Economic Policy Committee
Ageing Working Group

2025 Pension projections update

Czech Republic – Country Fiche

Ministry of Finance of the Czech Republic

April 2025

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Ministry of Finance, Czech Republic
Letenska 15, 118 10 Prague 1

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The present country fiche for the Czech Republic is an update of the 2024 Ageing Report, which provides long-term projections of the economic and budgetary impact of population ageing at unchanged policy.

This fiche was prepared by the Ministry of Finance of the Czech Republic. 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 Working Group on Ageing and Sustainability. The projections were finalised in March 2025.

Section 1 provides a general overview of the pension system in the Czech Republic. 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.

The country fiche of the Czech Republic describes long-term pension projections prepared in cooperation with European Commission and the Economic Policy Committee's (EPC) Working Group on Ageing and Sustainability (AWG). The fiche is an interim update of Ageing Report 2024.

All calculations are based on data of 2023. Data for 2024 was adjusted for known macroeconomic indicators and administrative data on pensions, such as average pension benefit and financial results of the pension system.

1 Czech Pension System

The first section of the fiche concerns facts about the pension system in the Czech Republic. It consists of three parts. In the first part we describe all pension pillars, in the second part we provide an overview of recent reforms incorporated in the projections and finally in the third part we present some "constant policy assumptions" that are adopted and should make the projections transparent.

1.1 Description of the System

The Czech pension system consists of two pillars – the main mandatory state pay-as-you-go system and a voluntary private fully funded system. There is no occupational pension scheme.

1.1.1 Mandatory Pay-as-you-go System

The first pillar is a mandatory basic pension insurance scheme, based on the pay-as-you-go financing and defined benefits. It covers all economically active persons and applies identically to all economic sectors with the exception for selected occupations (miners, members of integrated emergency system, workers in difficult conditions), who have lower retirement age. Regarding administration, so-called armed forces (e.g., soldiers, policemen, fire fighters) are secured by the respective ministries in charge, all other sectors are managed by the Czech Social Security Administration.

The basic pension insurance covers almost the whole population (except e.g., students) regardless of the actual economic activity of a person. A wide range of so-called non-contributory periods allows gaining pension entitlement at the time of a person's non-activity in the labour market (one does not have any income from which the contribution is derived). Thus, the system does not exclude (at least, not to the full extent) those, whose career was interrupted for many reasons (unemployment, childcare period etc.) Besides the solidarity of economically active persons with non-active ones, there is another type of solidarity within a generation – income solidarity.

Income solidarity is achieved through the formula used to calculate pension benefits. It leads to higher replacement rates for lower-income persons compared to those with higher income through the reduction thresholds. The personal assessment base (which is understood as a pensionable earning in the projections) is determined by the income and the income is divided by reduction thresholds to several reduction brackets. Different percentages are applied to various parts of income. The lowest part (for pensionable earnings up to 44% of the average wage) is fully taken into account, but the percentage will decrease between 2026 and 2035 by 1 percentage point per year to 90%, remaining unchanged at 90% from 2035 onwards, as shown in Table 1.2: Changes in pension formula. The rate of 26% (i.e., the second reduction coefficient) is applied to the second-lowest part (for pensionable earnings from above 44% to 400% of the average wage), while higher income is not included in the calculation at all. It is equivalent to sharp progressive taxation.

The pension insurance contributions (as a major part of the total social security contributions) form the revenue side of this scheme. The contribution is calculated by multiplying the assessment base by a contributory rate. The assessment base for employees consists of all the benefits paid by employer to the employee which are also subject to personal income tax. There is, however, an upper limit 48 times the average monthly wage per calendar year. This limit is valid for employees as well as for self-employed persons and is equivalent to the second reduction bracket (see previous paragraph). The contributory rate for pension insurance is 28%, which is paid partly by employee (6.5%) and partly by employer (21.5%).

Self-employed persons had their own assessment base, amounting to 50% of the difference between turnover and expenses (increased to 55% as of 1 January 2024). However, the minimum base was 25% of the average gross monthly wage in the national economy (or 10% for secondary activity). It is gradually increasing to 40% over three years, rising by 5 percentage points per year starting in 2024. The maximum base is the same as for employees. The contributory rate for self-employed persons is 28%.

The state pension system covers three main benefits – old-age pension, disability pension and survivors' pensions. To be entitled to an **old age pension** a person has to reach either a retirement age specified by a law and an insurance period of at least 35 years, or be two years older than the statutory retirement age with at least 20 years of insurance. Non-contributory periods are also included in the insurance period. If the non-contributory periods are excluded, the minimum insurance period is 30 or 15 years respectively. The statutory retirement age is determined based on a person's date of birth, sex, and the number of children raised (only in the case of women) until it unifies at 65 years and 8 months, then rises further to 67 for all persons, regardless of sex or the number of children brought up.

However, every five years the Government is to be provided by the Report on Pension System assessing changes in demography and life expectancy. If there is a significant change in life expectancy, the Government decides on rising

the statutory retirement age in the way assuring that 25% (+/- 1 p.p.) of life is spent in retirement. To be more specific, for each generation life expectancy can be calculated for every age (e.g., what is life expectancy of generation born in 1980 when the people from this generation are 30 or 40 etc.). This life expectancy is always compared to the age (number of years lived so far in each specific year) and when there is this ratio 25, the "correct" retirement age is given. Changes in retirement age may concern just the people at the ages of 25 up to 54. The mechanism, however, provides the Government just with the option to forward a proposal for the retirement age modification to the Parliament.

A person is allowed to retire up to 3 years prior the statutory retirement age. This rule applies since 1 November 2024 as until then it was longer (up to 5 years with minimum retirement age of 60). The other condition for early retirement is longer contribution period of at least 40 years (including non-contributory periods). In case of earlier retirement, the person is excluded from the right to receive a proper (full) old-age pension and thus obtains a permanently reduced early old-age pension. Retirement in ages higher than the statutory retirement age is awarded by additional bonuses, but only in case when a person does not draw a full old-age pension benefit. Bonuses for longer careers of people working beyond the statutory retirement age are preserved only for those who draw no or half old age pension benefit.

Certain professions, due to the nature of their work and its demands, have the option of early retirement without penalty. These include firefighters, paramedics and individuals employed in positions classified under category 4 of the risk classification of activities. The Ministry of Health determines these classified positions based on exposure to specific risks, such as extreme temperatures, noise, dust, and other hazardous conditions.

For those working in these positions, the retirement age is adjusted based on the number of shifts completed. Employees who have worked between 2,200 and 4,399 shifts will have their retirement age reduced by 15 calendar months. Those who have completed 4,400 shifts will see a reduction of 30 calendar months. Beyond this threshold, each additional 74 shifts will result in a further one-month reduction, up to a maximum of 60 calendar months.

Table 1.1: Qualifying Conditions for Retirement

			2022	2030	2040	2050	2060	2070
Qualifying condition for retiring with a full pension	Statutory retirement age - men		63.9	65.0	65.8	66.6	67.0	67.0
	Statutory retirement age - women		62.2	64.9	65.8	66.6	67.0	67.0
	Minimum requirements	Contributory period - men[1]	35.0	35.0	35.0	35.0	35.0	35.0
		Retirement age - men	63.9	65.0	65.8	66.6	67.0	67.0
		Contributory period - women[1]	35.0	35.0	35.0	35.0	35.0	35.0
		Retirement age - women	62.2	64.9	65.8	66.6	67.0	67.0
Qualifying condition for retirement WITHOUT a full pension	Early retirement age - men		60.0	62.0	62.8	63.6	64.0	64.0
	Early retirement age - women		59.2	61.9	62.8	63.6	64.0	64.0
	Penalty in case of earliest retirement age - men[2]		21.9%	19.5%	19.5%	19.5%	19.5%	19.5%
	Penalty in case of earliest retirement age - women[2]		15.9%	19.5%	19.5%	19.5%	19.5%	19.5%
	Bonus in case of late retirement[3]		1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
	Minimum contributory period - men[1]		35.0	40.0	40.0	40.0	40.0	40.0
	Minimum contributory period - women[1]		35.0	40.0	40.0	40.0	40.0	40.0
	Minimum residence period - men		:	:	:	:	:	:
	Minimum residence period - women		:	:	:	:	:	:

[1)] There is also an option to receive full pension while having less than required contributory period. He/she must have at least 20 years contributory period and 2 years higher retirement age than the men of the same year of birth.

[2)] Penalties in case of earliest retirement may differ in case of men and women because of different statutory retirement age and different possibility of early retirement, which had been gradually extended from 3 up to 5 years before 2024. Lower penalties (a cumulative penalty for earliest possible retirement is 9,75 %) effective from 2026 pertain to those with 45 or more contributory years. Penalties apply to earnings related component only leaving flat rate component unchanged.

[3)] Bonuses illustrated in the table apply to persons who continue working without drawing pension benefit for each 90 days.

Note: For an explanation of baseline assumption on the retirement age ceiling see Section 1.3 on page 7. Parameters for women refers to an "average" woman with two children. For differences in retirement ages for men and women depending on the number of children refer to the Annex C.

Source: Pension Insurance Act (No. 155/1995), calculations of the MoF.

Disability pensions are received by persons whose ability to work is reduced by at least 35% and are divided into three ranges: (i) First degree of disability – when a person has experienced a decline in his/her working capacity of at least 35% but not more than 49%; (ii) second degree of disability – a decline of at least 50% but not more than 69%; (iii) third

degree of disability – a decline of at least 70%. The required insurance period is at least 5 years[1] (it is derived from the ten-year period prior to the occurrence of disability).

A disability pension belongs to a person until his/her working ability improves, or until he/she reaches the statutory retirement age. If the statutory retirement age is lower than 65 years, the person is transferred from the disability pension scheme to the old age pension scheme by the age of 65 at the latest.

Survivors' pensions are paid out to a widow/widower or an orphan (dependent child) if a deceased person has met eligibility conditions for the old age or disability pension or he/she died due to job-relating injury. After one year of receiving the survivor's pension, the widow/widower has to meet other conditions stipulated by the law, otherwise the entitlement lapses (the entitlement continues when the widow/widower cares for a dependent child or disabled child, parents or relatives aged 80 and higher; or when a widow/widower is disabled in the third degree of disability or retired; or he/she has reached the age, which is 4 years lower than statutory retirement age of men of the same year of birth). The entitlement is also renewed when at least one of these conditions is met within 5 years from the last entitlement termination. Orphan's entitlement to survivor's pension lasts while he/she is dependent. If only one person adopts, the orphan loses part of the pension of the person he or she has now replaced (i.e., if only a woman adopts the orphan, the orphan loses the pension for the absent mother).

Pension calculations

The basic act that determines calculation of pension benefits is the Pension Insurance Act (No. 155/1995). Pensions[2] consist of two main parts:

Flat rate component is the same for all pensions regardless of the insurance period acquired (though, above the minimum one, see above) and earnings achieved. The flat rate amounts to 10% of the average monthly wage for all kinds of pensions. Thus, every time the average wage changes, the flat rate changes hereby automatically.

Earnings-related component is derived from the insurance period and earnings achieved. It is calculated as a percentage of personal assessment base, which takes into consideration a person's income between the age of nineteen and his retirement age (this means that earnings during virtually the whole career are taken into account); however, the earnings from the years before 1986 are not taken into account. This component also includes the allowance for each child raised beginning from the third child that amounts to 500 CZK (approx. 20 EUR). This allowance is granted to the parent who cared for the child mostly. However, this allowance is exempt from indexation of the earnings-related component.

Minimum amount of a pension is set by both the flat rate component (which is the same for everyone) and the minimum earnings-related component. Another instrument that also protects people against poverty is the institution of the subsistence level, which is, however, set and revaluated by the government on an irregular basis.[3] There is not any special minimum pension scheme besides this one inbuilt in all pension types.

The earnings-related component of **old age pensions** currently amounts to 1.5% of a person's assessment base (i.e., previous earnings adjusted by reduction thresholds, see above) for every completed year of acquired insurance period. The percentage will decrease due to the recent reform every year by 0.005 p.p. in between 2026 and 2035 to the level of 1.45%. Minimum earnings-related component has been rather low and constant for many years, amounting to 770 CZK per month (approx. 30 EUR). The recent reform linked the minimum to the average wage equally as is the case for the flat rate component. Thus, the new level of the minimum earnings-related component will be 10% of the average wage starting from 2026. A maximum amount is not determined.[4] Bonus for longer career is 1.5% of a person's assessment base for every additional completed 90 calendar days.[5] Early retirements are subject to penalization of 1.5%, or 0.75% for those who have at least 45 years of contributions, of person's assessment base for every period of 90 calendar days before the statutory retirement age (up to maximum of 3 years). However, the resulting earnings-related component must not be lower than 770 CZK until 2025 or 10% of the average wage as of 2026.

[1] This applies for persons above the age of 28. Younger people are required to reach shorter insurance period.

[2] Pensions include old age pension, disability pensions and also survivors' pensions.

3 A person whose income is lower than the subsistence level has a claim for social support benefits but these stand outside the pension scheme.

4 However, maximal value is implicitly bounded by ceilings on personal assessment base, amounting to four times average wage, from which a pension is calculated.

5 Alternatively, 1,5% for every additional completed 180 days if the person draws only half of the old-age pension.

The disability pension's earnings-related component for the 3rd degree disability pension is equal to the calculated earnings-related component but cannot be less than the flat-rate component [6]. The earnings-related component for 2nd and 1st degree pensions amounts to 2/3 and 1/3 of the calculated component respectively, but cannot be lower than 2/3 and 1/3 of the flat rate component. If a person becomes disabled after he/she reaches the necessary insurance period, it is presumed, that a disabled person has already reached the retirement age (added notional insurance period as he/she would work till retirement age).[7] In case the conditions of insurance period are not met to the full extent, the notional insurance period is correspondingly shorter. If a person becomes disabled before the age of 18, earnings related component amounts to 45% of the general assessment base.

In case of **widow's/widower's pensions,** the earnings-related component amounts to 50% of the earnings-related component of a spouse's old age or disability pension benefit of the 3rd degree at the time he/she died.

Calculation of earnings-related component for **orphan's pensions** is the same as in case of the widow's/widower's pension, but here the rate of 40% is applied instead.

In case of widow's/widower's or orphan's pension in concurrence with old-age/disability pension[8] the earnings-related component consists of full earnings-related component of the higher pension (be it old-age/disability pension or survivor's pension) and 50% of earnings-related component of the lower pension.

Pension indexation

Pension indexation proceeds on a regular basis (every January). Indexation represents an inflation growth (measured by the pensioner cost of living index[9]) plus a third of the growth in the real average wage.[10] The indexation must firstly guarantee that the flat rate will be 10% of the gross average wage and the earnings-related component will be adjusted to fulfil the condition of indexation formula. In exceptional cases where the inflation rate exceeds 5% since the end of the previous reference period, a partial increase and a temporary allowance of a uniform amount are applied. The remaining increase in line with inflation shall then be carried out in January of the following year.[11] Moreover, if the indexation of pension benefits according to the standard formula is lower than 2.7%, the Government may decide to set a higher rate but not more than 2.7%.

Pension taxation

Pension benefits are not taxed in the large majority of cases. This is due to relatively high threshold up to which income of pensioners is tax exempt. Only pension benefits exceeding 3times the minimum wage[12] are subject to 15% Personal Income Tax (but there is still an applicable tax deduction pushing the effective minimum taxable amount significantly higher). Currently only a negligible number of pensioners (not even 1% of them) pays taxes. Moreover, such negligible personal income tax revenue is a source of the State budget and not of the pension system itself. For these reasons tax calculations are not part of the projection exercise.

1.1.2 Voluntary fully funded private system

This pillar (known as the third pillar) is voluntary, supplementary, fully funded and state-subsidized pension scheme based on defined contribution. It also includes life insurance as a product of commercial insurance companies. Compared to the 1st pillar and with respect to pension sustainability and adequacy, the 3rd pillar plays rather minor role.

Besides the state subsidy, any employer can support his employees with additional contribution to the employee's fund. Both, employer's and employee's contributions are subject to additional tax allowances.

Moreover, a so-called preretirement scheme was established in 2013, which enables those subscribing to an additional insurance pension (the 3rd pillar) to already draw funds 5 years before reaching the statutory retirement age without imposing any sanctions. However, preretirement is conditional upon having a minimum amount of accumulated funds in the private 3rd pillar so as to provide a monthly pension amounting to at least 30% of the average wage. The old-age

6 Flat-rate component is equal to 10% of the average wage.

7 For this period of inactivity is used a general assessment base, which is determined by the government upon the average gross income.

8 In case of pensions in concurrence, a recipient receives the flat rate component for one of the two pensions only.

9 Pensioner cost of living index is provided by Czech Statistical Office and is tracked on consumption baskets based on a set of selected goods and services paid for by pensioners.

10 Official statistics of Czech Statistical Office is used.

11 For details see second paragraph in Section 1.2.1.

12 Minimum gross wage is set from 1st January 2025 to be 249,600 CZK per year (approx. 10,160 EUR).

pension will not be subsequently reduced for the years when the pre-pension is drawn. The possibility to draw pre-retirement was only used by 5,335 persons before the end of 2022. As to the sustainability of the pension system, the impact of this measure is negligible.

1.2 Recent Reforms

In the last 20 years the pay-as-you-go pension system has undergone some parametrical changes. Two sets of reform measures took place in the recent two years.

1.2.1 Policy measures included in the 2024 Ageing Report

From 1 January 2023 there was a new component of the pension benefit added. This concerns the remuneration for the children raised (so called allowance for each child raised) that is granted to one parent who cared mostly for the child/children. The allowance was based on the decision of both parents, who cared more for the child. However, for pensioners before 1 January 2023 women were taken automatically as the parents who cared most. The allowance for 2023 amounted to 500 CZK (approx. 20 EUR) per month for each child and was originally set to be indexed and valorised by the rate of the earnings-related component of the average old-age pension. The recent reform changes this arrangement and grants the allowance of the 3rd child, while for the first two children up to their age of 3 years it can be replaced with the fictional income and assignment of contributory period to the caring parent (for details see Section 1.2.2).

From 1 October 2023 a change in the pension indexation took place, setting the pensioner cost of living index as the only index considered for indexation. The indexation formula consists of the rise in pensioner cost of living index and one third of real wage growth (unlike one half of real wage growth that had been present from 2017). Another change in indexation relates to high inflation periods (inflation above 5% from the last indexation). The extraordinary indexation should contain rise of earnings-related component by 30% of the inflation rate and the temporary (maximal duration of 6 months) one-off allowance at the amount corresponding to the rise of average old-age pension benefit by 30% of the inflation rate. The one-off allowance should be the same (in absolute terms) for all pensioners. The aim was to provide less unequal indexation in times of high inflation, mitigate budgetary costs in the current year and leave enough time to adjust indexation in the next year (from 1 January in year t+1).

Major changes concerned early retirements. From 1 November 2024 the system of early retirement changes in terms of maximum period allowed, penalization, minimum contribution period and indexation. There are only 3 years allowed to claim for the early retirement (unlike up to 5 years with the minimum of 60 years of age). The applicant has to meet the condition of at least 40 years of contribution period (thus the minimum contribution period is higher than is required for those claiming standard old-age pensions) including the non-contributory periods. If the early pension benefit is granted, the indexation concerns only the flat rate component of the benefit until the standard retirement age is reached. This should prevent the situation that early retirement is financially more favourable than standard old-age pension benefit. Also, the penalizations are higher. For each 90 days the penalization is 1.5%[13] of personal assessment base. The penalization is now linear unlike the previous situation when it was smaller the closer to standard statutory retirement age (or alternatively the shorter the period of early retirement).

1.2.2 Current pension reform, included in the updated projections

The adoption process of pension law adjustment was completed just before the end of the year 2024 with approval of the Senate and the President's signature. Main changes are effective since January 1, 2025; some measures since 2026 or 2027, namely retirement conditions for workers in difficult conditions and measures affecting calculation basis of the pension benefits. The main intention of the current reform is to introduce cost-saving measures that would at least partially reinforce long-term sustainability of the pension system.

Increase in statutory retirement age

The existing pace of increase in retirement age up to 65 years of age for men and women will be maintained. The reform introduces an increase beyond this point up to a ceiling of 67 years. The table in Annex C taken from the Pension Insurance Act (No. 155/1995) shows the evolution of the retirement age. Thus, the increase up to 65 years is not affected by the recent reform. The pace of an increase remains at 2 months per generation for men and up to 6 months per generation for women depending on the number of their children. The newly introduced increase beyond 65 years up to 67 years is generally at a rate of 1 month per generation; similar for men and women, although women surpass the 65 years threshold in later generations (depending on the number of their children) than men. The table in the law explicitly assigns the retirement age for generations up to 1973, being the first generation for which the retirement age is the

[13] Lower penalties (0.75% per 90 days) effective from 2026 under the current pension reform pertain to those with 45 or more contributory years.

same regardless the sex and number of children raised. The law states that each younger generation born after 1973 has the retirement age higher by 1 month until the generation born in 1989 and for younger generations born after 1989, for which the retirement age is set to be 67 years. Early retirement will remain up to 3 years before the relevant statutory age.

The conditions for retirement age are somewhat relaxed in the specific case of persons who do not reach the minimum period of insurance of 35 years. Previously, it was necessary to reach an age at least 5 years higher than the statutory retirement age for men of the same year of birth. Now, only 2 extra years will be required.

Changes in penalizations for early retirement

Previously, early retirements were subject to penalization of 1.5% of person's assessment base for every period of 90 calendar days before the statutory retirement age. New legislation treats persons differently according to the length of contributory period. For insured persons who have reached 45 years of insurance (for this purpose periods of study before the age of 18, care of children up to the age of 4, foster care and care of dependants, military service for non-military personnel are excluded), the penalty is 0.75% for each 90 calendar days (even if started) of the period. For insured persons who have not reached 45 years of insurance (however at least 40 years), the penalty remains at 1.5% as before**.** In case an insured person reaches the threshold of 45 years of contributory periods with additional work, he/she is eligible for a conversion to a lesser penalty according to the previous point.

However, penalized earnings-related component may not be lower than newly introduced minimum earnings-related component. It must be at least equal to flat rate component, which is set to be 10% of average wage.

Changes in pension benefit calculation

In order to reduce newly granted pension benefits, two measures were introduced into the pension benefit calculation. The pension formula remains the same,[14] changes concern its parameters. Namely the 1st reduction coefficient will decrease from 100% to 90% between 2026 and 2035 by 1 percentage point every year as illustrated by Table 1.2. This coefficient applies to recalculate a pensionable earning up to the first reduction bracket threshold. This threshold is equal to 44% of the average wage. Secondly, the accrual rate will decrease from 1.50% to 1.45% between 2026 and 2035 by 0.005 p.p. every year. And finally, bonuses for working beyond the statutory retirement age will be preserved for those who draw none or half an old age pension benefit. Bonuses will no longer be available for those who work longer and draw a full old age pension benefit at the same time.

Table 1.2: Changes in pension formula

Year	1st reduction coefficient	Accrual rate
2025 and before	100%	1.500%
2026	99%	1.495%
2027	98%	1.490%
2028	97%	1.485%
2029	96%	1.480%
2030	95%	1.475%
2031	94%	1.470%
2032	93%	1.465%
2033	92%	1.460%
2034	91%	1.455%
2035 onwards	90%	1.450%

Source: Pension Insurance Act (No. 155/1995).

Contributory periods – period of care for children and other dependents

Previously introduced allowance for children raised granted to one parent who cared mostly for the child/children[15] has been modified.

In case it is beneficial for the recipient, the allowance for the first two children is replaced with the assignment of contributory period to the parent for the child care up to the age of 3. This is linked with a feature that the person's income during this period may be taken into account as a pensionable earning. After the reform, this includes not only an income

[14] For details, please refer to the chapter 4.5.2 and equations (4.19 – 4.21).

[15] The allowance for 2023 amounted to 500 CZK (approx. 20 EUR) per month for each child and should be indexed and valorised by the rate of earnings-related component of average old-age pension benefit (thus ensuring the already receiving as well as the new pensioners are granted the same allowance).

from work activity, but also fictive (unpaid) a "care award", which stems from the care for the dependent child and is calculated from the general assessment base. Then, for the purposes of pension benefit calculation, it is reconsidered whether it is more advantageous to take such pensionable earning into account, rather than consider the respective period as non-contributory in the pension equation for the insured person. The option that leads to a higher pension benefit is used. In case, the non-contributory period is chosen, the pension benefit includes allowance for the first two children. In both cases, for the third and each additional child the allowance of 500 CZK (approximately 20 EUR) is preserved. However, after the reform the amount is fixed and is subject to neither indexation nor valorisation for any child.

The fictive (unpaid) care award will be applied similarly not only for those caring for a child under 3 years of age, but also for those caring for other dependent persons.

Contributory periods – period of doctoral studies
The previously disregarded doctoral studies will now be considered as non-contributory periods for a maximum of 4 years. It will apply to studies undertaken from 2010 onwards, in full-time form. It must also be the first doctoral study that has been successfully completed.

Shared assessment base
A shared basis of assessment for married persons and (registered) partners is introduced on a voluntary basis, where active request is demanded. The assessment base for both persons is calculated at half of the sum of their assessment bases. The shared assessment base can be applied from the calendar year following the marriage (partnership) to the year preceding the voluntary withdrawal, divorce, the award of an old-age or invalidity pension to one of the partners or the death of one of the partners. Although the request for shared assessment base has retroactive effect, meaning the whole period of marriage (partnership) is considered, the withdrawal need not be retroactive.

It only applies to those whose date of entitlement to the old-age pension (both spouses) falls in the period from 2027 onwards.

Retirement age of workers in difficult conditions
Up to now firefighters, paramedics and miners have had a lower retirement age based on the number of eight-hour shifts. Beside them, the new legislation grants a lower retirement age (without penalization) also to persons working in a position classified in category 4 of the risk classification of activities. However, this includes a rather insignificant number of approx. 13 thousand people.

For work in the listed positions ranging from 2 200 to 4 399 shifts the retirement age will be lowered by 15 calendar months. For 4 400 shifts, the retirement age will be reduced by 30 calendar months and each additional 74 shifts will result in reduction of the retirement age by an additional month up to a maximum of 60 calendar months that can be deducted.

Calculation of disability pension benefits
Disability pensions are also affected by the decreasing accrual rate similarly to old-age pensions. The earnings-related component of disability pensions is now calculated in the same way as the old-age pension and is subsequently reduced depending on the degree of disability. Therefore, the following rules apply to earnings-related component.

- For the 3rd degree disability pension, it is equal to the calculated earnings-related component, but not less than flat-rate component. [16]
- For the 2nd degree disability pension, it is 2/3 of the calculated earnings-related component, but not less than 2/3 of the flat-rate component.
- For the 1st degree disability pension, it is 1/3 of the calculated earnings-related component, but not less than 1/3 of the flat-rate component.

1.3 Constant Policy Assumptions

Indexation: Although the indexation rule contains price index measured by pensioners' costs of living, we use the CPI inflation for the projection purposes. It is a question how these two will evolve and it is true that in the past, the pensioner costs of living index, in connection with a different composition of the consumer basket, was mostly higher in the Czech Republic. However, rather the opposite is true for the recent past, from 2014 consumer price index revealed to be higher except in 2020. Moreover, data from the remote past are "biased" by periods of deregulation that cannot be

[16] Flat-rate component is equal to 10% of an average wage.

reflected in the future. Above all, the consumer price index is well anchored via inflation expectations as the Czech National Bank has been targeting inflation since 1998 with an inflation target of 2% starting from January 2010. No such definition of price level development and expectations are clear for pensioner costs of living index. From this perspective and for the sake of transparency we take the two indices to be equal in the future.

Early retirement versus pre-retirement: Although the pre-retirement scheme is still scarcely drawn, we assume increasing popularity as this is financially more advantageous than the early retirement scheme. On the other hand, the pre-retirement scheme requires relatively high capital savings. Therefore, we assume that people up to 3 years prior to the statutory retirement age, not covered by any social security benefit, will draw upon early retirement schemes less than in 100% of the cases and use the pre-retirement scheme instead. This is reflected in the lower coverage in particular age cohorts.

Wage profiles: Observed wage profile across the ages from 15 to 65+ shows relatively high inertia, despite constantly decreasing wage relative to the average wage in higher ages. One cannot assume this will last forever. Instead, it seems very much reasonable to assume a constant wage profile in the future. We adopt, as in previous rounds of projections, the shift in the age specific wage profile from 2023 onwards with respect to postponement of retirement age and thus constant relationships to the average wage. This means that the average gross wage at retirement grows exactly at the same pace as the average wage given by the AWG assumptions and, is approximately 2.9% lower than the economy-wide average wage.

Age specific profiles of disability rates and probabilities to retire: In order to meet the commonly agreed assumptions (mainly in terms of inactive population coverage), there are some model adjustments, which aim at harming the constant policy assumption to the lowest possible extent. For a detailed explanation, see Annex B.

The retirement age: The Czech law assigns the retirement age according to birth year and is set to increase up to 67 years of age for generations born in 1989 and younger.[17] The mechanism checking the link between statutory retirement age and life expectancy (described in the chapter 1.1.1) is not taken into account, because it provides the Government just with the option to forward a proposal for the retirement age modification to the Parliament.

[17] The table illustrating the process of retirement age increase taken from the law is in Annex C.

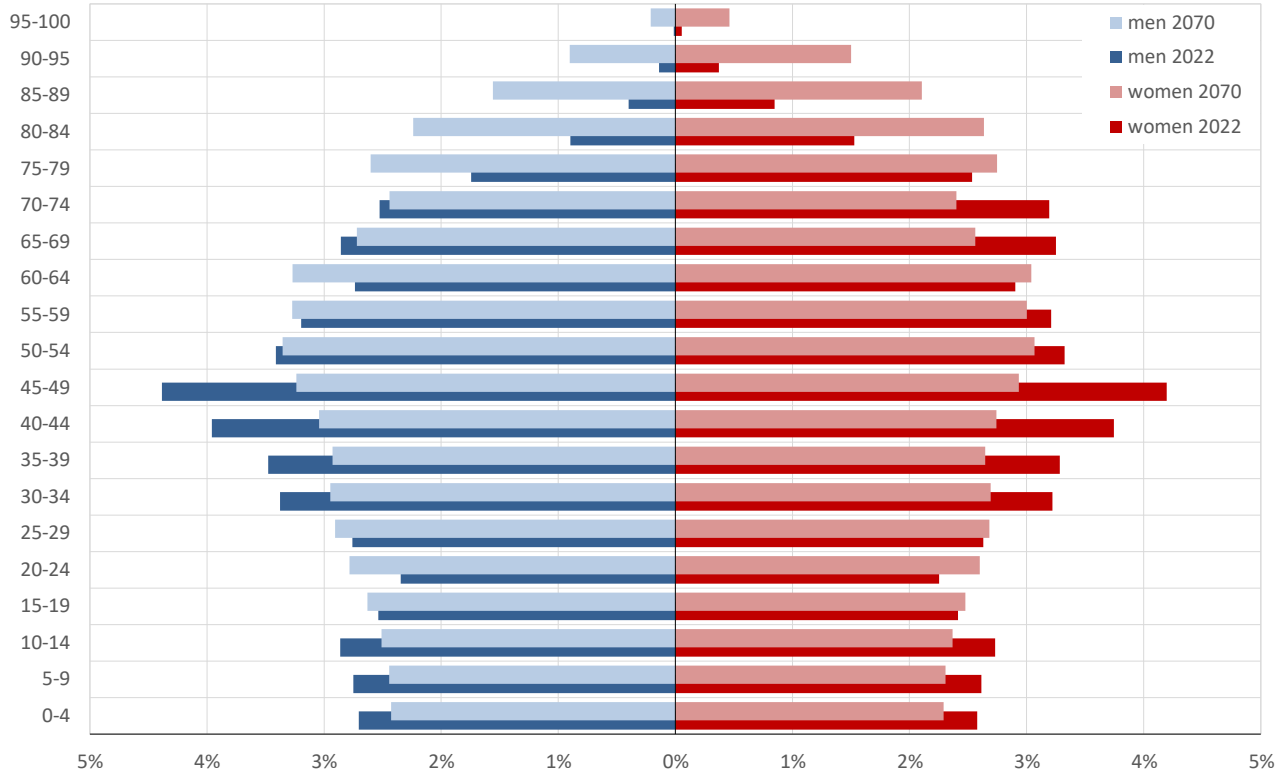
2 Demographic and Labour Forces Projections[18]

This section illustrates key assumptions about demographic and labour force projections. Exogenous to the pension projection model, the demography is provided by EUROSTAT and both labour force projections as well as macroeconomic assumptions are the result of Cohort Simulation Model (CSM). We fully employ all these assumptions in the pension model.

2.1 Demographic Development

The Czech population is relatively young, with a great majority of people in productive ages. This is mainly due to baby boom generations born in 1970s. Therefore, currently quite a lot of children are born in absolute terms. However, the reproduction itself does not seem to be sufficient to fully compensate the number of active population at later stage. Thus, the age pyramid is expected to somehow flatten during the next 50 years.

Figure 2.1: Age Pyramid, Comparison between 2022 and 2070



Source: Eurostat.

Eurostat projects the number of population to decrease in the long horizon. It reaches its peak in 2024; the old-age dependency ratio comparing elderly (65+) with active population (20–64) rises significantly over projection horizon, reaching more than 51% in 2070 with a peak in 2059 amounting almost to 56%. This is not only due to continuous decrease in the number of active population but also because of increase in longevity – share of population 80+ over 65+ rises from 21.0% to 43.5% – as life expectancy at birth increases by 8.7 p.p. for men and 7.3 p.p. for women. Survivor rates in the population improve over time.

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

Table 2.1: Main Demographic Variables

	2022	2030	2040	2050	2060	2070	peak value	peak year	change 2022-2070
Population *thousands*	10 672	10 836	10 718	10 748	10 707	10 563	11 033	2024	-109
Population growth rate	1.6%	-0.3%	0.0%	0.0%	-0.1%	-0.1%	1.8%	2023	-1.7%
Old-age dependency ratio (pop 65+/pop 20-64)	35.1	37.2	43.2	51.7	55.7	51.5	55.8	2059	16.4
Old-age dependency ratio (pop 75+/pop 20-74)	12.2	15.9	17.4	21.3	26.4	27.3	27.5	2068	15.0
Ageing of the aged (pop 80+/pop 65+)	21.0	28.5	30.6	29.7	39.4	43.5	43.5	2070	22.5
Men - Life expectancy at birth	76.1	77.9	79.8	81.6	83.3	84.8	84.8	2070	8.7
Women - Life expectancy at birth	81.9	83.5	85.1	86.6	87.9	89.2	89.2	2070	7.3
Men - Life expectancy at 65	16.0	17.4	18.8	20.0	21.3	22.4	22.4	2070	6.4
Women - Life expectancy at 65	19.8	21.0	22.3	23.5	24.6	25.7	25.7	2070	5.9
Men - Survivor rate at 65+	82.6	84.8	87.4	89.5	91.3	92.7	92.7	2070	10.1
Women - Survivor rate at 65+	91.3	92.6	93.7	94.7	95.5	96.2	96.2	2070	4.9
Men - Survivor rate at 80+	45.1	51.7	58.3	64.3	69.7	74.4	74.4	2070	29.3
Women - Survivor rate at 80+	66.5	71.3	75.9	79.8	83.2	86.1	86.1	2070	19.6
Net migration *thousands*	329.7	-1.8	29.7	26.2	23.8	24.8	329.7	2022	-304.9
Net migration (% population previous ye	3.1%	0.0%	0.3%	0.2%	0.2%	0.2%	3.1%	2022	-2.9%

Source: Eurostat, European Commission.

2.2 Labour Force

Labour force projections are the result of a common CSM model and assumptions made for a particular country. Characteristics of labour market situation summarized in Table 2.2 show an increase in participation rates. More positive development is visible in the case of the cohorts 55–64 and 65–74 due to the postponement of statutory retirement age and tightening conditions for early retirement.

Table 2.2: Participation Rate, Employment Rate and Share of Workers

	2022	2030	2040	2050	2060	2070	peak value	peak year	change 2022-2070
Labour force participation rate 20-64	83.1%	81.9%	81.6%	82.8%	83.6%	83.2%	83.8%	2023	0.1
Employment rate of workers aged 20-64	81.3%	79.7%	79.5%	80.6%	81.4%	81.0%	81.7%	2023	-0.3
Share of workers aged 20-64 in the labour force 20-64	97.8%	97.4%	97.3%	97.3%	97.4%	97.3%	97.8%	2022	-0.5
Labour force participation rate 20-74	70.7%	70.3%	68.9%	68.7%	70.8%	72.6%	72.6%	2069	1.9
Employment rate of workers aged 20-74	69.2%	68.5%	67.1%	67.0%	69.0%	70.7%	70.7%	2069	1.5
Share of workers aged 20-74 in the labour force 20-74	97.9%	97.4%	97.4%	97.4%	97.4%	97.4%	97.9%	2022	-0.5
Labour force participation rate 55-64	74.4%	74.5%	76.8%	80.2%	82.1%	82.0%	82.6%	2065	7.6
Employment rate for workers aged 55-64	72.9%	72.7%	75.0%	78.3%	80.2%	80.1%	80.7%	2065	7.2
Share of workers 55-64 in the labour force 55-64	98.0%	97.7%	97.6%	97.6%	97.7%	97.7%	98.0%	2022	-0.4
Labour force participation rate 65-74	10.6%	7.2%	11.1%	12.8%	15.7%	16.9%	16.9%	2070	6.3
Employment rate for workers aged 65-74	10.5%	7.1%	11.0%	12.7%	15.5%	16.7%	16.7%	2070	6.2
Share of workers 65-74 in the labour force 65-74	99.2%	98.9%	98.9%	98.9%	98.9%	98.9%	99.2%	2022	-0.3
Median age of the labour force	44.0	45.0	46.0	44.0	44.0	45.0	46.0	2038	1.0

Source: European Commission.

The magnitude of increase in participation rates is mainly driven by assumptions about effective entry and exit ages to or from the labour market.

The reason why “contributory periods” or better say “period covered by insurance” can be higher than the average effective working career assumed by CSM is because people can acquire those periods (pension claims) until they start receiving an old-age pension. This can happen even when a person is not active on the labour market. Thus, these periods include both, “real” contributory periods when a person pays contributions from his/her income and so-called non-contributory periods (defined by law) when a person does not contribute into the system. However, this period is recognized by the pension system and as such it enters to the “period covered by insurance” and into the pension formula for pension benefits calculation. Moreover, there are also people contributing voluntarily into the system to have pension claims (in case the law does not cover these periods as non-contributory).

Table 2.3: Labour Market Entry Age, Exit Age and Expected Duration of Life Spent at Retirement

Total	2022	2030	2040	2050	2060	2070	peak value	peak year	change 2022-2070
Average effective retirement age (administrative data)[1]	61.5	63.4	64.4	65.3	65.8	65.5	65.8	2060	4.0
Average labour market exit age (CSM)[2]	62.2	63.8	64.5	65.2	65.5	65.5	65.5	2054	3.4
Contributory period	44.3	46.3	46.8	44.8	42.8	42.8	47.8	2043	-1.5
Duration of retirement[3]	19.8	20.1	21.0	21.8	22.1	23.2	23.2	2070	3.4
Duration of retirement/ contributory period	45%	43%	45%	49%	52%	54%	54%	2070	10%
Percentage of adult life spent at retirement[4]	32%	31%	32%	32%	33%	34%	34%	2070	2%
Early/late exit[5]	1.0	1.2	1.0	1.1	1.3	1.6	1.6	2033	0.7
Men	**2022**	**2030**	**2040**	**2050**	**2060**	**2070**	**Peak value**	**Peak year**	**change 2022-2070**
Average effective retirement age (administrative data)[1]	62.0								
Average labour market exit age (CSM)[2]	62.6	63.9	64.6	65.2	65.5	65.5	65.5	2055	2.9
Contributory period	44.9	46.9	46.9	44.9	42.9	42.9	47.9	2043	-2.0
Duration of retirement[3]	17.3	18.2	18.8	20.0	20.4	21.6	21.6	2070	4.3
Duration of retirement/ contributory period	39%	39%	40%	45%	48%	50%	50%	2070	12%
Percentage of adult life spent at retirement[4]	29%	29%	30%	31%	31%	32%	32%	2070	3%
Early/late exit[5]	0.9	1.4	1.0	1.1	1.3	1.7	1.7	2070	0.8
Women	**2022**	**2030**	**2040**	**2050**	**2060**	**2070**	**Peak value**	**Peak year**	**change 2022-2070**
Average effective retirement age (administrative data)[1]	61.0								
Average labour market exit age (CSM)[2]	61.7	63.7	64.5	65.2	65.5	65.5	65.5	2054	3.8
Contributory period	43.6	45.6	46.6	44.6	42.6	42.6	47.6	2043	-1.0
Duration of retirement[3]	22.3	21.9	23.2	23.5	23.7	24.8	24.8	2070	2.5
Duration of retirement/ contributory period	51%	48%	50%	53%	56%	58%	58%	2070	7%
Percentage of adult life spent at retirement[4]	35%	33%	34%	34%	34%	35%	35%	2070	0%
Early/late exit[5]	1.0	1.0	1.1	1.1	1.3	1.6	1.8	2032	0.6

[1] 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 2023.
[2] 'Average labour market exit age (Cohort Simulation Model) refers to 2023 instead of 2022.
[3] 'Duration of retirement' is calculated as the difference between the life expectancy at average effective exit age and the average effective exit age itself.
[4] The 'percentage of adult life spent at retirement' is calculated as the ratio between the duration of retirement and the life expectancy diminished by 18 years.
[5] '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.
Source: European Commission, MoF.

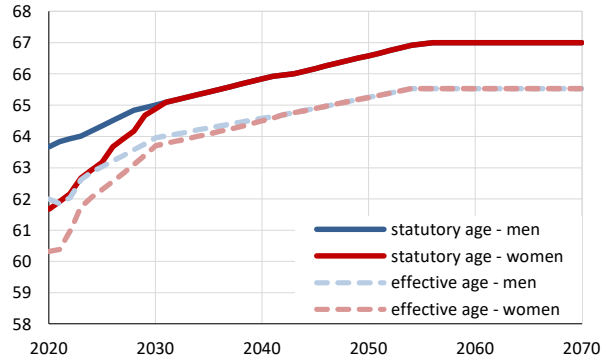
Average contributory periods increase in coming years for men by 3 years and for women by 4 years due to additional postponement of retirement age up to 67 years.[19] The decline in average career years beyond 2040 both, for men and women, is due to cancelling validation of education periods as non-contributory periods.[20] This change affects generations enrolled in secondary education after 1995 and / or in tertiary education after 2009. Since then, education periods are no longer considered in the pension system for pension benefits calculations. On the other hand, previously disregarded doctoral studies will now be considered as non-contributory periods of a maximum of 4 years. It will apply to successfully completed studies in full-time form undertaken from 2010 onwards.

There is, however, one important implication from the evolution of the average exit age as a result of CSM on the pension projection. It lies in the difference between this effective age and statutory retirement age recognized by the pension law. Development of the two is showed on Figure 2.2. We believe that a higher penalizations and reduction of the early retirement period, as it is supported by recent reforms, will bring the effective age closer to the statutory in the near future. However, such relationship is expected to be somewhat weakened in a later period, as further increase of retirement age is assumed to be less effective. This assumption opens the gap between the two series (Figure 2.3). The higher gap in recent years was driven by the temporary increase in exits to early retirement before the effectiveness of the law that makes early retirement pensions more restrictive.

This gap put pressure on pension system and question the current understanding of the 'constant' policy setting, as it brings additional number of inactive people, currently not observed in the data. In order to be in line with the macroeconomic assumptions, the model is forced to consider these inactive people as early pensioners (beyond probabilities to retire used by the pension model and calculated from administrative data) despite the fact they face high permanent penalizations for their "decision".[21]

Figure 2.2: Statutory Versus Effective Exit Age

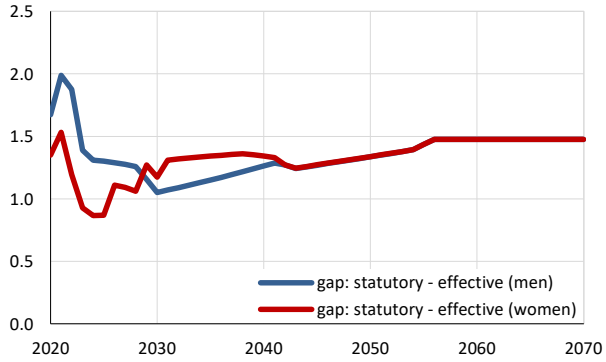
ages



Source: Pension Insurance Act (No. 155/1995), European Commission.

Figure 2.3: Gap Between Statutory and Effective Age

years of age



Source: MoF calculations.

[19] Retirement age of women increases up to 67 from currently lower level.

[20] For estimating impacts of policy measures on average contributory periods, we use outputs of simulation model run by Czech Ministry of Labour and Social Affairs.

[21] For detailed discussion of differences in assumption between CSM and pension model please see Annex B.

3 Pension Projection Results

This part presents the results of the pension model that applies policy settings described in Section 1, while applying the AWG assumptions from Section 2.

3.1 Extent of the Coverage of the Pension Schemes in the Projections

Pension projection focuses on mandatory social security pensions as the most important scheme. It fully covers all type of pensions – old-age, disability and survivors' with respect to current legislation. Special schemes for armed forces are not covered as they are administered by respective ministries. These schemes are of minor importance and do not pose additional pressures on public finances with changes in population structure.[22]

Projection excludes the third pillar, voluntary fully funded private scheme as it plays negligible role. Moreover, detailed data for contribution side are not available and expenditure side is not possible to analyse because benefits have a form of lump sum in the majority of cases. Therefore, pension projection fully covers and respects all settings of the pay-as-you-go pillar described in Section 1.1.1 and disregard pillar introduced in Section 1.1.2.

The comparison with the past showing the differences in pensions as a share of GDP does not mean that different data are used for the projection. The difference stems from the exclusion of armed forces in AWG projection due to lack of data and due to the fact that these marginal schemes are not financed from general social security system but rather from budgets of respective ministries.

Table 3.1: Eurostat (ESSPROS) vs. Ageing Working Group Definition of Pension Expenditure
% of GDP

	2013	2014	2015	2016	2017	2018	2019	2020	2021	change 2013-2021
Eurostat total pension expenditure	9.2	8.9	8.6	8.4	8.2	8.1	8.3	9.3	8.9	-0.3
Eurostat public pension expenditure (A)	9.2	8.9	8.6	8.4	8.2	8.1	8.3	9.2	:	0.1
Public pension expenditure (AWG: outcome) (B)	8.9	8.5	8.2	8.0	7.8	7.7	7.8	8.4	8.3	-0.6
Difference Eurostat/AWG: (A)-(B)	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.8	:	0.5

Source: Eurostat, European Commission.

3.2 Overview of Projection Results

Social security scheme is the major source of benefits for elderly generation based on pay-as-you-go system. With the population ageing, the expenditure pressures will rise to some extent with the old-age pension as the most demanding type of pension. This increase is caused by changes in population structure and longevity, resulting in higher number of pensions over time as illustrated on Figure D.14 in Annex D.

Public pension contributions are paid by working population from their wages that develop in line with GDP over the horizon. We also assume constant contribution rate in line with no policy change assumption. This results in the constant share of contributions on GDP in all projection years.

[22] Taking all the relevant ministries together, their total expenditures on pensions reach stable ratio of approx. 0.2% of GDP.

Table 3.2: Projected Gross and Net Pension Spending and Contributions
% of GDP

Expenditure	2022	2030	2040	2050	2060	2070	peak value	peak year	change 2022-2070
Gross public pension expenditure	8.4	8.0	8.4	9.1	9.2	8.7	9.2	2059	0.3
Private occupational pensions	:	:	:	:	:	:	:	:	:
Private individual pensions	:	:	:	:	:	:	:	:	:
Mandatory private	:	:	:	:	:	:	:	:	:
Non-mandatory private	:	:	:	:	:	:	:	:	:
Gross total pension expenditure	8.4	8.0	8.4	9.1	9.2	8.7	9.2	2059	0.3
Net public pension expenditure[1)]	:	:	:	:	:	:	:	:	:
Net total pension expenditure[1)]	:	:	:	:	:	:	:	:	:
Contributions	**2022**	**2030**	**2040**	**2050**	**2060**	**2070**	**Peak value**	**Peak year**	**change 2022-2070**
Public pension contributions	7.9	8.0	8.0	8.0	8.0	8.0	8.1	2024	0.1
Total pension contributions	7.9	8.0	8.0	8.0	8.0	8.0	8.1	2024	0.1
Balance of the public pension system[2)]	-0.5	0.1	-0.4	-1.0	-1.2	-0.7	-1.2	2059	-0.2

[1)] Net pension expenditure excludes taxes on pensions and compulsory social security contributions paid by beneficiaries.
[2)] Public pension contributions - gross public pension expenditure (peak value/year shows most negative value).
Source: MoF calculations.

In the light of the most recent population and macroeconomic assumptions, pension expenditures are expected to increase from recent 8.4% to 8.7% of GDP in 2070. The greatest part of expenditures is taken by **old-age pensions** being mostly affected by changes in population structure. However, the increase is somewhat limited, due to the postponement in retirement age, which takes place until mid-50's. Expenditures, as a share of GDP, are broadly constant in the period up to 30s due to increase in retirement age at a pace similar to increase in life expectancy, i.e., two additional months per generation. This effect is supported by measures that lower pension benefits (accrual rate and reduction coefficient), which even causes a decline in expenditure share. The period of relatively lower expenditure will be followed by their increase due to longevity. This longevity increase will not be sufficiently offset by retirement age increase, as its pace will slow down to one additional month per generation. This pace is legislated for retirement prolongation from 65 to 67 years that will take place between 2030 and 2056. The decrease in expenditure visible in the last decade is connected with fading of the wave of strong population cohorts. These cohorts will continuously disappear from retirement. After the peak in 2059 (amounting to 9.2% of GDP) expenditure decline by 0.5 p.p. in one decade landing at 8.7% of GDP in 2070. Thus, the overall increase between years 2022 and 2070 is expected to be 0.3 p.p.

Table 3.3: Projected Gross Public Pension Spending by Scheme
% of GDP

Pension scheme	2022	2030	2040	2050	2060	2070	peak value	peak year	change 2022-2070
Total public pensions	8.4	8.0	8.4	9.1	9.2	8.7	9.2	2059	0.3
of which									
Old age and early pensions:	7.1	6.8	7.2	8.0	8.1	7.5	8.1	2059	0.5
Flat component	1.6	1.8	2.0	2.2	2.3	2.2	2.3	2060	0.6
Earnings related	5.5	5.0	5.3	5.7	5.7	5.4	5.9	2023	-0.1
Minimum pensions (non-contributory) i.e. minimum income guarantee	:	:	:	:	:	:	:	:	:
Disability pensions	0.8	0.7	0.6	0.6	0.6	0.6	0.8	2023	-0.2
Survivor pensions	0.5	0.5	0.5	0.5	0.6	0.5	0.6	2060	0.0
Other pensions	:	:	:	:	:	:	:	:	:

Source: MoF calculations.

As the decomposition of old age pensions is concerned, both, flat rate and earnings-related component expenditures are equally affected by the numbers of paid out pensions, which explains the decrease in the last decade. Flat rate component, being set as a constant share of 10% of wages quite steadily increases from the beginning up to the peak year. On the other hand, earnings related component declines in the first period due to austerity measures affecting pension benefit calculation.

There are two opposite effects driving future development of **disability pensions**. First, (permanent) positive effect (decreasing expenditures) is related to legislative changes that introduced three levels of disability (instead of previous two) from 2010 onwards and more strict eligibility conditions for any of disability types.[23] Second, temporary negative effect (raising expenditures) stems from the fact that postponement of retirement age brings more disabled persons in preretirement ages due to their higher disability rates.[24] Number of disability pensions slightly decreases in the next couple of decades, which is a result of recent trend observed from the data. All in all, we observe a mild decline in expenditures. A disability pension belongs to a person until his/her working ability improves, or until he/she reaches the statutory retirement age. If the statutory retirement age is lower than 65 years, the person is transferred from the disability pension scheme to the old age pension scheme by the age of 65 at the latest.

There is not any special **minimum pension scheme**. Minimum amount of benefit is ensured by flat rate component and minimum earnings-related component. For details of pension calculations see system description in Section 1.1.1.

3.3 Main Driving Forces behind the Projection Results and Their Implications

Driving forces behind the projection results become more obvious after decomposing public pension expenditure into different ratios.

$$\frac{pension\ expenditure}{GDP} = \overbrace{\frac{population\ 65+}{population\ 20\text{–}64}}^{\boldsymbol{dependency\ ratio}} \times \overbrace{\frac{number\ of\ pensioners}{population\ 65+}}^{\boldsymbol{coverage\ ratio}} \times \overbrace{\frac{average\ pension\ income}{\frac{GDP}{hours\ worked\ 20\text{–}74}}}^{\boldsymbol{benefit\ ratio}} \times \overbrace{\frac{population\ 20\text{–}64}{hours\ worked\ 20\text{–}74}}^{\boldsymbol{labour\ market\ effect}}$$

$$\frac{number\ of\ pensioners}{population\ 65+} = \overbrace{\frac{number\ of\ pensioners\ 65+}{population\ 65+}}^{\boldsymbol{coverage\ ratio\ old\text{–}age}} + \left(\overbrace{\frac{number\ of\ pensioners \leq 64}{population\ 50\text{–}64}}^{\boldsymbol{coverage\ ratio\ early\text{–}age}} \times \overbrace{\frac{population\ 50\text{–}64}{population\ 65+}}^{\boldsymbol{cohort\ effect}} \right)$$

$$\frac{population\ 20\text{–}64}{hours\ worked\ 20\text{–}74} = \overbrace{\frac{population\ 20\text{–}64}{employed\ people\ 20\text{–}64}}^{\boldsymbol{1/employment\ rate}} \times \overbrace{\frac{employed\ people\ 20\text{–}64}{hours\ worked\ by\ people\ 20\text{–}64}}^{\boldsymbol{1/labour\ intensity}} \times \overbrace{\frac{hours\ worked\ by\ people\ 20\text{–}64}{hours\ worked\ by\ people\ 20\text{–}74}}^{\boldsymbol{1/careershift}}$$

Table 3.4 shows results of such decomposition. It seems that the main contribution to the increase in pension expenditure by 0.3 p.p. over time is the ageing population that will change the ratio between the elderly and active population. **The dependency ratio** is also behind the decrease in pension expenditure expected in the last decade, illustrating the outflow of large generations from retirement.

Opposing to that, **the coverage ratio** would decrease over time with the exception of the last decade when it increases because of a positive change in the cohort effect. The decline in the first two and a half decades is related to the postponement of the retirement age, especially in early-age coverage ratio, but also in old-age coverage ratio.[25] This will reduce the number of pensioners and together with the increase of population aged 65+ will affect the ratio. The following decades are mainly the result of population development in the respective cohorts of 50–64.

The main effect on the benefit ratio is linked with the decreasing accrual rate and 1st reduction coefficient as one of the key reform measures. As a result, one can observe the most negative benefit ratio effect in the first projection decades. However, a significant counter-effect on the **benefit ratio** is driven also by the evolution of average careers. As noted in Section 2.2, the average career will increase until the 2040s with the postponement of the retirement age and decline in the final decades of the projection horizon due to the abolishment of study periods as non-contributory periods. Moreover, one should take into account higher inflows of new pensioners from more abundant generations after 2030, because higher newly granted pensions in comparison with paid out pensions support the benefit ratio. Nevertheless, these counter-effects are dampened by the indexation of pensions, which is represented by an inflation growth (measured by the aggregate pensioner cost of living index growth, equal to consumer price index in projections) plus a third

[23] Impact of the reform on the number disability pensions is shown in Figure D.15—Figure D.17.

[24] Illustration of disability profiles development can be found in Annex D.

[25] The issue of the decrease in coverage ratio is addressed in detail in Annex B.

of the growth in real average wage. For the future, the indexation rule is set to be strict without possible discretions.[26] Another effect that drags the benefit ratio down is the assumed additional increase in the early retirement pensions comparing with the observed data in order to improve the coverage of inactive people determined by the CSM.[27] Early retirement pension benefits are subject to permanent penalization and are thus substantially lower than regular pension benefits.

Table 3.4: Factors behind the Change in Public Pension Expenditures between 2022 and 2070 – Pensioners
percentage points of GDP

	2022 - 2030	2030 - 2040	2040 - 2050	2050 - 2060	2060 - 2070	2022 - 2070
Public pensions to GDP	-0.4	0.4	0.7	0.1	-0.5	0.3
Dependency ratio effect	0.5	1.3	1.6	0.7	-0.7	3.4
Coverage ratio effect	-0.5	-0.5	-0.5	-0.2	0.2	-1.5
Coverage ratio old-age	-0.1	-0.2	-0.1	-0.1	0.0	-0.4
Coverage ratio early-age	-2.4	-0.4	-0.1	-0.4	-0.4	-3.6
Cohort effect	0.9	-1.1	-2.3	-0.9	1.5	-2.0
Benefit ratio effect	-0.7	-0.3	-0.2	-0.2	0.0	-1.4
Labour Market/Labour intensity effect	0.3	-0.1	-0.2	-0.1	0.1	-0.1
Employment ratio effect	0.2	0.0	-0.1	-0.1	0.0	0.0
Labour intensity effect	0.0	0.0	0.0	0.0	0.0	0.0
Career shift effect	0.1	-0.1	-0.1	0.0	0.0	-0.1
Residual	0.0	-0.1	-0.1	0.0	0.0	-0.2

Source: European Commission, MoF calculations.

Labour market effects are rather moderate with minor fluctuations over the projection horizon.

Table 3.5: Benefit Ratio, Replacement Rate at Retirement, and Coverage by Pension Scheme
%

	2022	2030	2040	2050	2060	2070	change 2022-2070
Public scheme (BR)	40.9	37.7	36.2	35.3	34.7	34.5	-6.5
Coverage	100.0	100.0	100.0	100.0	100.0	100.0	0.0
Public scheme old-age earnings related (BR)	41.4	38.2	36.8	35.6	34.8	34.8	-6.6
Public scheme old-age earnings related (RR)	45.9	45.9	42.9	42.6	40.6	40.5	-5.4
Coverage	83.2	83.4	84.9	86.8	86.9	85.8	2.5
Private occupational scheme (BR)	:	:	:	:	:	:	:
Private occupational scheme (RR)	:	:	:	:	:	:	:
Coverage	:	:	:	:	:	:	:
Private individual scheme (BR)	:	:	:	:	:	:	:
Private individual scheme (RR)	:	:	:	:	:	:	:
Coverage	:	:	:	:	:	:	:
Total benefit ratio	40.9	37.7	36.2	35.3	34.7	34.5	-6.5
Total replacement rate	36.1	34.6	33.5	32.7	30.9	30.6	-5.4

Source: European Commission calculations, MoF calculations.

The benefit ratio represents the relationship between the average pension benefit and the economy-wide average wage, while the replacement rate is the ratio of the average newly granted pension benefit to the average gross wage

[26] It is true that the Government has limited possibility to increase indexation up to 2.7% every year in case that legislated indexation (pensioner cost of living index + 1/3 real average wage growth) is lower than this threshold. Given the macroeconomic assumptions and taking pensioner cost of living index equal to CPI (see above Section 1.3), this situation does not occur over the projection horizon. Inflation is assumed to be 2% and average real wage growth (2023–2070) is 1.9%.

[27] Details can be found in Annex B.

at retirement. Both wages develop in line (for details see explanation in Section 1.3). Table 3.5 shows the evolution of these ratios over time for the public scheme. As the public pension that includes old-age, disability and survivors' benefits is the only scheme covered in the projections, its benefit ratio does not differ from the total benefit ratio.

Naturally, since the highest pension benefits are paid out to old-age pensioners, the replacement rate for these old-age earnings-related pensions is higher than the ones for the whole public scheme. The average new pension benefits that are in the numerator of the replacement rate are, every year, calculated in the same way based on pensionable earning, which correspond to wages.[28] Therefore, the average replacement rate would, in general, tend to be constant over time. Unfortunately, this is not the case for old-age pensions, where also another factor plays a role: It depends on the distribution of the number of people retiring around the statutory retirement age. The more people retire earlier than at the statutory retirement age, the higher the penalization that would apply to a larger number of pensioners, and thus the lower is the average pension benefit. This effect is behind the quite erratic evolution of the replacement rate,[29] as it depends on the number of people assigned to early old-age pension in order to cover the assumed number of inactive people. This reason also applies for explaining the evolution of the replacement rate (and also benefit ratio) over time. These ratios fall mainly because of an additional coverage of inactive people as explained in Annex B. The more people retire before the statutory retirement age, the earlier and the higher penalization would apply to a larger number of pensioners, and thus the lower the average pension benefit would be, and consequently the replacement rate (and benefit ratio). However, changes in the parameters for calculating pension benefits also have a significant impact on the decline in the replacement rates, which also gradually affects benefit ratio in the same way. The decline is at the beginning visible more in case of disability and survivors' pensions, because old age earnings related replacement rates are supported by average career prolongation. All replacement rates are illustrated on Figures in Annex D (Figure D.20—Figure D.26).[30] Additionally, the effect that materializes in the last three decades and drags down mainly the replacement rate stems from shorter average careers induced by disregarded education periods in pension benefit calculations (see Section 2.2).

In case of the benefit ratio,[31] not only newly granted pensions play a role, but also those paid out matter. All types of pensions are losing over time in comparison with average wage due to the indexation by inflation rate plus one third of real wage growth. The rather stable inflow of new pensions mitigates the drop in the ratio. On the other hand, the positive impact of new pensioners on the benefit ratio is, mainly at the beginning of the projection, dampened by lower pension benefits due to changes in parameters of calculation.

In fact, all pensions in the Czech Republic are covered by the social security pension scheme, therefore public scheme coverage is 100% and also old-age pensioners continually represent around 83 to 87% of the system's total beneficiaries.

While not as dramatic as old-age dependency ratio increase, the dependency in the pension system that measures the number of pensioners (receivers of pension benefits) over employment (contributors to the system) increases from 55.0% in 2022 to 66.1% in 2070. It is mainly due to the rise in the retirement age that helps to limit the increase in dependency. The change in this parameter between 2022–2070 declined from pre-reform 18.1% to currently projected 11.1%. As a result, also the share between this dependency measurement and old-age dependency ratio, denoted as "system efficiency", declines.

[28] Calculation of pensionable earning from wage through reduction brackets using reduction coefficients is described at the beginning of Section 1.1.1 and also in equation (4.20).

[29] The reason for erratic development in case of new pensions is in the retirement age postponement that happens every few years. As we work with a yearly model, we are not able to capture the smooth pattern of retirement increase. If we smooth the line, we would see a stable development with rather minor decreases in replacement rates due to the described effect.

[30] Figures of replacement rates show a visible jump around the beginning of the projection horizon (mainly between years 2018–2023). This is due to the recent negative developments connected with COVID-19 and unfavourable economic situation related to the war in Ukraine and the energy crisis, when wages relatively to pension benefits fell causing the temporary increase in the replacement rate.

[31] It is worth noting why the benefit ratio for the whole public scheme is only slightly different from the benefit ratio for old-age pensions (with higher average pension). In case of old-age pensions there is no difference between pensions and pensioners. On the other hand, the calculation of benefit ratio for the whole public scheme uses a share of all pension expenditures (including outlays for pensions in concurrence) on number of pensioners (which is lower than number of pensions). Therefore, a comparison of the two benefit ratios may be misleading.

Table 3.6: System Dependency Ratio and Old-age Dependency Ratio

		2022	2030	2040	2050	2060	2070	change 2022-2070
Number of pensioners (thousand) (I)		2 844	2 853	3 004	3 215	3 271	3 141	297
Employment (thousand) (II)		5 174	5 108	4 955	4 787	4 704	4 756	-418
Pension System Dependency Ratio (SDR) (I)/(II)	%	55.0	55.8	60.6	67.2	69.5	66.1	11.1
Number of people aged 65+ (thousand) (III)		2 188	2 329	2 600	2 938	3 065	2 892	703
Working age population 20 - 64 (thousand) (IV)		6 232	6 268	6 016	5 684	5 505	5 616	-616
Old-age Dependency Ratio (ODR) (III)/(IV)	%	35.1	37.2	43.2	51.7	55.7	51.5	16.4
System efficiency (SDR/ODR)		1.6	1.5	1.4	1.3	1.2	1.3	-0.3

Source: Eurostat, European Commission.

Shares of pensioners on inactive population (in Table 3.7 for both sexes and in Table 3.9 for women) include two effects. On the one hand, due to the increase in retirement age, the share decreases in relevant cohorts since they are no longer allowed to retire for full benefits. It is the case of age group of 60–64 and also 65–69 in later years. On the other hand, number of disability pensions rises due to higher disability rate in these older ages. However, the disability rates (probability of becoming disabled) do not fully offset the old-age pensions. Also, participation rates are very low in these ages. Factors driving the share of pensioners over inactive people down for a certain period of projection outweigh the effect of rising disability rates.

In the projection, all persons that fulfil the minimum age limit, including for early retirement pension, are covered. The age specific share of old-age pension allowed for early pensions (in cohorts of age minus 3) stems from observed data and such a distance from retirement age is kept constant over time. From the available data, it is visible that high penalizations for early retirement are effective, and that lower share of people retires in earlier ages. The share increases as the statutory age approaches. As we need to incorporate the CSM assumption about lower effective retirement age and increase the coverage, we make additional adjustments described in Annex B. The model recalculates the number of old-age pensions with increased share of early pensions beyond what data say so that the more inactive people are covered. While doing this, we respect the fact that the demand for early retirement increases as retirement age approaches. The rest of inactive people that could possibly retire is covered by so-called preretirement scheme described in Chapter 1.1.2. All people at the statutory retirement age and older are old-age pensioners automatically. Consequently, declining share of pensioners to inactive people in the age group 60–64 and 65–69 is explained by the fact that people from these cohorts are gradually losing eligibility for (early) old-age pensions as well as for preretirement scheme.

The same effect plays role also when comparing pensioners to the whole population. The result is here only more pronounced, because there is no compensation of labour market through participation rates.[32]

Table 3.7: Pensioners (Public Schemes) to Inactive Population Ratio by Age Group

%

	2022	2030	2040	2050	2060	2070	Peak year
Age group -54	9.0	9.0	8.4	8.0	8.5	8.5	2024
Age group 55-59	148.0	99.4	99.3	100.0	105.5	105.5	2022
Age group 60-64	118.4	84.7	83.1	82.1	79.0	78.9	2023
Age group 65-69	110.6	100.1	99.8	99.5	97.9	97.7	2023
Age group 70-74	102.9	100.0	100.0	100.0	100.0	100.0	2023
Age group 75+	103.4	100.1	100.0	100.0	100.0	100.0	2022

Source: MoF calculations.

[32] If every inactive person is covered by a pension benefit e.g., in cohort 70–74, the difference in terms of population must be active persons.

Table 3.8: Pensioners (Public Schemes) to Population Ratio by Age Group

%

	2022	2030	2040	2050	2060	2070	Peak year
Age group -54	4.0	3.8	3.6	3.5	3.6	3.6	2022
Age group 55-59	15.3	13.2	12.1	11.8	11.8	11.9	2022
Age group 60-64	52.1	34.9	27.3	22.6	19.7	19.4	2022
Age group 65-69	93.9	88.8	82.6	76.7	71.8	70.4	2022
Age group 70-74	96.9	97.3	97.2	96.3	95.4	95.2	2024
Age group 75+	101.4	100.1	100.0	100.0	100.0	100.0	2022

Source: MoF calculations.

In fact, same comments as for overall numbers apply to female pensioners as well. The drop in the coverage rate is, comparing to males, a bit more pronounced and affecting also age cohort of 55–59 to a larger extent. The former is caused by a faster increase in their retirement age comparing with males and the latter by women, who have currently a lower retirement age.

Table 3.9: Female Pensioners (Public Schemes) to Inactive Population Ratio by Age Group

%

	2022	2030	2040	2050	2060	2070	Peak year
Age group -54	9.1	8.5	7.5	7.1	7.5	7.5	2022
Age group 55-59	139.7	100.9	99.0	94.7	98.2	97.5	2022
Age group 60-64	118.1	83.8	84.6	80.9	78.7	77.7	2023
Age group 65-69	110.1	100.0	99.6	99.1	97.0	96.8	2023
Age group 70-74	102.9	100.0	100.0	100.0	100.0	100.0	2023
Age group 75+	103.8	100.1	100.0	100.0	100.0	100.0	2022

Source: MoF calculations.

Table 3.10: Female Pensioners (Public Schemes) to Population Ratio by Age Group

%

	2022	2030	2040	2050	2060	2070	Peak year
Age group -54	4.3	4.0	3.7	3.5	3.7	3.7	2022
Age group 55-59	17.0	15.6	13.9	13.6	13.4	13.4	2022
Age group 60-64	64.3	37.7	29.0	23.9	21.3	20.7	2022
Age group 65-69	96.2	90.4	84.1	77.3	71.9	70.5	2022
Age group 70-74	98.3	97.9	97.8	96.6	95.5	95.3	2024
Age group 75+	102.5	100.1	100.0	100.0	100.0	100.0	2022

Source: MoF calculations.

New old-age pension expenditures (first lines in each section of Table 3.11) are the product of number of new pensions and average newly granted pension benefit. The Table 3.11 disaggregates the calculation of earnings-related component of new old-age pension benefit into its main driving factors. One of the main inputs in pension benefit calculation is a statistic of distribution of the new pensions according to i) personal assessment base and ii) contributory period. It allows to compute not only the average contributory period, but also the average pensionable earning in the base year. We assume that this distribution will be shifted in accordance with retirement age and the extension of acknowledged contributory periods for the whole career. Therefore, the average contributory periods would increase during first decades. After, the average careers are expected to decline in following years as education period will be no longer recognized as contributory periods (see Section 2.2). It is worth noting that average contributory periods are somewhat different for men and women. Men have currently 44.9 contributory years on average ending up with 42.9 years, while women have 43.6 years, due to currently lower retirement age, and ending up with 42.6 in 2070.

Average pensionable earning develops in line with the wage development, so its ratio to economy-wide average wage tends to be constant over time. Pensionable earning is considered to be economy-wide average wage "transformed" into personal assessment base through reduction brackets using reduction coefficients (as described at the beginning of Section 1.1.1 and also in equation (4.20)). Due to the reform that changes the reduction coefficient, the share of pensionable earning on average wage gradually declines, which is visible in the Table 3.11 between years 2030 and

2040. Since there are no other changes in the following period and reduction brackets develop in line with wages, the share remains constant over the long horizon.

As the model works with annual data and statistics (e.g., averages of new pensions over year), we work with full year of 12 months.

Table 3.11: Disaggregated New Public Pension Expenditure

old-age and early earnings-related pensions

Total		2022	2030	2040	2050	2060	2070	Peak year
Projected new pension expenditure	*million EUR*	766.1	1 250.8	2 097.5	2 813.4	3 625.8	4 652.8	2070
I. Number of new pensions	*thousands*	104.7	116.7	145.5	130.6	123.1	113.3	2044
II. Average contributory period	*years*	44.3	46.3	46.8	44.8	42.8	42.8	2043
III. Average accrual rate	*%*	1.7	1.5	1.5	1.5	1.5	1.5	2022
IV. Monthly average pensionable earnings	*thousands EUR*	0.8	1.3	1.8	2.6	3.9	5.4	2070
V. Sustainability/adjustment factors		1.0	1.0	1.0	1.0	1.0	1.0	:
VI. Average number of months paid the first year		12.0	12.0	12.0	12.0	12.0	12.0	2022
Monthly average pensionable earnings/Monthly economy-wide average wage		48%	48%	46%	46%	46%	46%	2026
Men		**2022**	**2030**	**2040**	**2050**	**2060**	**2070**	**Peak year**
Projected new pension expenditure	*million EUR*	430.4	625.2	1 090.0	1 459.5	1 904.3	2 480.7	2070
I. Number of new pensions	*thousands*	55.1	56.9	72.5	65.0	62.3	58.2	2043
II. Average contributory period	*years*	44.9	46.9	46.9	44.9	42.9	42.9	2043
III. Average accrual rate	*%*	1.7	1.5	1.5	1.5	1.5	1.5	2022
IV. Monthly average pensionable earnings	*thousands EUR*	0.9	1.3	1.8	2.7	4.0	5.6	2070
V. Sustainability/adjustment factors		1.0	1.0	1.0	1.0	1.0	1.0	:
VI. Average number of months paid the first year		12.0	12.0	12.0	12.0	12.0	12.0	2022
Monthly average pensionable earnings/Monthly economy-wide average wage		50%	50%	48%	48%	48%	48%	2026
Women		**2022**	**2030**	**2040**	**2050**	**2060**	**2070**	**Peak year**
Projected new pension expenditure	*million EUR*	335.8	625.5	1 007.5	1 353.9	1 721.5	2 172.1	2070
I. Number of new pensions	*thousands*	49.6	59.8	73.0	65.6	60.8	55.1	2038
II. Average contributory period	*years*	43.6	45.6	46.6	44.6	42.6	42.6	2043
III. Average accrual rate	*%*	1.6	1.6	1.5	1.5	1.5	1.5	2022
IV. Monthly average pensionable earnings	*thousands EUR*	0.8	1.2	1.7	2.5	3.7	5.2	2070
V. Sustainability/adjustment factors		1.0	1.0	1.0	1.0	1.0	1.0	:
VI. Average number of months paid the first year		12.0	12.0	12.0	12.0	12.0	12.0	2022
Monthly average pensionable earnings/Monthly economy-wide average wage		46%	47%	44%	44%	44%	44%	2026

Source: MoF calculations.

Value of average accrual rate is legislated to decrease between 2026 and 2035 from 1.50% to 1.45%. Numbers in the Table 3.11 are slightly different, due to the calculation method of the accrual rate (being considered as a resulting residual variable).[33] It is affected by the distribution of the retirement around statutory retirement age, which has consequences in the form of bonuses or penalizations. Its development over time is related to the evolution of the replacement rate of average newly granted pension benefits that is also largely affected by early or postponed retirement. Naturally, the distribution (and the two variables) would be more or less constant over time if there is no adjustment to the population covered by the pension system[34]. When additional adjustment applies in order to reach the desired coverage of inactive people (targeting to 100% in relevant cohorts), the average replacement rate of new pensions (and thus average accrual rate) deviates. In the years with relatively higher share of early retirees and/or lower share of later retirements, the average replacement rate (and average accrual rate) decreases and vice versa.

[33] It is only an issue of illustration in the Table 3.11, which illustrates ex-post calculated average accrual. When calculating new pension benefit for each pensioner, the model, of course, works with the legislated accrual rate.

[34] As discussed in Annex B.

As the pension formula is the same for both sexes, identical driving factors work for all parts of the Table 3.11. Only minor differences can be noted in recent shorter careers of women and their lower income.

3.4 Financing of the Pension System

The only income of the pay-as-you-go system itself stems from pension insurance contribution (28%) paid from employees' income.[35] Therefore, numbers of contributors and employed are equal in the projection years. The contribution burden is shared between employee (6.5%) and employer (21.5%). In the same way, the total revenues of the system from public contributions in Table 3.13 are split between the two groups. The State does not take part in the system, not even in case of unemployed people, students or women on maternity leave.[36] The only relief for these people is in the fact that they acquire pension claims through the so-called non-contributory periods without paying contributions.

Table 3.12: Financing of the System

	Public employees	Private employees	Self-employed
Contribution base	salary	wage	profit
Contribution rate/contribution			
Employer	21.5%	21.5%	28.0%
Employee	6.5%	6.5%	:
State	:	:	:
Other revenues	Balance of pension system is part of general governement budget.	Balance of pension system is part of general governement budget.	Balance of pension system is part of general governement budget.
Maximum contribution	four times average wage	four times average wage	four times average wage
Minimum contribution	:	:	25% of average wage gradually raised to 40 % by 5 pp each year between 2024 and 2026

Source: Pension Insurance Act (No. 155/1995).

Table 3.13: Revenue from Contribution, Number of Contributors in the Public Scheme, Total Employment

	2022	2030	2040	2050	2060	2070	change 2022-2070
Public contribution (% GDP)	7.9	8.0	8.0	8.0	8.0	8.0	0.1
Employer contribution	6.1	6.2	6.2	6.2	6.2	6.2	0.1
Employee contribution	1.8	1.9	1.9	1.9	1.9	1.9	0.0
State contribution	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other revenues	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Number of contributors (I) (1000)	5 243	5 108	4 955	4 787	4 704	4 756	-488
Employment (II) (1000)	5 174	5 108	4 955	4 787	4 704	4 756	-418
Ratio of (I)/(II)	1.0	1.0	1.0	1.0	1.0	1.0	0.0

Source: European commissions, MoF calculations.

One must distinguish between flows and stocks. If the pension system in the Czech Republic has higher expenditures than revenues, the deficit is financed by other revenues from the State budget (e.g., taxes). In the opposite case, the surplus is transferred to the pension reserve fund created in 2004. This fund was set up to raise funds to support future pension reform.

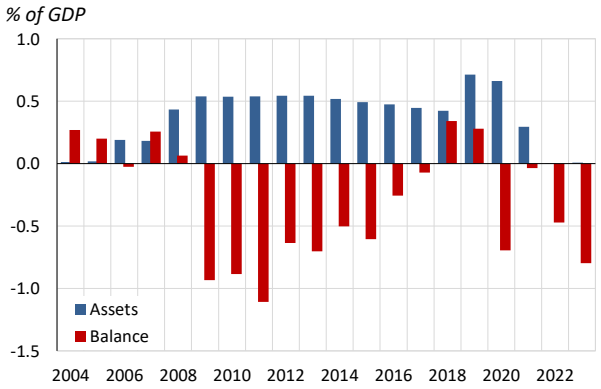
Figure 3.1 shows the evolution of the system balance and assets of the pension fund. Social security system balances illustrate yearly differences between revenue from contributions and expenditures paid out to all types of pensioners

[35] For details, see Section 1.1.1.

[36] State steps in only in case the pension system runs a deficit as the pay-as-you-go system is part of the state budget in the Czech Republic (see below).

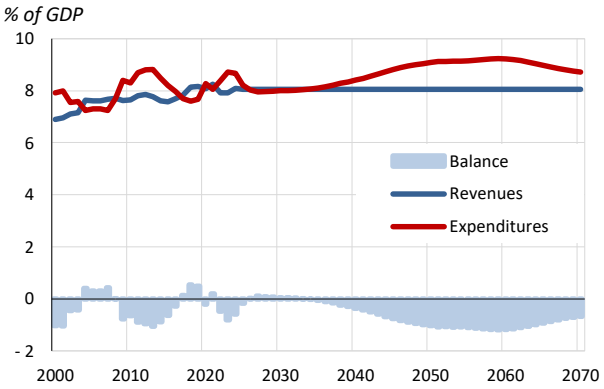
(it is the flow variable). Besides the contributions, the only legislated income of the pension reserve fund are some ad hoc inflows, e.g., from dividends paid by state-owned companies that were transferred there to finance the deficit of the pension system. These rather one-off operations are not expected to happen in the future. The pension fund assets variable shows the stock of money on the account, which is an integral part of the State budget, at the end of every year. These resources are not invested in any income generating assets. They cannot be spent deliberately, which prevents them to be depleted. The deficits are covered by other government revenues in the State budget. Thus, the assets are real on the one hand, but on the other hand, they are preserved just according to law but virtually would be already depleted. This is assumed for the future as this reflects the economic reality of the pension account. The system itself does not accumulate assets anymore. As the system currently runs deficits, the same is projected into the future (see Figure 3.2).

Figure 3.1: Social Security Balance and Pension Fund Assets



Source: MoF.

Figure 3.2: Revenues, Expenditures and Balance



Source: MoF calculations.

3.5 Sensitivity Analysis[37]

Besides the baseline discussed in all other parts of this document, several sensitivity analyses have been carried out. In the system with one pillar, the effects on public pensions and total pensions are the same.

Higher life expectancy shows higher expenditures simply because pensioners live longer and thus the pay-out period of pension is extended compared to the baseline. Pension system does not include any automatic compensation mechanism for longevity that would reduce this effect.

Under the assumption of **lower migration,** the increase in pension expenditures is somewhat higher compared to the baseline. The reason is solely in lower employment and lower GDP that raise the ratio. The level of total expenditures is lower in this scenario comparing to the baseline. **Higher migration** has very similar but opposite effects.

The lower fertility scenario has effects on pension expenditure through a negative impact on the working-age population and thus on performance of the economy. It is the lower GDP that is mainly behind a larger increase in the share of expenditure.

Higher employment of older workers lowers pension expenditures by contributing to higher GDP and creates less pressure on pensions as people remain on the labour market longer. However, in the longer horizon it will result in higher accumulated pension claims for longer careers and bonuses for working beyond statutory retirement age and thus the expenditure would, in the second half of the projection period, catch up with the baseline and would increase more dynamically beyond 2070. Moreover, when compared to the baseline, there is another effect worth noting, which deepens the mentioned effects. It lies in additional coverage of inactive people that takes place in the baseline, but not in this scenario as labour market here covers those who are inactive in the baseline. Thus, in the baseline, there are in absolute terms more pensioners also forced to accept permanently reduced pension benefits. This fact in the long term reduces pension expenditure and is also the reason why this scenario has lower expenditure over GDP than the baseline at the end of the horizon.

[37] 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.

Table 3.14: Public and Total Pension Expenditure under Different Scenarios

pps deviations from the baseline

Public Pension Expenditure	2022	2030	2040	2050	2060	2070	change 2022-2070 (pps)
Baseline	**8.4**	**8.0**	**8.4**	**9.1**	**9.2**	**8.7**	**0.3**
Higher life expectancy at birth (+2y)	0.0	0.0	0.1	0.2	0.4	0.6	0.6
Higher migration (+33%)	0.0	0.0	-0.1	-0.2	-0.3	-0.3	-0.3
Lower migration (-33%)	0.0	0.0	0.2	0.3	0.4	0.3	0.3
Lower fertility (-20%)	0.0	0.0	0.0	0.1	0.4	0.7	0.7
Higher employment rate of older workers (+10 pps.)	0.0	-0.4	-0.7	-0.5	-0.2	-0.2	-0.2
Higher productivity (TFP converges to 1%)	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.2
Lower productivity (TFP converges to 0.6%)	0.0	0.0	0.1	0.2	0.3	0.3	0.3
Policy scenario: link retirement age to longevity	0.0	0.0	0.0	0.0	-0.2	-0.6	-0.6
Policy scenario: constant retirement age	0.0	0.7	1.4	1.6	1.5	1.5	1.5
Policy scenario: constant benefit ratio	0.0	0.0	0.2	0.4	0.5	0.6	0.6

Source: MoF calculations.

Higher total factor productivity growth is slightly more demanding from the level of total expenditure point of view. But the opposite is true looking at the GDP ratios. This scenario creates higher GDP (causing higher denominator effect) and somewhat higher wages. However, the newly granted pension benefits will be higher, the indexation rule will translate only 1/3 of this positive effect into the growth of the pension benefit.

Lower TFP scenario affects GDP and wages in a negative way. The level of pension expenditure is lower, but the effect of lower GDP dominates and thus the resulting ratio is higher compared to the baseline.

Analysis of the **policy scenario linking statutory retirement age to gains in life expectancy** shows lower expenditure to GDP. This is due to the permanent postponement of retirement age, which limits the increase in pension spending. The effect is only apparent in the last two decades, as the link to changes in life expectancy is only applied in the scenario after the legislated retirement age shift has been achieved. However, under the current legislation, the pace of increase in the retirement age between 65 and 67 is slower than it would be if it were determined by the link to life expectancy gains.

On the other hand, if the **retirement age is fixed** at the current level and the additional postponement until the age of 67 is reached in 2055 is abolished, the pension system would, in the long term, require higher expenditure up to 1.8 p.p. of GDP (in 2055).

The third policy **scenario of offsetting declining benefit ratio** responds to the relatively significant decline in the benefit ratio caused by the reform and examines the potential evolution of expenditure if the benefit ratio were to fall by a maximum of 10% compared to the base year. This occurs in the baseline around 2035. Therefore, in the alternative scenario, an additional assumption of higher indexation of pensions is adopted from this year onwards, so that the benefit ratio is stable at around this level until the end of the projection horizon. It would result in 6 p.p. of GDP higher pension spending in 2070 compared with the baseline.

3.6 Description of the Changes in Comparison with Previous Projection Rounds

Table 3.15 shows the evolution of all projection rounds. Results in 2009 were better compared to 2006 mainly due to a delay of the statutory retirement age (up to 65, still differentiated for women with children) and a more favourable demographic outlook. 2012 projections further improved the situation through parametric changes in the system. In particular, the further postponement of the retirement age and the reform of disability pensions had a significant impact. The 2015 round further ameliorated the results thanks to better demographic and macroeconomic assumptions. The 2018 projections brought higher expenditures mainly because of the adoption of changes to the pension system by introducing a cap on the retirement age at 65 and higher indexation of paid out pension benefits amounting to CPI plus ½ real wage growth (instead of 1/3). Projections from 2021 showed very similar expenditure dynamics over the projection horizon. Also, the sizes of the impacts of disaggregated factors behind the evolution were comparable with 2018 and the differences are attributable only to changes in the assumptions about demographic and macroeconomic developments.

The 2024 Ageing report projection outcomes with lower public pension expenditure to GDP were due to better labour market prospects relative to 2021 Ageing report, tightening and higher penalisation of early retirement pensions. Measures to reduce the possible length of early retirement and, in particular, higher penalties for early retirement played an important role. Another factor from policy related changes is the lower indexation of pensions. On the other hand, an introduction of allowance for each child raised as of January 2023 pushed spending upwards.

Table 3.15: Overall Change in Public Pension Expenditure to GDP under the 2006, 2009, 2012, 2015, 2018, 2021, 2024 and Current Projection Exercises

% of GDP

		Public pensions to GDP	Depen. ratio effect	Coverage ratio effect	Benefit ratio effect	Labour market effect	Residual (incl. Interact. effect)
2006 Ageing Report	*period (2004-2050)*	5.6	10.5	-3.5	-0.6	-0.3	-0.6
2009 Ageing Report	*period (2007-2060)*	3.3	9.5	-3.5	-1.2	-0.5	-1.1
2012 Ageing Report	*period (2010-2060)*	2.6	9.1	-4.6	-0.3	0.0	-1.1
2015 Ageing Report	*period (2013-2060)*	0.7	6.8	-3.6	-1.0	-1.0	-0.5
2018 Ageing Report	*period (2016-2070)*	2.8	5.4	-1.9	-0.5	0.0	-0.3
2021 Ageing Report	*period (2019-2070)*	2.9	4.8	-1.6	-0.3	0.2	-0.1
2024 Ageing Report	*period (2022-2070)*	1.7	3.6	-1.0	-0.9	0.3	-0.1
2025 update	*period (2022-2070)*	0.3	3.4	-1.5	-1.4	-0.1	-0.2

Source: MoF calculations.

The current 2025 update shows 1.4 p.p. lower pension expenditure dynamics relative to the 2024 Ageing Report. While the dependency ratio effect is almost the same, the difference lies in the remaining factors of the decomposition that are affected by the pension reform. The reform, described in Chapter 1.2.2., is the main driver of the changes; especially its two most influencing measures.

First, the further increase in the retirement age up to 67 has a positive (i.e., expenditure dampening) effect on the labour market. Because the labour market exits are quite tightly connected to the statutory retirement age, postponed retirement opens more cohorts to participation. Although the activity rates do not increase that much in older pre-retirement cohorts, it creates a labour market effect of -0.1 p.p. It means a reduction of expenditure dynamics from the labour market by 0.4 p.p. comparing to last projection round. About the same relative effect has this measure also on the coverage ratio, as there are fewer people to be covered with some kind of benefit. The two additional years of increase in retirement age (from 65 to 67) lowers the expenditure pressure through the coverage ratio effect by an additional 0.5 p.p. The overall impact of the gradual retirement age increase from current levels amounts to -1.5 p.p. of GDP over the projection horizon according to the coverage ratio effect.

Second, changes in the parameters of pension formula aimed at lowering new pension benefits (lower accrual rate and reduction coefficient) further intensify the dampening effects of the benefit ratio on expenditure to the extent of an additional 0.5 p.p. There are also other changes at play, but their compound impact is rather negligible as they more or less cancel out. Whereas abolition of bonuses for working longer while receiving a pension has a downside effect on expenditure, the sum of the impacts of the remaining two measures (a minor reduction of early retirement penalizations and higher minimum earnings-related component) will increase expenditure approximately by the same amount. Overall, this second group of measures contributes to an expenditure reducing benefit ratio effect of 1.4 p.p. of GDP.

Table 3.16: Decomposition of the difference between the 2024 Ageing Report and the new public pension projection
% of GDP

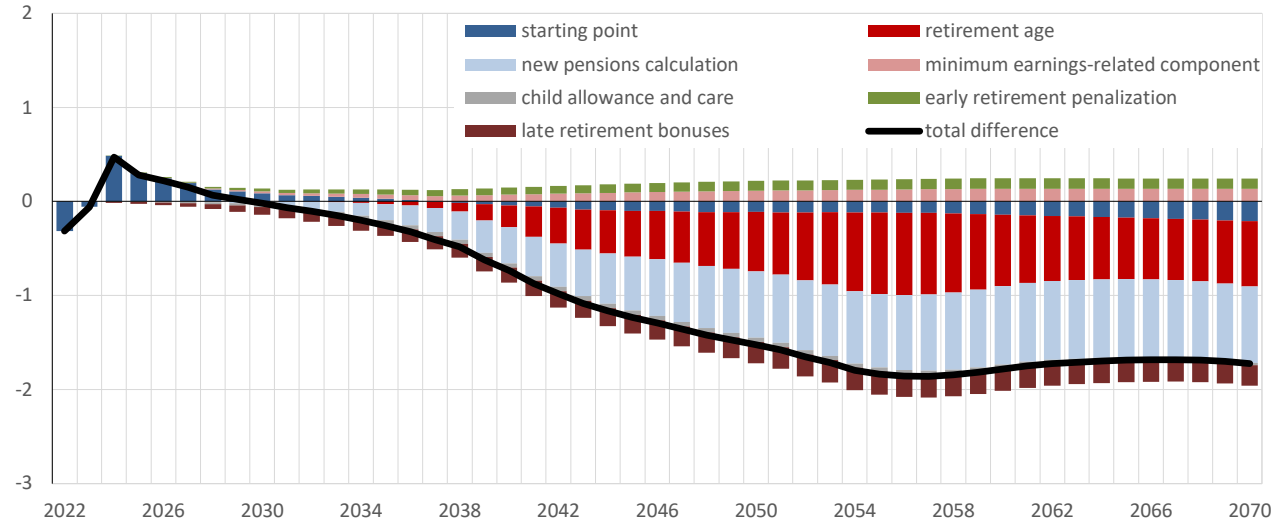
		2022	2030	2040	2050	2060	2070
2024 Ageing Report projections		8.7	8.0	9.1	10.6	11.0	10.4
Change in assumptions	*pps of GDP*	-0.3	0.1	-0.1	-0.1	-0.2	-0.2
Improvement in the coverage or in the modelling	*pps of GDP*	0.0	0.0	0.0	0.0	0.0	0.0
Change in the interpretation of constant policy	*pps of GDP*	0.0	0.0	0.0	0.0	0.0	0.0
Policy related changes; of which:	*pps of GDP*	0.0	-0.1	-0.7	-1.4	-1.6	-1.5
Increase in statutory retirement age	*pps of GDP*	0.0	0.0	-0.2	-0.6	-0.8	-0.7
Lower accrual rate and 1st reduction coefficient	*pps of GDP*	0.0	0.0	-0.4	-0.7	-0.8	-0.8
Higher minimum earnings-related component	*pps of GDP*	0.0	0.0	0.1	0.1	0.1	0.1
Changes in care allowance and care award	*pps of GDP*	0.0	0.0	0.0	0.0	0.0	0.0
Changes in penalizations for early retirement	*pps of GDP*	0.0	0.0	0.1	0.1	0.1	0.1
Changes in bonuses for later retirement	*pps of GDP*	0.0	-0.1	-0.2	-0.2	-0.2	-0.2
New projections		8.4	8.0	8.4	9.1	9.2	8.7

Source: MoF calculations.

The contribution to expenditure dynamics of adopted measures is illustrated in Table 3.16 and in the Figure 3.3. It is the full decomposition of changes between AR2024 and current projections. A small part of the difference is caused by the adjustment of the starting point for the data that have become available since the finalisation of the previous projections in autumn 2023. The current projections thus update data for 2022 and 2023 where macroeconomic and also administrative data on pensions are now available, and also make use of known macro data for 2024. The dynamics of macroeconomic variables beyond this year is fully preserved as in the AR2024.[38] In order to clearly present effects of pension reform, the impact of starting year update is isolated on the second line of the Table 3.16. The impact of the revisions on past data is shown in Table 3.17 for the years 2022–2024. It is worth noting that there are no data updates prior to 2022 with any effect on the projection results.[39]

The impact of the data update on the difference between the 2024 Ageing Report and the updated projection is illustrated in Figure 3.3 by dark blue columns. The data update has multiple effects on the future path of the expenditure-to-GDP ratio, some of which are offset each other.

Figure 3.3: Decomposition of the difference between the 2024 Ageing Report and the new public pension projection
pps of GDP



Source: MoF calculations.

[38] With the exception of labour input, which has been consistently re-estimated by the Commissions' CSM in order to assess the impact of the pension reform on the labour market.

[39] Changes in assumptions are solely due to data updates. The second row of Table 3.17 shows the changes in the real data for past years, while the second row of Table 3.16 shows the resulting impact of the data update on the projection results.

The first impact is the change in the level of nominal GDP. Since the most recent actual data used is from 2024, the level difference for this year is reflected over the entire projection horizon, assuming the GDP growth rate is the same from 2025 onwards. This means that the level of nominal GDP is approximately 7% lower over the entire horizon than in previous projections. This alone would result in a 0.6 p.p. higher expenditure-to-GDP ratio across all projected years.[40]

However, it would be inconsistent to adjust only GDP while ignoring other data updates. Wages and inflation were also lower, implying lower indexation, particularly at the beginning of the projection period. Actual administrative data show lower average pensions for 2022–2023, leading to lower replacement rates. This affects newly granted pension benefits and is gradually reflected in the benefit ratio. Together with lower indexation, this pushes the expenditure-to-GDP ratio downward. These effects outweigh the denominator effect of lower GDP. As a result, the overall impact of the data update is slightly negative, in the range of 0.1–0.2 pp in the long run.

From the policy changes, the highest impact on expenditure comes, not suprisingly, from retirement age postponement and decreasing new pension benefits thanks to lower accrual rate and lower reduction coefficient. The impacts of both measures will increase over time given their phase-in period and gradual pass-through into expenditure.

Other measures have a subtantially lower impact on expenditure. Moreover, the increasing minimum earnings related component and minor adjustments of early retirement penalization have opposite effect. Together, they will support expenditure dynamics by 0.2 p.p. at the end of the projection horizon.

Changes in care allowance and acknowledgment of care award in pension the benefit calculation have very limited impact, because the latter partially replace care allowances introduced to the system since January 2023.

The change in late retirement bonuses has the potential to reduce expenditure by 0.2 p.p. It should be added that it also has a revenue effect, as working pensioners will in turn benefit from not paying social security contributions. We estimate the impact on revenues at 0.1% of GDP per year.

Table 3.17: Breakdown of the Difference between the 2024 Projections and Outcome Figures
%, pps of GDP

		2022	2023	2024
2024 Ageing Report projections		8.7	8.8	8.2
Assumptions	*pps of GDP*	-0.3	-0.1	0.5
Coverage of projections	*pps of GDP*	0.0	0.0	0.0
Constant policy impact	*pps of GDP*	0.0	0.0	0.0
Policy-related impact	*pps of GDP*	0.0	0.0	0.0
Actual public pension expenditure		8.4	8.7	8.7

Source: MoF calculations.

[40] In other words, the dark blue column would continue to be the same from 2024 onwards.

4 Pension Projection Model

This Section aims at introducing the technical tool for computation and main data used for projection. In order to better understand the results presented in previous Section, we try to explain all steps of calculations and illustrate them with semi-results that are for practical purposes and reader's convenience moved to annexes.

4.1 Institutional Context

The pension model has been built in the Ministry of Finance, which maintains, updates and uses the model. The model is a semi-aggregated simulation model written and run under the MATLAB application. It enables to make long-term projections and simulate the impact of changes in all relevant parameters of the current system.

Presented projection results are prepared primarily for the update of the Ageing Report. The AWG platform is in fact the main and the only "formal" reviewer of these projections. However, the Ministry of Finance (MoF) cooperates with the Ministry of Labour and Social Affairs (MoLSA) – which runs own long-term projections – and consults these results on collegial basis. Results of the two institutions are comparable and differences explainable. They mainly stem from i) characteristics of models; MoLSA runs micro-simulation model while MoF uses macro-model and ii) assumptions about demography and macroeconomic framework used.

4.2 Assumptions and Methods Applied

Pension projections fully respect the commonly agreed AWG assumptions. The model aims at incorporating all features of the pension system as described in Section 1.1.1. For detailed description of methods, see Section 1.

4.3 Data Used

The model uses data since 2000. The most of them come from the Czech Social Security Administration, which is in charge of collecting social security contributions and disbursing all pension benefits. The model makes use of the information on:

- the number of pensions disaggregated by type of pension, single age and gender
- the number of new pensions (by type of pension, single age and sex),
- average pension benefit (by type of pension, single age and sex),
- average newly granted pension benefit (by type of pension, single age and sex),
- matrix of the number of new pensions (by type of pension) for a given combination of personal calculation basis and contributory period.

Apart from the above-mentioned data running the model requires a population projection (disaggregated by single age and sex), assumption on the average wage and labour market. All these data are taken from AWG assumptions.

Publicly available data on wage statistics from Czech Statistical Office are used for calculation the share of pre-retirement wage on average wage. The share is then applied to AWG wage assumptions.

4.4 Reforms Incorporated in the Model

The model fully applies current legislation. The model works with the statutory retirement age ceiling of 67 years and incorporate all policy measures introduced in Chapter 1.2.2 except the shared assessment base. It is very difficult to estimate an impact as it depends on periods when people are married or registered partners, but most importantly it is on voluntary basis. We do not have data on households' income composition and estimates whether they will opt for such possibility. Therefore, we do not include this into the calculations. However, it is believed that an impact on overall expenditure will be very limited (below 0.1 pp of GDP) because, on the one hand, the assessment base will be reduced (for the higher-income partner) and on the other hand, it will be increased (for the lower-income partner).

4.5 General Description of the Model

The model makes distinction among various pension benefits (old-age, disability, widows'/widowers' and orphans'), sexes (males, females) and generations (the year of birth).

In accordance with the Czech legislation the model explicitly differentiates several types of pensions:

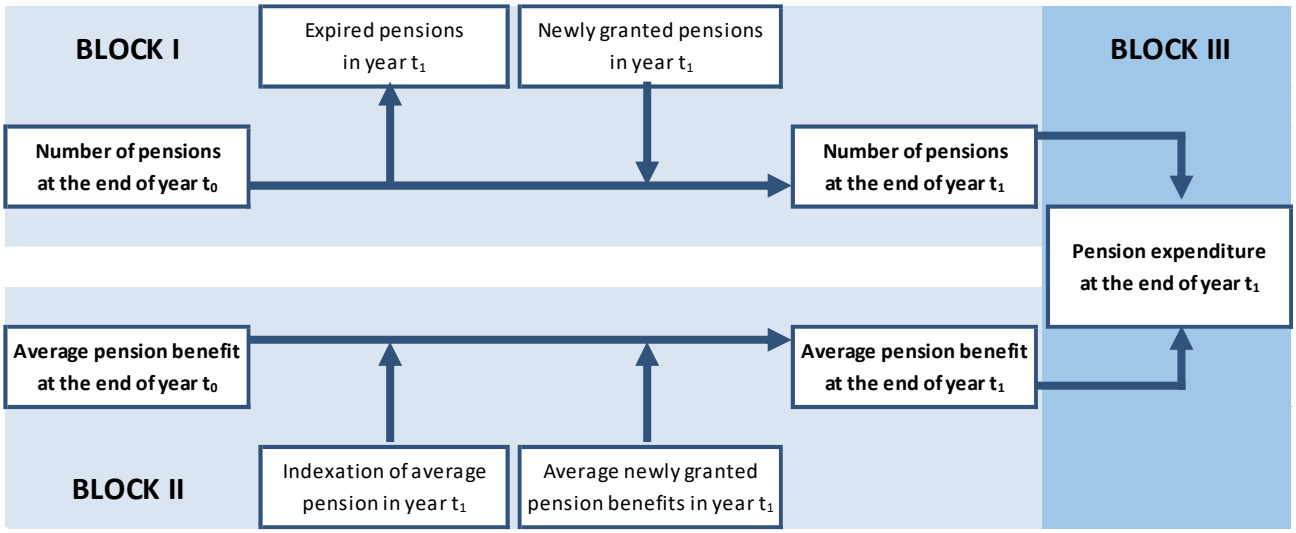
- Old-age pensions (including early retirement old-age pensions that can be granted up to three years prior to statutory retirement age);
- Disability pensions (distinguishes between all three types: 3rd degree – when working capacity is reduced by at least 70%, 2nd and 1st degree – with working capacity reduced by 50 - 69% and 35 - 49% respectively;
- Widow's/widower's pensions solo;
- Widow's/widower's pensions in concurrence with other pensions (disability, old-age);
- Orphan's pensions.

The distinction between males and females is important since they differ in their earnings profiles, length of their career and contribution periods. These differences result in different level of pension benefits. It is also important to apply cohort approach since the cohorts (generations) are not homogenous. Generations (identified by the year of birth) differ in some important characteristics, e.g., mortality rates (affects for instance the number of survivors´ pensions or the average lengths of receiving an old-age pension), disability rates (influences the number of disability pensions) and affiliation with a generation is also decisive for determination of the statutory retirement age.

The model primarily works with the number of pensions, not with the number of pensioners. The number of pensioners is somewhat lower than the number of pensions since some pensioners may be entitled to receive more (two) types of pension benefits. According to the Czech pension legislation recipients of disability or old-age pensions may under given conditions receive widow's/widower's pension at the same time. Thus, the number of pensioners can be obtained by subtracting the number of widow's/widower's pensions in concurrence with other pensions from the total number of pensions.

The model consists of three main building blocks, which is illustrated on Figure 4.1. The first block calculates the number of pensions and flow of new pensions. The second one computes the level of new pension benefits. The third block combines the information on the stock and flow of pensions with the projection of new pension benefits, which gives the evolution of an average pension benefit and spending on all pension benefits in the projection horizon. All blocks work directly with generational data, so we are still able to distinguish between males, females, single ages, years of birth and calendar years.

Figure 4.1: Simplified Structure of the Model



4.5.1 Block I – Number of Pensions[41]

The number of pensions is calculated based on the cohort methodology. The computation rests on the idea, that there is a certain probability that an individual of given age and sex and from given cohort retires, becomes disabled or becomes orphan/widow/widower.

[41] Graphs showing developments of numbers of pensions are in Annex D (Figure D.13—Figure D.19).

Old-age and disability pensions

First of all, we stem from observed age specific shares and probabilities and assume their evolution in the future. Age specific shares of respective pension (*pen_s*)[42] are given by number of pensions (*pen*) on population (*pop*) for each calendar year (*t*), age (*a*) and sex (*s*).

$$pen\_s_t^{a,s} = \frac{pen_t^{a,s}}{pop_t^{a,s}}. \tag{4.1}$$

This allows us to calculate conditional probability of becoming receiver of the respective pension (*pen_p*)

$$pen\_p_t^{a,s} = \frac{pen\_s_t^{a,s} - pen\_s_{t-1}^{a-1,s}}{1 - pen\_s_{t-1}^{a-1,s}}. \tag{4.2}$$

All pensions except the old-age can be terminated, when the pensioner changes its status, e.g., disability pension can be ended due to renewed working capacity or becoming entitled to old-age pension.[43] The conditional probability that a person ceases to be a pensioner can be expressed as follows

$$pen\_p_t^{a,s} = 1 - \frac{pen\_s_t^{a,s}}{pen\_s_{t-1}^{a-1,s}}. \tag{4.3}$$

Such shares and probabilities for the base year are then transformed from dimension age/calendar year into age/generation[44]

$$pen\_s_t^{a,s} \Rightarrow pen\_s_t^{g,s}, \qquad pen\_p_t^{a,s} \Rightarrow pen\_p_t^{g,s} \tag{4.4}$$

and projected into the future.[45] While projecting probabilities, we must take into account continuously increasing development of statutory retirement age (until the age ceiling is reached). Therefore, in case of old-age, each generation with higher retirement age[46] than the base generation takes the probability of retirement from a person who is according to base year profile as many years younger as the difference in their retirement ages, i.e., in such case

$$pen\_p_{g+a+(ret^{g,m} - ret^{1958,m})}^{g,m} = pen\_p_{1958+a}^{1958,m} \quad \text{and} \quad pen\_p_{g+a+(ret^{g,f} - ret^{1960,f})}^{g,f} = pen\_p_{1960+a}^{1960,f} \tag{4.5}$$

for males (*m*) and females (*f*). Such splitting is done in ages where probability profiles are flat (depending on the type of pension). We stem from generations that retire in the base year 2022 (generation of men born in 1958 has retirement age equal to 63 years, i.e. 2022 = 1958 + 63,[47] while the generation of women born in 1960 reaches the statutory retirement age in 2022 = 1960 + 62).

Projected probabilities from (4.2) and (4.3) are then used to calculate shares on population for all future generations:

$$pen\_s_{t+1}^{g,s} = pen\_s_t^{g,s} \cdot \left(1 - pen\_p_t^{g,s}\right) + pen\_p_t^{g,s}, \tag{4.6}$$

Or in accordance with (4.3)

$$pen\_s_{t+1}^{g,s} = pen\_s_t^{g,s} \cdot \left(1 - pen\_p_t^{g,s}\right). \tag{4.7}$$

Having derived this, it is easy to get numbers of old-age and all three disability types pensioners as a product of respective shares and population

[42] *pen* represents here old-age (*oa*) and disability pensions of all three types (*dis3*, *dis2*, *dis1*); _s denotes share.

[43] Beyond the statutory retirement age all disability pensions are considered to be old-age pensions. As a result, disability pensions disappear after reaching the statutory retirement age.

[44] The notation may seem a bit tricky, as we keep the index *t* for calendar year even in the generational form. The explanation behind is that $t = g + a$ and in generational form we keep *g* fixed, thus all shifts in *t* are translated into shifts of *a*.

[45] For illustration of age specific shares, see Annex D (Figure D-1—Figure D-12).

[46] For information about the development of retirement age in the model see Section 4.6.

[47] The sum does not necessarily add up exactly due to the real shift of the age limit by months. The discrepancy thus results from "rounding" to annual dates.

$$pen_t^{g,s} = pen\_s_t^{g,s} \cdot pop_t^{g,s}. \tag{4.8}$$

If we sum this over generations and sexes, we obtain total number of pensions for a calendar year.

$$pen_t = \sum_{g,s} pen\_s_t^{g,s} \cdot pop_t^{g,s}. \tag{4.9}$$

Widows'/widowers' pensions

Somewhat different approach is used to calculate the number of survivors' pensions. The number of widow's pensions (*wid*) depends on marital status, probability of spouse to die in a given year and compound probability of the couple to die within the same year. Moreover, we assume (on the basis of fairly stable mortality rates) that before the age a_0 [48] ($a_0 = t_0 - g$) the profile of widow's/widower's pension is the same as in the base year. The ratio of widow's pensions after age a_0 is calculated as follows:

$$wid\_s_t^{g,f} = wid\_s_{t-1}^{g,f} + \varepsilon_{a+k}^{g+k,m} \cdot \left(1 - \varepsilon_a^{g,f}\right) \cdot \frac{mpop_{t_0}^{g,f}}{pop_{t_0}^{g,f}} - \varepsilon_a^{g,f}\left(wid\_s_{t-1}^{g,f}\right), \tag{4.10}$$

ε stands for mortality rate and *mpop* is the number of married population. The same relation similarly holds for men. Since married couples are not necessarily of the same age, ε of the other sex should be viewed as an average mortality rate of the other sex of given generation *g+k* around the corresponding age *a+k*, where *k* is the average age difference in a legal union (computed for the base year t_0).

The number of widow's/widower's pensions is further split into the solo pensions (*wids*) and pensions in concurrence (*widc*) with other pensions (old-age and disability) according to the probability that the person is a recipient of old-age or disability pension, which is given by the fraction of population that receives old-age (*oa*) or disability pension (*dis = dis1 + dis2 + dis3*).

$$wids_t^{g,s} = wid_t^{g,s} \cdot \left(1 - \frac{oa_t^{g,s} + dis_t^{g,s}}{pop_t^{g,s}}\right), \tag{4.12}$$

$$widc_t^{g,s} = wid_t^{g,s} - wids_t^{g,s}. \tag{4.13}$$

Orphans' pensions

The number of orphan's pensions (*or*) is projected simply on the basis of the existing profile (age and sex specific ratio of orphan's pensions to population) since mortality rates for those aged less than 26 are not subject to any major changes. With respect to their limited importance this seems to be a good approximation, i.e. shares on population are same in all years as in the base year:

$$or\_s_t^{a,s} = or\_s_{2022}^{a,s}. \tag{4.14}$$

The number of pensions is calculated similarly for other pension types

$$or_t^{a,s} = or\_s_t^{a,s} \cdot pop_t^{a,s}. \tag{4.15}$$

Newly granted pensions (for all types of pensions)

The number of new pensions (*npen*) in generation *g* and sex *s* is consistent with the stock of pensions (*pen*), from which it is computed with the use of the probability of survivorship derived from sex and generation specific mortality rate (ε)

$$npen_t^{g,s} = pen_t^{g,s} - pen_{t-1}^{g,s} \cdot \left(1 - \varepsilon_t^{g,s}\right). \tag{4.16}$$

Unfortunately, there is no such straightforward relationship in the case of disability pensions since a disability benefit is withdrawn when the working capacity is restored. Thus, the number of new pensions computed according to (4.16) would be underestimated and spending on disability benefits and an average benefit would be lower (under the assumption of indexation lower than the wage growth).

$$ndis_t^{g,s} = k_{g+a}^{g,s} \cdot dis_t^{g,s}, \tag{4.17}$$

[48] After this age the entitlement for widow's/widower's pension is permanent (i.e., till the end of one's life) as opposed to the age before when the entitlement is only temporary (it lasts a year). The legislation sets the age to be four years before the statutory retirement age and as such it will rise with the postponement of this benchmark.

$$k_{g+a}^{g,s} \equiv k^{a,s} = \frac{ndis_{2022}^{a,s}}{dis_{2022}}. \quad (4.18)$$

The model assumes a fixed relationship between the number of new pensions and the stock of pensions in a given age (*a*) and the ratio was calibrated on the basis of 2022 data[49].

4.5.2 Block II – Average Newly Granted Pension Benefits

This block enables to (i) assess the impact of the government decisions (pertaining to the indexation of the main parameters of the pension formula) on the level of newly granted pensions in the short run and (ii) simulate the impact of changes in the pension formula in the long run.

The changes in pension formulae are simulated in a matrix with two dimensions – assessment basis and contribution period. It is a matrix, which gives the number of pensions for a given combination of personal calculation basis (average earnings during the contributory period) and contributory period. We assume that the distribution of pension numbers within this matrix will be shifted in terms of contributory periods in accordance with postponement of retirement and the extension of acknowledged contributory periods for the whole career.

Having such distribution, it is possible to compute a pension benefit for each cell of the matrix for each projection year on the basis of the pension formula (equations 4.19 – 4.21). Weighing the pension benefits by the number of recipients gives the average newly granted pension.

$$npen\_v = frc + erc\,, \quad (4.19)$$

$$erc = \begin{Bmatrix} \min\left(pab, rb_1\right)\cdot rc_1 + \\ +\max\left[\min\left(pab - rb_1, rb_2 - rb_1\right), 0\right]\cdot rc_2 + \\ +\max\left[pab - rb_2, 0\right]\cdot rc_3 \end{Bmatrix} \cdot \frac{cp_1 + 0.8\cdot cp_2}{365}\cdot ar\,, \quad (4.20)$$

$$pab = \frac{\sum_{y=Y-1-\min(car,Y-1-1986)}^{Y-1} ycb_y \cdot \prod_{t=y}^{Y-1}\frac{w_{t+1}}{w_t}}{\min\left(car, Y-1-1986\right) - \frac{ncp}{365}}\,. \quad (4.21)$$

npen_v stands for newly granted pension benefit, *frc* for flat rate component (currently in 2022 amounts to 3,900 CZK ≈ 159 EUR), *erc* earnings related component, *pab* personal assessment base, *rb* reduction brackets (currently rb_1 = 17,121 CZK ≈ 697 EUR and rb_2 = 155,644 CZK ≈ 6,336 EUR),[50] *rc* reduction *coefficient* (currently rc_1 = 100% up to rb_1, rc_2 = 26% up to rb_2), *cp contribution* period up to the statutory retirement age in days (including non-contributory periods assessed as if contributory but only up to 80%), *ar* accrual *rate* (1.5%), *car* years of career, *Y* year of *retirement*, *ycb* yearly calculation basis[51] in present value calculated on the basis of index derived from the growth rate of average wage in the economy (*w*) and *ncp* is for excluded non-contributory periods.

The description concerns mainly old-age pensions. In fact, the same procedure is used for other pension benefits with minor changes in the pension formula. For details of calculation, see description in Section 1.1.1.

4.5.3 Block III – Average Pension and Total Pension Spending

In the base year the average pension benefit (for all types of pensions) is reported for each age and sex by the Czech Social Security Administration. It then enters the equation computing total pension expenditure. Total spending on a given type of pension (*pen_e*) in equation 4.22 is a function of the average pension benefit (*pen_v*) from the previous year indexed in accordance with the pension legislation (*index*), the value of newly granted average pension benefit (*npen_v*) calculated in the Block II of the model, and the number of pensions (*pen*) and newly granted pensions (*npen*) from the Block I.

[49] That is, the model assumes a constant probability of restoring the working capacity.

[50] rb_1 and rb_2 are assumed to develop with wages.

[51] Current legislation of the pension system takes into consideration all career years but not those before year 1986.

$$pen\_e_t = \sum_{g,s}\left(pen_t^{g,s} - npen_t^{g,s}\right)\cdot pen\_v_{t-1}^{g,s}\cdot\left(1+index_t\right)+npen_t^{g,s}\cdot npen\_v_t^{g,s}\,. \tag{4.22}$$

Total pension expenditure is simply a sum of the pension spending on all the pension types.

In the projection horizon the average pension benefit (*pen_v*) for a given generation *g* and sex *s* is calculated on the basis of the pension spending (*pen_e*) and the number of pensions (*pen*). The average pension in respective year of projection is a weighted average of average pension from the previous period and the newly granted pension benefits

$$pen\_v_t^{g,s} = \frac{pen\_e_t^{g,s}}{pen_t^{g,s}} = \frac{\left(pen_t^{g,s} - npen_t^{g,s}\right)}{pen_t^{g,s}}\cdot pen\_v_{t-1}^{g,s}\cdot\left(1+index_t\right)+\frac{npen_t^{g,s}}{pen_t^{g,s}}\cdot npen\_v_t^{g,s}\,. \tag{4.23}$$

Replacement rate of each pension type is simply share of average pension benefit of paid out pension (*pen_v*), resp. newly granted pension (*npen_v*), over average gross wage at retirement (*aw_ret*)

$$pen\_rr_t^{g,s} = \frac{pen\_v_t^{g,s}}{aw\_ret_t}, \qquad npen\_rr_t^{g,s} = \frac{npen\_v_t^{g,s}}{aw\_ret_t}. \tag{4.24}$$

4.6 Additional Features of the Model

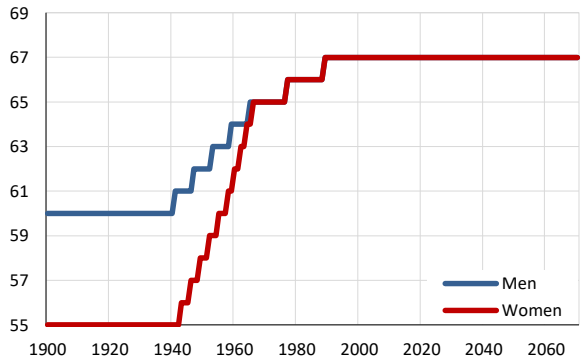
Statutory Retirement Age Increase

The model must take into consideration the continuous increase in retirement age. According to the legislation, statutory age changes for each generation by several months until the age ceiling at the age of 65. However, the model works with yearly data, therefore the evolution of statutory age is not so smooth. This causes a somewhat erratic development in case of data for new pensions.

There are still differences in retirement age not only in case of sexes, but for women the number of children raised matters too. For the modelling purposes, we assume an average woman has two children.

Figure 4.2: Evolution of Statutory Retirement Age in the Model

age for respective generation



Source: Pension Insurance Act (No. 155/1995), MoF calculations.

A Methodological Annex

Methodological annex summarizes required explanations of some pension projection features. To some extent, these issues are also included in several parts throughout the document, where the respective clarifications are needed.

Economy-wide average wage at retirement
In order to estimate the relationship between the economy-wide average wage and the average wage at retirement, we used the data of the Czech Statistical Office on wage distribution.

We start from wage statistics, published by Czech Statistical Office in structural statistics on employees' wages. Gross wages include all wages for work, including bonuses, as well as any wage compensation for time not worked (vacation, holidays, work interruptions, etc.) and on-call pay for the entire year. An employee's average salary in a given year is calculated by comparing it with his or her paid time, i.e., the number of months for which he or she actually received salary or wage compensation, less periods of sickness and other unpaid absences from work in that year.

These data are available for each calendar year in five-year cohorts, which we interpolate into individual age categories. Thus, we can derive the relative ratio of the pre-retirement wage to gross average wage from the same statistics. We then use this ratio to calculate the pre-retirement age from the gross average wage given by the AWG assumptions.

We examined data for past twenty years, which show relatively high inertia of the wage profile across the ages from 15 to 65+. This enables us to assume constant wage profile in the future. We assume the shift in the age specific wage profile from 2023 onwards with respect to postponement of retirement age and thus constant relationships to average wage. This means that the average gross wage at retirement grows exactly at the same pace as the average wage given by the AWG assumptions and is approximately by 2.9% lower than economy wide average wage.

Table A.1: Economy Wide Average Wage at Retirement Evolution
thousands of Euro

	2022	2030	2040	2050	2060	2070	% change 2022-2070
Economy-wide average wage at retirement	20.1	30.1	44.2	66.7	97.1	136.0	577.8
Economy-wide average wage	20.7	31.0	45.6	68.7	100.0	140.1	577.8

Source: European Commission, MoF calculations.

Pensioner cost of living index
Pensioner cost of living index is provided by Czech Statistical Office. The evolution of the index is tracked on consumption baskets based on a set of selected goods and services paid for by pensioners. These baskets are annually updated (always from January of the respective year).

Pensions vs. pensioners
The model primarily works with the number of pensions, not with the number of pensioners. The number of pensioners is somewhat lower than the number of pensions since some pensioners may be entitled to receive more (two) types of pension benefits. According to the Czech pension legislation recipients of disability or old-age pensions may under given conditions receive widow's/widower's pension at the same time. Thus, the number of pensioners can be obtained by subtracting the number of widow's/widower's pensions in concurrence with other pensions from the total number of pensions. The ratio between pensioners and pensions is rather stable over time amounting to 80% – 86%.

Pension taxation
Pension benefits are not taxed in absolute majority of cases. This is due to relatively high threshold up to which income of pensioners is tax exempt. Only pension benefits exceeding 3times minimum wage[52] are subject to 15% Personal Income Tax. Currently only a negligible number of pensioners (not even 1% of them) pays taxes. Moreover, such negligible personal income tax revenue is a source of the state budget and not of the social security system itself. For these reasons tax calculations are not part of projection exercise.

[52] Minimum gross wage is set from 1st January 2023 to be 207,600 CZK per year (approx. 8,450 EUR).

Disability pension
Disabled people of any type could occur only in ages under 65. At 65 they are automatically transferred to old-age pensions. There has not been any reform since last projections. Evolution of disability rates is rather stable over the horizon as illustrated in Table A.2. Graphical illustrations of disability profiles development can be found in Annex D.

Table A.2: Disability Rates by Age Groups
%

	2022	2030	2040	2050	2060	2070
Age group -54	3.3	3.0	2.8	2.7	2.9	2.9
Age group 55-59	14.2	12.2	11.1	10.9	11.0	11.1
Age group 60-64	13.5	12.0	12.4	12.7	14.6	14.8
Age group 65-69	0.1	0.0	0.0	1.2	3.3	3.7
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: Mof calculations.

Survivor pensions
The way of calculation of survivors' pensions is in detail introduced at the end of Section 4.5.1. Equation 4.10 and 4.15 give intuition, that the development of both widows'/widowers' and orphans' pensions is affected solely by population projection (and mortality rates). It is confirmed by illustrative graphs Figure D-18 and Figure D-19, where numbers of pensions are more or less stable over projection horizon. The same applies to expenditure too as replacement rates are constant over time. See Figure D-25 and Figure D-26.

Non-earnings-related minimum pension
Desired minimum amount of any pension is ensured by the flat rate component (which is the same for everyone) and the minimum earnings-related component for each pension type. Another instrument that also prevents people from the poverty is the institute of the subsistence level.[53] Both these instruments are set by the government and are revaluated on irregular basis. There is not any special minimum pension scheme besides this one inbuilt in all pension types. For details of pension calculations see system description in Section 1.1.1.

Contributions
Public pension contributions are paid by working population from their wages that develop in line with GDP over the horizon. We assume constant contribution rate, which equals to 28% as stipulated by law. Contribution burden is shared between employee (6.5%) and employer (21.5%). This results in the constant share of contributions on GDP in all projection years.

Alternative pension spending decomposition
Not surprisingly Table A.3 is similar to Table 3.4 with the difference that it focuses rather on decomposition based on number of pensions instead of pensioners. The results are, however, quite similar. The difference between pensions and pensioners is caused solely by widow's/widower's pensions in concurrence, which is not considered among the number of pensioners. Dependency ratio and Labour market effect differs only marginally in the two tables, as number of pensions or pensioners do not play a role here. Coverage ratio and benefit ratio changes over decades are comparable.

[53] A person whose income is lower than the subsistence level has a claim for social support benefits.

Table A.3: Factors behind the Change in Public Pension Expenditures between 2022 and 2070 – Pensions
alternative decomposition, in percentage points of GDP

	2022 - 2030	2030 - 2040	2040 - 2050	2050 - 2060	2060 - 2070	2022 - 2070
Public pensions to GDP	-0.4	0.4	0.7	0.1	-0.5	0.3
Dependency ratio effect	0.6	1.3	1.6	0.7	-0.7	3.5
Coverage ratio effect	-0.3	-0.5	-0.5	-0.2	0.1	-1.5
Coverage ratio old-age	-0.1	-0.3	-0.2	-0.1	0.0	-0.7
Coverage ratio early-age	-1.9	-0.5	-0.1	-0.4	-0.4	-3.3
Cohort effect	0.7	-1.1	-2.3	-0.9	1.5	-2.2
Benefit ratio effect	-1.1	-0.2	-0.1	-0.2	0.0	-1.6
Labour Market/Labour intensity effect	0.1	-0.1	-0.2	-0.1	0.1	-0.2
Employment ratio effect	0.1	0.0	-0.1	-0.1	0.0	-0.1
Labour intensity effect	0.0	0.0	0.0	0.0	0.0	0.0
Career shift effect	0.1	-0.1	-0.1	0.0	0.0	-0.1
Residual	0.3	-0.1	-0.1	0.0	0.0	0.1

Source: European Commission, MoF calculations.

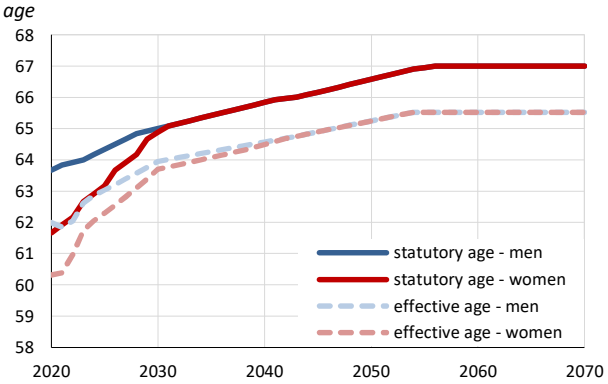
B Annex: Coverage Rate Adjustments

This annex aims at shedding some light on differences between the Cohort Simulation Model (CSM) and the national pension model that have impact on pension projection exercise. Naturally, there are and will be reasonable differences between the two models by definition. Therefore, it requires more explanations how the pension model has been adjusted, mainly on the share of pensioners over inactive people, as illustrated in Table 3.7 and Table 3.9.

Statutory Retirement Age vs. Effective Retirement Age

What drives the decline in the coverage rate is the difference between the statutory retirement age and effective retirement age assumed by CSM. The Czech Republic has legislated an increase in the statutory retirement age up to 67 years as shown in the following Figure B.1. Although the retirement age is assigned to each generation (according to the year of birth), with a simple calculation, it can be assigned to calendar years as depicted by solid lines for men and women. This retirement age postponement is crucial for the pension model, which shifts the profiles of pensions according to that, as shown in Equation 4.5.

Figure B.1: Statutory Retirement Age vs. Effective Exit Age in CSM Assumptions



Source: European Commission, Pension Insurance Act (No. 155/1995).

On the other hand, macroeconomic assumptions work with effective retirement. It is assumed that with increasing retirement age there will be a weaker link between the two ages, i.e., the higher the retirement age the more people will tend to leave labour market relatively earlier.[54] Thus the share of inactive people over population increases.

Pension model adjustments

Pension model, as was introduced in Section 4.5.1 respects current legislation and shifts profiles with respect to statutory retirement age, which is the only relevant age for e.g., old-age pension entitlements. On the other hand, there is an automatic adjustment from the disability pensions' scheme. As visible in quoted Figures, the share of disabled people in population increases with age. This increase and shifts of profile stem from past observed data.

However, the pension model incorporates additional adjustments in order to consider the commonly agreed assumption to the highest possible extent. But at the same time, it is important to stick to the assumption of no-policy change projections. With this regard, the only solution seems to assume that people will opt much more for early retirement as the pension age increases. Therefore, the model takes the initial result of projection of numbers of pensions and calculates numbers of uncovered inactive people. Then, it analyses, whether a person could possibly be entitled for early retirement pension. If yes, such a person is additionally assigned early retirement pension. In this respect, we assume that this additional demand for early retirement increases with the proximity of statutory age. The problem is that old-age pensions are, in case of some ages and cohorts (namely 55–59), unable to cover additional inactive people, as they are not allowed even for early retirement.

In addition to that, we expect that in line with this rationale more people will tend to withdraw their capital savings from 3rd pillar and opt for pre-retirement scheme.[55]

There are not additional adjustments made in other types of pensions, e.g., in disabilities. Last observed data and the reform effective since 2010 show strong effect of tightening eligibility conditions in order to limit possible leaking from labour market. To use disability pensions for increasing coverage, it would require quite substantial jumps in disability profiles. This would violate the rule of no policy change.

[54] However, recent data shows that it has not been the case as effective retirement age develops with statutory retirement age. This is mainly due to very strict and painful penalizations for early retirement.

[55] For details about pre-retirement scheme see Section 1.1.2.

C Annex: Retirement Age

Table C.1: Retirement Age by the Year of Birth

y = year, m = month

Generation	Men	Women and number of raised children				
		0	1	2	3 and 4	5+
1936	60y+2m	57y	56y	55y	54y	53y
1937	60y+4m	57y	56y	55y	54y	53y
1938	60y+6m	57y	56y	55y	54y	53y
1939	60y+8m	57y+4m	56y	55y	54y	53y
1940	60y+10m	57y+8m	56y+4m	55y	54y	53y
1941	61y	58y	56y+8m	55y+4m	54y	53y
1942	61y+2m	58y+4m	57y	55y+8m	54y+4m	53y
1943	61y+4m	58y+8m	57y+4m	56y	54y+8m	53y+4m
1944	61y+6m	59y	57y+8m	56y+4m	55y	53y+8m
1945	61y+8m	59y+4m	58y	56y+8m	55y+4m	54y
1946	61y+10m	59y+8m	58y+4m	57y	55y+8m	54y+4m
1947	62y	60y	58y+8m	57y+4m	56y	54y+8m
1948	62y+2m	60y+4m	59y	57y+8m	56y+4m	55y
1949	62y+4m	60y+8m	59y+4m	58y	56y+8m	55y+4m
1950	62y+6m	61y	59y+8m	58y+4m	57y	55y+8m
1951	62y+8m	61y+4m	60y	58y+8m	57y+4m	56y
1952	62y+10m	61y+8m	60y+4m	59y	57y+8m	56y+4m
1953	63y	62y	60y+8m	59y+4m	58y	56y+8m
1954	63y+2m	62y+4m	61y	59y+8m	58y+4m	57y
1955	63y+4m	62y+8m	61y+4m	60y	58y+8m	57y+4m
1956	63y+6m	63y+2m	61y+8m	60y+4m	59y	57y+8m
1957	63y+8m	63y+8m	62y+2m	60y+8m	59y+4m	58y
1958	63y+10m	63y+10m	62y+8m	61y+2m	59y+8m	58y+4m
1959	64y	64y	63y+2m	61y+8m	60y+2m	58y+8m
1960	64y+2m	64y+2m	63y+8m	62y+2m	60y+8m	59y+2m
1961	64y+4m	64y+4m	64y+2m	62y+8m	61y+2m	59y+8m
1962	64y+6m	64y+6m	64y+6m	63y+2m	61y+8m	60y+2m
1963	64y+8m	64y+8m	64y+8m	63y+8m	62y+2m	60y+8m
1964	64y+10m	64y+10m	64y+10m	64y+2m	62y+8m	61y+2m
1965	65y	65y	65y	64y+8m	63y+2m	61y+8m
1966	65y+1m	65y+1m	65y+1m	65y+1m	63y+8m	62y+2m
1967	65y+2m	65y+2m	65y+2m	65y+2m	64y+2m	62y+8m
1968	65y+3m	65y+3m	65y+3m	65y+3m	64y+8m	63y+2m
1969	65y+4m	65y+4m	65y+4m	65y+4m	65y+2m	63y+8m
1970	65y+5m	65y+5m	65y+5m	65y+5m	65y+5m	64y+2m
1971	65y+6m	65y+6m	65y+6m	65y+6m	65y+6m	64y+8m
1972	65y+7m	65y+7m	65y+7m	65y+7m	65y+7m	65y+2m
1973	65y+8m	65y+8m	65y+8m	65y+8m	65y+8m	65y+8m

Note: Each younger generation born after 1973 has the retirement age higher by 1 month until the generation born in 1989 and younger, for which the retirement age is set to be 67 years.

Source: Pension Insurance Act (No. 155/1995).

D Annex: Detailed Results

This Annex brings an overview of more detailed results for illustration so the reader can better see what is behind the results.

Cross sectional profiles – age specific shares

The following figures show cross sectional profiles in specific years that reflect the calendar year, in which the statutory retirement age increases by one additional year. It is apparent that the process takes longer for women despite the faster speed (rise by 2 months a year for men compared to 4 months for women) until they reach the retirement age of men. It is a result of the much higher increase in statutory age for women.

Figure D.1: Old-Age Pensions – Males

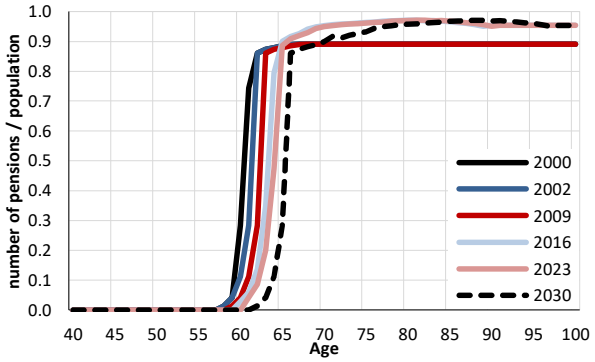


Figure D.2: Old-Age Pensions – Females

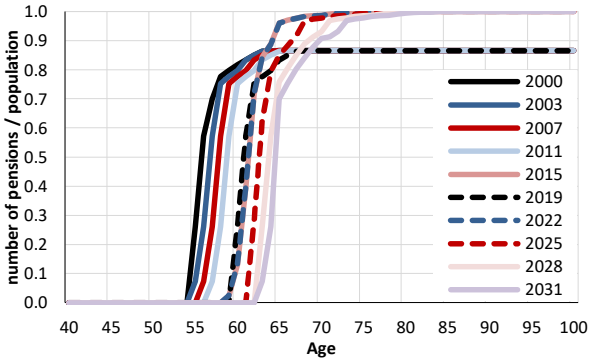


Figure D.3: 3rd Degree Disability Pensions – Males

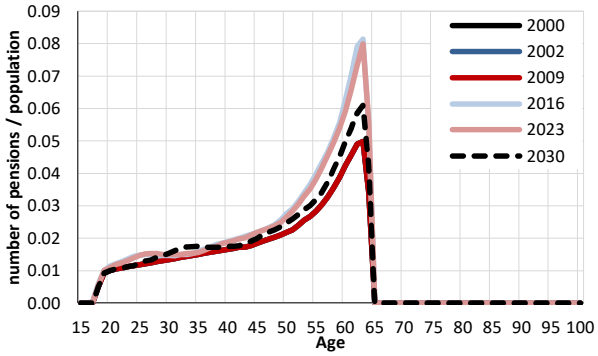


Figure D.4: 3rd Degree Disability Pensions – Females

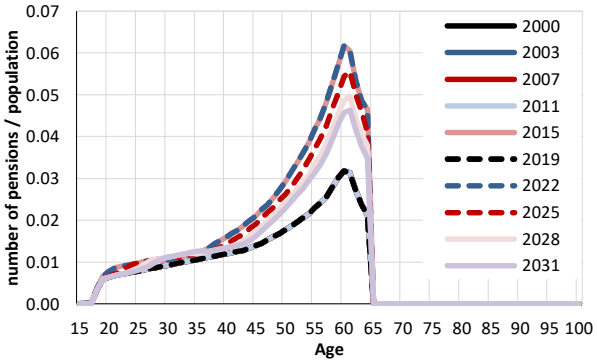


Figure D.5: 2nd Degree Disability Pensions – Males

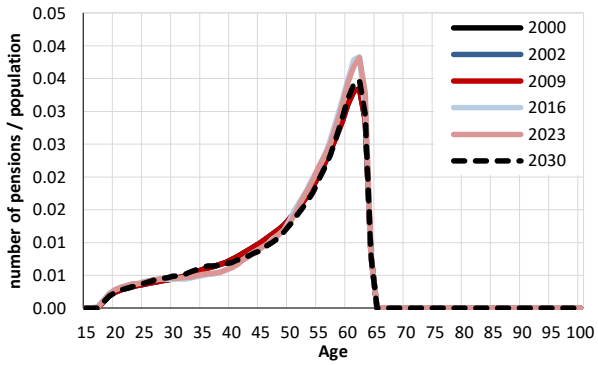


Figure D.6: 2nd Degree Disability Pensions – Females

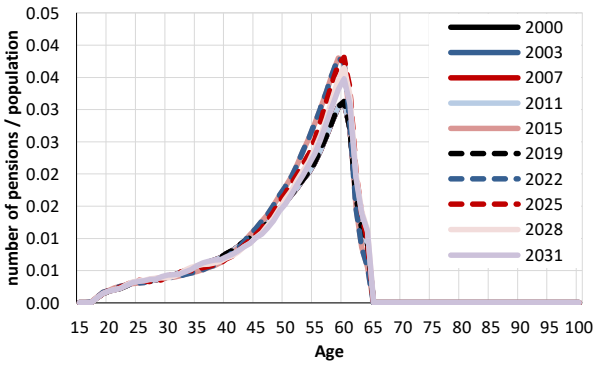


Figure D.7: 1st Degree Disability Pensions – Males

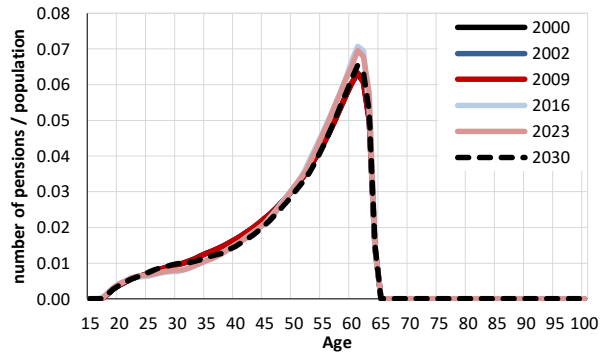
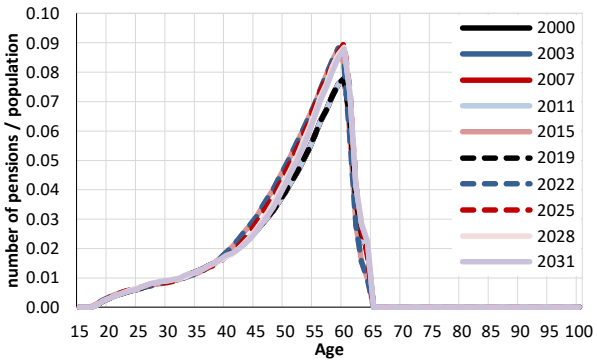


Figure D.8: 1st Degree Disability Pensions – Females



Note that minor changes in the peak of profiles for disability pensions for years at the beginning of projections are caused by generational effect of the 2010 reform. However, important feature of profiles – an increase of disability shares for pre-retirement ages – are clearly visible for projection years as retirement age increases.

Figure D.9: Widower's Pensions – Males

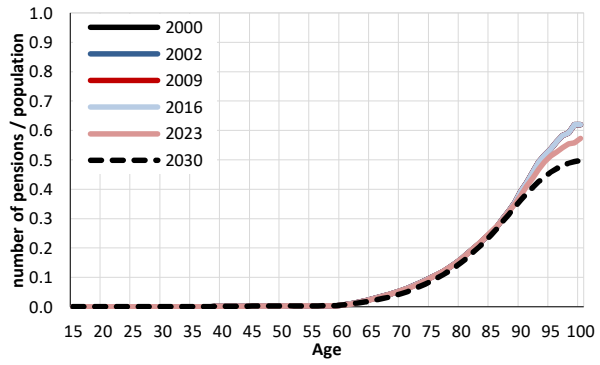


Figure D.10: Widows' Pensions – Females

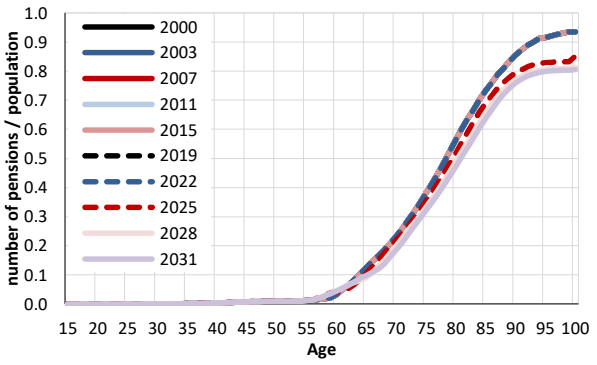


Figure D.11: Orphan's Pensions – Males

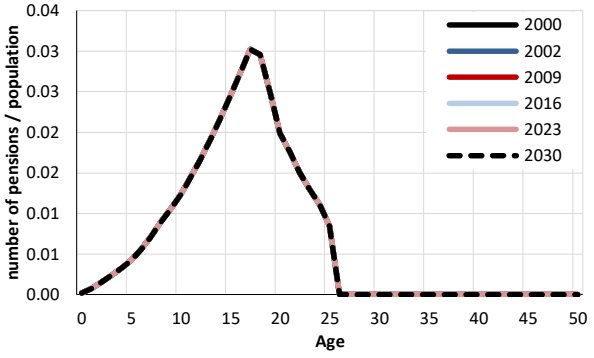
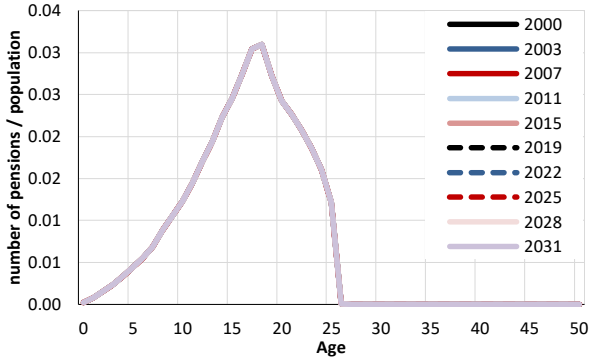


Figure D.12: Orphan's Pensions – Females



Profiles of orphans' pensions do not change with retirement age and are held constant for all years of projection.

Numbers of pensions

Figure D.13: Number of Pensions - All Pensions

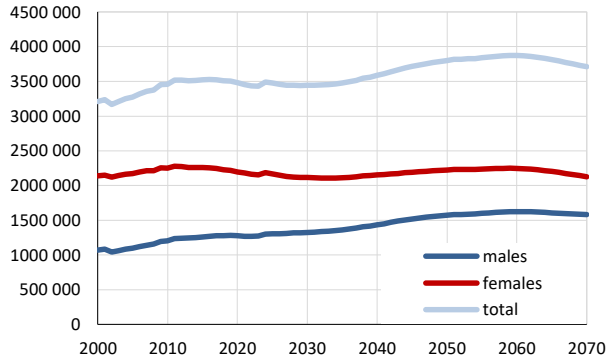


Figure D.14: Number of Pensions - Old-Age Pensions

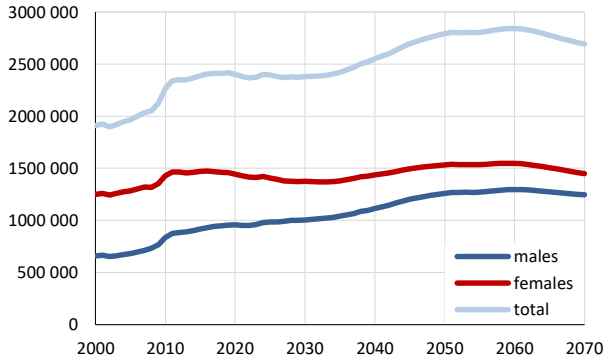


Figure D.15: Number of Pensions - 3rd Degree Disability Pensions

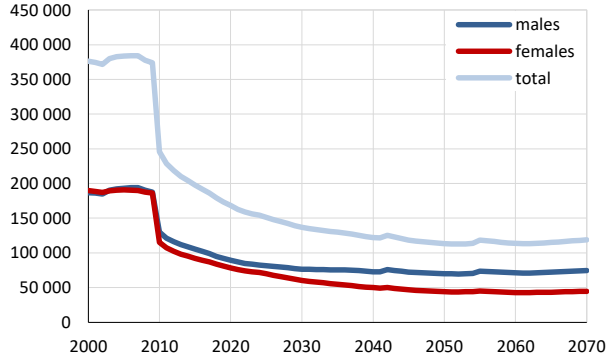


Figure D.16: Number of Pensions - 2nd Degree Disability Pensions

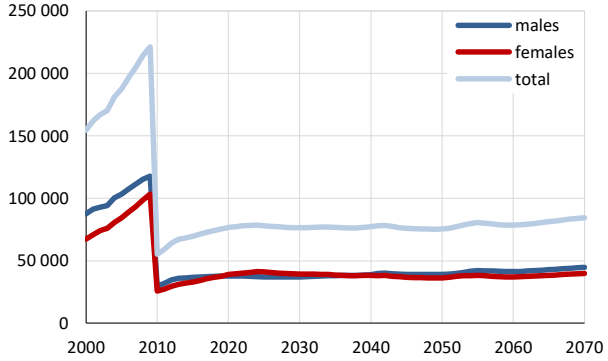


Figure D.17: Number of Pensions - 1st Degree Disability Pensions

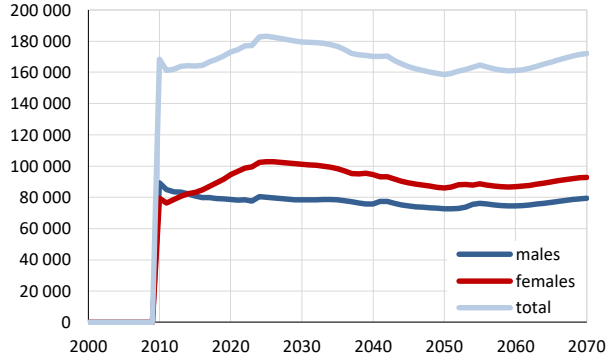


Figure D.18: Number of Pensions - Widows'/Widowers' Pensions

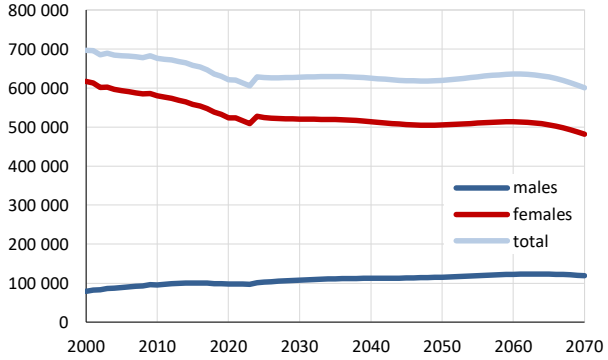
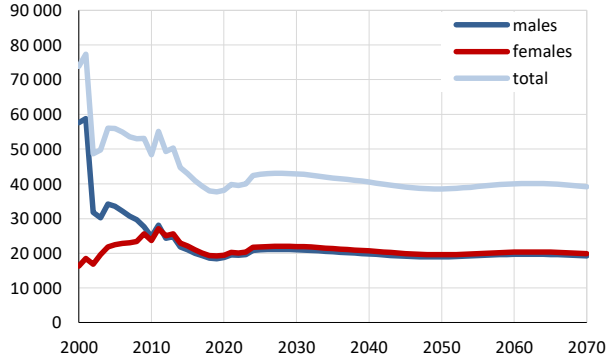


Figure D.19: Number of Pensions - Orphans' Pensions



Replacement rates

Figure D.20: Replacement Rates - All Pensions

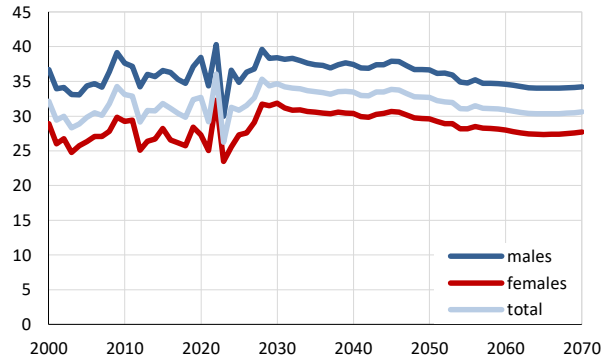


Figure D.21: Replacement Rates - Old-Age Pensions

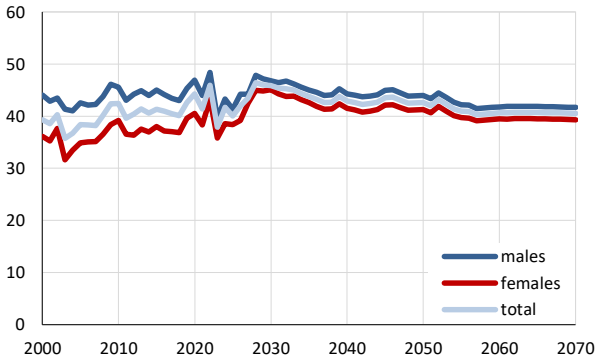


Figure D.22: Replacement Rates - 3rd Degree Disability Pensions

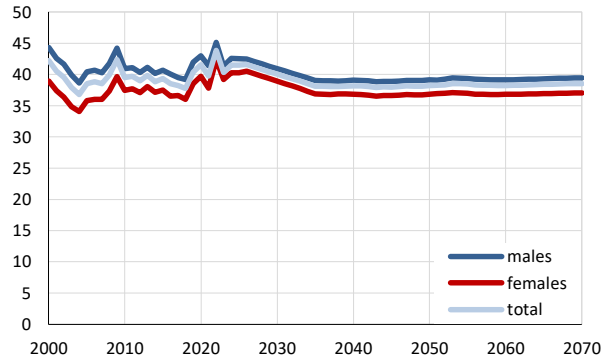


Figure D.23: Replacement Rates - 2nd Degree Disability Pensions

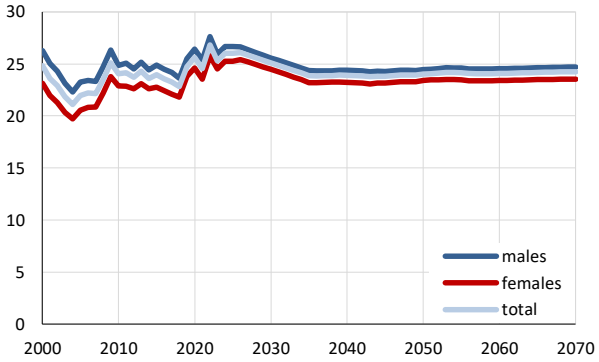


Figure D.24: Replacement Rates - 1st Degree Disability pensions

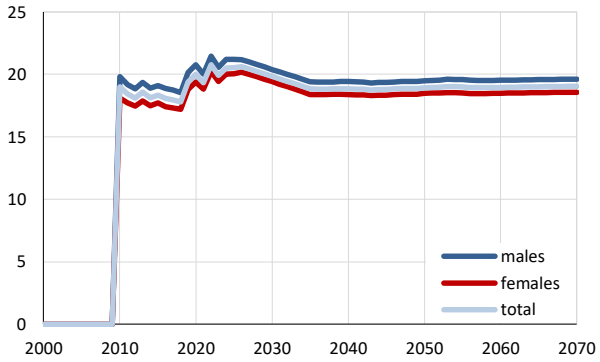


Figure D.25: Replacement Rates - Widows'/Widowers' pensions

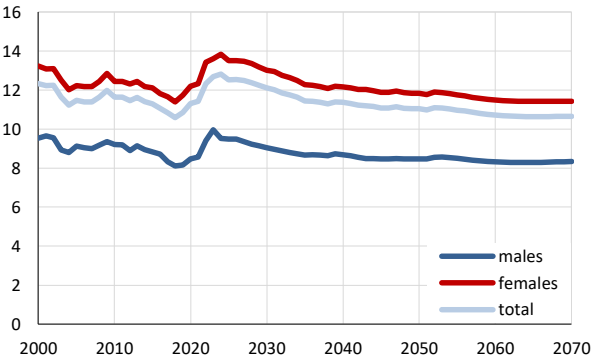
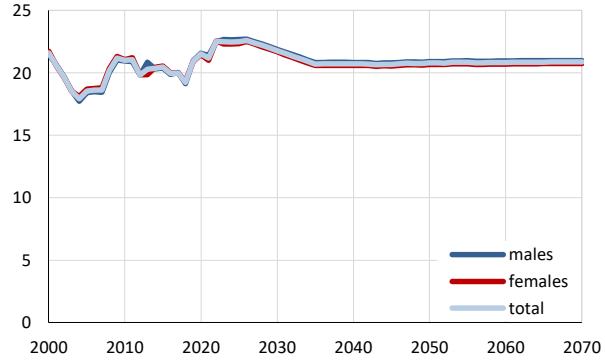


Figure D.26: Replacement Rates - Orphans' Pensions



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