pillar participants decided to receive combined two-pillar pensions, while all others chose to return to the first pillar. Total number of pensions paid out from the second pillar insurance was around 11,100 at the end of 2022.

1.1.3. The third pillar: voluntary private funded scheme

The third pillar is a voluntary private pension scheme that started operating in 2002. This is a fully-funded, defined contribution, privately managed pension scheme. In the accumulation phase, open-ended and close-ended² pension funds exist. Contributions to the third pillar are voluntarily paid by the members themselves and/or by their employers. Coverage of the third pillar is relatively low but is steadily increasing. At the end of 2022, net asset of voluntary pension funds was around 1.1 billion euros, which is around 6% of net assets accumulated in the mandatory pension funds. There were around 375,000 members of open-ended funds and 48,000 members of close-ended funds. With a total of 423,000 it covers around 16% of all pension funds members. There were some 5,200 pensions paid out of the third pillar insurance at the end of 2022. In this scheme, payment of pensions is possible as of the age of 55 without other qualifying conditions. Overall, the third pillar provides for a rather small portion of overall retirement incomes and, therefore, it is not modelled in the current projections.

1.1.4. Social assistance

The Croatian social care system aims to assist socially vulnerable people as well as people living in unfavourable personal or family circumstances. The social care system is financed by the State Budget. The most important programme for poverty alleviation is the Guaranteed Minimum Benefit (GMB). It is a means-tested programme and the benefit amount is determined on the basis of household income.

The elderly can apply for social assistance according to the general rules applied to the rest of population. In 2021, around 6,500 beneficiaries of the GMB were of age 65 years and more, which is around 13% of all beneficiaries. The GMB benefit bill for the elderly was around EUR 7 million (0.01% of GDP) in 2021. The pension for 15 years of service of the large majority of such beneficiaries might be higher than the GMB threshold. However, the eligibility for GMB depends on the income per family member. Other social care programmes are targeted to protect the disabled and other vulnerable persons and families and they are also means-tested. Social care benefits are not modelled in the current projections.

² An *open-ended pension fund* is offered commercially by pension fund management companies and it is open to any person residing in Croatia. A *closed-end pension fund* on the other hand is a pension fund set up by a plan sponsor and managed by a pension fund company. The plan sponsor can be an employer, a group of employers, a trade union or, an association of self-employed. The group of people covered can be employees with a particular employer, trade union members, or self-employed persons.

As of 2021, a new benefit was introduced for elderly (Law on National Benefit for Older Persons, Official Gazette no. 62/2020). The benefit is targeted at citizens at the age of 65+ who have resided in Croatia for 20 years and whose income does not exceed the amount of the national benefit for the elderly. Total number of beneficiaries of the newly introduced National Benefit was around 6,500 in 2022 and total expenditure were around 8 million euros (about 0.1% of total public pension expenditure). The benefit is financed by the general State Budget revenues.

The National Benefit for Older Persons is not included in the 2024 projections considering that the estimated costs are relatively low, and the newly introduced benefit has a very limited impact on the long-term sustainability of the pension system.

1.1.5. Statutory retirement age, early retirement and qualifying conditions for retirement

The *statutory retirement age* is 65 years for men. For women, old-age retirement is possible at the age of 63 years and 3 months in 2023. The pensionable age for women will increase by 3 months every year, reaching the age of 65 in 2030. As of 2030, the pensionable age (for both women and men) will remain 65 years. The minimum contributory period for old-age pension for both genders remains at 15 years (Table 1).

In case of a *contribution period of 41 years and more*, retirement is possible at the age of 60 for both genders without reduction of pension benefit by penalties due to early retirement.

Persons working in arduous or hazardous occupations are granted special treatment and can realise old-age pension earlier, without reductions of pension benefit. For these persons the insurance periods are calculated in extended duration (each 12 months of work, the insurance period is counted as 14, 15, 16 or 18 months) and the age prescribed for the entitlement to the old-age pension is decreased, depending on the degree of increment of the insurance periods and the length of such periods. Employers' contribution rates for such occupations are higher than the standard rate.

Early retirement is possible maximum 5 years prior to the statutory retirement age, under the condition of a minimum contributory period of 35 years (or less for women until 2030; 33 years and 3 months in 2023). In 2023, the earliest retirement is possible at the age of 60 for men and 58 years and 3 months for women. In case of early retirement, the pension benefit linearly decreases by 0.2% per month of anticipation (2.4% per year, 12% for the maximum of 5 years). For example, in 2023 men (women) at the age of 60 (58 years and 3 month) can retire with 35 years (33 years and 3 months) of contribution and his/her pension benefit will be permanently reduced by 12%.

On the other hand, it is possible to defer retirement beyond the statutory retirement age. For every month of deferment, the bonus of 0.45% is applied, 5.4% per year, up to a maximum of 27% for 5 years of deferment.

Disability pensions are provided from the first pillar on condition that the insurance period is equal to one third of working life. Working life is the full number of years between the age of 20 (23 for persons with post-secondary education and 26 for persons with university degree) and the day of the contingency that caused disability. Persons under the age of 30 are entitled to disability pensions if they have completed at least 1 year of insurance; whereas for those aged 30 to 35, the entitlement is conditional upon an insurance period of 2 years (1 year, if graduated from university).

There is no minimum insurance period requirement if the disability is the consequence of a work injury or an occupational disease, in which case disability pension is calculated as at least 40 years of insurance is realised. To qualify for a disability pension, changes in health must occur before the age of 65. In the case of partial incapacity, the benefit is lower than in the case of total incapacity, and partially incapacitated pensioners can be employed while simultaneously receiving a reduced disability pension.

Survivors' pensions are provided to family members of the deceased person if the deceased was a pension beneficiary, a beneficiary of occupational rehabilitation or an insured person who had completed a five-year insurance period or ten-year qualifying period. After the death of the pension beneficiary, the pension base is the old-age or disability pension that the deceased beneficiary actually received. After the death of insured person, the pension base is the hypothetical old-age pension or disability pension that the person should receive if alive. In the latter case the minimum number of years of coverage for pension calculation is 21; if the death was the consequence of a work injury or an occupational disease, the minimum number of years for pension calculation is 40.

The survivor's pension ranges from 77% to 110% of the pension, depending on the number of eligible survivors. For example, the surviving partner, who already receives a pension benefit, may chose the survivor's pension (amounting to 77% of the deceased beneficiary's pension) if higher than his/her own pension.

The children of the deceased beneficiary are eligible if under the age of 15, or under the age of 18 and out of employment or in regular education, until reaching the maximum age of 26. The benefit depends on the number of eligible survivors - 77% of the pension for one survivor, 88% for two survivors, 100% for three survivors and 110% for four or more survivors.

Table 1 – Retirement qualifying condition

		2022	2030	2040	2050	2060	2070	
Qualifying condition for retiring with a full pension	Statutory retirement age – men	65	65	65	65	65	65	
	Statutory retirement age – women	63	65	65	65	65	65	
	Minimum requirements	Contributory period – men	41	41	41	41	41	41
		Retirement age – men	60	60	60	60	60	60
		Contributory period – women	41	41	41	41	41	41
		Retirement age – women	60	60	60	60	60	60
Qualifying condition for retirement WITHOUT a full pension	Early retirement age – men	60	60	60	60	60	60	
	Early retirement age – women	58	60	60	60	60	60	
	Penalty in case of earliest retirement age*	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	
	Bonus in case of late retirement*	4.08%	5.4%	5.4%	5.4%	5.4%	5.4%	
	Minimum contributory period – men	35	35	35	35	35	35	
	Minimum contributory period – women	33	35	35	35	35	35	
	Minimum residence period – men	-	-	-	-	-	-	
	Minimum residence period – women	-	-	-	-	-	-	

Source: Croatian Pension Insurance Institute

*Figures show penalties/bonus for each year of retirement before/after the statutory retirement age

1.1.6. Pension benefit calculation rules

Pension benefits paid by the public PAYG scheme (first pillar) are determined by a point system. There are certain differences in pension formulas for those insured only in the first pillar compared to those who retire in both mandatory pension pillars.

1.1.6.1. Pension formulas for those insured in the first pillar only

The new pension benefit (PB) is calculated according to the general pension formula:

$$PB = \text{personal points (PP)} \times \text{pension factor (PF)} \times \text{actual pension value (APV)} \times 1.27$$

Personal points (PP) value earnings and employment record of the insured person by:

$$PP = \text{insurance period (IP)} \times \text{average value point (AVP)} \times \text{initial factor (IF)}$$

Insurance period (IP) is the effective work history period for which the pension contributions were paid. Insurance period is expressed in years (months and days are expressed as decimals).

Insurance period used for calculation of PPs contain insurance period counted in extended duration, special non-contributory periods, i.e. for war veterans. As of 2019, six months per child are added to women for the benefit calculation purposes only.

The insurance periods realised in EU and countries with which Croatia have a social agreement, count for the pension entitlement purposes only, not for the pension calculation.

The *average value point (AVP)* is one of the key parameters in the formula by which the pension benefit is linked to the earnings history. It is calculated by dividing the annual wage earned in each year of insurance by the economy-wide average wage in that year. This ratio is averaged over the entire insurance period.

For example, a person who received a wage equal to the average national wage during her/his entire career, will have an average value point of 1.0. The economy-wide average wage is published by the Central Bureau of Statistics.³

The *initial factor (IF)* values the timing of retirement. For old-age retirement at the statutory retirement age it takes the value of 1. For *early retirement*, it is lowered by a decrement rate of 0.2% for each month of earlier retirement compared to the statutory retirement age. The qualifying period requirement is lower for women, but gradually increasing in the transition period up to 2030 (in 2023, it is minimum 33 years and 3 months of insurance period). In case of *deferred retirement*, i.e. at an age exceeding the statutory retirement age and with a qualifying period of at least 35 years, the initial factor increases by 0.45% per month of deferment, with the maximum deferment bonus set at 5 years (27%). The initial factor for disability pension is 1.

³ Up to 2015, the official figure for the average wage was based on the establishment survey of the incorporated sector conducted by the Croatian Bureau of Statistics. In 2016, the data source was changed to the so-called tax form JOPPD (a report summarising information on income, taxes and social security contributions), what resulted in a gross average wage around 5.5% lower than before. This change is of importance for the pension system because it increases the average value point on the basis of higher value points for wages earned in 2016 and later. New official average wages are incorporated in the current projections.

The *pension factor (PF)* accounts for the type of pension. It takes a value of 1 for old-age and early retirement pensions. For disability pensions, the pension factor equals 1 in case of total disability; in case of partial disability it amounts to 0.8 if the person is unemployed and 0.5 if the beneficiary is employed or self-employed (0.667 if partial disability is work-related).

Actual pension value (APV) is the monetary value of one personal point. In the second half of 2023, the APV was EUR 11.77. The APV is the channel for pension valorisation. It is adjusted twice a year according to specific rules that take into account the average wage and consumer price developments (see below).

The pension supplement of 27% (factor 1.27 in the formula above) is granted to all new mono-pillar pensions.⁴

The calculation of the pension benefit could be illustrated in an example. For a man with a career of 40 years in which he has earned wages equal to the economy-wide average wage in each year, the monthly gross pension benefit (PB) would be as follows in case of retirement at the age of 65 in the second half of 2023:

$$PB = 40 \times 1 \times 11.77 \times 1.27 = 597.92 \text{ euros}$$

Minimum pension

The calculation formula for minimum pensions in Croatia is roughly the same as that for earning-related pensions. However, the minimum pension is defined as a flat rate per qualifying year and therefore the amount depends on the length of the qualifying period completed. The eligibility for minimum pension is not means-tested. Minimum pensions are an integral part of the insurance in the public PAYG scheme and financed by its regular revenues. The minimum pension (MP) is calculated as follows:

$$MP = \text{insurance period (IP)} \times \text{initial factor (IF)} \times \text{pension factor (PF)} \times \text{actual minimum pension value (AMPV)}$$

The formula resembles the general pension formula, but previous earnings are not taken into account and there is no pension supplement for minimum pensions. The actual minimum pension value was 100% of the actual pension value (APV) used in the general formula, but was additionally increased by 3.04% as of the 1 January 2023. In the second half of 2023, the AMPV was EUR 12.13. For illustration, the minimum monthly pension for a man with 40 years of service taking old-age retirement at the age of 65 in the second half of 2023 would be 485.20 euros ($40 \times 1 \times 1 \times 12.13$).

Minimum pensions cover all types of pensions – old-age, early, disability, and survivors. It is provided to persons whose regular pension as calculated by the pension formula (with pension supplement up to 27%) is lower than the minimum pension.

⁴ The Law on the Supplement on Pension Acquired According to the Pension Insurance Act (OG no. 79/2007 and its amendments) stipulates an increase that affects the pensions acquired from 1999 to 2010, which are increased from 4% to 27%, whereas the post-2010 new pensions paid from the first pillar are increased by 27%, on top of the benefit determined by the point formula defined by the Pension Insurance Law (OG no. 157/2013). The purpose of the supplement was to balance the benefits between older and younger cohorts of pensioners due to a gradual switch in the calculation of pension rights from the best consecutive 10 years to lifetime earnings and other differences that have arisen due to the 1999 reform. The pension supplement is applied neither in the calculation of the minimum pension, nor that of the maximum pension. Pensioners retired according to special regulations under more favourable conditions are not entitled to the supplement either.

Valorisation and indexation of the minimum pension are subject to the same rules as all other pensions. Through the initial factor, the minimum pension is subject to penalty/bonus in case of early/late retirement.

A special type of minimum pension concerns the Homeland War 1991-1995 veterans who served in combat units for more than 100 days. Their pension is determined on the basis of 45% of the average net wage in 2016, increased on the basis of the number of days spent in the combat sector during the Homeland War. The pension base is increased every year using the same formula as for the indexation of the actual pension value.⁵

Maximum pension

The maximum pension is the maximum amount at which pension benefits can be determined. It is calculated on the basis of the general pension formula, but limited to 3.8 times the average value points (AVP) in calculation of personal points. Like the minimum pension, the maximum pension is subject to penalty/bonus in case of early/late retirement and refers to all types of pension benefits paid out from the public pension scheme.

1.1.6.2. Pension formulas for those insured in the first and the second pillar

Participants in both mandatory pillars receive their pensions from both the public PAYG scheme and from the pension insurance company in the second pillar pension scheme. The pension benefit paid out from the second pillar is determined according to actuarial rules. The pension benefit paid out from the first pillar for two-pillar participants is called the *basic pension* and is determined in a similar manner as for mono-pillar participants with two differences: a) a pension supplement of 20.25% is used in the calculation of the pension benefit⁶, and b) in calculation of personal points the basic pension factor is added.

$PB = \text{personal points } (PP) \times \text{pension factor } (PF) \times \text{actual pension value } (APV) \times 1.2025$

$PP = \text{insurance period } (IP) \times \text{average value point } (AVP) \times \text{initial factor } (IF) \times \text{basic pension factor } (BP)$

For the insurance period prior to the introduction of the second pillar (pre-2002 period), the pension benefit paid by the PAYG scheme is determined in the same way as for mono-pillar pensions, with a pension supplement of 27% and the basic pension factor set at 1 for that insurance period.

For insurance periods as of 2002, the pension benefit paid by the PAYG scheme is calculated by applying the point formula as shown above, with personal points multiplied by the basic pension factor of 0.75, and by adding the pension supplement of 20.25% (27% x basic pension factor 0.75= 20.25%).

The basic pension factor is calculated as an average share of the first pillar contribution rate in the total (first and second pillar) contribution rate in the period from 2002 until the current year. Currently, this factor equals 0.75 for the post-reform period (15% /20%).

⁵ The Law on Homeland War Veterans (OG no. 121/2017)

⁶ The 2018 pension reform introduced the pension supplements of 27% (for the period of insurance realised until 2001) and 20.25% (for the period of insurance realised from January 2002) on 1st pillar basic pension for two-pillar participants.

The minimum and maximum pensions also apply to pensioners with combined pensions but only to the basic pension, i.e. the pension benefit paid from the public PAYG scheme. It is calculated according to the general formulas for the pre-2002 period. For post-2002 insurance periods, minimum and maximum pensions are calculated by applying the basic pension factor of 0.75.

It is worth noting that the pension supplement is not applied to minimum and maximum pensions, neither for mono-pillar nor for two-pillar pensioners. There are no minimum and maximum pensions for benefits paid out from the second pillar as they are based on the *defined contributions* principle.

1.1.7. Valorisation, indexation and taxation of pensions

1.1.7.1. Valorisation of pensions

The actual pension value (APV) is adjusted twice a year, in January and July, hence influencing valorisation of previous earnings/contributions. On 1 January and on 1 July of each calendar year, the APV increases by a rate that is a combination of the average gross wage and consumer price index growth rate in the previous semester. A simple interpretation of the APV adjustment mechanism is that it is regularly adjusted with wage and price changes in a 70%:30% proportion, where the 70%-weight is given to the indicator that has increased more. If the above adjustment rule results in a negative value, there will be no change in the APV.

1.1.7.2. Indexation of pensions

Indexation of pensions from the public scheme i.e. adjustment of pensions in payments, is subject to the same rules and the same rates as the valorisation of pensions.

Pension payments from the second pillar are adjusted twice a year in line with changes in the consumer price index.

1.1.7.3. Taxation

Pension benefits are subject to income taxation but pensioners have a more favourable tax treatment and a large majority of pensions go untaxed in practice. The personal tax deduction is applied on pension income and pensions are taxed according to general income tax rules but the calculated income tax is reduced by 50%. Considering that the average pension is lower than the amount of the personal tax deduction (monthly 530.90 euros in 2023), the result is that the majority of pension benefits are untaxed and that the average gross and the average net pensions are very similar (the difference is around 1%).

1.2. Recent reforms of the pension system included in the projections

The most important changes in the pension system legislated by the Parliament since the Ageing Report 2021 that are covered in the projections include:

1. The group of pension beneficiaries who may work and receive pension was extended to survivor's pension beneficiaries – in case of part-time work that does not exceed daily half-time of normal working hours, these beneficiaries may receive the full pension payment (effective from 1 August 2021).
2. The minimum pension beneficiaries in case of part-time work that does not exceed daily half-time of normal working hours may receive the full minimum pension amount. According to previous legislation, during the periods of part-time work, these categories of pensioners would receive pension based on the general pension formula, taking into the account their earnings over the working life (effective from 1 August 2021).
3. The pension factors for the calculation of the survivor's pension have been increased by 10 percent, from 70% - 100% to 77% - 110% of the pension of the deceased pension beneficiary or deceased insured person, depending on the number of eligible survivors (effective from 1 January 2023).
4. The possibility of combining personal pension with the partial survivor's pension was introduced (effective from 1 January 2023). A widow/widower who is a beneficiary of an old-age, early old-age or disability pension and meets the conditions for acquiring the right to a survivor's pension, may acquire the part of the survivor's pension under the following conditions:
 - a. *if he is the only beneficiary of the survivor's pension,*
 - b. *if he has reached the age of 65 and,*
 - c. *if the total amount of his pension from the mandatory pension insurance (I. + II. pillar) does not exceed the amount of 80 actual pension values (868.80 euros in 2023).*

Part of the survivor's pension is determined in the amount of 27% of the survivor's pension determined for one family member.

5. The bonification for a deferred pension has been increased from 0.34% to 0.45% per month of deferment after fulfilling the age requirement for the old-age pension, 27% for the maximum of 5 years of deferment (effective from 1 January 2023).
6. The bonification for a deferred pension for the beneficiaries of old-age pension based on long-term insurance period (41 years of the effective contributory period) has been introduced. The bonus is set at 0.15% per month of deferment, after the fulfilment of the age requirement for the old-age pension based on long-term insurance period until the fulfilment of the age requirement for the old-age pension, and at 0.45% per month of deferment after fulfilling the age requirement for the old-age pension. The maximum bonification cannot exceed 27% (effective from 1 January 2023).
7. The minimum pension has been increased from 100% to 103% of the actual pension value for each year of the insurance period (effective from 1 January 2023).

8. According to the Act on the Reduction of Pensions Determined According to Special Regulations on Pension Insurance adopted in 2010, the pensions acquired under special pension regulation and higher than 464.53 euros were decreased by 10% from 2010 until July 2023, however this Act was abolished in 2023.⁷

1.3. Description of the actual "constant policy" assumptions used in the projection

It is assumed that the current legislation will remain in force over the entire projection period. The valorisation and indexation rules set in the laws defining the first and the second pillar pensions are assumed to remain applicable until 2070. Under normal economic conditions, these rules will lead to adjustments that are below average wage growth and therefore will lead to declining benefit and replacement rates unless other changes compensate for that, for example, longer contribution periods.

The results of the current projections indicate notable reductions of the benefit ratio and replacement rate in Croatia and one could ask whether the above assumptions on *unchanged* legislation are in line with the “constant policy” assumptions required to use in the projections.

For this reason, an alternative scenario was developed that keeps the benefit ratio constant when declining by 10% relative to the base year, which, in the case of Croatia, is as of 2049. The projection results are shown in the sensitivity analysis in section 3.5.

⁷ The reduction in pensions determined according to special regulations will cease to apply in two stages: by 5% starting from July 2023 and by 5% starting from January 2024.

2. OVERVIEW OF THE DEMOGRAPHIC AND LABOUR FORCES PROJECTIONS⁸

2.1. Demographic developments

The Croatian population is rapidly declining and ageing. In the period 2022-2070, the *population* is projected to decline by around 22%, from 3.86 to 3.01 million. In parallel, *life expectancy* should increase significantly. At the age of 65, life expectancy is projected to increase by 6.4 years for men and by 6.0 years for women between 2022 and 2070. *Survivor rates* at 65+ and 80+ are also expected to increase notably.

The *old-age dependency ratio* (pop65+/pop20-64) will increase from 38.9% in 2022 to 62.2% by 2070. The ratio of older old-age population (80+) to total old-age population (65+) is expected to reach 40.5%, up from 24.3% in 2022. *Net migration*, on the other hand, is expected to be positive throughout the projection period. However, it is expected that net migration will have a rather small impact on the overall demographic developments (Table 2).

Table 2 – Main demographic variables

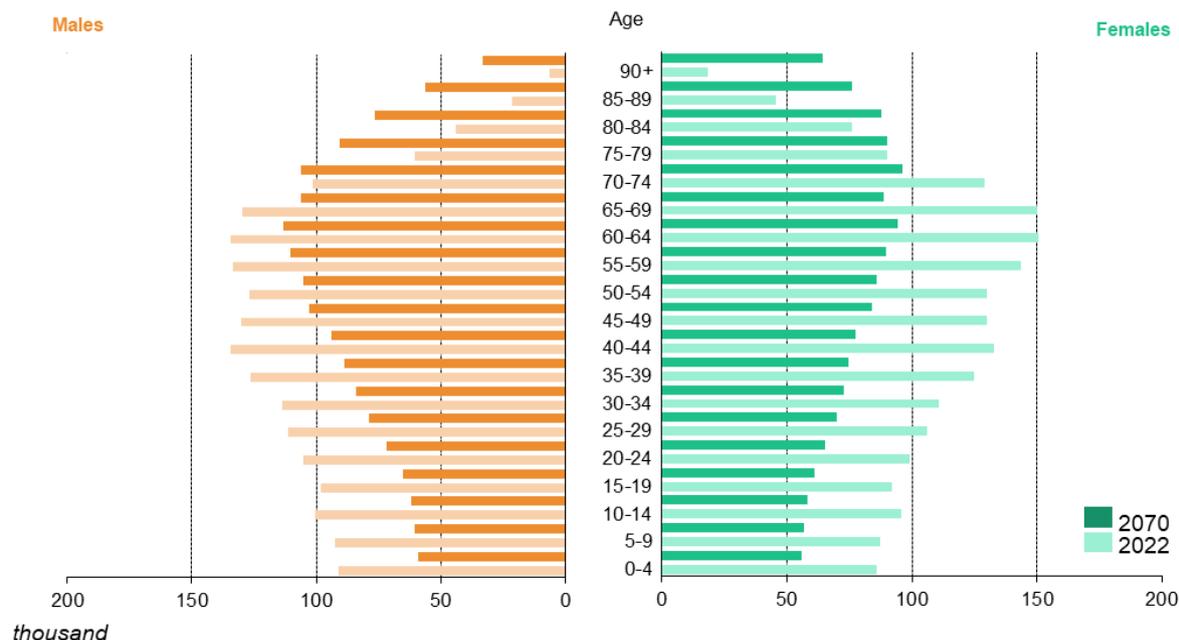
	2022	2030	2040	2050	2060	2070	peak value	peak year	change 2022-2070
Population (thousand)	3,858	3,683	3,486	3,301	3,141	3,012	3,858	2022	-847
Population growth rate	-2.3%	-0.5%	-0.5%	-0.5%	-0.5%	-0.4%	-0.4%	2023	1.9
Old-age dependency ratio (pop 65+ / pop 20-64)	38.9	45.6	50.5	56.2	59.1	62.2	62.2	2070	23.3
Old-age dependency ratio (pop 75+ / pop 20-74)	13.1	17.1	22.0	24.0	27.7	29.3	29.3	2070	16.2
Ageing of the aged (pop 80+ / pop 65+)	24.3	24.7	32.7	34.6	37.5	40.5	40.5	2070	16.2
Men - Life expectancy at birth	74.9	76.7	78.8	80.8	82.6	84.2	84.2	2070	9.3
Women - Life expectancy at birth	81.2	82.9	84.5	86.1	87.5	88.9	88.9	2070	7.7
Men - Life expectancy at 65	15.6	16.9	18.2	19.5	20.8	22.0	22.0	2070	6.4
Women - Life expectancy at 65	19.3	20.5	21.8	23.0	24.2	25.3	25.3	2070	6.0
Men - Survivor rate at 65+	80.2	82.9	85.9	88.4	90.4	92.1	92.1	2070	11.9
Women - Survivor rate at 65+	91.1	92.4	93.6	94.6	95.5	96.2	96.2	2070	5.1
Men - Survivor rate at 80+	42.0	49.0	56.1	62.5	68.3	73.3	73.3	2070	31.2
Women - Survivor rate at 80+	64.8	70.2	75.0	79.2	82.7	85.7	85.7	2070	20.9
Net migration (thousand)	14.5	2.0	4.8	6.8	8.3	10.1	14.5	2022	-4.4
Net migration over population change	0.4%	0.1%	0.1%	0.2%	0.3%	0.3%	0.4%	2022	0.0

Source: EUROSTAT and European Commission

The projected demographic trends will put strong pressure on the pension system sustainability, in particular on the public PAYG scheme. Although there is no automatic adjustment mechanism in the Croatian pension system, the increase of the statutory retirement age for women from 63 years and 3 months in 2023 to 65 and of early retirement age from 58 years and 3 months in 2023 to 60 by 2030, should release some of the pressure.

⁸ For more details, see European Commission and EPC (2023), '[2024 Ageing Report: Underlying assumptions and projection methodologies](#).' European Economy, Institutional Paper 257.

Figure 1 – Age pyramid, comparison between 2022 and 2070



Source: Eurostat and European Commission

2.2. Labour force

Croatia is characterized by rather low participation and employment rates in general, and that can also be said for participation and employment rates of older cohorts (55-64 and 65-74 years), as shown in Table 3.

Table 3 – Participation rate, employment rate and share of workers for the age groups 20-64, 20-74, 55-64 and 65-74

Labour force	2022	2030	2040	2050	2060	2070	peak value	peak year	change 2022-2070
Labour force participation rate 20-64	74.9	78.6	80.5	81.4	81.3	81.2	81.6	2054	6.2
Employment rate of workers aged 20-64	70.0	73.7	75.3	76.3	76.2	76.1	76.5	2054	6.1
Share of workers aged 20-64 in the labour force 20-64	93.4	93.8	93.5	93.7	93.7	93.7	94.4	2025	0.3
Labour force participation rate 20-74	62.0	64.7	67.0	66.7	67.3	66.7	67.3	2061	4.8
Employment rate of workers aged 20-74	57.9	60.7	62.7	62.5	63.1	62.6	63.1	2061	4.7
Share of workers aged 20-74 in the labour force 20-74	93.4	93.8	93.6	93.8	93.8	93.8	94.4	2025	0.3
Labour force participation rate 55-64	53.0	57.2	63.5	64.3	65.0	65.4	66.0	2066	12.4
Employment rate of workers aged 55-64	50.4	54.6	60.5	61.3	62.0	62.3	63.0	2066	11.9
Share of workers aged 55-64 in the labour force 55-64	95.2	95.5	95.2	95.3	95.3	95.3	95.8	2025	0.1
Labour force participation rate 65-74	5.0	7.4	9.0	10.0	10.0	10.0	10.4	2064	5.0
Employment rate of workers aged 65-74	4.8	7.2	8.7	9.7	9.6	9.7	10.0	2064	4.9
Share of workers aged 65-74 in the labour force 65-74	96.7	97.0	96.5	96.6	96.7	96.8	97.9	2024	0.1
Median age of the labour force	41.0	42.0	42.0	42.0	43.0	43.0	43.0	2057	2.0

Source: European Commission

Both the *labour force participation rate* and the *employment rate* for the overall population at working age (20-64 or 20-74) are projected to increase over the projection horizon. This is partly due to the increasing retirement age for women for both early and statutory retirements. Also, fewer retirements among specific population groups that currently retire relatively young, should further increase the participation rate for older workers. However, even with an increase of the participation and employment rate for age group 55-64 by more than 12 percentage points in the period 2022-2070, the participation rate for this age group will be only around 66% in 2070, while the employment rate is projected to be around 63%. For the 65-74 age group the participation rate is projected to increase over the projection horizon; from 5.0% in 2022 to 10.0% in 2070 with its peak in 2064.

Similar trend is projected for the *employment rate* in the same age group. Such projected increase is in line with the legislated increase in the statutory retirement for women and expected economic growth.

The *median age of the labour force* would increase by 2 years, from 41 years in 2022 to 43 years in 2070.

According to the Cohort Simulation Model used by the European Commission to model labour market entry and exit rates per single age and sex, the average *effective exit age* is projected to increase for both men and women (Tables 4a and 4b). For men, it starts at 63.3 years in 2022 and should reach its peak in 2040 and stay constant thereafter at 63.7 years. For women, it starts at 62.5 years in 2022 and should reach its peak in 2041 and then stay constant at 63.7 years.

The *average effective retirement age* is also projected to increase over the forecasting period, in line with the increase of the labour market exit age. It starts at 63.2 years in 2022 and should reach its peak in 2046 at 63.7 years.

In the period 2022-2070, the *average contributory period* is projected to increase from 32.1 to 33.9 years for men and from 32.3 to 33.9 years for women. At the same time, the *expected duration of retirement* and the projected *share of adult life spent at retirement* are increasing for both men and women.

Table 4a – Labour market exit age, effective retirement age and expected duration of life spent in retirement – TOTAL

TOTAL	2022	2030	2040	2050	2060	2070	peak value	peak year	change 2022-2070
Average effective retirement age*	63.2	63.6	63.6	63.7	63.6	63.6	63.7	2046	0.4
Average labour market exit age (CSM)**	62.9	63.4	63.7	63.7	63.7	63.7	63.7	2070	0.8
Contributory period	32.2	33.1	33.8	33.9	33.9	33.9	33.9	2063	1.7
Duration of retirement***	17.7	19.9	20.9	22.1	23.4	24.5	24.5	2070	6.8
Duration of retirement/contributory period	55%	60%	62%	65%	69%	72%	72%	2070	17%
Percentage of adult life spent in retirement****	28%	31%	32%	34%	35%	36%	36%	2070	8%
Early/late exit*****	1.5	1.6	1.5	1.2	1.3	1.4	1.9	2025	-0.2

Table 4b – Labour market exit age, effective retirement age and expected duration of life spent in retirement – MEN

MEN	2022	2030	2040	2050	2060	2070	peak value	peak year	change 2022-2070
Average effective retirement age*	63.7								
Average labour market exit age (CSM)**	63.3	63.6	63.7	63.7	63.7	63.7	63.7	2040	0.4
Contributory period	32.1	33.1	33.7	33.8	33.8	33.9	33.9	2064	1.8
Duration of retirement***	17.0	17.6	19.0	20.3	21.6	22.8	22.8	2070	5.8
Duration of retirement/contributory period	53%	53%	56%	60%	64%	67%	67%	2070	14%
Percentage of adult life spent in retirement****	28%	29%	30%	32%	33%	34%	34%	2070	6%
Early/late exit*****	2.0	1.5	1.5	1.2	1.3	1.3	2.0	2023	-0.6

Table 4c – Labour market exit age, effective retirement age and expected duration of life spent in retirement – WOMEN

WOMEN	2022	2030	2040	2050	2060	2070	peak value	peak year	change 2022-2070
Average effective retirement age*	62.6								
Average labour market exit age (CSM)**	62.5	63.2	63.7	63.7	63.7	63.7	63.7	2041	1.1
Contributory period	32.3	33.3	33.8	33.9	33.9	33.9	34.0	2063	1.6
Duration of retirement***	18.4	22.2	22.7	23.9	25.1	26.2	26.2	2070	7.8
Duration of retirement/contributory period	57%	67%	67%	70%	74%	77%	77%	2070	20%
Percentage of adult life spent in retirement****	29%	34%	34%	35%	36%	37%	37%	2070	9%
Early/late exit*****	1.1	1.8	1.5	1.2	1.2	1.4	2.2	2028	0.3

Source: European Commission

* The 'average effective retirement age' is the age at which people start receiving a pension benefit (old-age, early or disability). It is calculated on the basis of the administrative data on new pensioners for 2022, showing projected data for the other years for the total. ** 'Average labour market exit age (Cohort Simulation Model)' refers to 2023 instead of 2022. *** 'Duration of retirement' is the remaining life expectancy at the average labour market exit age. **** The 'percentage of adult life spent in retirement' is calculated as the ratio between the duration of retirement and the life expectancy minus 20 years. ***** 'Early/late exit' is the ratio between those who exit the labour market before reaching the statutory retirement age and those who exit at or beyond the statutory retirement age. For 2022, the value refers to 2023.

3. PENSION PROJECTION RESULTS

3.1. Coverage of the pension schemes in the projections

The projections cover all pensions from the public pension scheme, as well as pensions from the mandatory private second pillar. Up until 2014 (Table 5), practically all pension expenditures were entirely within the public pension scheme because payments under the second pillar were of marginal importance at that time.

The AWG projection covers almost all pension expenditures included in the Eurostat (ESSPROS) official figures.

Table 5 - Eurostat (ESSPROS) vs. Ageing Working Group definition of pension expenditure (% GDP)

	2013	2014	2015	2016	2017	2018	2019	2020	2021	change 2013- last available year
Eurostat total pension expenditure	10.7	10.8	10.5	10.3	10.1	10.0	9.9	11.0	9.8	-1.0
Eurostat public pension expenditure (A)	10.7	10.8	10.5	10.3	10.1	10.0	9.9	11.0	9.8	-1.0
Public pension expenditure (AWG: outcome) (B)	10.7	10.8	10.7	10.3	10.1	10.0	9.9	11.0	9.8	-1.0
Difference Eurostat/AWG: (A) - (B)	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Expenditure categories not included in the AWG definition :</i>										
-										

Source: EUROSTAT and Croatian Pension Insurance Institute

3.2. Overview of projection results

In the baseline scenario, *gross public pension expenditure*, measured as a proportion of the GDP, is projected to reach the peak value in 2025, at 10.4% of GDP, and then to decline continuously, to 8.8% in 2070 (Table 6). Although demographic trends, foremost the increase in life expectancy and a higher share of elderly in the total population, tend to push up future pension expenditure, other important factors are working in the opposite direction:

- a. More than 30% of the total population is already in retirement, due to insufficient incentives for postponing early retirement in the past, loose conditions for achieving disability pensions and war veterans from the Croatian Homeland War. As a result, population cohorts which represent the base for future retirement are reduced.
- b. Disability pension beneficiaries are projected to remain at relatively low levels following the trends observed over the last 10 years, as a result of the new system for acquiring disability pensions, with much stricter medical assessment rules, improved occupational rehabilitation system and the fact that the number of war veterans with disability pensions will gradually decline in the future.
- c. Survivors' pension beneficiaries are also projected to decrease due to demographic trends and increased female participation rate and employment.
- d. Decrease in the benefit ratio and the aggregate replacement rate due to the fact that the projected rate of valorisation and indexation of pensions is lower than the projected wage growth rate.

The *mandatory private scheme* is projected to have growing importance as it matures. Potential new pensioners of this scheme have an option to return to the public scheme and receive pension only from the first pillar and it is assumed that in the beginning of the projection period the majority of them will use this option as the public pension is projected to be somewhat higher than combined ones. The share of new retirees that will opt to keep their pensions from the funded scheme is projected to gradually increase to around 20% by 2034 and stay constant until the end of projection period, and therefore the private pension expenditure is projected to increase in the future.

The *net pension expenditure* is following the trends of gross pension expenditure as it is assumed that taxes on pensions remain constant at around 1% of pension expenditure.

Table 6 - Projected gross and net pension spending and contributions (% of GDP)

	2022	2030	2040	2050	2060	2070	peak value	peak year	change 2022-2070
Expenditure									
Gross public pension expenditure	9.0	10.1	9.6	9.1	8.8	8.8	10.4	2025	-0.2
Private occupational pensions	:	:	:	:	:	:	:	:	:
Private individual mandatory pensions	0.0	0.1	0.2	0.3	0.3	0.3	0.3	2070	0.3
Private individual non-mandatory pensions	:	:	:	:	:	:	:	:	:
Gross total pension expenditure	9.0	10.2	9.8	9.4	9.1	9.1	10.4	2025	0.1
Net public pension expenditure*	8.9	10.0	9.5	9.0	8.7	8.7	10.3	2025	-0.2
Net total pension expenditure*	8.9	10.1	9.7	9.3	9.0	9.0	10.3	2025	0.1
Contributions									
Public pension contributions	5.7	6.1	6.5	6.6	6.5	6.6	6.6	2070	0.9
Total pension contributions	7.3	7.8	8.2	8.3	8.2	8.3	8.3	2070	1.0
Balance of the public pension system (%GDP)**	-3.3%	-4.0%	-3.1%	-2.5%	-2.3%	-2.2%	-4.4%	2024	1.2

Source: European Commission and Croatian Pension Insurance Institute

*Net pension expenditure excludes taxes on pensions and compulsory social security contributions paid by beneficiaries. **Public pension contributions - gross public pension expenditure (peak value/year shows most negative value).

Contributions to the public PAYG scheme were 5.7% of GDP in 2022 and will increase towards 6.6% by 2040, mainly due to the transfers of the 2nd pillar savings to the State Budget for beneficiaries that will opt to receive pension only from the public pension scheme. After the two-pillar system reaches its maturity, around 2030, and most of the employees are assumed to be enrolled in the combined insurance scheme from that moment on, contributions to the public scheme are thus projected to stabilize at around 6.6% of GDP. The gap between public pension expenditures and public pension contributions is financed from the general State Budget revenues, and it is projected to decline from 3.3% of GDP in 2022 to around 2.2% of GDP in 2070.⁹

⁹ Pension contributions in Table 6 include accumulated funds in the 2nd pillar transferred to the State Budget.

Table 7 reveals the *composition of gross public pension spending by pension type*. Public expenditure for old-age and early pensions is projected to increase until 2033 in terms of GDP, after which it would decrease to 7.2% of GDP by 2070, predominately as a consequence of the decreasing public benefit ratio and also marginally due to the maturation of the two-pillar system.

In 2022, disability pensions accounted for a rather high 1.4% of GDP. High spending on disability pensions is due to loose conditions for achieving disability pension rights in the past and the relatively large number of war veteran's disability pensions.

However, in line with trends in recent years, disability pension expenditure is expected to decline over the projection period, falling to 0.5% of GDP in 2070, mainly because of the expected decrease in the number of disability pension beneficiaries, as it is projected that disability rates will remain at a relatively low level as a result of the tightened system for acquiring disability pension. In addition, rather limited inflows of new disability pensions on the grounds of participation in the Homeland War are expected whose disability pensions are significantly higher than other disability pensions.

Gross public pension spending on survivors' pensions is also declining, mainly due to the projected increase in female labour market participation and earnings, meaning that for more and more women survivor pensions under the current rules will not be more favourable than their own pension benefit.

Table 7 - Projected gross public pension spending by scheme (% GDP)									
	2022	2030	2040	2050	2060	2070	peak value	peak year	change 2022-2070
Total public pensions	9.0	10.1	9.6	9.1	8.8	8.8	10.4	2025	-0.2
Old-age and early pensions	6.2	7.2	7.0	6.9	6.9	6.9	7.2	2033	0.7
<i>Flat component</i>	:	:	:	:	:	:	:	:	:
<i>Earnings-related</i>	6.2	7.2	7.0	6.9	6.9	6.9	7.2	2033	0.7
<i>Minimum pensions (non-contributory)</i>	:	:	:	:	:	:	:	:	:
Disability pensions	1.4	1.3	1.0	0.7	0.5	0.5	1.5	2024	-0.9
Survivor pensions	1.4	1.7	1.6	1.5	1.4	1.4	1.8	2024	0.0
Other pensions	:	:	:	:	:	:	:	:	:

Source: European Commission and Croatian Pension Insurance Institute

3.3. Description of main driving forces behind the projection results and their implications

To assess the relevance of the driving forces behind the pension projection results, the following formulas have been agreed in the AWG to disaggregate the change in the pension expenditure-to-GDP ratio into the effects of the following four factors: dependency ratio, coverage ratio, benefit ratio and labour market effect.

Figure 2 – Disaggregation of public pension expenditure

$$\frac{\text{pension expenditure}}{\text{GDP}} = \frac{\text{population } 65+}{\text{population } 20-64} \times \frac{\text{number of pensioners}}{\text{population } 65+} \times \frac{\text{average pension income}}{\frac{\text{GDP}}{\text{hours worked } 20-74}} \times \frac{\text{population } 20-64}{\text{hours worked } 20-74} \quad [1]$$

$$\frac{\text{number of pensioners}}{\text{population } 65+} = \frac{\text{number of pensioners } 65+}{\text{population } 65+} + \left(\frac{\text{number of pensioners } \leq 65}{\text{population } 50-64} \times \frac{\text{population } 50-64}{\text{population } 65+} \right) \quad [2]$$

$$\frac{\text{population } 20-64}{\text{hours worked } 20-74} = \frac{\text{population } 20-64}{\text{employed people } 20-64} \times \frac{\text{employed people } 20-64}{\text{hours worked by people } 20-64} \times \frac{\text{hours worked by people } 20-64}{\text{hours worked by people } 20-74} \quad [3]$$

Source: European Commission

According to the results reported in Table 8, demographic trends will exert a strong upward pressure on public pension expenditures. Other things being constant, the *dependency ratio* (elderly/working-age population) alone would lead to an increase in the pension expenditure-to-GDP ratio by 4.6 percentage points between 2022 and 2070, with more than half of the effect arising in the period up to 2040. However, other factors related to the pension system reforms and labour market developments would more than compensate for the demographic impact and drive public pension expenditures in the opposite direction.

The *benefit ratio*¹⁰ has a downward effect on public pension expenditures, 1.6 percentage points between 2022 and 2070. The benefit ratio for the public scheme is set to decline from 30% in 2022 to 24% in 2070 (Table 9). The main reasons for this fall are: i) valorisation and indexation of pensions at a rate below wage growth, ii) growing importance of the second pillar of the pension system, which results in lower benefits and expenditure of the public scheme, iii) change in the composition of pensioners, as pensioners with higher pension benefits acquired earlier will pass away and will be replaced by new pensioners with lower pensions, and iv) the share of pensioners from special schemes that have higher pensions compared to the general pension scheme is projected to decline.

¹⁰ The *benefit ratio* is defined as the average pension benefit divided by the economy-wide average wage.

Table 8 – Factors behind the change in public pension expenditures between 2022 and 2070 (percentage points of GDP) – pensioners

	2022-30	2030-40	2040-50	2050-60	2060-70	2022-70
Public pensions to GDP	1.1	-0.5	-0.5	-0.3	0.0	-0.2
Dependency ratio effect	1.6	1.1	1.1	0.5	0.5	4.6
Coverage ratio effect*	-0.9	-0.5	-0.5	-0.1	-0.1	-2.1
<i>Coverage ratio old-age</i>	-0.1	-0.2	-0.3	-0.1	-0.1	-0.7
<i>Coverage ratio early-age</i>	-3.4	-2.0	-0.2	-0.1	-0.1	-5.7
<i>Cohort effect</i>	-1.5	-0.7	-1.2	-0.2	-0.4	-3.9
Benefit ratio effect	1.1	-0.8	-0.9	-0.6	-0.4	-1.6
Labour market effect	-0.6	-0.2	-0.2	0.0	0.0	-1.0
<i>Employment ratio effect</i>	-0.5	-0.2	-0.1	0.0	0.0	-0.8
<i>Labour intensity effect</i>	0.0	0.0	0.0	0.0	0.0	0.0
<i>Career shift effect</i>	-0.1	0.0	-0.1	0.0	0.0	-0.2
Residual	-0.1	0.0	0.0	0.0	0.0	-0.2

Source: European Commission and Croatian Pension Insurance Institute

* Subcomponents of the coverage ratio effect do not add up necessarily.

The *coverage ratio effect* (pensioners/elderly population) is estimated to decrease the pension expenditure-to-GDP ratio by 2.1 percentage points in the period 2022-2070. This is the result of the rising statutory and early retirement ages for women and projected increase in average exit ages, but also due to stricter rules for acquiring disability pensions. Due to a rising employment rate, particularly in the first half of the projection horizon and for older workers (career shift), the *labour market effect* is estimated to lower the expenditure-to-GDP ratio by 1.0 percentage points over the 2022-2070 period.

The *replacement rate at retirement*¹¹ in the public scheme is projected to steadily decline over the projection horizon (Table 9). Two main reasons for this are i) the already mentioned valorisation of pensions at rates below the wage growth, and ii) increasing numbers of two-pillar pensioners. The replacement rate in the mandatory private scheme that comes on top of the pensions from the first pillar is projected to gradually decline to 6% until 2070. The projected decline is due to increases in life expectancy that, combined with stable retirement age (from 2030), will have a negative impact on the value of 2nd pillar annuities, but also due to a conservative estimate of the evolution of the rate of return in the funded scheme¹². The total replacement rate (from both mandatory pillars) will gradually decline from 30% in 2022 to 25% in 2070. The longer expected contribution period is projected to be relatively weak in driving the replacement rate up compared to other factors that drive it down. A similar trend is projected for the *benefit ratio*.

¹¹ The *replacement rate at retirement (RR)* is defined as the average first pension of those who retire in a given year over the average wage they earned before retirement.

¹² Average assumed rate of return in the funded scheme is linked to the interest rate assumptions.

Table 9 - Benefit ratio (BR), replacement rate at retirement (RR) and coverage by pension scheme (in %)

	2022	2030	2040	2050	2060	2070	change 2022- 2070 (pps)
Public scheme (BR)	30%	32%	30%	27%	25%	24%	-6%
Coverage	100%	100%	100%	100%	100%	100%	0%
Public scheme: old-age earnings related (BR)	30%	32%	29%	27%	25%	24%	-6%
Public scheme: old-age earnings related (RR)	29%	29%	27%	26%	25%	24%	-5%
Coverage	69%	72%	75%	77%	78%	79%	10%
Private occupational scheme (BR)	:	:	:	:	:	:	:
Private occupational scheme (RR)	:	:	:	:	:	:	:
Coverage	:	:	:	:	:	:	:
Private individual schemes (BR)	7%	7%	7%	7%	6%	6%	-1%
Private individual schemes (RR)	9%	7%	7%	7%	6%	6%	-2%
Coverage	1%	4%	9%	12%	14%	14%	13%
Total benefit ratio	30%	33%	30%	28%	26%	25%	-5%
Total replacement rate (earnings-related benefits)	30%	30%	28%	27%	26%	25%	-5%

Source: European Commission and Croatian Pension Insurance Institute

Coverage of each pension scheme is calculated as a ratio of the number of pensioners within the scheme and the total number of pensioners in the country. In case data on pensioners are not available, the calculation is based on the number of pensions.

The low replacement rate and benefit ratio and their significant decline raise serious concerns about pension adequacy and poverty among the elderly in the long run. It is worth mentioning that the replacement rate and benefit ratio expressed in net terms are notably higher than in gross terms due to a much lower tax burden on pensions than on wages. For example, in 2022 the benefit ratio in the public scheme in gross terms was 30%, while in net terms it is around 40%. In 2070, the total benefit ratio, that includes the private individual scheme, is projected at 25% in gross terms, while in net terms it is projected at around 33%. Declining benefit and replacement ratios are likely to lead to increasing pressures to change certain parameters of the pension system.

The public PAYG scheme is mandatory and its coverage is 100% over the entire projection period. The coverage rate of the mandatory private pension scheme increases from 1% in 2022 to 13% in 2070. This lower coverage for the private scheme is due to the high share of old-age pensioners that is assumed to opt to receive pension from the mono-pillar system, but also because the majority of disability and survivors' pensions should be, in most cases, paid out only from the public scheme, just as pensions of military and police personnel as well as pensions granted under special regulations.

The number of pensioners, as well as the number of employees, is expected to decrease from 2022 onwards and the pension system dependency ratio will generally increase in the period until 2070 when it would reach 88%. However, the increase in the pension system dependency ratio will be slower than that of the old-age dependency ratio, mostly thanks to pension system reforms that slow down the inflow of new pensioners. The constant decrease in the number of pensioners from 2022 onward is due to an increase in participation rates in older age groups, an increase in the retirement age for women, but also due to less and less people retiring before the statutory retirement age (compared to the current large share of early retirement pensioners),

reducing thereby future inflows of new pensioners. The inflow of new disability pensioners is also projected to decline due to stricter eligibility conditions.

System efficiency seems to be improving in the sense that the ratio of the system dependency ratio to the old-age dependency ratio is decreasing up to 2060. In the period 2060 to 2070, the system efficiency ratio should stay constant at 1.4.

Table 10 – System dependency ratio and old-age dependency ratio

	2022	2030	2040	2050	2060	2070	change 2022- 2070
Number of pensioners (thousand) (I)	1228	1204	1180	1149	1116	1095	-133
Employment (thousand) (II)	1610	1579	1500	1401	1311	1237	-373
Pension system dependency ratio (SDR) (I)/(II)	0.76	0.76	0.79	0.82	0.85	0.88	0.12
Number of people aged 65+ (thousand) (III)	872	944	970	992	977	972	99
Working age population 20-64 (thousand) (IV)	2244	2072	1923	1764	1653	1562	-682
Old-age dependency ratio (OADR) (III)/(IV)	0.39	0.46	0.50	0.56	0.59	0.62	0.23
System efficiency (SDR/OADR)	2.0	1.7	1.6	1.5	1.4	1.4	-0.5

Source: European Commission and Croatian Pension Insurance Institute

The *coverage ratio of pensioners* in the public PAYG scheme is shown in Tables 11a and 11b, while the *coverage ratio* of female pensioners is shown in Tables 12a and 12b.

Younger pensioner cohorts (up to the age of 60) represent a relatively large share of both the inactive and the overall population at the beginning of the projection period. This is mainly due to disability pensions, particularly those of war veterans. The shares of these younger cohorts should decline in the future as the average retirement age increases and inflows of new disability pensions falls. It is interesting to note that the pensioner-to-population ratio for the 65+ group in 2022 is above 100%, particularly in the age groups 70-74 (112.2%) and 75+ (112.8%). This reflects the recent past in Croatia, with some people receiving pensions from the Croatian pension system, but living in other countries, particularly countries of former Yugoslavia. Workers' flows were intensive in former Yugoslavia and Croatia was one of the most developed republics, thus attracting workers from other republics. In addition, there were very intensive migration flows in the early 1990s. As a consequence, in 2022, around 14% of pension beneficiaries were living abroad (10% in countries of former Yugoslavia). Demographic projections indicate that migration flows will be rather moderate in the future and pension projections show that the initial imbalance will gradually disappear, i.e. toward the end of the projection horizon the number of pensioners and the old-age population tend to be more aligned.

Following recent developments, the model assumes a continued decrease in the number of non-resident pensioners that resulted in the decrease of coverage ratios of older age groups, especially in the later years. The reason is that pensioners that live in other countries of former Yugoslavia but receive a Croatian pension on the basis of their working history in Croatia will gradually pass away.

However, positive developments on the domestic labour market and labour force shortages resulted in a significant increase in the number of immigrant workers in recent years, that is expected to further increase in the future. Possible future non-resident pension claimants are not specifically modelled, but the model implicitly takes them into account as one of the key parameters of the model, the rate of retirement, that is adjusted for non-resident pension claimants. This explains why the coverage ratio in age group 75+ remains over 100% over the projection period.

Disability entry rates are assumed to remain at the relatively low level attained in recent years, following several legislative and administrative changes that reduced the inflow of new disability pensioners. The new system for acquiring disability pensions with much stricter procedure and medical assessment rules, as well as the improved occupational and rehabilitation system were established in 2014. In addition, the Law on Unique Body of Expertise was endorsed, founding the Institute for Medical Assessment and Professional Rehabilitation to ensure standardisation of the disability assessment practice. Finally, new disability pensions for war veterans can only be acquired in very specific circumstances, which contributed to the falling number of new disability pensioners. The abovementioned reforms have resulted in a significant decrease of new disability pensioners, which led us to further revise the disability entry rates assumption compared to the previous rounds of projection.

Table 11a – Pensioners (public schemes) to inactive population ratio by age group (%)

<i>pensioners / inactive population</i>	2022	2030	2040	2050	2060	2070
Age group -54	5.8	4.0	3.6	3.5	3.6	3.5
Age group 55-59	61.3	46.2	36.6	36.7	38.3	38.4
Age group 60-64	87.4	70.6	66.8	68.3	68.0	66.4
Age group 65-69	113.6	108.4	111.2	107.6	109.2	108.1
Age group 70-74	114.2	113.7	109.6	105.4	104.5	103.5
Age group 75+	112.8	117.4	114.6	111.4	107.9	106.8

Source: European Commission and Croatian Pension Insurance Institute

Table 11b – Pensioners (public schemes) to population ratio by age group (%)

<i>pensioners / total population</i>	2022	2030	2040	2050	2060	2070
Age group -54	2.4	1.6	1.4	1.3	1.3	1.3
Age group 55-59	19.9	12.8	8.5	7.9	7.9	8.0
Age group 60-64	53.4	40.8	33.3	33.6	32.8	31.8
Age group 65-69	105.0	95.2	94.7	90.4	91.3	90.3
Age group 70-74	112.2	110.9	106.4	101.6	100.7	99.7
Age group 75+	112.8	117.4	114.6	111.4	107.9	106.8

Source: European Commission and Croatian Pension Insurance Institute

Table 12a – Female pensioners (public schemes) to inactive population ratio by age group (%)

<i>female pensioners / inactive population</i>	2022	2030	2040	2050	2060	2070
Age group -54	3.4	3.5	3.4	3.3	3.4	3.4
Age group 55-59	44.5	26.6	27.3	29.9	32.3	32.9
Age group 60-64	84.8	61.3	62.2	64.3	63.5	60.9
Age group 65-69	105.7	98.8	102.0	101.7	104.9	104.4
Age group 70-74	107.3	110.3	100.4	100.1	99.3	98.4
Age group 75+	107.5	114.1	113.5	108.9	106.7	106.7

Source: European Commission and Croatian Pension Insurance Institute

Table 12b – Female pensioners (public schemes) to population ratio by age group (%)

<i>female pensioners / total population</i>	2022	2030	2040	2050	2060	2070
Age group -54	1.5	1.5	1.4	1.4	1.4	1.4
Age group 55-59	16.3	8.1	7.1	6.9	7.1	7.2
Age group 60-64	56.9	37.3	32.9	32.7	31.7	30.2
Age group 65-69	100.2	88.2	86.7	84.9	86.8	86.1
Age group 70-74	106.1	108.2	97.7	96.7	95.9	95.0
Age group 75+	107.5	114.1	113.5	108.9	106.7	106.7

Source: European Commission and Croatian Pension Insurance Institute

New public pension expenditure can be disaggregated in the number of new pensions and the average pension, which in turn can be disaggregated, within the Croatian pension point system, in the number of pension points at retirement and the point value. The Croatian system has no sustainability or adjustment factors (i.e. they are equal to 1). The results are shown in Table 13a for all new old-age and early earnings-related pensions, whereas results for men and women are presented in Table 13b and in Table 13c, respectively. Tables 13a to 13c refer to the first pillar public pension scheme, while the comparable results for the second pillar private individual scheme are given in Table 13d.

The number of new public pensions is projected to steadily increase up to 2040, and after that inflows into retirement are projected to decrease, mainly because of a declining population. The number of new female (old-age and early earnings-related) pensioners increases more than the number of male pensioners in the first half of the projection period, due to the substantial increase of participation rates for women and projected increase of average contributory period, that would result in a higher proportion of women receiving a personal old-age pension than a survivors pension of the deceased spouse.¹³ In the second half of the projection period, the number of female population in older age groups is projected to decrease, while the number of male population is projected to slightly increase, and this explains the more pronounced decrease in the number of new pensioners for women than for men. Additional factor behind the higher projected number of new male than female pensioners in outer decades is related with the assumed higher share of men among the immigrant workers that would acquire pension in the future periods.

The *average contributory period* is projected to increase by 1.7 years between 2022 and 2070 (1.6 years for women and 1.8 years for men) as a reflection of projected increase in employment rates and rising labour market exit rates. The rising contributory period is related to the projected increase in the effective retirement age, which is, aside from the rising statutory age, assumed to be driven also by rather low replacement rates and penalties/bonus in case of early/deferred retirement, meaning that workers have strong income incentive to stay longer in employment.¹⁴

Due to valorisation rules that increase the point value at a lower rate than wage growth, the *average new pension* will increase slower than the average wage, and the replacement rate will decline accordingly. In the period from 2022 to 2040, both valorisation rules (via point value) and rising importance of the two-pillar regime (via total pension points) will result in a fall in the replacement rate of new public pensions.

¹³ In the previous periods, for significant share of women the survivor's pension was higher than their personal pension, due to the relatively short contributory period they have acquired and on average lower earnings than of men.

¹⁴ The strong link between increases in the effective retirement age and increases in statutory retirement age in the situation of relatively low replacement rates was observed in the period 1999-2008 when the statutory retirement age has increased by 5 years, by 6 months annually, for both men and women.

After 2040, the transition to the two-pillar regime will be complete and it is projected that total pension points and the average contributory period will remain relatively stable, in line with the projected evolution of the average effective *retirement* age that follows the projected increase in the average effective *exit* age.

Table 13a - Projected and disaggregated new public pension expenditure (old-age and early earnings-related first-pillar pensions)

TOTAL	2022	2030	2040	2050	2060	2070
Projected new pension expenditure (million EUR)*	89.5	144.4	209.1	292.6	368.9	491.1
I. Number of new pensions (1000)	36.6	39.1	40.5	39.2	35.2	34.4
II. Point value (EUR/month)	12.4	18.2	24.9	35.9	50.5	68.5
III. Average accrual rate (points/year) (IV/V)	1.0	1.0	1.0	1.0	1.0	1.0
IV. Total pension points at retirement	32.9	33.8	34.5	34.6	34.6	34.7
V. Average contributory period (years)	32.2	33.1	33.8	33.9	33.9	33.9
VI. Sustainability/adjustment factors	1.0	1.0	1.0	1.0	1.0	1.0
VII. Correction coefficient	1.0	1.0	1.0	1.0	1.0	1.0
VIII. Average number of months paid the first year	6.0	6.0	6.0	6.0	6.0	6.0

Source: European Commission and Croatian Pension Insurance Institute

**New pension expenditure equals the product of I, II, IV, VI, VII & VIII*

Table 13b - Projected and disaggregated new public pension expenditure (old-age and early earnings-related first-pillar pensions) - MEN

MEN	2022	2030	2040	2050	2060	2070
Projected new pension expenditure (million EUR)*	51.8	80.3	117.3	167.9	225.1	300.7
I. Number of new pensions (1000)	20.8	21.5	22.5	22.3	21.3	20.9
II. Point value (EUR/month)	12.5	18.2	24.9	35.8	50.3	68.4
III. Average accrual rate (points/year) (IV/V)	1.0	1.0	1.0	1.0	1.0	1.0
IV. Total pension points at retirement	33.1	34.2	34.9	35.0	35.0	35.1
V. Average contributory period (years)	32.1	33.1	33.7	33.8	33.8	33.9
VI. Sustainability/adjustment factors	1.0	1.0	1.0	1.0	1.0	1.0
VII. Correction coefficient	1.0	1.0	1.0	1.0	1.0	1.0
VIII. Average number of months paid the first year	6.0	6.0	6.0	6.0	6.0	6.0

Source: European Commission and Croatian Pension Insurance Institute

**New pension expenditure equals the product of I, II, IV, VI, VII & VIII*

Table 13c - Projected and disaggregated new public pension expenditure (old-age and early earnings-related first-pillar pensions) - WOMEN

WOMEN	2022	2030	2040	2050	2060	2070
Projected new pension expenditure (million EUR)*	37.7	64.1	91.7	124.7	143.8	190.4
I. Number of new pensions (1000)	15.7	17.6	18.0	16.9	13.9	13.5
II. Point value (EUR/month)	12.2	18.1	25.0	36.1	50.6	68.8
III. Average accrual rate (points/year) (IV/V)	1.0	1.0	1.0	1.0	1.0	1.0
IV. Total pension points at retirement	32.6	33.4	34.0	34.1	34.1	34.1
V. Average contributory period (years)	32.3	33.3	33.8	33.9	33.9	33.9
VI. Sustainability/adjustment factors	1.0	1.0	1.0	1.0	1.0	1.0
VII. Correction coefficient	1.0	1.0	1.0	1.0	1.0	1.0
VIII. Average number of months paid the first year	6.0	6.0	6.0	6.0	6.0	6.0

Source: European Commission and Croatian Pension Insurance Institute

**New pension expenditure equals the product of I, II, IV, VI, VII & VIII*

In addition to new pension expenditure from the public scheme, there will be a rising importance of expenditure on new pensions from the mandatory private individual scheme. Table 13d shows the disaggregation of expenditures on new pensions in that scheme. The number of new pensions shows that this scheme will become fully functional at around 2030 with around 6,900 new second pillar pensioners.

Thereafter, the number of new pensioners will depend on the decision regarding the opting out of the funded scheme and the demographic developments. In 2070, new pension expenditure in the private scheme is projected at 26.1 million euro.

The average accrual rate decreases through the projection period as a consequence of modest projected returns in the funded scheme (lower than actual returns in the 2002-2022 period) and increasing life expectancy, whereas the effective retirement age in outer decades stays almost unchanged, in line with assumptions on the development of exit ages.

Table 13d - Projected and disaggregated new mandatory private individual pension expenditure – individual private second pillar scheme

TOTAL	2022	2030	2040	2050	2060	2070
Projected new pension expenditure (million EUR)*	2.4	5.9	10.8	15.0	18.9	26.1
I. Number of new pensions (1000)	3.3	6.9	7.8	7.6	6.8	6.7
II. Monthly Average Pension (III)*(IV)*(V)*(VI)	121.7	142.5	230.8	331.2	462.1	650.3
III. Average contributory period (years)	19.0	27.8	33.4	33.5	33.5	33.5
IV. Average accrual rate (%)	2.6	1.7	1.6	1.5	1.4	1.4
V. Monthly average pensionable earnings (1000 EUR)	2.5	3.0	4.2	6.4	9.5	13.4
VI. Sustainability/adjustment factors	1.0	1.0	1.0	1.0	1.0	1.0
VII. Average number of months paid the first year	6.0	6.0	6.0	6.0	6.0	6.0

Source: European Commission and Croatian Pension Insurance Institute

3.4. Financing of the pension system

The Croatian public pension system is primarily financed by contributions of 20% paid by employees out of their gross earnings. Table 14 shows the main characteristics of the financing of the system. Contributions should be paid on earnings up to a maximum of 6 times the average gross wage. For those insured in both mandatory pension pillars, contributions of 15% of gross wage go to the first pillar and 5% goes to the second pillar. Additional contributions should be paid for pension insurance of employees in arduous and hazardous occupations and for some professions listed in special legislation. These contributions are paid by employers at rates from 4.86% to 17.58% of the gross wage. If a person is insured in both pillars, these contributions are also divided between two pillars: $\frac{3}{4}$ goes to the first pillar, $\frac{1}{4}$ to the second pillar.

The Government does not pay specific contributions to the public pension scheme. However, it transfers resources to cover some specific expenditure such as pension expenditures ensuing from special regulations, costs of the pension supplement (4%-27%) expenditures and other extraordinary pension increases, as well as expenditures due to the transitional cost of the pension reform following the introduction of the mandatory second pillar pension scheme. The Government is obliged to cover any remaining financing gap.

The Croatian Pension Insurance Institute is integrated into the General Government Budget and it operates within the State Treasury.

Table 14 – Financing of the public pension system

	Public employees	Private employees	Self-employed
Contribution base	Gross wage	Gross wage	Gross wage or contribution base that depends on the type of activity
Contribution rate/contribution			
<i>Employer</i>	4.86% to 17.58% for employees in arduous and hazardous occupations	4.86% to 17.58% for employees in arduous and hazardous occupations	20% (public PAYG scheme participants only); 15% (participants in both public PAYG scheme and mandatory fully-funded DC scheme)
<i>Employee</i>	20% (public PAYG scheme participants only); 15% (participants in both public PAYG scheme and mandatory fully-funded DC scheme)	20% (public PAYG scheme participants only); 15% (participants in both public PAYG scheme and mandatory fully-funded DC scheme)	-
<i>State</i>	-	-	-
<i>Other revenues</i>	Government is committed to cover deficit	Government committed to cover deficit	Government committed to cover deficit
Maximum contribution	6 times the average wage	6 times the average wage	6 times the average wage
Minimum contribution	0.38 times the average wage	0.38 times the average wage	0.38 to 1.1 times the average wage

Source: European Commission and Croatian Pension Insurance Institute

Table 15 shows the projected revenues from contributions and the number of contributors. The number of contributors steadily declines in line with the employment trend, which is negatively affected by the decline of the working-age population (20-64). It should be noted that the number of contributors is slightly higher than total employment. The main reason are the existing differences in the methodology and definition of employed persons and active contributors. The pension projection model counts the *average* number of persons that actually pay contributions in a given year based on administrative data on persons who were actively insured in the public pension insurance system, while the number of employed persons is based on the methodology and data used in the EU Labour Force Survey.¹⁵

Table 15 – Revenue from contributions, number of contributors in the public scheme, total employment

	2022	2030	2040	2050	2060	2070	change 2022-2070 (pps)
Public pension contributions (%GDP)	5.7	6.1	6.5	6.6	6.5	6.6	0.9
<i>Employer contributions</i>	0.1	0.1	0.1	0.1	0.1	0.1	0.0
<i>Employee contributions</i>	5.3	5.3	5.3	5.3	5.3	5.3	0.0
<i>State contribution*</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Other revenues*</i>	0.2	0.7	1.1	1.2	1.1	1.2	1.0
Number of contributors (I) (1000)	1613	1602	1515	1415	1323	1249	-364
Employment (II) (1000)	1610	1579	1500	1401	1311	1237	-373
(I) / (II)	1.00	1.01	1.01	1.01	1.01	1.01	0.0

Source: European Commission and Croatian Pension Insurance Institute

*Only legislated contributions are reported; 'Other revenues' include the transfers from the funded mandatory private schemes for those retirees switching back in full to the public scheme.

¹⁵ According to the EU Labour Force Survey methodology, persons in employment are those who were engaged in any work for payment in cash or kind during the reference week and persons who were not at work during the reference week but had a job or business from which they were temporarily absent. Therefore, the Survey covers all persons who worked for at least one hour in the reference period, irrespective of their formal status or means of payment.

By assumption, the number of contributors rises at the same rate as total employment, so the contributors-to-employment ratio is equal to 1.0 in 2022, after which it grows slightly to 1.01 by 2030 due to assumed improvements in the fight against the hidden economy. After 2030, it remains constant over the rest of the projection horizon.

3.5. Sensitivity analysis

The baseline projections of pension expenditures presented so far have been challenged by a number of sensitivity tests in which particular parts of the baseline assumptions are changed. The results in terms of deviation of the expenditure-to-GDP ratio from the baseline projection are presented in Table 16.

Table 16 - Public and total pension expenditures under different scenarios (pps deviation from the baseline)¹⁶							
<i>Public pension expenditure</i>	2022	2030	2040	2050	2060	2070	change 2022-2070 (pps)
Baseline (%GDP)	9.0	10.1	9.6	9.1	8.8	8.8	-0.2
Higher life expectancy at birth (+2y)	0.0	0.0	0.2	0.4	0.5	0.7	0.7
Higher migration (+33%)	0.0	-0.1	-0.2	-0.3	-0.3	-0.2	-0.2
Lower migration (-33%)	0.0	0.1	0.2	0.3	0.3	0.2	0.2
Lower fertility (-20%)	0.0	0.0	0.0	0.1	0.5	0.8	0.8
Higher inflation scenario (2% by 2052)	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Higher employment rate of older workers (+10 pps)	0.0	-0.3	-0.5	-0.6	-0.7	-0.7	-0.7
Higher productivity (TFP converges to 1%)	0.0	0.0	-0.1	-0.1	-0.2	-0.3	-0.3
Lower productivity (TFP converges to 0.6%)	0.0	0.0	0.0	0.1	0.2	0.2	0.2
Policy scenario: link retirement age to longevity	0.0	0.0	-0.4	-0.8	-1.1	-1.3	-1.3
Policy scenario: constant retirement age	0.0	0.1	0.1	0.2	0.2	0.2	0.2
Policy scenario: constant benefit ratio	0.0	0.0	0.0	0.1	0.5	0.9	0.9
<i>Total pension expenditure</i>	2022	2030	2040	2050	2060	2070	change 2022-2070 (pps)
Baseline (%GDP)	9.0	10.1	9.6	9.1	8.8	8.8	-0.2
Higher life expectancy at birth (+2y)	0.0	0.0	0.2	0.4	0.5	0.7	0.7
Higher migration (+33%)	0.0	-0.1	-0.2	-0.3	-0.3	-0.2	-0.2
Lower migration (-33%)	0.0	0.1	0.2	0.3	0.3	0.2	0.2
Lower fertility (-20%)	0.0	0.0	0.0	0.1	0.5	0.8	0.8
Higher inflation scenario (2% by 2052)	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Higher employment rate of older workers (+10 pps)	0.0	-0.3	-0.5	-0.6	-0.7	-0.7	-0.7
Higher productivity (TFP converges to 1%)	0.0	0.0	-0.1	-0.1	-0.2	-0.3	-0.3
Lower productivity (TFP converges to 0.6%)	0.0	0.0	0.0	0.1	0.2	0.2	0.2
Policy scenario: link retirement age to longevity	0.0	0.0	-0.4	-0.8	-1.1	-1.3	-1.3
Policy scenario: constant retirement age	0.0	0.1	0.1	0.2	0.2	0.2	0.2
Policy scenario: constant benefit ratio	0.0	0.0	0.0	0.1	0.5	0.9	0.9

Source: European Commission and Croatian Pension Insurance Institute

¹⁶ For more information on the design of the sensitivity scenarios, see Chapter 5 of Part I in European Commission and EPC (2023), *2024 Ageing Report: Underlying assumptions and projection methodologies*, European Economy, Institutional Paper 257.

Higher life expectancy: A scenario with an increase of life expectancy at birth of about two years by 2070 compared with the baseline projection. *Higher life expectancy* by two years compared to the baseline is projected to gradually increase pension spending by up to 0.7 percentage points of GDP by 2070, relative to the baseline projections. Higher spending will be entirely borne by the public pension scheme, as the private individual scheme will adjust its pension payment to higher life expectancy. In the public scheme there is no automatic adjustment mechanism so the longer duration of retirement increases pension spending.

Lower/higher migration: A scenario with 33% less/more migration compared with the baseline projection.

Due to relatively low migration flows in Croatia, the *lower/higher migration scenarios* would have only a limited effect on future pension expenditure, which may be lower/higher by 0.2 percentage points of GDP in 2070 compared to the baseline scenario.

Lower fertility: under this scenario the fertility rate is assumed to be 20% lower compared to the baseline scenario over the entire projection horizon.

The *lower fertility scenario* projects a substantial increase in future expenditure on pensions relative to the baseline. In this scenario, public pension expenditure is projected to be higher by 0.8 percentage points of GDP in 2070 compared to the baseline scenario.

Higher inflation: In this scenario the inflation rates are projected to remain higher than in the baseline scenario and will gradually converge towards the inflation target of 2% until 2052.

Higher inflation would result in the increase of the pension indexation rates and higher pension expenditure in the future compared to the baseline scenario. However, in this scenario the projected increase in the growth rate of nominal GDP is higher than the projected growth rate of pension expenditure resulting in a lower pension expenditure-to-GDP ratio over time compared to the baseline scenario.

Higher employment rate of older workers: A scenario with the employment rate of older workers (55-74) being 10 p.p. higher compared with the baseline projection. The higher employment rate of this group of workers is assumed to be achieved through a reduction of the inactive population.

Higher employment rates of older workers are estimated to have beneficial effects on public pension spending, foremost through a higher GDP, higher number of contributors and less pensioners. The public pension expenditure is projected to decrease by about 0.7 p.p. of GDP in this scenario.

Higher productivity: A scenario where total factor productivity (TFP) growth is assumed to converge to 1.0% by 2070 (instead of 0.8%).

In the *higher productivity scenario*, the pension expenditures-to-GDP ratio is projected to gradually decline by additional 0.3 p.p. of GDP by 2070 compared to the baseline scenario. In the case of higher productivity growth, a higher wage growth is expected. Then, the current valorisation and indexation rules would lead to a somewhat lower benefit ratio and hence lower overall pension expenditures. The effect is again concentrated in the public pension scheme.

Lower productivity: A scenario where the TFP growth is assumed to converge to 0.6% by 2070 (instead of 0.8%).

Such lower total factor productivity would lead to 0.2 percentage points of GDP higher expenditure on public pensions in 2070 in comparison with the baseline scenario.

Policy scenario: linking retirement age to change in life expectancy. This scenario considers the adoption of an automatic mechanism to adjust legal retirement ages. The latter are shifted year-over-year in line with changes in life expectancy at current retirement ages.

The *policy scenario* of linking retirement age to increases in life expectancy has the largest potential downward impact on pension expenditures relative to GDP. The projection results show a decline by 1.3 percentage points for public and total pension expenditures in 2070 compared to the baseline scenario. The dynamic retirement age will extend the contribution period, slowdown inflows into retirement and reduce the duration of retirement as compared to the baseline, resulting in a lower expenditure-to-GDP ratio. The private scheme with actuarial calculations of pension benefits is expected to partially compensate for these effects.

Policy scenario: unchanged retirement age. This scenario assumes that the main eligibility requirements (early and statutory retirement age, career requirement) are unchanged over the projection horizon.

In the case of unchanged retirement age, the pension expenditure-to-GDP ratio would increase by 0.2 p.p. compared to the baseline scenario. The increase is relatively limited given that the baseline scenario already considers only limited legislated increases in statutory and early retirement ages for women.

Policy scenario: offset declining pension benefit ratio. This scenario assumes that policy measures are taken when the earnings-related public benefit ratio decreases by 10% relative to the base year. The scenario keeps the benefit ratio constant at this 10% lower point for the remainder of the projection period.

In order to prevent the decline in the benefit ratio below the 90% threshold, it was assumed that pension indexation would change to full wage indexation starting from 2049. In addition, further increases of pensions in payment were assumed, on average by 0.1 percentage points on top of the wage indexation growth rate, in order to keep the benefit ratio constant until 2070. In this scenario, public pension expenditure is projected to be lifted by 0.9 percentage points of GDP compared to the baseline scenario. Among the sensitivity scenarios, the declining benefit ratio scenario exerts the highest upward pressure on future expenditure, underscoring the potentially high budgetary cost of addressing the low adequacy of the Croatian pension system.

3.6. Changes in comparison with previous Ageing Report projections

Croatia first participated in the AWG projections in the 2015 projection round.

The 2019 updated projections were prepared in line with the legislated pension reform that came into force in 2019. Most noticeable changes in comparison to the previous projections were related to a smaller decline in the public pensions-to-GDP ratio (-3.9% in 2015 vs. -2.4% in 2019 projections) given a smaller benefit ratio effect. The change in the long-term trend was a result of the introduced legislative changes that increased future pension benefits and improved adequacy of the pension system.

The 2021 projections were prepared taking into account the legislative changes that came into force in 2020 and, in comparison to the previous rounds of projections, the difference was quite significant. Projections showed that public expenditure to GDP would decrease by only 0.7 p.p. in the period until 2070. The main driver behind this revision was the smaller impact of the labour market effect.

In the 2019 projections, the labour market effect decreased pension expenditure by 3.7 p.p., while in the 2021 projections it resulted in a decrease by only 0.6 p.p. The milder impact can be explained by the reversal of previously legislated reforms and the fact that the statutory retirement age was again fixed at 65 years.

In the most recent 2024 Ageing Report projections the decline of public pension expenditure-to-GDP ratio over the projection horizon is very mild and much smaller compared to the previous projection rounds. In this round the impact of declining in benefit ratio on pension system sustainability is much less pronounced, due to the introduced legislative changes that came into force in 2023 that were aimed at improving pension adequacy for current and future pensioners.

Table 17 - Overall change in public pension expenditure to GDP under the 2015, 2018 and 2021 projection exercises

	Public pension expenditure	Dependency ratio effect	Coverage ratio effect	Benefit ratio effect	Labour market effect	Residual (incl. interaction effect)
2015 Ageing Report (2013-2060)	-3.9	6.4	-3.3	-5.0	-1.7	-0.4
2018 Ageing Report (2016-2070)	-3.8	6.3	-3.3	-4.9	-1.5	-0.4
2021 Ageing Report (2019-2070)	-0.7	6.8	-3.2	-3.3	-0.6	-0.4
2024 Ageing Report (2022-2070)	-0.2	4.6	-2.1	-1.6	-1.0	-0.2

-The disaggregation is on the basis of pensioners.

-The projection horizon has been extended over consecutive Ageing Reports, limiting comparability over time.

Source: European Commission and Croatian Pension Insurance Institute

The difference between the 2021 projections and the actual public pension expenditure in the period 2019-2022 is between 0.3 p.p. and 1.7 p.p. of GDP (Table 18A).

The actual expenditure is lower mainly because of the assumptions used; previously assumed GDP growth was much lower than actual GDP growth and the economic recovery after the COVID-19 crisis was much faster than previously assumed. Hence, higher actual GDP resulted in a lower pension-expenditure-to-GDP ratio.

Table 18A – Breakdown of the difference between the previous projections and outcome figures (% of GDP)

	2019	2020	2021	2022
Ageing Report 2021 projections (%GDP)	10.2	11.5	10.7	10.7
<i>Assumptions (pps of GDP)</i>	-0.3	-0.4	-1.0	-1.7
<i>Coverage of projections (pps of GDP)</i>				
<i>Constant policy impact (pps of GDP)</i>				
<i>Policy-related impact (pps of GDP)</i>				
Actual public pension expenditure (%GDP)	9.9	11.0	9.8	9.0

Source: European Commission and Croatian Pension Insurance Institute

When comparing new projections with the 2021 projections, the difference is decreasing from 1.7 pps (lower pension expenditure-to-GDP ratio in 2022) to 0.7 p.p. of GDP by 2070. The drivers of the decrease in the pension expenditure-to-GDP ratio compared to the previous projection are the new assumptions used (more favourable demographic and macroeconomic assumptions than in the 2021 round). However, recently introduced policy-related changes have the opposite effect on the pension system, increasing pension expenditure by 0.4 p.p. of GDP over the projection period (Table 18B).

Table 18B - Breakdown of the difference between the previous and the new public pension projection (% of GDP)

	2022	2030	2040	2050	2060	2070
Ageing Report 2021 projections	10.7	11.0	10.4	9.9	9.7	9.5
<i>Change in assumptions (pps of GDP)</i>	-1.7	-1.3	-1.2	-1.2	-1.2	-1.0
<i>Improvement in the coverage or in the modelling (pps of GDP)</i>						
<i>Change in the interpretation of constant policy (pps of GDP)</i>						
<i>Policy-related changes (pps of GDP)</i>	0.0	0.4	0.4	0.4	0.4	0.4
New projections	9.0	10.1	9.6	9.1	8.8	8.8

Source: European Commission and Croatian Pension Insurance Institute

4. DESCRIPTION OF THE PENSION PROJECTION MODEL AND ITS BASE DATA

4.1. Institutional context in which those projections are made

The pension projection model has been developed by experts from the Croatian Pension Insurance Institute. The model is designed specifically to run long-term pension projections for AWG purposes. It is expected to give useful insights into outcomes and driving forces of the Croatian pension system as a whole and of its components in the projection period up to 2070. The projections have been reviewed by the Ministry of Labour and Pension System.

4.2. Assumptions and methodologies applied

The model and the structure of input and output data are developed in a way to comply with the AWG methodologies and assumptions.

All the commonly-agreed AWG assumptions for this projection round are used in the modelling as supplied by Eurostat and the Commission.

4.3. Data used to run the model

The model uses the data from the base year (2022). Most of them are provided by the Croatian Pension Insurance Institute, which is in charge of disbursing all public pension benefits, and the Croatian Registry of Insured People, which administrates second pillar individual accounts opened in mandatory pension funds.

The model requires the following data disaggregated by type of pension, gender and age:

- number of pensions,
- number of new pensions,
- number of pensioners,
- number of outflow pensioners,
- number of new pensioners,
- average pension benefit,
- average newly granted pension benefit from the first pillar and second pillar.

Projections of the labour market and macroeconomic parameters are from the AWG assumptions.

4.4. Reforms incorporated in the model

The state of the pension system as of 2022, including pension reforms that came into force in 2023 as described in section 1.2 of the fiche, is incorporated in the pension projections.

4.5. General description of the model

The model is a macro simulation model, i.e. aggregated data are used in the calculations. The pension model is based on a cohort approach. The model covers the public PAYG scheme (first pillar) and the mandatory private funded scheme (second pillar).

4.6. Additional features of the projection model

Main equations used in the modelling of the new pension benefits are given in part one of this fiche.

The number of pensions in projection year t for a specific cohort (pension type, gender, and age) results from the number of pensions in year $t-1$ minus outflow of pensions plus new pensions in year t .

Outflow of pensions in each projection year is equal to the number of pensions in year $t-1$ multiplied by the mortality rates given the AWG population scenario, plus the outflows due to other reasons like switching from one type of pension to another, outflow of orphan pension due to finishing the education, etc.

New old-age and new disability pensions are calculated with probabilities of pension entry, estimated on the basis of past trends, taking into account the legislated increase of the statutory retirement age, demographic trends and other relevant reasons.

Number of new orphan benefits and number of new survivors' pensions for spouses are calculated on the basis of past trends and demographic projections.

The public pension benefits of new entrants are calculated by the point formula on a basis of their wages relative to average country wage and the average contribution years for different cohorts, types of pension and genders, taking into account penalties/bonuses in case of early/deferred retirement and the effect of minimum/maximum pension on pension amount and other issues relevant for calculation of new pensions.

Pension formula and benefit amount differ in case of new pensioners who acquire pension only in the first public pillar and of those who acquire pension both in the first and second fully funded pillar (described in the section 1.1.6.). Average new public pension is calculated as a weighted average of public pensions from these two pension regimes.

New second pillar (fully funded, DC) pension benefits are calculated on the basis of individual account (the value of account depends on contribution years, wage amount, contribution rate, contribution collection efficiency, and rate of return), retirement age (unisex life expectancies are used that evolve in line with demographic projections) and type of pension (single, joint for spouses, both types can be with or without guaranteed period), and legislated regime of indexation. Administrative charges in both contribution-accumulation and pension-payment phases are also taken into account in the calculation of the second pillar benefits.

The number of public pensions is higher than the number of pensioners reflecting the fact that from 2023 a person can receive personal and partial survivor's pension from the public pension system.

As the second pillar is mandatory for younger cohorts, growing number of pensioners in the public system will be entitled also to second pillar pension in the next decades as well, while their first pillar pension will be accordingly smaller than the pension of the older cohorts who acquired only the first pillar pension.

METHODOLOGICAL ANNEX

Economy-wide average wage at retirement

Over the entire projection horizon economy-wide average wage at retirement is very similar as the economy-wide average wage (Table A1). There is a small difference in the overall change in the period 2022–2070, the reason being that the calculation of the economy-wide average wage at retirement also includes the contribution base for self-employed and farmers, and the figure is based on the assumption that workers approaching the retirement age have a somewhat higher average wage than younger workers.

Table A1 – Economy wide average wage at retirement (1000 EUR)						
	2022	2030	2040	2050	2060	2070
Economy-wide average gross wage at retirement	16.8	25.5	38.1	58.0	85.5	120.3
Economy-wide average gross wage	16.6	25.2	37.6	57.2	84.2	118.4

Source: European Commission and Croatian Pension Insurance Institute

Pensioners vs Pensions

The number of public pensions is higher than the number of pensioners, reflecting the fact that a person can receive personal old-age or disability pension and partial survivor's pension from the public pension system. As the second pillar is mandatory for younger cohorts, growing number of pensioners in the public system will be entitled also to second pillar pension in the next decades as well.

In line with that, the total number of pensioners will be lower than the number of public pensions, while the total number of pensions will be the sum of pensions from both mandatory pillars.

Pension taxation

In Croatia, pensions are taxed according to general income tax rules, but the calculated income tax is reduced by 50%. Also, there is a personal tax deduction on pensions with the result that the majority of the pension benefits are untaxed. However, the average gross and the average net pensions are similar (the difference is around 1%) and this holds for the entire projection period.

Disability pension

Disability pensions in Croatia are paid from the first pillar on condition that insurance period is equal to one third of working life.¹⁷ Disability pension beneficiaries are projected to remain at relatively lower levels than it was the case several years ago mainly as a result of the new system for achieving disability pensions which has been established alongside with the introduction of compulsory medical assessment during first 3 years for disability pensioners, improved occupational rehabilitation system and also considering the fact that the number of disability pensioners-war veterans reached its peak and will gradually decline in the future. New disability pensions are calculated with probabilities of pension entry, estimated on the basis of past trends and taking into account the legislated increase of the statutory retirement age. Conversion of disability pensions to old-age pensions when pensioner reaches statutory retirement age is practiced in Croatia as of 2015.

Table A2 presents incidences of *new* disability pensioners relative to population in the same age group, i.e. disability rates. Over the entire projection period, disability rates remain stable for younger age groups while for the population older than 65 they remain zero.

	2022	2030	2040	2050	2060	2070
Age group -54	0.0	0.1	0.1	0.1	0.1	0.1
Age group 55-59	0.3	0.4	0.5	0.5	0.5	0.5
Age group 60-64	0.2	0.3	0.3	0.3	0.3	0.4
Age group 65-69	0.0	0.0	0.0	0.0	0.0	0.0
Age group 70-74	0.0	0.0	0.0	0.0	0.0	0.0
Age group 75+	0.0	0.0	0.0	0.0	0.0	0.0

Source: Croatian Pension Insurance Institute

¹⁷ See section 1.1.5 for more details.

Survivors' pensions

Survivors' pensions in Croatia are paid to the family members when conditions stipulated by law are met, i.e. the deceased must have been a pension beneficiary, a beneficiary of occupational rehabilitation or an insured person who had completed five-year insurance period or ten-year qualifying period.¹⁸

Survivor pensions are declining in Croatia over the projection period, mainly due to demographic trends and the projected increase in female employment rates. Number of new survivors' pensions for spouses is calculated on the basis of past trends and demographic projections, corrected by the probability that they will acquire their own old age pension.

Non-earnings related minimum pension

Amount of minimum pension in Croatia crucially depends on contribution years and therefore it is not flat rate. Namely, the calculation formula for minimum pension is roughly the same as that for earning-related pensions, including the penalisation in case of early retirement and bonus in case of deferred retirement. Also, the eligibility for minimum pension is not means-tested. Valorisation and indexation of the minimum pension is subject to the same rules as for all other public pensions. Hence, minimum pension is an integral part of the insurance in the public PAYG scheme and financed by its regular revenues.

The same refers to maximum pension.

Contributions

Majority of pension contributions in Croatia are paid by employees on the basis of gross wage. There is minimum and maximum contribution base. Employers pay pension contributions for employees in arduous and hazardous occupations. The State has no obligation to pay pension contributions, except for lump-sum transfers for specified purposes (pension supplement, expenditures for pensions realised according to special legislation, transition cost due to implementation of the second pillar, etc.).

¹⁸ See section 1.1.5 for more details.

Alternative pension spending disaggregation

Table A3 is similar in structure to Table 8, but provides a disaggregation based on pension data as compared to pensioners in Table 8.

Table A3 – Factors behind the change in public pension expenditure between 2022 and 2070 (percentage points of GDP) – pensions

	2022-30	2030-40	2040-50	2050-60	2060-70	2022-70
Public pensions to GDP	1.1	-0.5	-0.5	-0.3	0.0	-0.2
Dependency ratio effect	1.5	1.1	1.1	0.5	0.5	4.5
Coverage ratio effect*	-0.8	-0.4	-0.4	-0.1	-0.1	-1.8
<i>Coverage ratio old-age</i>	-0.1	-0.1	-0.3	-0.1	-0.1	-0.7
<i>Coverage ratio early-age</i>	-3.0	-2.0	-0.2	-0.1	-0.1	-5.3
<i>Cohort effect</i>	-1.3	-0.7	-1.2	-0.2	-0.4	-3.8
Benefit ratio effect	0.3	-0.8	-0.9	-0.6	-0.4	-2.5
Labour market effect	-0.4	-0.2	-0.2	0.0	0.0	-0.8
<i>Employment ratio effect</i>	-0.4	-0.2	-0.1	0.0	0.0	-0.7
<i>Labour intensity effect</i>	0.0	0.0	0.0	0.0	0.0	0.0
<i>Career shift effect</i>	-0.1	0.0	-0.1	0.0	0.0	-0.1
Residual	0.5	0.0	-0.1	0.0	0.0	0.4

Source: European Commission and Croatian Pension Insurance Institute

*Subcomponents of the coverage ratio effect do not add up necessarily.

Administrative data on new pensioners

Tables A4A, A4B and A4C contain data on actual new retirement from registries of the Croatian Pension Insurance Institute. Data cover the age distribution of pension take-up in 2022 by gender. Most new retirees start receiving a pension at the age of 60-64 years, while among women there is a significant proportion of retirees aged 55-59 because early retirement for women in 2023 was possible at the age of 58 years and 3 months.

Table A4A – Number of new pensioners by age group in 2022 - administrative data (MEN)

Age group	All	Old age	Disability	Survivor	Other (including minimum)
15 - 49	1069	157	264	648	0
50 - 54	586	229	313	44	0
55 - 59	1022	422	562	38	0
60 - 64	8769	8116	562	91	0
65 - 69	11540	11372	24	144	0
70 - 74	601	438	0	163	0
75+	482	111	0	371	0

Table A4B – Number of new pensioners by age group in 2022- administrative data (WOMEN)

Age group	All	Old age	Disability	Survivor	Other (including minimum)
15 - 49	920	5	160	755	0
50 - 54	722	20	174	528	0
55 - 59	3373	2262	253	858	0
60 - 64	10819	9199	145	1475	0
65 - 69	5990	4052	3	1935	0
70 - 74	2297	167	0	2130	0
75+	3757	24	0	3733	0

Table A4C – Number of new pensioners by age group in 2022 - administrative data (TOTAL)

Age group	All	Old age	Disability	Survivor	Other (including minimum)
15 - 49	1989	162	424	1403	0
50 - 54	1308	249	487	572	0
55 - 59	4395	2684	815	896	0
60 - 64	19588	17315	707	1566	0
65 - 69	17530	15424	27	2079	0
70 - 74	2898	605	0	2293	0
75+	4239	135	0	4104	0

Source: Croatian Pension Insurance Institute