Long-term projections of pension adequacy in a selection of countries

Report produced in the context of the 2024 Pension Adequacy Report

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Executive summary

Since a couple of decades, the pension policy of member states is a focal point of attention on the European level. The Working Group on Ageing Populations and Sustainability produces the 2024 Ageing Report, which provides long-term projections of the economic and budgetary impact of population ageing at unchanged policy. The SPC Working Group on Pension Adequacy (SPC WGPA) in its Pension Adequacy Report (PAR) assesses the adequacy of pensions in the European Member States. This report includes prospective Theoretical Replacement Rates, which describe how a hypothetical retiree's pension income in the first year after retirement would compare to their earnings immediately before retirement. In the 2024 PAR, this hypothetical individual is assumed to start his or her career in 2022 and retire in 2062. Prospective values of the key ISG indicators, such as the at-risk of poverty rate or the Gini, are not available.

Dynamic microsimulation models allow to simulate the behaviour of individuals and households over time. Often but not always, these models do this while aligning to auxiliary information, such as the projections of demographic or macroeconomic models. It was decided in the SPC WG AGE that Belgium, Czechia, Norway and Slovenia would use their dynamic microsimulation models to simulate possible developments of pension adequacy, while taking into account the projections and hypotheses of the 2024 Ageing Report[1]. This report presents the results of this project, and therefore shows for a selection of countries (Belgium, Czechia, Slovenia, and Norway) how the adequacy of pensions would develop given the budgetary costs of ageing set out by the 2024 Ageing Report.

1. Introduction

Every three years, the European Commission and the Social Protection Committee publish a Pension Adequacy Report, which provides an overview of the current and future adequacy of old-age incomes in EU Member States. A crucial indicator of adequacy is the at-risk-of-poverty rate of older people. Results for this indicator are however only given for past years. Future adequacy is assessed mainly on the basis of the Theoretical Replacement Rates (TRRs), which show future theoretical replacement rates for a range of model persons (e.g. the base case is a person who has worked 40 years full-time at the average wage).

The purpose of this report is to show for a selection of countries (Belgium, Slovenia, Czechia, and Norway) that dynamic microsimulation models can produce projections of the future at-risk-of-poverty rates of older people and pensioners. These simulations are made in such a way that they are consistent with projections of both Eurostat (for the demography) and the Ageing Working Group (AWG), which gets its mandate from the Economic Policy Committee[2]. In this way, they allow to assess jointly the financial and

[1] Note that in Belgium, the budgetary and adequacy projections are produced by two separate models; the former by a semi-aggregate model MALTESE and the latter by a dynamic microsimulation model MIDAS. In Slovenia, Czechia and Norway, the dynamic microsimulation models produce both budgetary and adequacy projections.

[2] Note that, by convention, pension expenditures in the Ageing Report include disability pensions. In contrast to Slovenia, pen-sions in Norway and Belgium in this report do not include disability benefits. This does not make much of a difference for the poverty risks or inequality indicators of various groups, since these are based on total equivalent household income, and therefore do include disability pensions. Neither does it make a difference for the definition of elderly, but for the Belgian and Norwegian results, the definition of 'pensioners' refers to old-age pension recipients only, while in Slovenia it includes disa-bility pension recipients. The impact of this difference is however minimal.

social sustainability of pensions in these countries, using the AWG reference scenario and several sensitivity tests and alternative policy scenarios.

Similar simulations of at-risk-of-poverty rates were produced in the contexts of the Pension Adequacy Reports of 2015, 2018 and 2021, though the sets of countries varied: Belgium, Hungary and Sweden in 2015, Belgium, Italy and Sweden in 2018 and Belgium, Hungary and Italy in 2021. See Dekkers et al. (2015), Dekkers et al. (2018) and European Union (2021).

The simulations presented in this report are produced through dynamic microsimulation models. The Belgian results are produced by the model MIDAS, developed and used by the Belgian Federal Planning Bureau. The results for Norway come from the model MOSART; which is developed and used by Statistics Norway. The results for Slovenia come from the model DYPENSI from the Institute for Economic Research, Slovenia. Finally, the results for Czechia are produced by the model NEMO, from the Ministry of Labour and Social Affairs of Czechia.

This note is structured as follows. The next section describes briefly the AWG projections and hypotheses for the countries involved in this microsimulation project. These projections are used as input for the dynamic microsimulation models and also form the background by which the adequacy results can be evaluated. It also presents the reference scenario and the alter-native scenarios which serve as sensitivity tests. Section three, after a short introduction to dynamic microsimulation models, discusses the simulation results by country. Section four contains a brief conclusion.

2. A brief discussion of the AWG results on the financial sustainability of pensions

In order to assess the long-term financial sustainability of pension systems in the EU, the Economic Policy Committee (EPC) mandates the Ageing Working Group (AWG) to produce the Ageing Report, which contains budgetary projections for each Member State and Norway between 2022 and 2070 based on comparable and consistent projections and assumptions, using the latest Eurostat population projections as the starting point.

As such, the AWG projections for this report provide a background by which the adequacy results can be evaluated. This section of the report therefore briefly describes the underlying assumptions, trends and results for the countries involved in this simulation project.

2.1. Demographics

The first step of the AWG projections is the demographic projections produced by Eurostat. These follow a partial convergence approach where the demographic determinants are assumed to converge between member states (henceforth MS) in the very long run, and often even well beyond the simulation horizon. On fertility and mortality rates, the projection methodology would gradually move from a country-specific extrapolation to a convergence path towards the ‘best performing’ Member States. As a result, fertility would grow more in Belgium, followed by Norway, Slovenia and the least in Czechia (European Union, 2023, Table I.1.2, page 13).Similarly, the increases of life expectancy at 65 would be a bit higher than the EU average in Czechia and Slovenia, while they would be lower for Belgium, and Norway.

Concerning migration, after the high values in 2022 (following the war in Ukraine), net annual inflows are assumed to return to their pre-2022 values by the mid-2020s, after which net migration would roughly converge to a level of 0.2 to 0.3% of population per year.

All in all, the population of the EU as a whole would decline by 4% between 2022 and 2070 (European Union, 2023, Table I.1.7, page 21). However, this development would be highly diverse when the different countries are considered. In Belgium and Norway, population would increase by 9% and 20% between 2022 and 2070, while it would decrease by 5% in Slovenia. Finally, in Czechia, the decline would be small (2%).

Table 1 – Population projections and dependency ratios

	Population in mio		%-change	Old-age dependency ratio(1)		Pps change 22-70	Very old-age dependency ratio(2)		Pps change
	2022	2070	2022-2070	2022	2070	2022-2070	2022	2070	2022-2070
BE	11.7	12.7	9%	33.7	53.0	19.2	9.5	21.3	11.8
CZ	10.7	10.6	-2%	34.9	51.5	16.6	7.3	22.4	15.0
SI	2.1	2.0	-5%	36.1	57.5	21.5	9.5	26.3	16.7
NO	5.4	6.5	20%	31.2	54.4	23.2	7.6	21.3	13.7
EU	449.1	431.9	-4%	36.1	59.1	23.0	10.3	25.3	14.9

(1) 65+/20-64
(2) 80+/20-64

Source of the financial budget impacts: European Union, 2023, Table I.1.7 (page 21) and Table I.1.9 (page 24).

The projections of increasing but still rather low fertility and higher life expectancy would result in demographic ageing, by which the old-age dependency ratio would increase between 17 and 25 percentage points. Also the very old-age dependency ratio would increase, between 12 and 17 pp.

Note, finally that, compared to the 2021 Ageing Report, the projected EU population in 2070 would end up about 2% higher. For the participating countries in this microsimulation exercise, this difference (relative to the 2019 projections) would range between 7% for Belgium and -3% for Norway.

2.2. Labour market projections

Concerning the labour market projections, increasing participation rates and decreasing unemployment and non-employment rates among older workers and especially women would drive up the employment rates. In Belgium and Norway, these would be enough to counter the decrease of the active population, so the number of people at work and total hours worked would increase. However, for the EU, Czechia, Slovenia and most of the other MS, this would not be the case, so that the number of people at work and total hours worked would decline.

But irrespective of whether labour supply increases or not, demographic ageing would still drive up the economic old-age dependency rate (older people relative to employed people) and the economic dependency rate (inactive people relative to employed people) in the EU and all member States, and this especially up to 2045.[3]

2.3. Economic growth

In a third step, projections of labour productivity are based on various economic assumptions. In technical terms, labour productivity is composed of TFP (total factor productivity) growth and capital deepening.

The real wage growth rate is assumed to be equal to the real labour productivity growth rate. In average over the entire simulation period, it varies between 1.1% in Belgium and 1.7% in Slovenia. With the exception of Slovenia, labour productivity growth would be lowest up to the end of the current decade and would then increase to reach its highest average value in the 2040s, after which it would fall back to a long-term level that still would be higher than today (European Union, 2023, Table I3.3, I3.4 and I3.5).

Table 2 – Labour productivity (reference scenario)

Average annual growth rate in %

	2022-2030	2031-2040	2041-2050	2051-2060	2061-2070	2022-2070
Belgium	0.5	1.0	1.4	1.3	1.3	1.1
Czechia	1.2	1.9	2.1	1.8	1.8	1.4
Slovenia	2.2	2.1	1.7	1.5	1.3	1.7
Norway	0.9	1.0	1.4	1.3	1.3	1.2
EU	1.1	1.5	1.7	1.5	1.3	1.4

3 For most countries, these projections are a bit more favourable than those used in the 2021 Ageing Report. This is the result of higher populations and higher participation rates and lower unemployment rates projections. So, the employment rate is a bit higher. In Belgium, for example, total population in 2070 would end up 7.2% higher in the 2024 projections than the 2021 projections (FPB, 2023, Belgium Country Fiche, 10). Furthermore, the Labour Force Survey in recent years show an increasing participation rate for the 25-54 age group, which was not included in the 2021 simulation results. In addition, the marked expected increase of the unemployment rate following the Covid-crisis that was included in the 2021 projections turned out to be fairly small. As a result, the Belgian starting level for unemployment in the long run is lower in 2024 than it was in 2021. Consequently, the employment rate is higher in the 2024 projections than it was in the 2021 projections.

2.4. Financial sustainability of pensions

The information on the various key variables and developments in the reference scenario and the alternative scenarios are used to produce estimates of the budgetary costs of ageing. In this section, the pension results of this exercise will be briefly discussed. For a more extensive presentation, the reader is referred to the various Country Reports as well as the 2024 Ageing Report.

Table 3 – Projected gross public pension spending

In % of GDP

	Belgium				Czechia				Slovenia				Norway			
	2022	Peak value	Peak year	Change pps(1)	2022	Peak	Peak year	Change	2022	Peak	Peak year	Change	2022	Peak value	Peak year	Change pps
Total public pension scheme	12.7	16.2	2070	3.5	8.1	10.8	2056	1.7	9.8	13.8	2057	3.8	10.8	12.5	2070	1.7
Old-age and early pensions	10.4	14.5	2070	4.1	6.6	9.4	2058	1.7	7.9	11.4	2056	3.4	7.6	9.2	2070	1.6
Disability pensions	1.6	1.7	2031	-0.1	1.0	1.2	2038	0.1	0.9	2.0	2059	0.3	3.2	3.6	2030	0.1
Survivor pensions	0.7	0.7	2022	-0.5	0.5	0.5	2022	0.0	1.0	1.3	2063	0.3	-	-	-	-

(1) The “change pps” describes the rate of change in percentage points between 2022 and 2070.

Source: FPB, Country Report 2023, Table 9, page 15; without foreseen measures (see footnote 5). Other countries: the specific Country Reports. Note that pension expenditures in the Ageing Report include disability pensions.

Compared to other countries, survivors' pension is less important in Norway. It is being phased out for younger cohorts and replaced with an adjustment allowance. The projections do not include this adjustment allowance. Furthermore, the number of people on disability benefits is already quite high in Norway and therefore not projected to increase in the future.

Between 2022 and 2070, total public pension expenditures would increase by 3.5 percentage points of GDP in Belgium. This would be largely due to the increase in old-age and early retirement pensions, while disability pensions and especially survivors' pensions would decrease as a percentage of GDP.

In Czechia the pension expenditure is projected to increase by 1.7 percentage points of GDP. At the simulation horizon, the expenditure trajectory will have been downward, as the highest expenditure would be reached approximately a decade earlier in late 2050s at 10.8 percentage points of GDP. The change is driven by old-age pensions as disability and survivor pension expenditure are expected to remain broadly unchanged throughout the projection timeframe.

Slovenian total public pension expenditures will peak in the late 2050s when they reach the level of 13.8 per cent of GDP. The increase will be largely driven by the increase in the old-age and early retirement pensions. On the other hand, disability and survivor pensions would contribute to the public pension expenditures increase to a lesser extent.

For Norway, the spending on public pension in percent of GDP increases slightly over the projection period. In principle, the Norwegian system should stabilize spending, provided that the longevity adjustment is actuarially neutral and workers respond by prolonging their working lives. However, the longevity adjustment is based on a moving average of ten years and is therefore less than actuarially neutral. Furthermore, the AWG baseline projections do not include life expectancy effects on labour market participation, which means that the increase of labour market participation rates will be too low to compensate for these actuarial corrections. As a result of these two effects, spending on public pensions to GDP would increase slightly.[4]

3. Sensitivity tests

As is traditional, the AWG highlights that the reference scenario is produced with lots of assumptions and therefore comes with uncertainty. So "it is essential" (European Union, 2023, 76) that the reference scenario is considered in conjunction with sensitivity tests and alternative policy scenarios to assess how these assumptions affect the results. The sensitivity tests introduce a change to a specific variable, and serve to show the impact of key factors on the simulation results in the reference scenario.

The following table shows these tests and scenarios together with a summarizing description and the abbreviation that will be used in the remaining text.

[4] Note that a currently debated government proposal will increase government spending on public pensions, mainly due to a more generous indexation of the guarantee-pension level. It will also increase spending on disability pension due to the shielding of formerly disabled old-age pensioners' benefits. The latter involves transferring disability recipients from disability pension to old-age pension at an increasing age for each cohort. This effect is not accounted for in these projections, as they are not yet passed in the parliament.

Table 4 – Sensitivity tests

Name		Description	BE	CZ	SI	NO
Alternative scenarios/sensitivity tests						
Higher Life expectancy	HLE	+ 2 years in 2070	X	X	X	X
Lower migration	LMIG	33% less non-EU migration over projection period	X	X	X	X
Higher migration	HMIG	+ 33%	X	X	X	X
Lower fertility	FERLOW	20% lower fertility rate over projection period	X	X	X	X
Higher inflation	HINF					
Higher Employment Rate of Older Workers	OER	10pps above reference scenario	X		X	
Higher TFP growth	TFPHIGH	Growth increases from 0.8% (ref) to 1%	X	Not relevant		X
Lower TFP growth	TFPLOW	Growth decreases from 0.8% (ref) to 0.6%	X	Not relevant		
Pension policy scenarios						
Link retirement age to life expectancy		Effective RA increases with 2/3 of expected life expectancy		X		
Constant retirement age	CRA	All labour market exit ages remain as in 2023	X			
Offset declining pension benefit ratio	CBR	Undefined measures are taken to prevent the benefit ratio falling below 10% lower than in the reference scenario	Not relevant	Not relevant		

In the Higher Life Expectancy (HLE) scenario, the age-specific mortality rates are reduced gradually so that life expectancy at birth increases by of two years by 2070 compared to the baseline. In the lower and higher migration scenarios (LMIG, HMIG), immigration of non-EU nationals is, respectively, 33% lower and 33% higher than the baseline over the entire projection period. The lower fertility scenario (FERLOW) sets the fertility rate in all countries 20% lower than in the reference scenario. The higher inflation scenario reduces the speed by which the inflation rate converges to the ECB target. In the case of Belgium, the impact of this scenario on financial sustainability is very small[5]. Furthermore, it is not relevant for the adequacy simulations, as all benefits are at least indexed to prices. In the

[5] Note, furthermore, that the results of this sensitivity test are not discussed in the Ageing Report but limited to the Country Fiches. The reason is that the results were for technical reasons not comparable across countries.

Higher Employment Rate of Older Workers scenario, the employment rate of the older population increases by 10 pps relative to the reference scenario by 2036 and stays at that higher level thereafter. In the Lower and Higher Total Factor Productivity Growth scenarios, the total factor productivity growth in the long run, is 0.6% (TFPLOW) and 1% (TFPHIGH), compared to a steady state growth rate of 0.8% in the reference scenario. Finally, the AWG develops three policy variants that change several parameters in a "what-if view to enrich the analysis" (European Union, 2023, 76). The first of these policy variants increases the effective retirement age with 2/3rds of the expected change in life expectancy. The second, the Constant Retirement Age scenario freezes labour market exit ages to their 2023 values. Note that in the CRA variant the already legislated increases of the SPA like in Belgium will not be implemented. Finally, the Offset declining Benefit Ratio scenario gives the MS freedom in simulating measures to keep the benefit ratio from falling more than 10% relative to the reference scenario. As this last scenario is not included in the Ageing Report, we do not include it here either.

4. Simulation results of pension adequacy

4.1. Microsimulation: what, why and how?

The key characteristic of microsimulation models is that modelling is done on the level of the individual agent, particularly the individual or their household. Microsimulation is able to simulate the entire distribution of a variable, and not just the aggregates, which makes it especially suitable to produce indicators of (re-)distribution, inequality, and poverty. Microsimulation models allow an exact description of all rules in e.g. the tax or the pension system. The database of microsimulation consists usually of a representative sample of micro-units (individuals, households, enterprises) from a population.

Dynamic microsimulation models have the additional feature that simulations are done for several periods (years). Starting from a dataset of observed individuals in a first period, dynamic microsimulation models build up complete synthetic life histories by changing the characteristics of these individuals throughout subsequent periods. This includes the simulation of demographic events, such as death, birth, marriage, cohabitation and divorce, and also retirement, unemployment, disability and other labour market transitions. Often, these simulations include a stochastic element.

In addition, earnings and social-security benefits are derived using wage equations and simulation of the rules of those benefits. Most dynamic microsimulation models do not include a macro-economic model. Typically, dynamic microsimulation models (including those used for the simulations in this note) constrain or calibrate their results to external (semi-)aggregate information. E.g. mortality, marriage, divorce and birth rates are aligned to the outcomes of demographic models. Participation rates, unemployment and disability rates are aligned to the projections made with meso-economic models. Earnings (or wage rates) are adjusted so they correspond to the growth rates produced through macroeconomic modelling.

4.2. Risk of poverty and inequality

The risk of poverty (AROP, at-risk-of-poverty rate) is defined in accordance with the scoreboard of the European Pillar of Social Rights[6], implemented by Eurostat, namely as the proportion of individuals who live in a household where the equivalent household income is lower than 60% of the median. Equivalent income is the total net income of all household members added up and corrected for the size and composition of the household through the so-called modified OECD-equivalence scale, which assigns a weight of 1.0 to the first adult; 0.5 to the second and each subsequent person aged 14 and over and 0.3 to each child aged under 14. AROP reflects a notion of poverty that is relative to the standard of living of a society as a whole. Both AROP and Income inequality are measured in terms of equivalent income.

4.3. Belgium

4.3.1. The Belgian microsimulation model MIDAS

The Belgian model is called MIDAS_BE (Microsimulation for the Development of Adequacy and Sustainability) owned by the Federal Planning Bureau of Belgium. It simulates individuals and households between 2011 and 2070. The current version is based on a compound administrative and Census dataset of 553 722 individuals in 249 121 households. MIDAS is a discrete-time dynamic microsimulation model, which models the intricate interactions between demographic, economic, and policy variables at the level of the individual and the household. This enables policymakers, researchers, and analysts to explore the long-term effects of various policy interventions on different segments of the population.

MIDAS aligns to auxiliary information on demographics (fertility, mortality, household formation and dissolution) in such a way that the Belgian LIPRO-projections are replicated. It also simulates the impact of exogenous immigration and emigration projections. The extensively used alignment techniques refer in particular to labour market participation rates by age group and gender, so that MIDAS adheres to long-term labour market and productivity projections. Finally, the model aligns the growth rate of the average earnings at the microlevel to that of earnings at the macro-level.

The model MIDAS includes the first pillar pension systems for employees, self-employed and civil servants, as well as the means-tested Guaranteed Income for Older people. Furthermore, it simulates hours worked and hourly earnings in the private and public sector, unemployment benefits, disability benefits, means-tested minimum guaranteed income, and child benefits. It furthermore includes a fiscal block that simulates the gross-net trajectory. MIDAS is a discrete-time model where individuals occupy just one state per calendar year. Furthermore, it does not include private savings or pensions from the second or third pension pillars, wealth and housing. This, and the difference in the nature of the data, results in the simulated poverty risks to differ with the official SILC statistics (see Dekkers et al, 2023b for a more detailed discussion) which should be kept in mind when considering the results. Finally, all calculations are made in constant prices of 2011.

6 https://ec.europa.eu/eurostat/web/european-pillar-of-social-rights/scoreboard

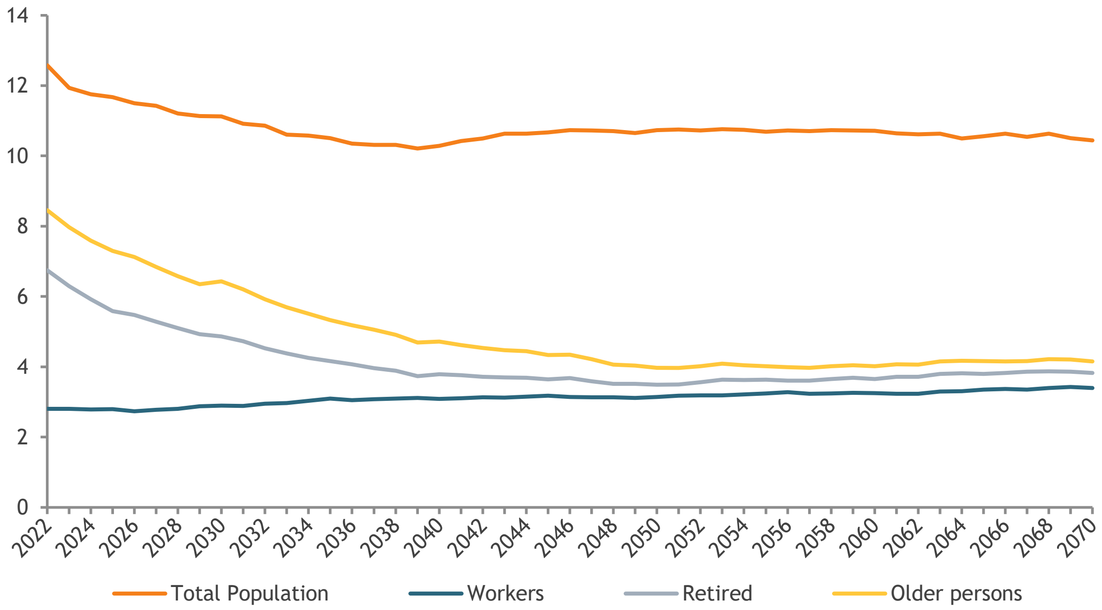
4.3.2. The reference scenario[7]

The reference scenario is described in chapter 2 of this report. As explained, population in Belgium in this scenario increases by 9% between 2022 and 2070. The old-age dependency ratio (65+/20-64) would increase by a factor 1.6 to 53% in 2070. The very old age dependency ratio (80+/20-64) would even increase by a factor 2.2. Nevertheless, labour input would remain a driving force for GDP growth in Belgium. As a result, in the reference scenario gross public pension spending relative to GDP would increase by 3.5 percentage points between 2022 and 2070.

The results in Figure 1 show the development of the poverty risk of the population as a whole, and of people in employment, retired persons and older people, i.e. people at the statutory pension age (SPA) or older.[8] As explained above, the poverty risk is derived from the equivalent household income and the poverty threshold moves up with increasing median income over time.

Figure 1: At-Risk-Of-Poverty rates for Belgium; reference scenario

Per cent



Source: MIDAS

[7] Some reform measures were decided in July 2023 and should be voted in February 2024. They therefore are not included in the AWG reference scenario that we report here, nor in the PAR. These measures include the reintroduction of a capital-amount pension bonus; the limitation of the welfare adjustment of the pension of civil servants; the introduction of a working condition for access to the minimum pension in the employees' pension system; and, finally, a change in the eligibility for the minimum pension for parttime working employees. The combined budgetary impacts of these reforms, as shown in Table 6, are however small and certainly do not affect the impact of the sensitivity scenarios relative to the base scenario.

[8] This is 65 until 2024, 66 from 2025 until 2029 and 67 from 2030 on.

The poverty risk of the working group is always much lower than that of the total population, and also lower than that of people in retirement[9]. In 2022 the poverty risk of older people is 1.7 percent points higher than that of pensioners, but this difference is much reduced at the end of the projection period (0.4 percent points). The difference between the two groups is due to 1) early-retirement pensioners aged below the SPA, and 2) those that are older than the SPA but do not receive a pension of their own. The first group are counted as pensioners but not as older people, while the second group are counted as older people but not as pensioners. Those that retire early generally have long careers (otherwise they could not have retired early in the first place) and therefore substantial pension benefits. Their poverty risk is consequently lower than that of pensioners over the SPA. Conversely, older people without a pension of their own have a much higher poverty risk than older people who do receive a pension. This group consists mainly of married women without a pension either because they never worked, or because they had only a short career. In the latter case it is often advantageous for the couple to waive the low pension so that their husband is entitled to a higher so-called 'family pension'. Despite the family pension, the poverty risk of couples with one pension is much higher than that of two-pension couples and even than that of single pensioners (Dekkers et al., 2023b, Graph 15). The poverty risks of retired and older people converge over time because the two groups themselves increasingly overlap. First, we assume that the increments of the SPA in 2025 and 2030 would result in less early retirement because of more stringent condition. Furthermore, the proportion of older women without a pension gradually decreases.

Next we turn to the discussion of the development of the poverty risks of pensioners and older people over time. These decrease the first part of the simulation period, to increase afterwards. To see why this is, note that, during the entire projection period, the minimum pensions are assumed to increase by 1% in real terms[10]. The means-tested Guaranteed Income for Elderly Persons (hereafter GIEP) would, according to the assumptions by the AWG, increase by 1% per year only for the first ten years. Thereafter, it would follow the growth rate of average wages. Finally and again following the assumptions and projections made by the AWG and as shown in Table 2, although increasing from the mid-2020s on, real growth rate of wages would remain below 1% per year throughout the first period. It would surpass 1% around 2036, after which it would increase to nearly 1.5 in the early 2040s and then converge to this long-term growth rate of 1.2% per year.

The poverty risks of both elderly and pensioners decrease over time: for pensioners during the first period, i.e. until the mid-2030s for pensioners and for older people until the end of the 2040s. There are two main reasons for this decline. First, both the minimum

9 A comparison of MIDAS' simulated poverty rates of the elderly and pensioners with those of the SILC show that the former are lower than the latter. It must be kept in mind that the starting data for MIDAS are derived from administrative data collected by the Datawarehouse Labour Market and Social Security. =A detailed comparison of the SILC 2012 wave, MIDAS results and the original register data from the Datawarehouse (Dekkers et al., 2023, annex 2) shows that 1) the discrepancies are more important for the 65+ than for other groups; 2) the differences between poverty rates are more important in net than in gross income, and 3) more important between the SILC data and the register data of the Datawarehouse, while the differences between MIDAS results and the Datawarehouse poverty rates are limited, both in net and gross terms. This suggests that a more extensive study of the gross-net trajectory in the SILC data might be required. As a result, MIDAS is anyway primarily a tool to simulate and assess the *evolution* of social sustainability indicators, rather than their levels.

10 In Belgium, almost all allowances are indexed to prices. On top of that, ad-hoc decisions adjust benefits to living standards in real terms. This procedure is set in the so-called Generation Pact. The first step in this procedure is the determination of the budget devoted to the adjustment to living standards. This budget is based on current expenditures, which are then indexed in real terms by parameters which are independent of actual wage growth, and equal an annual growth rate of 1.25% for the wage ceilings and the minimum claim per career year; 1% for minimum and lump sum social benefits, and 0.5% for all other benefits. Finally, the real growth rate for the means-tested Guaranteed Income for Elderly persons and other minima follows the rules set by the AWG: equal to 1% per year the first ten years of simulation (like the Generation Pact), after which it follows the average wage growth rate. It is these parameters that we follow in our modelling of indexation. In the next step, the budget is spent: social partners can propose concrete measures for the adjustment to living standards. These can differentiate between sectors, categories of beneficiaries, or types of benefits. In the third and final step, the government decides on the final measures, and how the budget is spent. It is these 2nd and 3rd steps that in the PAR is described as the "ad hoc decisions", and those we do not include in the projections.

pension and the GIEP during this first period increase by 1% per year. This means that they grow faster than wages during this period and consequently also faster than the poverty threshold. Second, the proportion of women, in particular married women, who obtain their own pension rises substantially. The cohorts of women who will retire during the coming decades have much longer careers and obtained higher wages than the women who are currently retired.

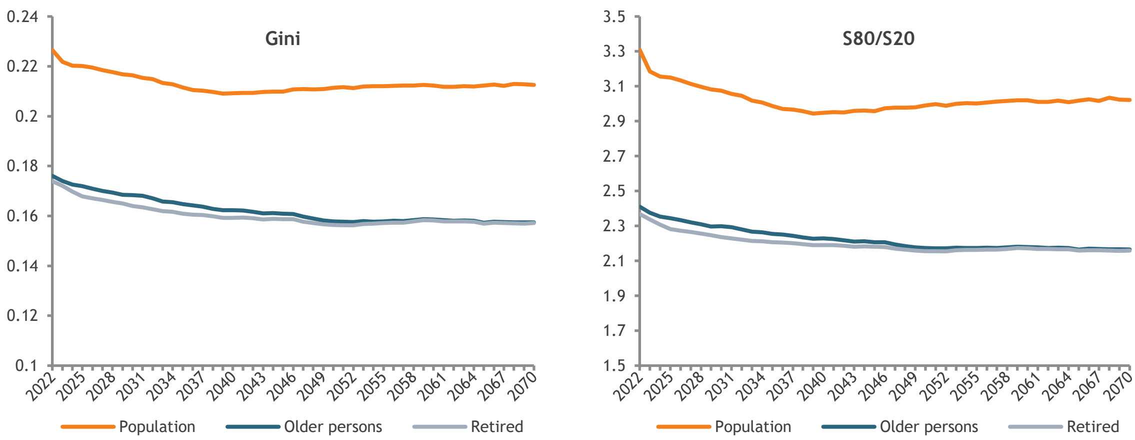
In the second part of the projection period, the growth rate of wages would surpass 1% per year, while the minimum pension by assumption would continue to grow at an 1% rate in real terms. Consequently, the minimum pension would now lag behind wage growth, and therefore behind the poverty threshold. Also, the proportion of women with a pension of their own reaches a plateau at nearly 100% around 2050. So the factors that were responsible for the earlier decrease of the poverty risk are not effective anymore. Two other developments have an upward effect on the poverty risks. First, because the rate of marriage is assumed to continue to decline, there will be fewer widows in future years. Many widows receive relatively generous survivor pensions, so fewer widows imply a higher risk of poverty for the group of single women. Second, an increasing proportion of older and retired people will be immigrants born outside Belgium. Immigrants tend to have incomplete careers because they entered Belgium in their late twenties or thirties and because of the continuing employment gap between immigrants and non-immigrants. Consequently, their pensions are lower, and their poverty risk is much higher than that of people born in Belgium.

Finally, the poverty risk for the population as a whole exceeds both that of the working and retired groups. This group includes not only the unemployed, but also the non-active population such as disabled people and people on social assistance. Moreover, the poverty risk of children (below 18 years) is considerably higher than that of people at working age.

Next, we turn to the inequality of equivalent income in the reference scenario. Figure 2 shows the development of the Gini coefficient and the S80/S20 Income Quintile Share ratio throughout the simulation period.

Figure 2: Inequality for Belgium, reference scenario

Gini-coefficient, S80/S20 ratio



Source: MIDAS

Both the Gini and the Income quintile share ratio show a slight decline up to the mid-2040s after which a rebound sets in. The reasons are the same as for the trends in poverty risks explained above. Inequality among pensioners and older people is much lower than among the population as a whole, which is the result of the redistributive impact of the pension system and the more heterogeneous population (working, unemployed, …) below retirement age.

4.3.3. Sensitivity tests

Table 5 shows the results for the various sensitivity tests on the poverty risk of retired. The poverty risks are expressed as differences in percentage point from those in the reference scenario. As in the financial sustainability simulations, the parameters regarding the living standard adjustment of social benefits are in all scenarios the same as in the reference scenario.

Table 5 – At-risk-of-poverty rate (AROP) under different scenarios, as deviation from the base scenario in pp, Belgium

	2022	2030	2040	2050	2060	2070
Total Population						
Base scenario	12.6	11.5	10.7	11.2	11.1	11.0
CRA	0.0	0.0	0.	-0.1	-0.0	-0.0
FERLOW	0.0	-0.0	0.2	0.0	-0.0	0.0
HLE	0.0	-0.0	0.00	-0.2	-0.2	-0.1
LLE	0.0	-0.1	0.1	0.1	0.2	0.2
MIGHIGH	0.0	0.1	0.3	0.3	0.1	0.1
MIGLOW	-0.0	-0.1	0.0	0.1	-0.3	-0.2
OER	0.0	0.3	0.4	0.5	0.5	0.5
TFPHIGH	0.0	0.0	0.0	0.2	0.1	0.8
TFPLOW	0.0	0.0	-0.0	-0.1	-0.4	-0.4
Older people						
Base scenario	8.4	6.4	4.8	4.3	4.4	4.7
CRA	-0.0	0.3	0.3	0.4	0.6	0.6
FERLOW	0.0	-0.2	0.1	0.0	-0.0	0.1
HLE	0.0	-0.1	-0.1	-0.1	-0.1	-0.1
LLE	0.0	-0.1	-0.1	-0.1	-0.1	-0.1
MIGHIGH	0.0	0.0	0.1	0.3	0.3	0.2

	2022	2030	2040	2050	2060	2070
MIGLOW	-0.0	-0.3	-0.2	-0.3	-0.4	-0.4
OER	-0.0	-0.3	-0.3	-0.3	-0.2	-0.2
TFPHIGH	0.0	0.0	0.0	0.1	0.3	0.7
TFPLOW	0.0	0.0	-0.1	-0.4	-0.8	-1.0
Retired						
Base scenario	6.7	4.8	3.9	3.8	4.0	4.4
CRA	-0.0	0.2	0.3	0.4	0.6	0.6
FERLOW	0.0	-0.1	0.1	0.1	-0.0	0.1
HLE	0.0	-0.1	-0.0	-0.1	-0.1	-0.1
LLE	0.0	-0.0	-0.1	-0.1	-0.1	-0.0
MIGHIGH	-0.0	-0.0	0.1	0.3	0.2	0.2
MIGLOW	-0.0	-0.2	-0.2	-0.3	-0.3	-0.3
OER	-0.0	-0.3	-0.3	-0.3	-0.1	-0.1
TFPHIGH	0.0	0.0	0.0	0.1	0.3	0.8
TFPLOW	0.0	0.0	-0.1	-0.4	-0.8	-1.0
Working Population						
Base scenario	2.8	3.0	3.2	3.3	3.3	3.4
CRA	0.0	-0.0	-0.1	-0.2	-0.2	-0.2
FERLOW	0.0	0.0	0.0	-0.1	0.0	0.1
HLE	0.0	-0.0	0.0	-0.1	-0.1	-0.1
LLE	0.0	-0.0	0.0	0.0	0.0	0.1
MIGHIGH	0.0	0.0	-0.0	-0.0	-0.0	-0.0
MIGLOW	0.0	0.0	0.0	0.0	-0.1	0.1
OER	0.0	0.1	0.0	0.0	0.0	0.0
TFPHIGH	0.0	0.0	0.0	-0.5	-0.1	-0.1
TFPLOW	0.0	0.0	0.0	0.1	0.1	0.1

The impact of most alternative scenarios on the poverty risk of retired is limited and appears only from the mid-2050s on. The exceptions are the two productivity scenarios TFPHIGH and TFPLOW and the constant labour market exit age scenario CRA. Indeed, the higher productivity rate in the TFPHIGH scenario drives up hourly wages and therefore increases the earnings of those that are working. This, in turn, drives up the poverty threshold, which explains why the poverty risk of non-working groups, including retirees, is higher than in the reference scenario. As pensions in Belgium are (partially) earnings-related, higher earnings will result in higher pensions. However, this effect will play out only in the very long run when those that have the higher earnings throughout most of their career will eventually retire. In contrast, the indirect effect through the poverty threshold will be immediate. As a secondary effect, however, one should note that the welfare adjustment of the Guaranteed Income for Elderly People also changes with this scenario, at least from 2030 on, it is assumed to follow the development of wages. Indeed, the growth rate of this means-tested minimum will increase faster than in the reference scenario, thereby limiting the increase of poverty.

The impact of the low productivity rate scenario TFPLOW is obviously the reverse: poverty risks of the retired are reduced relative to the reference scenario, while the lower growth rate of the Guaranteed Income will again partially counter this.[11]

The constant labour market exit age scenario (CRA) freezes the labour market exit ages at the situation in 2023. This results in a higher poverty risk from the late 2020s on, as people retire earlier and with shorter careers than in the reference scenario. Note that this scenario has an impact sooner than many of the other scenarios, because the legislated increases of the SPA in 2025 and 2030 would not be implemented in this scenario.

In the Low migration scenario (LMIG), the poverty risk at the simulation horizon would end up lower than in the reference scenario. Conversely, in the High migration scenario (HMIG), the poverty risk in 2070 would end up higher. Lower migration dampens poverty among pensioners because it results in a lower proportion of pensioners with short careers and lower pension benefits.

The Higher Employment Rate for Older workers (OER) scenario results in a lower poverty risk of pensioners. These older people below the SPA work more than in the reference scenario, and enter retirement with a longer career and, therefore, higher pension benefits.

The two other alternative demographic scenarios (HLE: Higher life expectancy at birth; FERLOW: lower fertility) have quite small effects on the poverty risk of retirees. These effects are difficult to interpret, as a number of mechanisms may be involved: household formation, widowhood and others.

One of the goals of this report is to assess jointly the impact of the other scenarios on the expenditures as a percentage of GDP as well as on the poverty risk among pensioners. The first cell of the first row shows the AROP rate among retirees in 2070 in the reference scenario (5.2%). The second column shows the expenditures as a fraction of GDP, also in 2070 in the reference scenario. The following rows then show the impact of the various scenarios on the AROP rate of retirees (deviation from the reference scenario in percentage points): this “AROP impact” is a proxy of the adequacy impact of this scenario) and on expenditures to GDP (again in deviation from the reference scenario in percentage points). This “budget impact” is a proxy of the broader sustainability impact.

[11] Note that the impact of the scenario with low TFP growth affects the poverty risk of pensioners sooner than the scenario with high TFP growth. The reason is that the assumptions of the higher/lower TFP growth are not symmetrical. Indeed, there is no difference between the baseline and the higher TFP scenario in the period 2022-2040, whereas in the low TFP scenario it from the outset follows the same development as in the reference scenario, albeit at a lower level.

Table 6 – Public pension expenditures and poverty risk among retirees under different scenarios in 2070[12], Belgium

		AROP impact in 2070	Budget impact in 2070
Public pension expenditure			
Baseline in %		4.4(3)	16.2(1)
Alternative scenarios: deviation from the reference scenario in percentage points			
Higher life expectancy at birth (+2y)	HLE	-0.1(4)	0.8(2)
Higher migration (+33%)	HMIG	0.2	-0.4
Lower migration (-33%)	LMIG	-0.3	0.5
Lower fertility (-20%)	FERLOW	0.1	1.3
Higher employment rate of older workers (+10 pps)	OER	-0.1	-1.1
Higher TFP growth (convergence to 1%)	TFPHIGH	0.8	-0.6
Lower TFP growth (convergence to 0.6%)	TFPLOW	-1.0	1.1
Policy scenario: constant retirement age	CRA	0.6	1.1

(1) baseline in % of GDP; scenario without reform.
(2) sensitivity analysis in percentage points of GDP.
(3) AROP of retirees.
(4) sensitivity analysis in deviation of AROP from the base scenario in pp.

Source of the financial budget impacts: FPB, 2023 (including reforms, see footnote 8), table 20, page 27. Only the scenarios that are simulated by MIDAS are included.

In the alternative TFP scenarios, there is a trade-off between the AROP impact and the financial budget impact: the scenario with high productivity results in lower expenditure but also a higher poverty risk among retirees, while the opposite is the case for the low productivity scenario. This is because the TFP scenario has an immediate impact on the growth rates of earnings, which, through the poverty threshold, affects the poverty risk of other groups. Also in the migration scenarios is there such a trade-off between the AROP impact and the budget impact: the higher migration scenario would result in lower expenditure (as a percent of GDP) but also a higher poverty risk among retirees. Likewise would the lower migration scenario result in higher expenditure but also a lower poverty risk among retirees.

In some other scenarios, there is no such clear trade-off, however. The higher life expectancy scenario clearly results in higher expenditure to GDP, but the impact on the poverty risk among retirees is small. The Constant retirement age scenario would result in both an increase in the poverty rate and higher expenditure, while the Higher employment

[12] 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. Note that public pension expenditures include disability pensions, whereas the poverty risks do not include recipients of disability pensions. This introduces a limited discrepancy between the budgetary and AROP impacts of the scenarios.

rate among older workers (OER) scenario would result in lower expenditure as well as lower poverty risks among retirees.

4.4. Czechia

4.4.1. The Czech NEMO model

Czechia developed it's dynamic microsimulation model in 2011 which was a culmination of a two year projecect financed from the European communitarian programme PROGRESS. The model was later dubbed NEMO by it's users. The name started as a joke as it originally stood for The Best Model (Nejlepší Model). The original meaning became lost in time but the name stuck.

The NEMO model was developed and runs on the engine of specialized actuarial software Prophet, which was initially developed by Sungard company, but now falls within the portfolio of FIS that provides financial solution software.

NEMO consists of two main elements – the database of model points representing modelled individuals and the code library responsible for running the simulation. The model point database encompasses the full population of Czechia including the so-called new business, i.e. individuals that have not been born yet. Therefore, in full settings the model runs a simulation of approximately 18 million model points, in case where timeliness is required or an in depths distributional impact analysis is not required, reduced model runs simulating 1-in-10 or even 1-in-100 can be used.

Characteristics of model points, including historical earnings and details on labour market attachment are taken form administrative sources, especially social security administration data. For the mentioned new business these characteristics are modelled based on distributions and properties of the existing population. A simplified method of matching partners/spouses is used to add a multi-person dimension that is required for modelling derived pension entitlements, especially survivor pensions.

NEMO calculations can be divided into the following inter-connected groups:

- Events, such as births, marriages, deaths, disability, etc.
- Career paths capturing the economic (in)activity of an individual throughout his/her life.
- Family relations reflecting the marital status of an individual and number of children born and raised.
- Calculation of cash flows consisting of modelling of the individual's earnings (including the earnings of the husband/wife), payments to the pension system (pension contributions), and payments of pension benefits.

The model then runs these individual trajectories through the rules of the pension system where policy scenarios can be formulated. Two sets of results are provided – individual micro results that allow a detailed look into distributional effects of proposed changes and aggregate output which is calculated of either sum or average of the individual results.

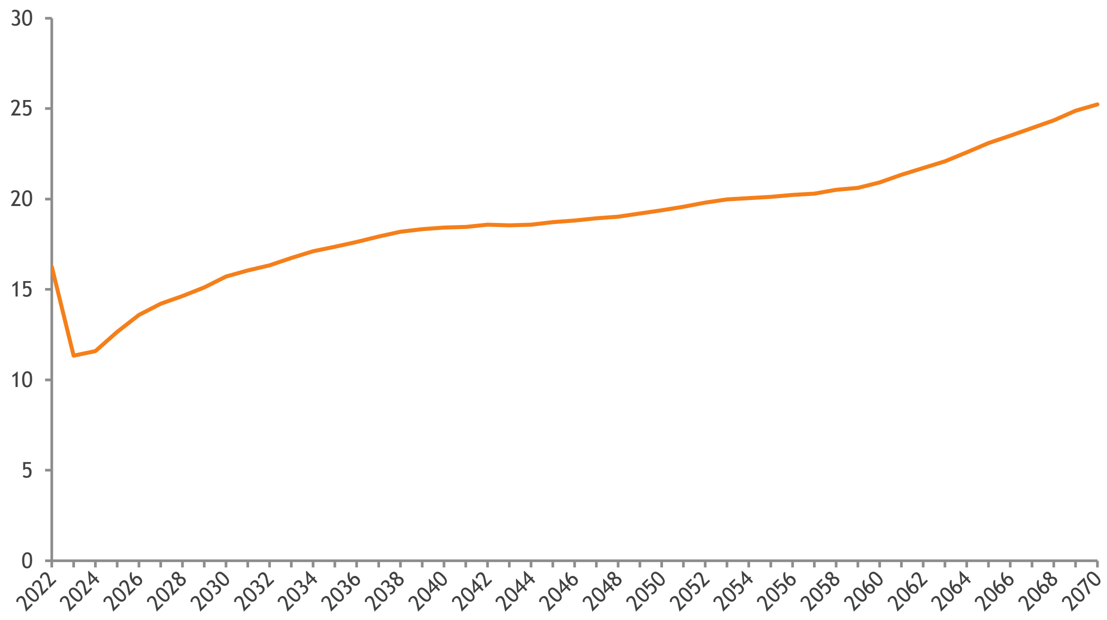
Macroeconomic assumptions are an integral part of the model inputs. A macroeconomic framework is used whereas many variables are endogenous to the model, but for the main aggregate indicators such as inflation and average wage growth are calculated outside of the model, which allows for sensitivity calculations with respect to these variables.

4.4.2. The reference scenario

In the base scenario the population of Czechia is projected to shrink by approximately quarter of a million people, i.e. by 2.5%, between 2002 and 2070. This decline will be brought about by lower fertility rates and partly offset by net immigration. The ratio of economically active to pensioners would drop from 2.35 to 1.68 during this period. The number of pensioners would increase by 25 % which would put additional strain on public finances, that would translate into additional 1.7 percentage points of GDP of pension expenditure.

Figure 3: At-Risk-Of-Poverty rates for pensioners in Czechia; reference scenario

Per cent



Source: NEMO

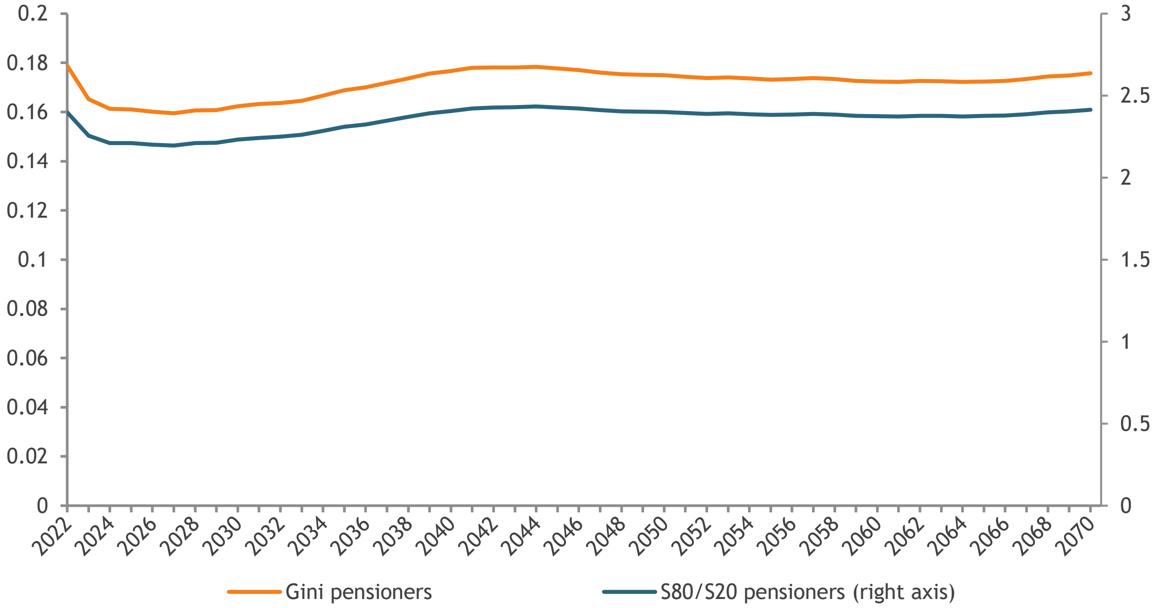
The at-risk-of-poverty rate (AROP) for pensioners is expected to more than double from the current (2023) value of slightly above 11 percent to over 25 percent in 2070. The growing risk of poverty will be brought about by two factors.

Firstly, the differentiation among pensioners is expected to grow. Measured by the S80/S20 indicator, inequality between pensioners is projected to rise from about 2.2 to more than 2.4 (see Figure 4). This development will be relatively swift as generations that witnessed the centrally planned economy with full employment and extremely low wage differences will retire and will start to get replaced by generations who spent most, if not whole, of their lives in market economy conditions.

Secondly, after 2040 a gradual decline in pension levels (as a result of non contributory period of studying counting reduction approved in 1995 and 2010 respectively) relative to wages will occur. Ratio of average old-age pension to average wage will drop from around

44 percent to just above 39 percent in 2070. This represents a relative reduction of pensions of roughly 10 percent. As the poverty threshold is mainly driven by income from work the AROP for pensioners will continue to grow through the whole projection period.

Figure 4: Inequality for Czechia; reference scenario



Source: NEMO

The developments in inequality and risk of poverty are tightly linked. Inequality, measured in Figure 4 both by Gini coefficient and the quintile income ratio, show that inequalities in the population of pensioners are quite low. In 2022 they were elevated due to turbulent economic growth which led to high pension indexations that were concentrated towards the income related part of the pension. After 2022 these will start to dissipate. In addition, measures that increase pension by flat amounts, most notably the CZK 500 top up for each raised child (mainly for women with generally lower pensions), will take effect which will keep inequality low for a certain period.

In the late 2030s and early 2040 a structural change in the population of pensioners will occur. More and more pensioners will recruit from people whose whole career have been spent in market economy conditions with higher differences in wages, spells of unemployment etc. The higher diversity in income and career lengths will cause inequality among pensioners to increase to a point where the respective indicators will reach the same values they had around 2020.

Despite the tendency towards increasing, inequality among pensioners should stay at relatively low levels with Gini stabilizing around 0.17 after 2040.

4.4.3. Sensitivity tests and alternative scenarios

Czechia has run simulations with the different demographic assumptions in specific variables. The effect of different demographic assumptions on pension sustainability is relatively limited. The highest change is reported in the increased life expectancy case, where in the peak year of 2058 pension expenditure is 0.4 percent GDP higher than in the reference scenario (base case) and the excess expenditure does not dissipate as time progresses and the increase between 2022 and 2070 is 0.6 percentage points of GDP higher. The other scenarios effects are less pronounced and in some cases they only become more apparent beyond the projection horizon of 2070.

A series of runs with different assumptions in one of the underlying assumptions has been run to describe the sensitivity of the Czech pension system to different demographic developments. Scenarios capturing sensitivity to different TFP rates were not included as the Czech system lacks any funded component and the resulting sensitivity would be meagre at best. In addition, one of the AWG policy scenarios, namely the linking of retirement age to life expectancy gains, has been simulated. Results of these simulations on risk of poverty and inequality among pensioners are shown in the following figures.

Table 7[13] – At-risk-of-poverty rate (AROP) under different scenarios, as deviation from the base scenario in pp, Czechia

	2030	2040	2050	2060	2070
Base scenario	15.7	18.2	19.3	20.8	24.9
Higher net migration	-0.1	0.1	0.1	0.4	0.6
Lower fertility rate	0.4	0.5	0.9	0.8	0.5
Lower net migration	0.0	0.0	-0.1	-0.4	-0.5
Higher life expectancy	0.1	0.1	-0.1	-0.4	-0.5
Link SRA to LE	-0.2	0.4	0.8	0.8	-0.1

Table 8 – Public pension expenditures and poverty risk among retirees under different scenarios in 2070, Czechia

	AROP impact in 2070	Budget impact in 2070
Base scenario	24.9	9.8
Alternative scenarios: deviation from the reference scenario in percentage points		
Higher net migration	0.6	0.2
Lower fertility rate	0.5	-0.1
Lower net migration	-0.5	-0.3
Higher life expectancy	-0.5	0.6
Link SRA to LE	-0.1	-1.5

The effect of different demographic assumptions is quite limited. The AROP differences for most scenarios do not exceed 0.5 percentage point of AROP. At the same time budgetary, i.e. sustainability effects are mostly limited as well. This is mostly driven by the projection horizon being set to 2070. Thus different magnitudes of influx of new people

13 For technical reasons and in contrast to the models in the other countries; the Czech model NEMO is not designed to simulate poverty risks for other groups than pensioners.

into the pension system cannot fully manifest. Changes in expenditure remain under 0.3 percentage points GDP.

In terms of poverty protection, the most pronounced differences can be seen for the sensitivity to lower fertility and the policy scenario of linking retirement age to life expectancy. The drivers for the relatively similar development in the two scenarios are different though. In the low fertility case the effect can be traced to changes in the poverty threshold. A lower number of children, and thus person in general, in households leads via the equivalization of income to higher poverty threshold. While the situation of pensioners households remains broadly unaffected, the rising threshold gradually engulfs a higher proportion of pensioners households and cause a slight increase in AROP. Meanwhile the life-expectancy link causes a shift in the structure of pensioner population. After introducing the link the inflow of new pensioners with higher pensions is slowed down. This causes the initial increase in AROP rate. Paradoxically, as the total number of pensioners is lower in this scenario this means lower absolute number of pensioners at risk of poverty. As time progresses in the simulation the overall (average) pension level is increase as the newly granted pensions record longer contribution periods which brings about proportionally higher pensions.

On the other hand budgetary impact is strongest in the higher life expectancy scenario and the policy scenario of linking retirement age to life expectancy. The higher life expectancy leads directly to a higher number of pensions in payment thus driving expenditure higher. Again, due to the projection horizon, the resulting increase in pension expenditure remains limited to an increase of 0.6 percent GDP, but the effect increases over time. The policy scenario works exactly reversely. The increases in retirement age translate into a significantly lower number of pensioners, which drives the projected expenditure down. The full effect is slightly mitigated by, on average, higher pensions in payment as discussed above. On the overall the decrease in the number of pensioners is about three times bigger than the increase in the higher life expectancy scenario which leads to a much stronger impact of the policy scenario.

4.5. Slovenia

4.5.1. The model DYPENSI

DYPENSI is a cross-sectional continuous-time dynamic microsimulation pension model that simulates individuals and their family links between 2018 and 2080. DYPENSI aims to assess a) the future pension expenditures and b) the adequacy of pensions. The model was used to support the generational accounting model that was the basis for AWG pension projections. DyPENSI is highly modular, and modules can be grouped into demographic, labour market, retirement, income, and technical modules, which set out the simulation engine's basic functionalities. Demographic modules include fertility, education, partnerships, children leaving home, immigration, emigration, disability, and mortality. Labour market modules simulate entry into and exit from the labour market, labour market transitions between employment and unemployment, and transition between employment sectors (private sector, public sector and self-employment). Income modules capture the monetary realm of the simulations. They calculate wages, other incomes, taxes, and most important benefits, such as benefits related to parenthood, unemployment, and social exclusion. Retirement modules regulate old-age, disability and survivor retirement events and pensions. While disability and survivor pensions are linked to events (death of a relative or disability), old-age pensions depend on the fulfilment of retirement conditions and retirement decisions.

Exogenous data needed to run the model enter as demographic, macroeconomic, policy-related, and behavioural parameters for every simulation year. The model's structure allows for a straightforward simulation of changes in external assumptions (for example, demographic parameters, labour force participation rates, etc.), policy parameters (for example, the statutory retirement age, minimum age, etc.) and also parameters that drive the transitions between different labour market states or decisions.

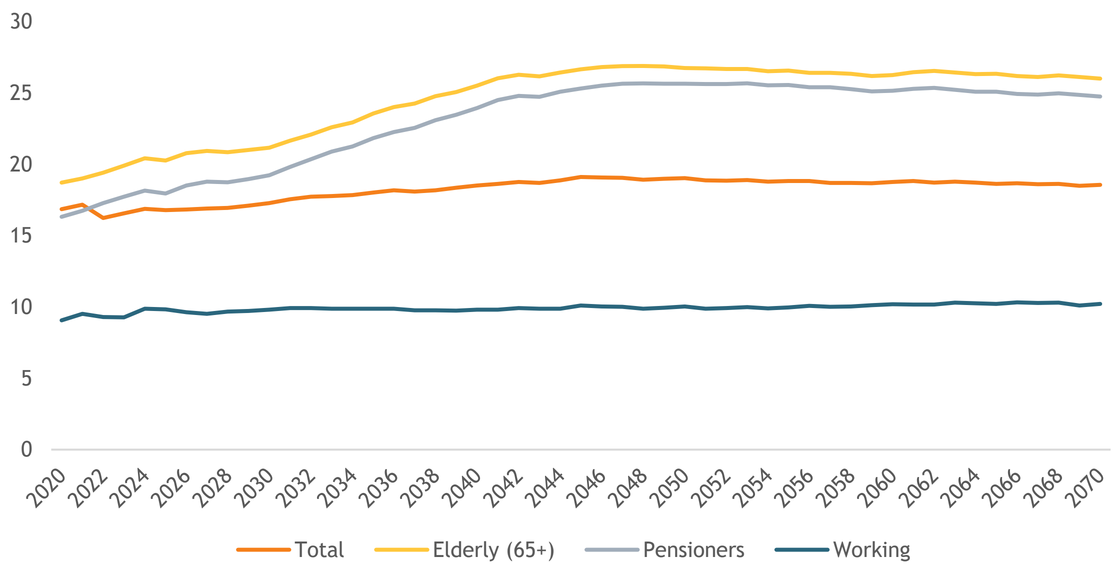
The starting population for the dynamic microsimulation pension model DYPENSI is a cross-sectional dataset, which is a representative 20% sample of the Slovenian population in 2017. All calculations are made in constant prices of 2017.

4.5.2. The reference scenario

The Figure 5 shows the projected development of the AROP in Slovenia.

Figure 5: At-Risk-Of-Poverty rates for Slovenia; reference scenario

Per cent



Source: DYPENSI

Note: The small number of single men drives very high poverty risk of men compared to single women. Due to the shorter life expectancy of men, mostly women live in single households.

The poverty risk of the elderly (as well as pensioners; not in Figure 5) is higher than the poverty risk of the total population, which is in line with the official poverty rates published by NSI and EUROSTAT. Poverty rates for elderly and pensioners would increase. The main driver for this increase would be the drop in the contributory period of old-age pensioners and, consequently, the replacement rate, both discussed in the Slovenian Country Fiche (Table 10).

Data on the contributory periods of the currently active population, maintained and published by the Slovenian Pension and Disability Insurance Institute (PDII), show that there are significant differences between the generations that have retired so far or are close to retirement and the generations that will retire in the future. Younger generations have accumulated lower contributory periods than older generations, mostly due to later entry into the labour market, which is also a consequence of high participation in tertiary education (see Country Fiche for Slovenia, Table 9). Simulation results show that the contributory period after the initial increase drops until 2054. In the early 2050s, individuals who entered the labour market during the financial crisis, which was marked by higher youth unemployment and consequently later labour market entry, will retire. After the 2050s the contributory period increases and remains relatively stable until 2070.

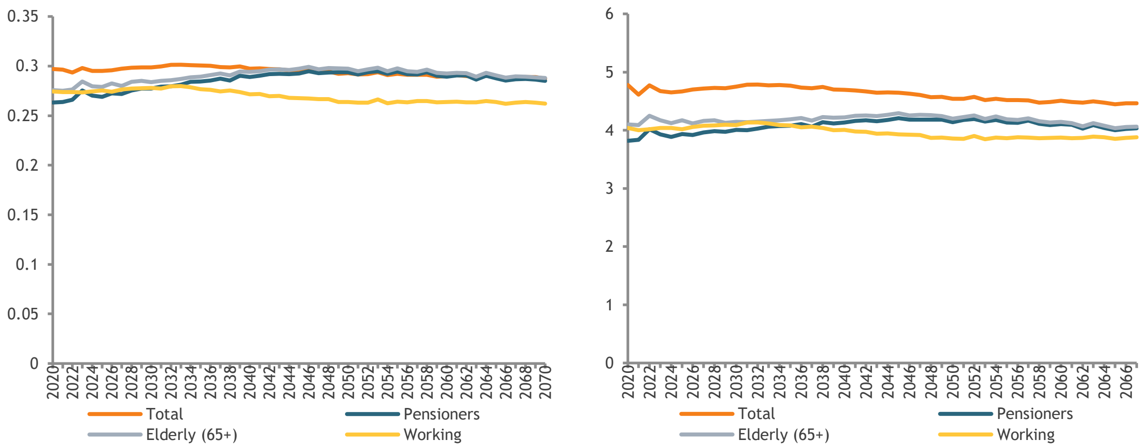
The poverty risk among the elderly exceeds the poverty risk of the retired population. There are two main reasons. First, some individuals aged 65 or over do not have any pension rights, although their number is very small. Second, those who retire before age 65 are not included in the elderly group. Moreover, individuals who retire before 65 must have at least 40 years of career and have, on average, higher pensions than the pensioners retiring at 65. The group of pensioners retiring at 65 is very heterogeneous, but some of them have shorter, unstable careers with unemployment or inactivity spells.

The poverty rates for pensioners and the elderly become closer over time as the share of pensioners who retire before 65 becomes smaller due to shorter contributory periods.

Figure 6 shows the projected development of inequality in Slovenia measured by the Gini index (left) and the S80/S20 ratio (right).

Figure 6: Inequality in Slovenia, reference scenario

Gini-coefficient, S80/S20 ratio



Source: DYPENSI

Inequality among the working population is lower than overall inequality because the working population is more homogenous than the total population. The inequality among workers would decrease and this would drive down total inequality too. The reason is the that the share of higher educated workers would increase in decades to come, while the share of low educated would decrease. Hence the work force would become more homogeneous over time.

The Gini index for pensioners and elderly would increase until the mid-2040s. The same reasons as for the increase in poverty rates can explain the rise in inequality among pensioners. The entering of pensioners with shorter contributory periods and, therefore, lower pensions would increase inequality among pensioners. Until the mid-2040s, the inequality among pensioners is lower than overall inequality, but later, it is slightly above.

The Gini index for the elderly is a bit higher than that of pensioners, which is probably the result of a small share of the population without pensions and lower pensions of those retiring at 65 with shorter careers.

4.5.3. Sensitivity tests and alternative scenarios

The below Table 9 shows the poverty risks of various groups in Slovenia in the various sensitivity tests. The Table 10 thereafter summarises the impacts of these alternative scenarios on poverty rates of pensioners as well as financial sustainability of pensions.

Table 9 – At-risk-of-poverty rate (AROP) under different scenarios, as deviation from the base scenario in pp, Slovenia

	2030	2040	2050	2060	2070
Total					
Base scenario	17.3	18.5	19.0	18.8	18.6
Higher net migration	0.4	0.3	0.3	0.2	0.2
Higher employment rate for older	-0.1	-0.2	-0.3	-0.2	-0.2
Lower fertility rate	0.2	0.3	0.6	0.5	0.3
Lower net migration	-0.2	-0.4	-0.3	-0.2	-0.1
Higher life expectancy	0.1	-0.2	0.0	0.2	0.1
Elderly (65+)					
Base scenario	21.2	25.5	26.7	26.3	26.0
Higher net migration	0.3	0.0	0.4	0.4	0.2
Higher employment rate for older	0.4	0.3	-0.2	-0.3	-0.4
Lower fertility rate	0.5	0.5	0.8	0.4	-0.1
Lower net migration	0.0	-0.1	-0.1	-0.1	-0.4
Higher life expectancy	0.1	-0.1	0.4	0.4	0.2
Pensioners					
Base scenario	19.2	23.9	25.6	25.2	24.7
Higher net migration	0.2	0.0	0.4	0.4	0.3
Higher employment rate for older	0.3	0.3	-0.2	-0.2	-0.3
Lower fertility rate	0.4	0.6	0.9	0.4	-0.1
Lower net migration	0.0	-0.1	-0.1	-0.1	-0.4
Higher life expectancy	0.0	-0.1	0.3	0.4	0.3

	2030	2040	2050	2060	2070
Working population					
Base scenario	9.8	9.8	10.0	10.2	10.2
Higher net migration	0.3	0.5	0.4	0.2	0.2
Higher employment rate for older	0.1	0.0	-0.1	0.1	0.0
Lower fertility rate	0.2	0.3	0.0	0.1	0.0
Lower net migration	-0.3	-0.5	-0.5	-0.3	0.1
Higher life expectancy	0.1	-0.1	-0.2	0.0	0.0

Table 10 – Public pension expenditures and poverty risk among retirees under different scenarios in 2070, Slovenia

	AROP impact in 2070	Budget impact in 2070
Base scenario	24.7	13.7
Alternative scenarios: deviation from the reference scenario in percentage points		
Higher net migration	0.26	-0.66
Higher employment rate for older workers	-0.33	-0.68
Lower fertility rate	-0.06	1.14
Lower net migration	-0.41	0.89
Higher life expectancy	0.29	0.92

Like Table 6, the Table 10 allows to compare the adequacy and budget impact of the various sensitivity tests. The first row shows the AROP rate among retirees in 2070 and expenditures as a fraction of GDP, both in the reference scenario. The following rows then show the impact of the various sensitivity tests on the AROP rate of retirees, the AROP impact, and on expenditures to GDP, which we refer to as the budget impact. Like in Belgium, the alternative migration scenarios show a trade-off between the AROP impact and the budget impact: the higher migration scenario would result in lower expenditures (as a percent of GDP) but also a higher poverty risk among retirees. Likewise would the lower migration scenario result in higher expenditures but also a lower poverty risk among retirees. In some other scenarios, there is no such clear trade-off, however. The higher life expectancy scenario results in higher expenditures to GDP, while having a positive impact on the poverty risk among retirees. The Low fertility rate scenario would increase expenditures while not affecting much the poverty risks among retirees. Finally, and again analogous to Belgium, the Higher employment rate among older workers scenario would result in lower expenditures as well as lower poverty risks among retirees.

4.6. Norway

4.6.1. The microsimulation model MOSART

The analysis is done using the Norwegian microsimulation model MOSART. This is a dynamic microsimulation model that simulates lifetime trajectories for the entire Norwegian population (see Andreassen, 2020, for more details). The model uses transition probabilities depending on individual characteristics that are estimated from observed transitions in a recent period. Events included in the simulation are migration, deaths, births, household formation, educational activities, retirement, labour force participation, and income. Pension benefits are calculated from the simulated labour market earnings and other characteristics included in the simulation according to an accurate description of the pension system.

The social security system consists of an earnings-based pension, and a guaranteed pension for people with no or only a small earnings-based pension. The guaranteed pension is income-tested against the earnings-based pension. In 2006, a mandatory occupational pension was introduced in the private sector as a supplement to the public pension. Public sector employees are covered by a defined benefit pension scheme. After a reform in 2018, the public sector pension scheme has become a supplementary pension for public sector workers born 1963 and later. In addition, there is a separate early retirement scheme (AFP) and some voluntary private pension saving.

In the simulation of the model, we use up-to-date available data on the entire Norwegian population including immigrants and emigrants. We use the population projections (Europop) as used by the Ageing Working Group (AWG), which differ slightly from the national population projections used in MOSART made by Statistics Norway. Higher life expectancy and lower net migration contribute to a more pronounced population ageing in the national projections compared to the assumptions in Europop. Furthermore, any effects on labour market participation related to life expectancy effects on average annual benefits are not included in the AWG projections. The results are provided for resident individuals only, as poverty measures can be misleading when including non-residents with limited attachment to Norway.

We define «retired old-age pensioners» as persons aged 62+ who claim old-age pension from social security, the National Insurance System (NIS), and who have retired from the labour market. In Norway, pension benefits can be claimed flexibly starting at age 62 in combination with continued work. To evaluate the adequacy of the pension system, we focus on individuals who have old-age pension as their main source of income, i.e. who do not combine claiming with continued work. Meanwhile, we define the «older population» as everyone aged 65+ and the «working population» as everyone who are not claiming old-age pension and who have not exited the labour market.

Our measure of income includes all after tax labour market earnings, old-age pension benefits as well as a defined contribution occupational pension and other public benefits (e.g. unemployment insurance, work assessment allowance, disability benefits), but excludes capital income. Equivalised household disposable income puts an equivalence weight on the second (adult) person in the household to 0.5, while each child member (below age 14) has an equivalence weight of 0.3.

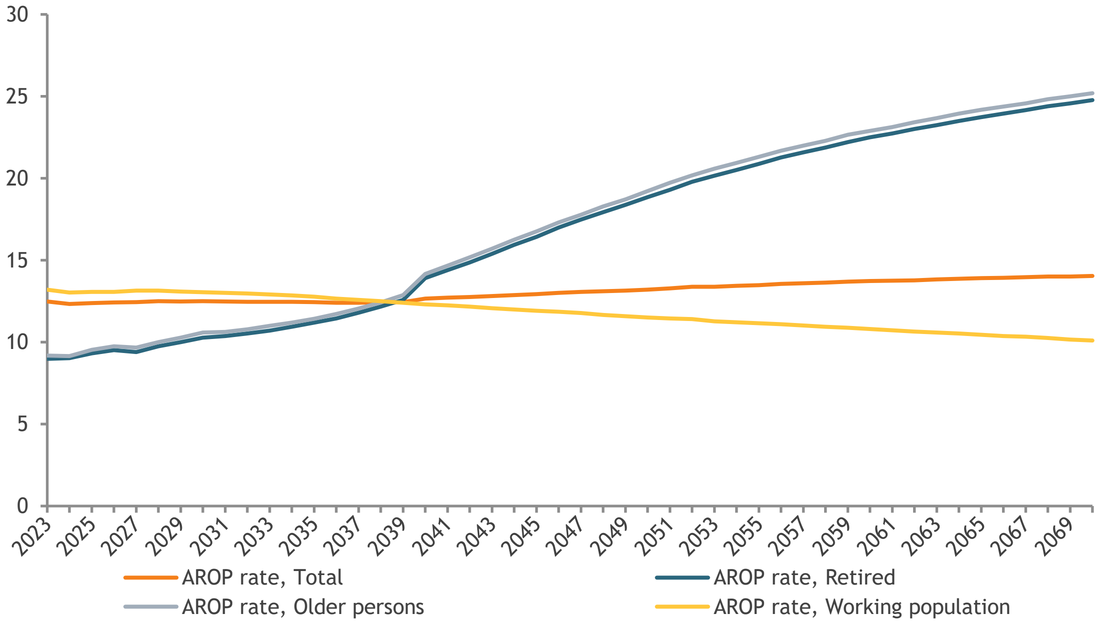
4.6.2. The reference scenario

In this section we present and discuss our projections of the At-Risk-Of-Poverty (AROP) rates, the Gini-coefficient, and the income quintile ratio (S80/S20-share). All measures of poverty and inequality are based on the equivalised disposable income as defined by EU.

The below figure shows the AROP rate for the retired, older people and working population from 2023–2070 in the reference scenario. We see that the AROP rate for the total population stays roughly constant throughout the estimation period. However, the AROP for the working age population is decreasing while for the elderly and the retired it is increasing.

Figure 7: At-Risk-Of-Poverty rate in Norway, reference scenario

Per cent



Source: MOSART

For the retired and the older people, starting in 2023 at around 9 percent, the AROP is increasing to around 25 percent in 2070.

There are two reasons for this strong increase. First, In Norway, the spending on public pension in percent of GDP increases only slightly (1.7 pps GDP) between 2022 and 2070. This is because increases in pension expenditures due to population ageing are in the Norwegian system stabilized somewhat through an actuarial correction that drives down pension benefits when life expectancy increases. Further, annual pension benefits are driven down even more by the AWG assumption that labour supply in the reference scenario does not follow the increase of life expectancy, thereby compensating for these actuarial corrections. Thus, the AROP of both pensioners and older persons is projected to almost triple up to 2070.

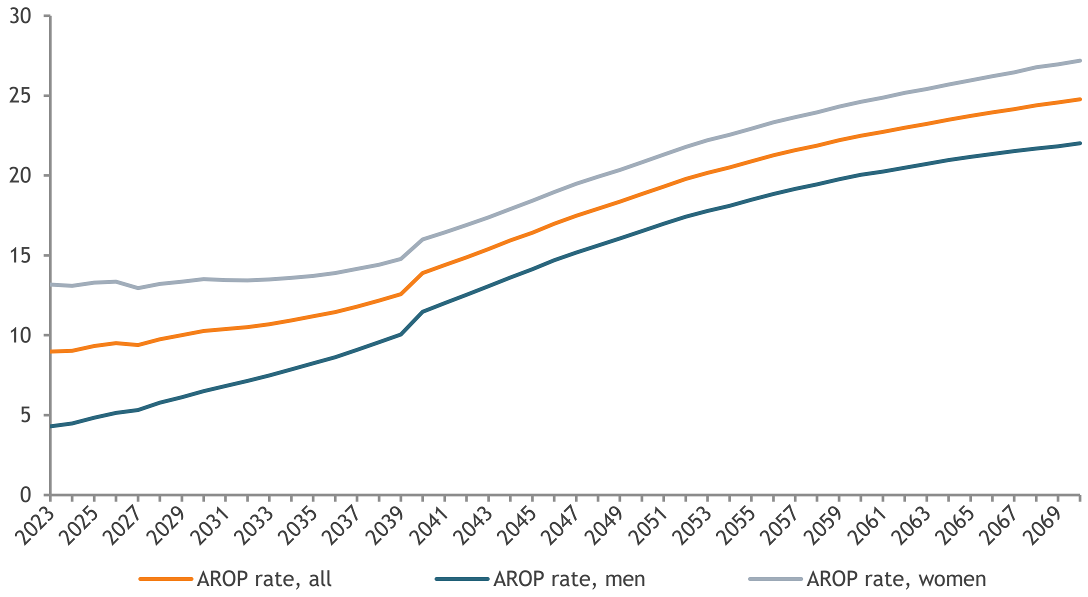
A second reason for this prominent increase is the under-indexation of the guarantee-pension level in the current system. In the present system, the guarantee-pension level is indexed annually according to the wage-growth but subtracted a fixed factor of 0,75 percentage points. This leads to the level growing slower than the median wage growth in the economy, gradually increasing the AROP[14]. The group containing all older people aged 65+ is naturally highly correlated with the group containing the retired people. Therefore, the explanation for why the AROP rate is increasing is also the same.

A recent policy evaluation in Norway lead to the government proposing a new indexation of the guaranteed pension level. In the proposition (Meld. St. 6, 2023–2024), the government proposes to index the level according to the wage growth without a subtraction factor. This will alleviate some of the increasing poverty risk for the retired and elderly, if passed.

For the working age population, the AROP is decreasing from around 13 percent in 2023 to almost 10 percent by 2070. Since wage growth is higher than pension growth, a larger fraction of retired persons in the population will contribute to a slower growth in the population wide poverty measure compared to growth in incomes of the working population.

Figure 8: Poverty risks to gender, Norway; reference scenario

Per cent



Source: MOSART

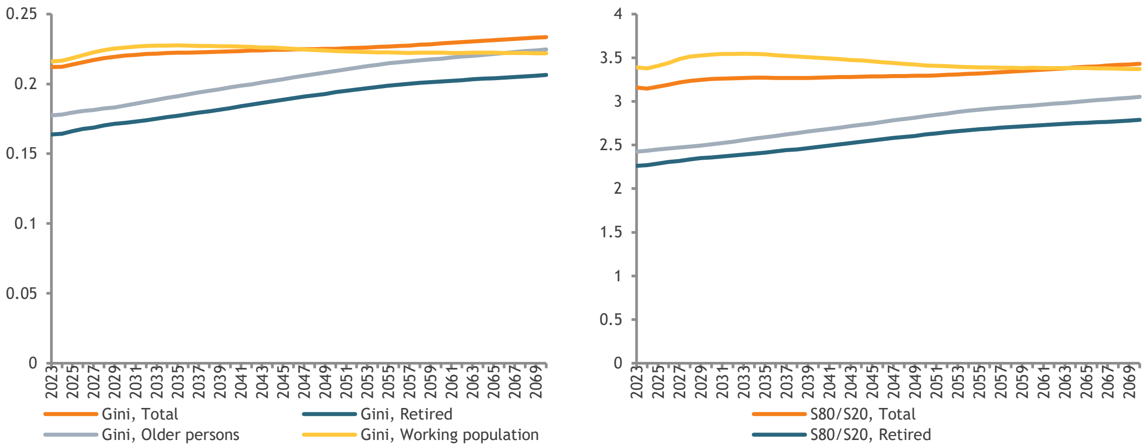
In Figure 8, we see that the AROP for both retired men and women are increasing over time. The AROP is higher for women than for men, but the gap is slowly closing. The narrowing of the gap is attributed to more women having full-length careers and therefore an earnings-based pension on top of the guarantee-pension level that pushes them out of the risk of poverty.

The next figure shows the development of inequality, described by the Gini coefficient and the S80/S20 ratio, in the reference variant for Norway.

14 Note that there are «bumps» in the lines, specifically around the year 2040. These bumps likely are due to the guarantee-pension level creating «flatness» in the income distribution. This level is decreasing slightly slower than the median income level in the population, so that when this threshold surpasses 60 percent of the median income in the population, we experience a «jump» in the share with income below 60 percent of the median.

Figure 9: Inequality in Norway, reference scenario

Gini, S80/S20 ratio



Source: MOSART

It shows that the Gini-coefficient is generally low (recall that our income measure does not include capital income). For the total population it is around 0.22 in 2023 and increasing slightly over time. It is substantially lower for the retired population but increasing over time. The increase over time can again partly be attributed to the under-indexation of pensions. More importantly, the pension system as a whole will move towards becoming more proportional to lifetime earnings over time and therefore cause pension incomes to become more unequal. Cohorts born in 1963 and later will have both social security pensions and occupational pensions in the public sector linked to lifetime earnings, while older cohorts in the social security system receives pensions based on their 20 best years, and older cohorts with occupational pensions in the public sector gets pensions defined as 66 percent of their final earnings. Furthermore, the mandatory occupational pensions in the private sector that was introduced in 2006 will mature over this period and provide another component of pension accrual that is proportionate to earnings. It can also be shown that the Gini coefficient is quite similar for retired men and women, although slightly higher for women.

The income quintile ratio (S80/S20) reflects the ratio of the income in earned by the upper quintile relative to the income earned by the lower quintile. We see from Figure 4 that the overall S80/S20 for the population is slightly increasing from 3.2 in 2023 to 3.4 in 2070, meaning that the upper quintile holds from 320 to 340 percent of the income of the lower quintile. For the working population, the rate is higher than average, while for the retired and elderly it is lower. The reason is the distributive effects of the pension system leading to less income inequality in these groups. However, as for the Gini-coefficient, we find that the income quintile ratio is increasing among the elderly and the retired.

4.6.3. Sensitivity tests and alternative scenarios

Table 11 shows the impact of various alternative assumptions about demographics and total factor productivity (TFP) on the poverty rate of retired persons. Only the scenarios that are simulated by MOSART for Ageing Working Group are included.

Table 11 – At-risk-of-poverty rate (AROP) under different scenarios, as deviation from the base scenario in pp

	2030	2040	2050	2060	2070
Total					
Base scenario	12.5	12.7	13.2	13.7	14.0
Higher net migration	0.1	0.0	0.2	0.2	0.1
Lower net migration	-0.2	-0.2	-0.1	-0.2	-0.1
Lower fertility rate	0.2	0.5	0.4	0.6	0.8
Higher life expectancy	0.0	-0.3	-0.1	-0.1	-0.1
Higher TFP	0.0	-0.2	0.1	0.1	0.2
Retirees					
Base scenario	10.3	13.9	18.9	22.5	24.8
Higher net migration	-0.1	-0.1	0.1	0.3	0.4
Lower net migration	0.1	0.0	0.0	-0.2	-0.4
Lower fertility rate	0.7	1.2	1.1	0.9	0.9
Higher life expectancy	0.0	-0.2	-0.2	-0.2	0.0
Higher TFP	0.0	0.0	0.2	0.6	0.9
Working population					
Base scenario	13.0	12.3	11.5	10.8	10.1
Higher net migration	0.2	0.3	0.3	0.3	0.2
Lower net migration	-0.2	-0.3	-0.3	-0.3	-0.3
Lower fertility rate	0.2	0.3	0.1	0.2	0.2
Higher life expectancy	0.0	-0.1	-0.1	-0.2	-0.4
Higher TFP	0.0	0.0	0.0	0.0	-0.1

Changes in income inequality among retirees under different assumptions about demographics and wage growth are mostly in line with the results for poverty risk. Higher migration leads to a higher proportion of immigrants among retired, which increases inequality. Conversely, lower net migration reduces inequality.

Lower fertility affected the risk of poverty mainly through its effect on the median of equivalized income. Looking at inequality among retirees we see that the effect of fewer children, more full-time work and higher income levels will also be lower inequality in the long run. Higher TFP and wage growth on the other hand will tend to exacerbate the main driver of inequality in the baseline, i.e. the transition onto an overall pensions system that is more closely linked to lifetime earnings.

Table 12 – Public pension expenditures and poverty risk among retirees under different scenarios in 2070, Norway

		AROP impact in 2070	Budget impact in 2070
		AROP retirees	in % of GDP
Baseline in %		24.8	12.5
Alternative scenarios: deviation from the reference scenario in percentage points			
Higher life expectancy at birth (+2y)	HLE	0.0	0.3
Higher migration (+33%)	HMIG	0.4	-0.5
Lower migration (-33%)	LMIG	-0.4	0.5
Lower fertility (-20%)	FERLOW	0.9	1.0
Higher TFP growth (convergence to 1%)	TFPHIGH	0.9	-0.2

Only the scenarios that are simulated by MOSART are included.

Total public expenditure is projected to increase from 10.8 percent of GDP in 2022 to 12.5 percent in 2070, according to calculations done for the Ageing Working Group. The increase is mainly due to population ageing and the associated increase in the dependency ratio. Note that in national population projection there is a more pronounced population ageing than in the Europop projections, due to higher life expectancy and lower net migration. As shown in Table 12, both higher life expectancy and lower net migration will contribute to a higher estimated expenditure. On the other hand, higher life expectancy and lower net migration has different effects on adequacy as higher life expectancy has little or no effect, while lower net migration also lowers the risk of poverty for retirees. Lower fertility impacts both adequacy and fiscal sustainability in a negative way, while higher TFP lowers expenditure but at the cost of higher fractions of retirees below the poverty line.

5. Overall discussion of the budgetary and adequacy impacts

Before concluding, this paper revisits the country specific scenarios depicted in the country-specific Tables 6, 8, 10 and 12. The results are again presented in below Table 13. The below discussion will not go back to the details, but aims to find broad conclusions on the comparison of the effects between countries.

As became clear in the discussion of the country-specific tables, various sensitivity tests show a trade-off between the AROP impact and the budget impacts. This is the case in both the higher and lower TFP growth scenarios in Belgium and the higher TFP growth scenario in Norway. The scenario with higher productivity results in lower expenditure but also a higher poverty risk among retirees, while the opposite is the case for the lower productivity scenario in Belgium. This is because the TFP scenario has an immediate impact on the growth rates of earnings, which, through the poverty threshold, affects the poverty risk of pensioners and the elderly. Also in the migration scenarios there is such a trade-off between the AROP impact and the budget impact for all countries (but for Czechia, where the impact of migration on GDP appears limited): the higher migration scenario would result in lower expenditure as a percent of GDP but also a higher poverty risk among retirees, as there would in the long run be a higher proportion of migrant pensioners that have shorter careers and lower earnings. Conversely, the lower migration scenario would result in higher expenditure but also a lower poverty risk among retirees.

In some other scenarios, there is no such clear trade-off, however. The higher life expectancy scenario clearly results in higher expenditure to GDP, but the impact on the poverty risk among retirees is small (Belgium) or absent (Norway). Only in Slovenia is there a higher poverty impact of this scenario (possibly caused by a partial indexation of on-going pension benefits, which means that the income of old pensioners will gradually lag behind the poverty line), while poverty would decrease in Czechia. The lower fertility scenario increases expenditures to GDP (save for Czechia where the impact is negligible), while also increasing the poverty risk[15] (save for Slovenia where the impact is negligible). The same goes for the constant retirement age scenario in Belgium. Finally, the higher employment rate among older workers (OER) scenario in both Belgium and Slovenia, as well as the scenario where the SRA would increase with life expectancy in Czechia, would result in lower expenditure as well as lower poverty risks among retirees. The lower expenditure would be the result of the higher activity rate in these scenarios, which would increase GDP relative to the reference scenario. This in turn would drive down expenditures as a fraction of GDP. The higher activity rate would also result in higher pension benefits when these cohorts reach retirement age. However, also seeing that the scenario would affect limited groups of the active population, the increase in the activity rate would not be strong enough to increase the poverty line. This indirect effect would therefore be too small to counter the direct effect of a higher activity rate.

15 The lower fertility decreases the average household size of the active population and thereby the equivalent scale that puts a downward correction on household income. Hence equivalent income of the active population increases. This in turn drives up the poverty threshold. The fertility scenario has less impact on the household size of the older population. Thus, the poverty risk of the older persons and retired increases.

Table 13 – Public pension expenditures and poverty risk among retirees under different scenarios in 2070: all countries

	Belgium		Czechia		Slovenia		Norway	
	AROP impact in 2070	Budget impact in 2070	AROP impact in 2070	Budget impact in 2070	AROP impact in 2070	Budget impact in 2070	AROP impact in 2070	Budget impact in 2070
Public pension expenditure								
Baseline in %	4.4	16.2	24.9	9.8	24.7	13.7	24.8	12.5
Alternative scenarios: deviation from the reference scenario in pp								
Higher life expectancy at birth (+2y) (HLE)	-0.1	0.8	-0.5	0.6	0.3	0.9	0.0	0.3
Higher migration (+33%) (HMIG)	0.2	-0.4	0.6	0.2	0.3	-0.7	0.4	-0.5
Lower migration (-33%) (LMIG)	-0.3	0.5	-0.5	-0.3	-0.4	0.9	-0.4	0.5
Lower fertility (-20%) (FERLOW)	0.1	1.3	0.5	-0.1	-0.1	1.1	0.9	1.0
Higher employment rate of older workers (+10 pps) (OER)	-0.1	-1.1			-0.3	-0.7		
Higher TFP growth (convergence to 1%) (TFPHIGH)	0.8	-0.6					0.9	-0.2
Lower TFP growth (convergence to 0.6%) (TFPLOW)	-1.0	1.1						
Policy scenario: constant retirement age (CRA)	0.6	1.1						
Policy scenario: link SRA to life expectancy			-0.1	-1.5				

6. Conclusion

Every three years the European Commission and the Social Protection Committee publish a Pension Adequacy Report, which provides an overview of the current and future adequacy of old-age incomes in EU Member States. Future adequacy is assessed mainly on the basis of the Theoretical Replacement Rates (TRRs). This note shows that dynamic microsimulation models could be useful by providing projections of the at-risk-of-poverty rate of older people and retired. The simulations are made in such a way that they are consistent with projections by the Ageing Working Group (AWG) of the Economic Policy Committee of the financial sustainability of pensions.

Much of the projected trends in the poverty risks of older people are due to demographic and socio-economic developments that are independent of policies, such as the increase in the labour market participation of women, immigration flows and a declining propensity to marry among couples (which results in more single-person households in old age and fewer survivors' pensions). To make the impact of these developments visible in a quantified way is an important added value of dynamic microsimulation models (that cannot be provided by TRRs).

Between 2022 and 2070, total public pension expenditures would increase by 3.5 percentage points of GDP in Belgium. The poverty risks of pensioners and older people in Belgium would decrease at first, and thereafter followed by a rebound. This would be the result of several socio-economic trends, including different growth rates between the (minimum) pensions and earnings.

In Slovenia, the budgetary costs of ageing would increase by 4.0 percentage points, but the peak would be reached in the late 2050s already. During that period, poverty risks for elderly and pensioners would increase by roughly 5 percentage points, after which it would stabilize.

The results paint a very different picture for Czechia and Norway, however. In both countries, the projected increase of pension expenditure would be smaller than in Belgium and Slovenia, namely 1.7 percentage points of GDP. The at-risk-of-poverty (AROP) rate for pensioners or retired in both countries would however more than double from its current value.

The increase of the risk of poverty for retirees and older people in Norway is partly due to the current regulation of the minimum pension, called guarantee pension. In a new proposition from the Government, a suggestion to regulate the guaranteed pension with wage growth will diminish some of this projected increase in poverty.

Another interesting finding is that in several alternative scenarios, there is a trade-off between the AROP impact and the financial budget impact compared to the reference scenario. A lower poverty risk is associated with higher expenditure, and vice versa. This is especially the case in the higher or lower migration and TFP scenarios.

In some other scenarios, there is no such clear trade-off, however. For example, the higher employment rate among older workers scenario in Belgium as well as Slovenia would result in lower expenditures as well as lower poverty risks among retirees.

7. References

Andreassen, L., D. Fredriksen, H. M Gjefsen, E. Halvorsen, N. M Stølen; 2020; The dynamic cross-sectional microsimulation model MOSART; *International Journal of Microsimulation*; 13(1); 92-113. DOI: 10.34196/IJM.00214

Dekkers, Gijs, Raphaël Desmet and Karel Van den Bosch, 2023a. MIDAS 2.0. Revisie van een Dynamisch Microsimulatiemodel. Working Paper 2-23. Brussels: Federal Planning Bureau, January 2023.

Dekkers, Gijs, Raphaël Desmet, Ádám Rézmovits, Olle Sundberg, and Krisztián Tóth, 2015. On using dynamic microsimulation models to assess the consequences of the AWG projections and hypotheses on pension adequacy: Simulation results for Belgium, Sweden and Hungary. Report Federal Planning Bureau, Central Administration of National Pension Insurance (ONYF), Hungary. https://lirias.kuleuven.be/handle/123456789/493177

Dekkers, Gijs, Riccardo Conti, Raphaël Desmet, Olle Sundberg, Karel Van den Bosch, 2018. What are the consequences of the AWG 2018 projections and hypotheses on pension adequacy? Simulations for three EU member states. Report Federal Planning Bureau 11732, June 2018. https://www.plan.be/admin/uploaded/201807181105000.REP_AWG2018pension_11732.pdf

Dekkers, Gijs, Raphaël Desmet and Karel Van den Bosch, 2023b. Armoederisico's en inkomensongelijkheid tot 2070. Projecties van het gereviseerde dynamische microsimulatiemodel MIDAS 2.0. Working Paper 3-23. Brussels: Federal Planning Bureau, May 2023.

European Union, 2023, 2024 Ageing Report. Underlying Assumptions and Projection Methodologies. Luxembourg: Publications Office of the European Union, 2023.

Federal Planning Bureau, 2023, Economic Policy Committee - Ageing Working Group. 2024 Ageing Report Belgium: Country Fiche. Mimeo November 2023. Brussels: Federal Planning Bureau.

European Union, 2021. Poverty Risk and Income Inequality for older people in a long-term Perspective. Results from dynamic microsimulation models for Belgium, Hungary and Italy. Luxembourg: Publications Office of the European Union, 2021. Retrieved from the European Commission website Publications catalogue - Employment, Social Affairs & Inclusion - European Commission (europa.eu) [13/12/2023].

Dekkers, Gijs, Karel Van den Bosch, Mikkel Barslund, Tanja Kirn, Nicolas Baumann, Nataša Kump, Philippe Liégeois, Amílcar Moreira and Nada Stropnik, 2022, How Do Gendered Labour Market Trends and the Pay Gap Translate into the Projected Gender Pension Gap? A Comparative Analysis of Five Countries with Low, Middle and High GPGs. Soc. Sci. 2022, 11(7), 304; https://doi.org/10.3390/socsci11070304

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