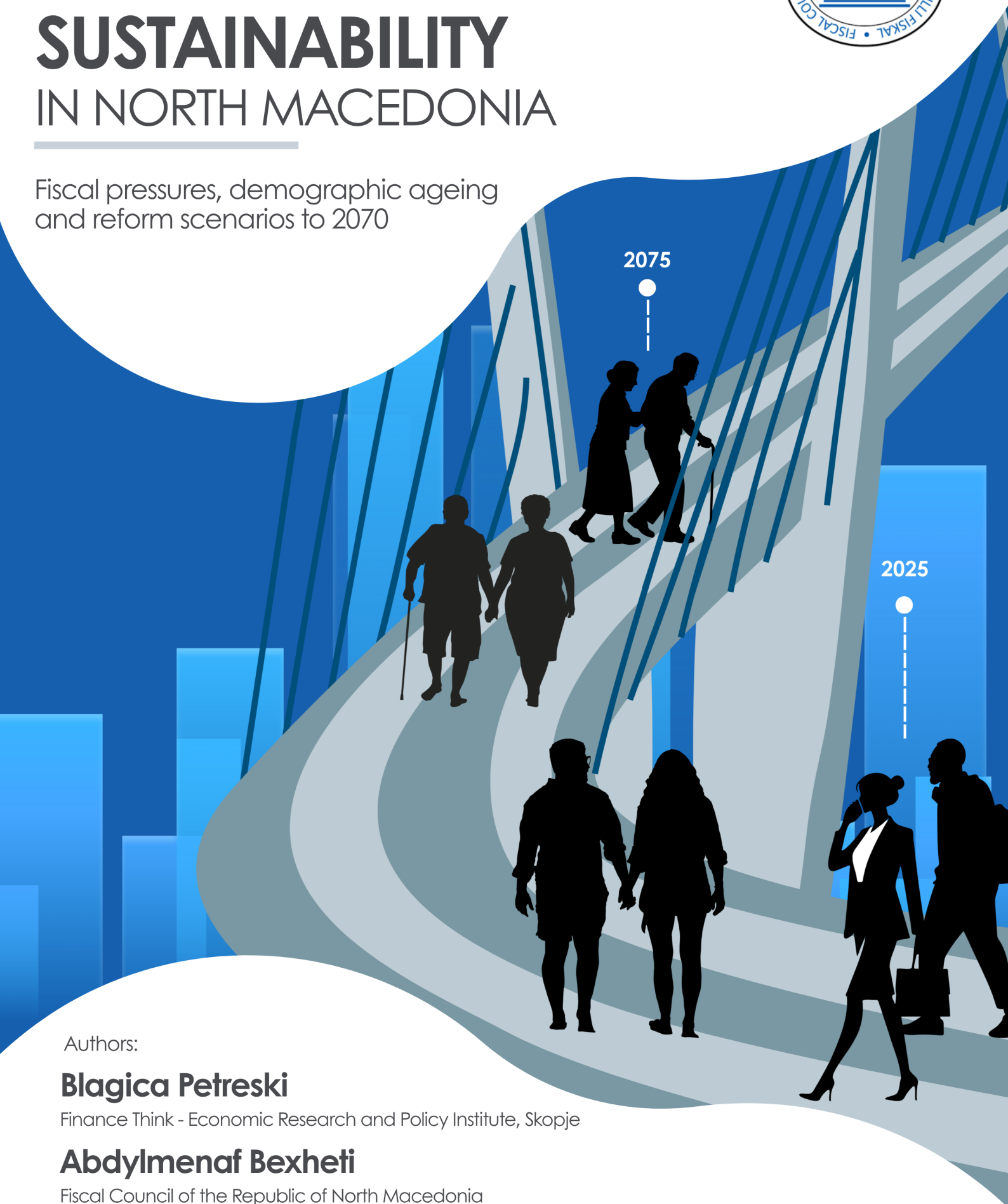


PENSION SYSTEM SUSTAINABILITY IN NORTH MACEDONIA



Fiscal pressures, demographic ageing
and reform scenarios to 2070



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Funded by the European Union Trust Fund for Strengthening Fiscal Governance,
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1 Introduction

North Macedonia's pension system is under structural fiscal stress. The pension deficit reached 54.4 billion MKD in 2025 — equivalent to 5.2% of GDP — and is projected to grow continuously without reform. This outcome is not the product of a single policy failure but of the compounding interaction of three structural forces over more than two decades.

The first is legislative. The transition from a mono-pillar pay-as-you-go system to a three-pillar architecture in 2003 was followed by a significant reduction in the pension contribution rate — from 21.2% in 2008 to 19% in 2009 and further to 18% in 2010 — permanently reducing PAYG contribution revenues without a corresponding reduction in benefit obligations. Subsequent legislative cycles produced incremental parametric adjustments but did not restore the contribution base or address the structural financing imbalance. On the expenditure side, pensions have repeatedly been increased through amounts exceeding the statutory indexation formula — through fixed nominal top-ups in 2014–2016 and 2020, and flat linear increases in 2024 and 2025 — each permanently resetting the expenditure base upward and establishing a pattern of discretionary intervention that has substituted for a rule-based adequacy framework.

The second is demographic. North Macedonia is undergoing one of the most pronounced demographic transitions in the region. The total fertility rate stands at 1.6 — well below the natural replacement threshold — natural population change has been negative since 2019, and outward migration has been disproportionately concentrated among working-age cohorts. The old-age dependency ratio rose from 16.5% in 2003 to around 27% in 2025 under the SSO Baseline projection, with all demographic scenarios pointing to a breach of 50% before 2050 — a trajectory that mechanically deteriorates the ratio of active contributors to pension recipients regardless of the policy parameters in force.

The third is structural in the labour market. Despite substantial employment growth since the mid-2000s, the contribution base remains constrained by incomplete formalisation (informal employment rate of 13.5% in 2025) and a persistently large gender gap in economic activity — both representing untapped contributor reserves that have not been sufficient to offset demographic deterioration. At the same time, strong nominal wage growth in recent years simultaneously raised contribution revenues and, under the restored Swiss

indexation formula, accelerated pension expenditure, limiting the net fiscal benefit. The contributors-to-pensioners ratio remains well below the conventional sustainability threshold and is projected to fall below 1.0 before 2050 under baseline assumptions.

Against this background, this paper aims to assess the fiscal sustainability of the pension system in North Macedonia by simulating the long-run budgetary consequences of demographic ageing under seven alternative parametric reform scenarios.

This paper constructs and applies the Pension System Sustainability Model for North Macedonia (PSSM-MK), an aggregate fiscal projection tool designed to simulate the long-run budgetary consequences of demographic ageing under alternative parametric reform scenarios over the 2025–2070 horizon. The model integrates SSO demographic projections, Pension and Disability Insurance Fund administrative data, Ministry of Finance fiscal series, and official macroeconomic forecasts into a transparent accounting framework.

Two questions guide the analysis:

- i. **What is the structural magnitude of the pension financing gap; and**
- ii. **Which parametric reform instruments — individually and in combination — offer the greatest fiscal relief; and at what adequacy cost.**

The paper is structured as follows. Section 2 reviews the conceptual and empirical literature on pension sustainability, adequacy, and reform. Section 3 presents the pension system architecture, contribution structure, and key parametric changes across several legislative cycles. Section 4 documents the demographic, labour market, and fiscal evidence that motivates the simulation. Section 5 describes the PSSM-MK model structure, scenario definitions, and data sources. Section 6 presents and interprets the simulation results. Section 7 draws conclusions and sets out a structured policy reform agenda.

2 Conceptual framework and literature review

Pension reform is increasingly understood in literature as a multidimensional policy challenge rather than a narrow actuarial exercise. A pension system is expected to provide income security in old age, prevent poverty, smooth consumption across the life cycle, redistribute toward vulnerable groups, and remain fiscally affordable over time. Barr and Diamond (2008) frame pension design as a question of managing trade-offs between these objectives, rather than identifying a universally optimal model. This is particularly relevant for countries with pay-as-you-go components, where demographic developments, labour-market participation, contribution compliance and benefit rules jointly determine the system's long-term balance.

Demographic ageing as a structural driver of pension pressures

Within this multidimensional framework, demographic change is increasingly recognised as the key structural driver shaping pension-system sustainability across both advanced and emerging economies. The IMF emphasises that population ageing, rising life expectancy and declining fertility rates are fundamentally transforming the balance between contributors and beneficiaries, creating growing pressure on public pension systems and government finances (IMF, 2014). Similarly, the World Bank stresses that countries are increasingly challenged to provide adequate and sustainable retirement income in the context of rapidly ageing populations, shrinking workforces and changing labour-market structures (Hartley and Abels, 2025).

Demographic ageing affects pension systems through several interconnected channels. Rising longevity increases the duration of pension benefit payments, while declining fertility and outward migration, in the case of the Western Balkans, reduce the future supply of contributors entering the labour market. As a result, old-age dependency ratios rise and contributors-to-pensioners ratios deteriorate over time, weakening the financial basis of pay-as-you-go systems. The IMF projects that old-age dependency ratios in advanced economies could approximately double by mid-century, while emerging economies are also expected to experience substantial ageing pressures in the coming decades (IMF, 2014). Recent European evidence similarly highlights the rapid decline in worker-to-retiree ratios and identifies demographic ageing as a structural challenge to the sustainability of pension systems (European Commission, Aging Reports).

Literature consistently identifies demographic ageing as a long-term rather than temporary phenomenon. The United Nations population projections show persistent increases in the share of older persons in total population, accompanied by shrinking working-age cohorts and declining fertility rates (United Nations, 2022; United Nations, 2013). OECD analysis further notes that ageing societies are expected to face growing fiscal and labour-market pressures unless pension systems and labour-force participation adapt accordingly (OECD, 2006; OECD, 2023).

Fiscal sustainability and pension deficits

The fiscal implications of demographic trends are substantial. Pension expenditures represent one of the largest components of public spending in many countries, and ageing populations place increasing pressure on fiscal balances, debt sustainability and public expenditure composition. The IMF framework emphasises that sustainability should not be assessed solely through the pension system itself, but through the broader fiscal capacity of the state to finance pension obligations without generating excessive deficits, debt accumulation or crowding-out effects on other productive public spending such as education, healthcare or infrastructure (IMF, 2014).

The literature further notes that traditional fiscal indicators often underestimate pension-related risks because they fail to fully capture implicit pension liabilities and future demographic pressures. Buiter (1983) emphasised the importance of intertemporal fiscal analysis in assessing public-sector sustainability, while later IMF work proposed pension-adjusted fiscal indicators capable of capturing long-term obligations and transition costs arising from pension reforms (Soto, Clements and Eich, 2011).

These dynamics are particularly relevant for North Macedonia. Petreski and Petreski (2021) show that the pension-system deficit doubled over a decade and significantly outpaced the central budget deficit, linking these developments to demographic pressures, contribution-rate reductions, ad-hoc pension increases and early-retirement channels. North Macedonia's pension system has thus become increasingly dependent on transfers from the central budget — a structural vulnerability that this paper quantifies and projects forward over the 2025–2070 horizon.

The literature also stresses that pension sustainability should not be interpreted narrowly as expenditure containment. Excessive fiscal adjustment through

lower benefits or restrictive eligibility rules may undermine social protection objectives and increase old-age poverty risks. Therefore, sustainability assessments increasingly integrate fiscal affordability with social adequacy considerations (Barr and Diamond, 2008).

Adequacy and old-age income protection

Pension systems simultaneously perform a critical social-protection function by reducing old-age poverty and providing income security after retirement. The World Bank argues that many pension systems struggle to simultaneously achieve adequacy, affordability and sustainability, particularly in ageing societies (Hartley and Abels, 2025). Similarly, the IMF notes that pension reforms inevitably involve trade-offs: improving fiscal sustainability through lower replacement rates or tighter eligibility conditions may reduce adequacy and increase vulnerability among pensioners (IMF, 2014).

The adequacy dimension therefore occupies a central role in contemporary pension analysis. Adequacy refers to the ability of pension systems to ensure sufficient income replacement and preserve minimum living standards in old age. Reforms that reduce pension generosity through indexation changes, longer contribution periods or lower replacement rates may improve fiscal balances, but can disproportionately affect vulnerable groups, including low-income workers, women, informal workers and workers with interrupted careers.

The literature further emphasises that pension adequacy is closely connected to labour-market trajectories accumulated during working life. Workers with unstable employment histories, long unemployment periods or informal employment often accumulate insufficient contribution records and face lower pension entitlements in retirement.

Equity and intergenerational fairness

The literature increasingly emphasises equity as a core dimension of pension reform. Pension systems redistribute resources both within and across generations, making fairness considerations central to reform debates. The IMF distinguishes between intragenerational equity, concerning fairness among individuals within the same generation, and intergenerational equity, concerning the distribution of pension burdens between current and future generations (IMF, 2014).

McDaniel and Repetti (1993) discuss the concepts of horizontal and vertical equity in tax and transfer systems, emphasising the importance of balancing redistribution with fairness across different income and demographic groups. In the Macedonian context, the practice of discretionary pension increases outside the statutory indexation formula—whether fixed nominal top-ups applied in earlier years or flat linear increases applied uniformly to all pensioners as recently — represents a concrete violation of vertical equity: an identical absolute amount applied across differentiated pension levels compresses the differential accumulated through the full contribution record, de facto redistributing without a statutory principle and normalising a pattern of discretionary intervention that repeatedly resets the expenditure base upward.

Gender dimensions are also increasingly emphasised in the pension literature. Women frequently experience shorter contribution histories, lower lifetime earnings and more interrupted careers due to caregiving responsibilities, resulting in lower pension entitlements and higher poverty risks in old age. European Commission studies highlight that pension reforms may therefore have differentiated impacts across gender and employment categories (Istituto per la Ricerca Sociale and Fondazione Brodolini, 2011).

Informality, coverage and labour-market incentives

The literature also highlights that labour-market structures are critical for pension sustainability. Contributory pension systems depend heavily on formal employment and stable contribution histories. Where informality is widespread, contribution density declines, coverage gaps widen and future pension adequacy weakens. The World Bank notes that contributory systems in many middle-income economies fail to achieve broad coverage because labour markets are characterised by informal employment, unstable careers and weak administrative capacity (Hartley and Abels, 2025).

The broader informality literature further demonstrates that high payroll contributions, weak institutional trust and fragmented social-insurance systems may themselves discourage formalisation and contribution compliance. Levy (2008), analysing the Mexican context, argues that poorly designed social-insurance arrangements may unintentionally create incentives for informality by increasing labour costs without generating sufficiently valued benefits — a diagnostic observation relevant independently of the specific reform prescription advanced in that context. Ohnsorge and Yu (2022) similarly show that

economies with high informality tend to have lower fiscal capacity, weaker governance and more limited ability to finance sustainable social-protection systems.

For pension systems, informality creates a double challenge. First, it weakens current contribution revenues and increases pension-system deficits. Second, it reduces future pension entitlements and increases the likelihood of inadequate income in old age. Consequently, pension sustainability cannot be achieved only through parametric reforms such as retirement-age increases or indexation changes, but also through policies that broaden the contribution base and increase formal labour-market participation. Recent World Bank work on pension inclusion for informal workers emphasises the importance of flexible contribution mechanisms, digital enrolment systems, voluntary savings arrangements and trust-building communication strategies (Guven, 2019; Guven, Jain and Joubert, 2021; World Bank, 2024).

Parametric and structural pension reforms, governance and institutional context

The literature distinguishes between parametric and structural pension reforms. Parametric reforms aim to improve sustainability within the existing system through changes in retirement age, contribution rates, eligibility rules, indexation or benefit formulas. Structural reforms involve broader changes in system architecture, including shifts between pay-as-you-go and funded financing, public and private management, or defined-benefit and defined-contribution schemes (IMF, 2014).

International evidence suggests that while funded pillars may diversify pension financing and reduce long-term fiscal pressures, they may also create significant transition costs and expose individuals to financial-market risks if institutional design and regulation are weak (European Commission, 2008). Impavido (2002) further stresses the importance of transparent governance and accountability in pension-fund management. Finally, the IMF highlights that reform success depends not only on actuarial calculations but on institutional credibility and public understanding of reform objectives — political-economy constraints that are particularly acute when reforms redistribute resources across generations and social groups (IMF, 2014).

3 Structure of the pension system of North Macedonia

The pension system of North Macedonia operates as a mandatory multi-pillar structure, combining a defined-benefit pay-as-you-go (PAYG) first pillar with a mandatory funded second pillar and a voluntary third pillar. The current architecture reflects the structural reform initiated in 2003, when the country transitioned from a mono-pillar PAYG system to a partially funded multi-pillar system following regional reform trends in Central and Eastern Europe. Understanding the design, financing mechanisms, and recent parametric changes of the system is prerequisite to interpreting the empirical evidence on its sustainability.

3.1 Architecture and pillars

First Pillar — mandatory PAYG (defined benefit)

The first pillar is administered by the Pension and Disability Insurance Fund (PDIF) and covers old-age, disability, and survivor pensions. It operates on a PAYG basis: current contributions from active insured persons finance current pension payments. Eligibility for an old-age pension requires a minimum of 15 years of pensionable service, with the statutory retirement age set at 64 years for men and 62 years for women — unchanged across the three major legislative reforms of 2013, 2020, and 2023.

Pension benefits are calculated from the insured person's lifetime valorized average monthly wage (the pension basis), to which accrual rates and a percentage scale are applied depending on years of service and pillar participation. For persons remaining exclusively in the first pillar (generally pre-2003 insured), the legacy replacement rate schedule applies: starting at 35% for men (40% for women) at 15 years of service, rising at 1.8 percentage points per year for both genders after year 20, capped at 80% (reached at 40 years for men, 35 years for women). For post-2013 service years, an additional accrual of 1.61% per year for men and 1.84% per year for women (subsequently unified at 1.47% from 2020) applies to the pension basis.

Survivor pensions equal 70% of the deceased person's pension for one beneficiary, rising by 10 percentage points per additional beneficiary up to a maximum of 100%. Disability pensions for occupational injury were set at 80% of the

pension basis, declining at 0.32 percentage points per year from 2016, reaching approximately 77.4% by 2023.

The indexation formula — the mechanism by which pensions in payment are adjusted over time — has been the most politically contested parameter in the system. The 2013 law established a Swiss-model formula: 50% CPI + 50% average wage growth, applied twice yearly (January and July). The 2020 reform shifted to a CPI-only formula in response to fiscal pressures. The 2023 reform restored the 50% CPI + 50% wage formula with a new GDP bonus clause (additional adjustment when real GDP growth exceeds 4%), and shifted the adjustment dates to March and September. Beyond the statutory formula, pensions have also been subject to recurring ad hoc and linear nominal increases outside the indexation cycle, reflecting their role as a politically salient commitment rather than a purely actuarial parameter. Fixed nominal top-ups — including 600–722 MKD per pensioner applied across three consecutive years (2014–2016), a further 722 MKD increase in 2020, and two flat additions of 2,500 MKD each in September 2024 and March 2025, and additional increases of 1,000 MKD in September 2025 and March 2026— have been applied uniformly regardless of pension level, compressing the distribution of pension income and permanently resetting the expenditure base upward outside any statutory sustainability framework.

Second pillar — mandatory funded (defined contribution)

Persons entering employment for the first time on or after 1 January 2003 (subsequently extended to persons under 40 entering after 1 January 2019) are mandatorily enrolled in the second pillar. Six percentage points of the total pension contribution rate are diverted to individual funded accounts managed by licensed private pension fund management companies, supervised by the Agency for Supervision of Fully Funded Pension Insurance (MAPAS). The second pillar is a defined contribution (DC) scheme: retirement income depends entirely on accumulated contributions, investment returns, and fund costs. There is no guaranteed benefit level.

The transition from the mono-pillar PAYG system created a permanent structural fiscal cost: the 6 percentage points of contribution rates diverted to the second pillar were previously financing first-pillar payments. This transition cost, the financing gap created by diversion, must be covered by general budget transfers, constituting a permanent additional obligation on the state budget

that compounds over time as the share of post-2003 insured people in the active workforce grows.

Third pillar — voluntary

The third pillar consists of voluntary supplementary pension savings, also supervised by MAPAS. Participation is low relative to European comparators, limiting its current role as a buffer for adequacy in retirement.

3.2 Contribution rates and financing

The architecture of the current pension system reflects a long sequence of reforms stretching back to independence. North Macedonia established an independent Pension and Disability Insurance Fund in 1991, inheriting a mono-pillar PAYG system from the Yugoslav period that was characterised by generous replacement rates, early retirement provisions, and a high contribution burden. The Law on Pension and Disability Insurance, first enacted in 1994, has undergone continuous amendment in the three decades since.

The first major structural reform came in 2000–2003, when legislation was enacted to transition toward a three-pillar architecture. The mandatory second funded pillar entered into force in January 2003, with the third voluntary pillar following in 2008–2009. The 2005–2006 reform package — implemented alongside the second-pillar launch — raised the statutory retirement age to 64 years for men and 62 for women (from 63 and 60, respectively), introduced the Swiss indexation formula (50% CPI + 50% wages), and reduced accrual rates relative to the pre-reform schedule. These changes represented the most comprehensive parametric adjustment in the system's post-independence history and initially improved the contributors-to-pensioners ratio from 1.31 in 2005 to 1.85 by 2017.

However, the fiscal gains of the 2005–2006 reform were progressively eroded. The pension contribution rate — which stood at 21.2% prior to reform — was reduced to 19% in 2009 and further to 18% in 2010 as part of a job-creation strategy, permanently reducing PAYG contribution revenues. Simultaneously, pensions were increased on multiple occasions through amounts exceeding the statutory indexation formula, establishing a pattern of discretionary intervention that has persisted to the present. The rate remained at 18.0% through 2018, before being raised in two steps under the 2018 amendments to the Law

on Contributions from Compulsory Social Insurance (Official Gazette 247/2018): to 18.4% with effect from January 2019, and to 18.8% from January 2020, where it remained through July 2026. Effective July 2026, as a temporary measure applying until December 2026, amendments to the Law on Contributions from Compulsory Social Insurance redirected 1.1 percentage points from the unemployment insurance contribution (from 1.2% to 0.1%) to the pension and disability insurance contribution, raising the pension rate from 18.8% to 19.9% while leaving the total contribution burden unchanged (28% of gross wages). This rate is an obligation of the employer, applied to gross wages. For second-pillar members, 6 percentage points flow to individual funded accounts and 13.8 percentage points to the first-pillar PAYG fund; for PAYG-only members, the full 18.8% flows to the first pillar.

Crucially, contribution revenues alone have been structurally insufficient to finance PDIF expenditure since at least the early 2000s. The Law on Pension and Disability Insurance (and its successive amendments) obliges the state budget to cover: (a) pension rights accrued under privileged conditions, (b) the transition cost of second-pillar contribution diversion, and (c) any residual financing gap. This open-ended budget obligation — with no statutory ceiling — means that the PAYG deficit is ultimately financed by general taxation, making pension sustainability an issue of broad fiscal policy.

3.3 Key parametric changes 2013–2023

Three legislative cycles have produced incremental parametric reforms without resolving the structural financing imbalance. Contribution rate changes are governed by the Law on Contributions from Compulsory Social Insurance; all remaining parameters in Table 1 are governed by the Law on Pension and Disability Insurance.

Table 1: Key parametric changes 2003–2026

Parameter	Pre-2013 (2003–2012)	2013 Law	2019–2020 changes	2023 Law and July 2026 Amendment
Contribution rate	21.2% → 19% (2009) → 18% (2010)	18.0%	18.4% (Jan 2019) → 18.8% (Jan 2020)	19.9% (temporary, Jul–Dec 2026)
Retirement age (M/F)	Raised to 64/62 (2005–2006 reform)	64/62 (unchanged)	64/62 (unchanged)	64/62 (unchanged)

Parameter	Pre-2013 (2003–2012)	2013 Law	2019–2020 changes	2023 Law and July 2026 Amendment
Accrual rates	1.8–2.6%/yr by gender and pillar (pre-2013 service)	1.61%/yr (M); 1.84%/yr (F) for post-2013 service	1.47%/yr (unified M and F)	1.47%/yr (unchanged)
Indexation formula	Swiss formula introduced (2005–2006): 50% CPI + 50% wage	50% CPI + 50% wage (Jan and Jul)	CPI-only (267/2020)	50% CPI + 50% wage + GDP bonus (Mar and Sep)
2nd pillar	Introduced Jan 2003; 3rd pillar Jan 2009	Entry ≥ 1 Jan 2003	Entry ≥ 1 Jan 2019, age <40 (180/2019)	Amended
Disability rate (work injury)	—	80%	~78.4% (per schedule)	~77.4% (per schedule)

Sources: Law on Pension and Disability Insurance (Official Gazette 98/2012, 166/2012, 15/2013, 180/2019, 267/2020, 79/2023); Law on Contributions from Compulsory Social Insurance (Official Gazette 247/2018) for contribution rate changes; World Bank Special Focus Note on Pension Reforms in North Macedonia (2019).

The table reveals a consistent pattern across four legislative periods: structural reforms that improve sustainability in the short run have been repeatedly offset by parametric reversals and discretionary interventions. The 2005–2006 reform package — raising the retirement age, introducing the Swiss indexation formula, reducing accrual rates, and launching the mandatory second pillar — was the most comprehensive structural adjustment and produced a measurable improvement in the contributors-to-pensioners ratio. However, the subsequent reduction of the contribution rate from 21.2% to 18% between 2009 and 2010, combined with recurring ad hoc pension increases that exceeded the statutory indexation formula, eroded these gains and widened the structural deficit. The 2019–2020 changes were the most fiscally restrictive of the post-2013 cycles — reducing accrual rates, switching to CPI-only indexation, and raising the contribution rate — while the 2023 law partially reversed course by restoring the Swiss formula with a GDP bonus clause. The statutory retirement age has remained unchanged throughout all four periods, and no automatic adjustment mechanism linking pension parameters to demographic or fiscal indicators exists in current legislation.

4 Descriptive analysis

4.1 Demographic transition

The demographic transition underway in North Macedonia constitutes the structural foundation of long-run pension system pressures. The simultaneous decline in fertility, the ageing of the existing population, and sustained outward migration have produced a demographic trajectory that mechanically deteriorates the PAYG financing ratio — regardless of the policy parameters in force. Crucially, these trends are not projected but observed: the structural turning points have already been crossed.

Population decline and working-age contraction

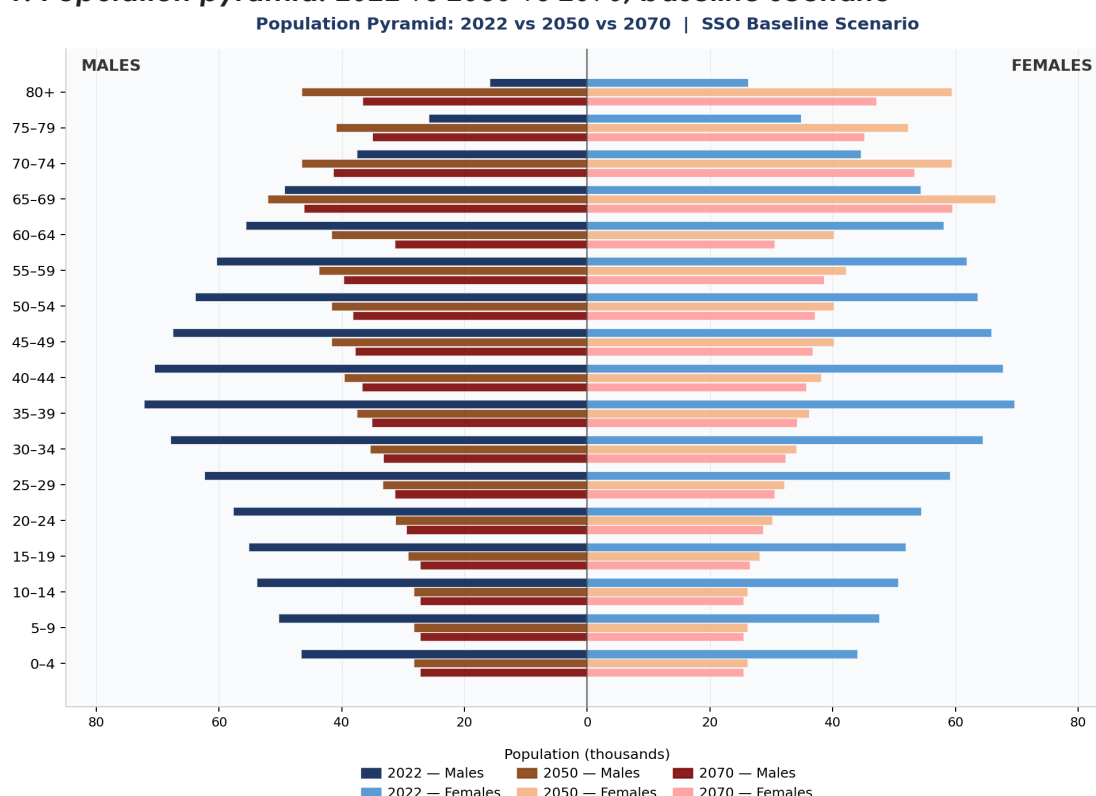
Total population fell from approximately 2.03 million in 2000 to 1.82 million in 2026 — a reduction of more than 200,000 persons (10%) in two decades. State Statistical Office (SSO) demographic projections to 2070 indicate continued decline under all scenarios, with the total population reaching between 1.12 million (Risk scenario) and 1.41 million (Optimistic scenario) by 2070. The range between scenarios narrows over time because fertility differentials feed into labour market entry only with a 20-year lag: regardless of births today, the working-age population contracts substantially across all scenarios up to 2050.

The lag structure of demographic change has a direct implication for pension policy. The workers who will retire in 2045–2070 have been already born; their number is fixed. Fertility improvements today affect the labour market only from approximately 2045 onward — after the primary financing stress window has already peaked. Under the Baseline scenario, the working-age population (15–64) falls from 1.20 million in 2022 to 641,000 by 2070, a 47% contraction of the potential contributor base that no labour market or migration policy currently under discussion is calibrated to offset.

Figure 1 presents the age structure of North Macedonia's population at three reference points. The shift from a broad-based pyramid in 2022 to a near-rectangular structure by 2070 reflects a 24% contraction of the prime-age contributor base (25–54) alongside a 60% growth of the 65+ population — the defining arithmetic of PAYG financing deterioration.

The structural inversion is already visible by 2050: the cohorts that were of working age in 2022 have since retired, while the incoming contributor base is substantially smaller. By 2070, low fertility and mortality compression at older ages produce a top-heavy structure in which the PAYG system's core arithmetic — many contributors financing few retirees — is simply no longer present in the data. For a PAYG pension system, this structure is the actuarial equivalent of structural insolvency. The longer average pension duration for women, reflecting higher female longevity, adds a further expenditure dimension that aggregate headcount figures do not fully capture.

Figure 1: Population pyramid: 2022 vs 2050 vs 2070, baseline scenario



Source: SSO population projections DS001M24 Baseline. 5-year cohorts estimated from aggregate 0-14/15-64/65+ projections. Sex split: 0-14=51/49, 15-64=50/50, 65+=43/57. Totals calibrated to SSO: 2022=1,831,712 | 2050=1,323,009 | 2070=1,192,963.

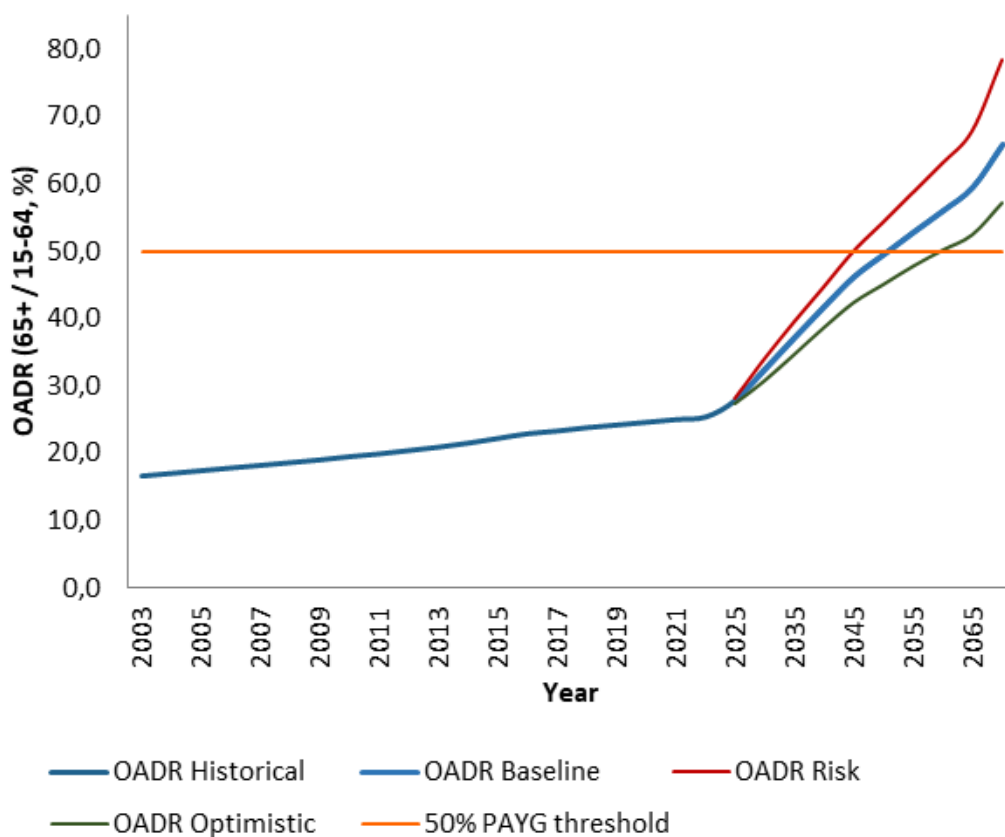
Source: SSO Baseline projections

Old-age dependency ratio — the core PAYG indicator

The old-age dependency ratio (OADR = population 65+ / population 15-64 × 100) directly captures the relationship between potential pension beneficiaries and potential contributors. The OADR rose from 16.5% in 2003 to 25.3% in 2022 — a 53% increase in about two decades. Figure 2 plots the full historical series alongside three SSO projection scenarios to 2070, illustrating both the pace of deterioration to date and the divergence between scenarios going forward.

The 50% threshold — implying fewer than two working-age persons per elderly person — is conventionally associated with structural PAYG financing stress. All three scenarios breach this threshold before 2050: the Baseline crosses it around 2049, the Risk scenario a decade earlier. The OADR reaches 65.8% under the Baseline and 78.5% under the Risk scenario by 2070. The difference between scenarios is one of pace, not direction — and at the current contributors-to-pensioners ratio of 1.61, already below the sustainability threshold— the system will face structural financing collapse without reform well before 2050.

Figure 2: Old-Age Dependency Ratio 2003–2070 — Three Scenarios



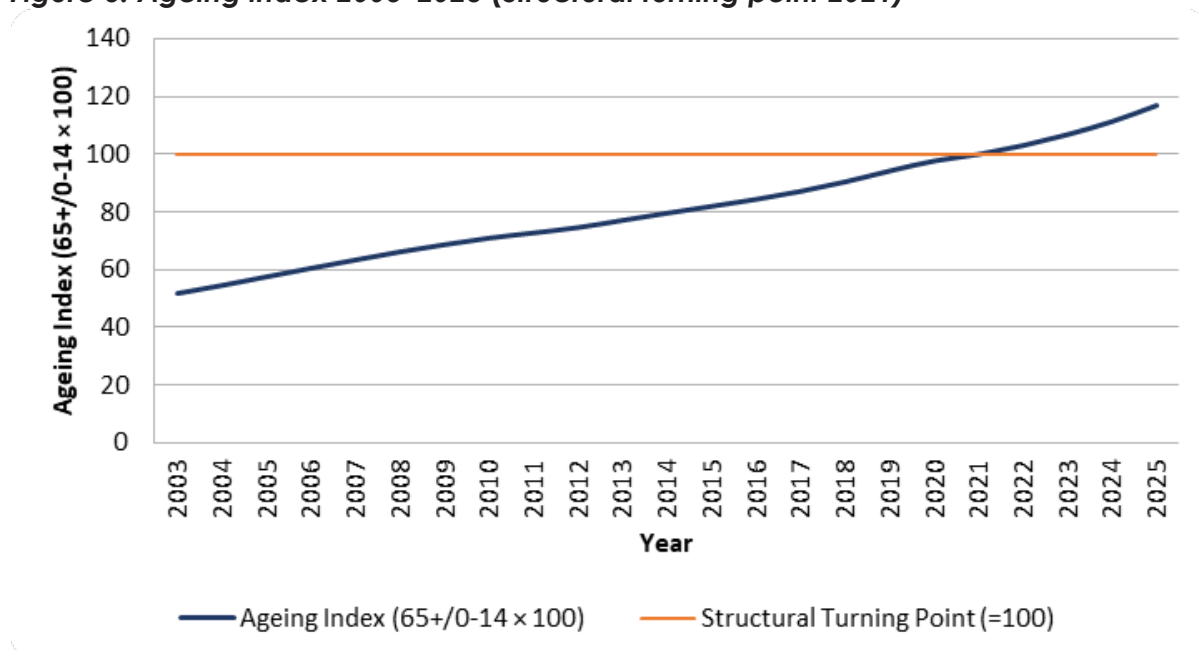
Source: SSO historical 2003–2022 + SSO population projections 2022–2070 (DS001M24).

Two underlying drivers sustain the OADR trajectory: persistently low fertility and accelerating population ageing. The total fertility rate stood at 1.6 in 2022 — well below the natural replacement threshold of 2.1 — and the rate of natural population increase turned definitively negative in 2019, reaching -2.4% in 2022 following the COVID-19 mortality spike of -5.4% in 2021. Without migration inflows of sufficient scale and age composition, population decline and ageing are structurally locked in for decades. Figure 3 tracks the ageing index — the ratio of persons aged 65+ to persons aged 0–14, multiplied by 100

over the 2003–2025 period. The index crossed 100 in 2021, marking the first time in the country's recorded history that the elderly population outnumbered children.

The threshold crossing is self-reinforcing: fewer children today means fewer contributors in 20 years; more elderly today means more pensioners in the immediate term. The combination constitutes a demographic scissor effect that mechanically worsens the PAYG financing ratio regardless of policy parameters. This dynamic is further amplified by the selective character of emigration: migration outflows have been disproportionately concentrated among the young and working-age population (Petreski and Petreski, 2021), meaning that each permanent emigrant represents approximately 35–40 years of lost future contributions — an effect that aggregate population figures systematically understate. The uncertainty range for future emigration flows, particularly given accession-linked mobility to EU labour markets, is wide enough that the Risk scenario may understate the true downside exposure.

Figure 3: Ageing index 2003–2025 (Structural turning point 2021)



Source: SSO demographic indicators.

4.2 Labour market

The contribution revenue of the PDIF depends on three interconnected labour market variables: the number of employed persons, the formality of their employment, and the level of their wages. A larger formal workforce at

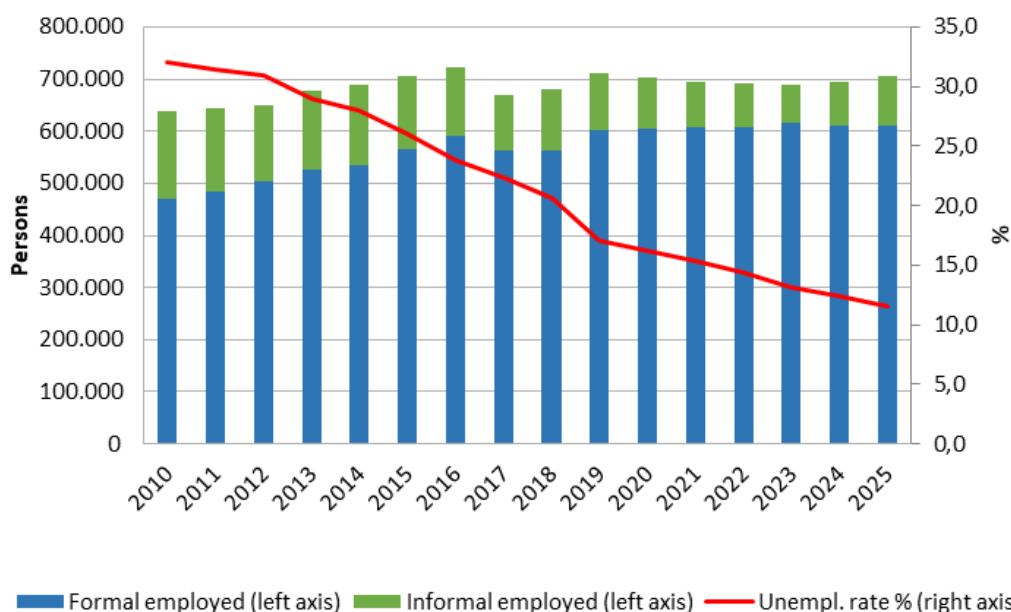
higher wages generates greater contribution income; a smaller, more informal, or lower-wage workforce constrains it. North Macedonia's labour market² has improved substantially since the mid-2000s, yet structural features — notably a persistently large gender gap in economic activity and incomplete formalisation — limit the extent to which employment growth can offset demographic deterioration of the PAYG ratio.

Employment and unemployment — aggregate trends

The employment improvement documented since 2006 is genuine and substantial. Employment grew from approximately 570 thousand persons in 2006 to a peak of around 724 thousand in 2016 (old methodology and based on old-census data), and stands at around 705 thousand on the revised 2025 basis — a 22% expansion over nearly two decades. Unemployment fell from 36.0% in 2006, among the highest rates in the region, to 11.3% in Q1 2026 — a structural improvement reflecting formalisation, FDIs, economic growth, and migration outflow of some unemployed. However, this improvement is now approaching structural limits. With unemployment at 11.3%, the remaining unemployed population increasingly consists of hard-to-employ groups, long-term unemployed, structurally mismatched workers, and those in geographic or skill-specific unemployment traps. The marginal contribution of further unemployment reduction to PAYG sustainability diminishes as unemployment approaches frictional levels.

Informality, after declining steadily through the mid-2010s to a low of 8.8% in 2021, has since reversed course: the informal employment share rose to 12.3% in 2024 and 13.5% in 2025, returning to levels last recorded in 2017. This reversal represents a structural vulnerability for PAYG finances. Applied to around 705 thousand employed persons in 2025, the 13.5% informality rate implies approximately 95 thousand workers generating zero contribution income for the first pillar. At a conservative gross wage of 45,000 MKD/month, slightly above the minimum wage and an 18.8% contribution rate, this represents foregone PDIF contribution revenue of approximately 10.2 billion MKD annually — equivalent to roughly 11.8% of estimated PDIF contribution income. Full formalisation of the informal workforce would materially improve short-run PAYG finances, but cannot substitute for the structural reforms required by demographic ageing, and the post-2021 reversal suggests that formalisation gains achieved during the preceding decade are not irreversible without sustained institutional effort.

Figure 4: Employment, Formal Employment & Unemployment Rate 2010–2025



Source: SSO Labour Force Survey

Beyond full informality, a parallel phenomenon further erodes contribution revenues: envelope wages — formal employment contracts concealing partial cash payments outside the declared wage base. Domestic evidence indicates that 17.8% of formally employed workers received envelope wages in 2017, with the practice most concentrated among minimum-wage recipients, construction workers, and those in service occupations (Finance Think, 2017). A granular analysis of undeclared work and income underreporting estimates that undeclared work constitutes approximately 21% of total labour input, equivalent to around 69.7 billion MKD in gross value added, with wage underreporting — rather than full informality — representing the dominant form in manufacturing, while construction and retail are characterised more by informal self-employment (Srbinoski et al., 2023). Since pension contributions are calculated on the declared wage base, systematic underreporting directly compresses both current PDIF revenues and the future pension entitlements of affected workers.

Despite these gains, the aggregate employment picture conceals important structural vulnerabilities. Youth unemployment (15–29), at 23% in 2025, remains nearly double the adult rate, signalling weak integration of new labour market entrants — precisely the cohorts expected to constitute the future PDIF contributor base. This is not a cyclical problem but a structural one: young workers who delay formal labour market entry — or enter informally — accumulate fewer years of pensionable service, qualify for lower pensions, and contribute

less revenue during their most productive decades.

A cohort entering formal employment at 27 instead of 22 loses five years of contributions at the beginning of the wage accumulation curve, compounding the PAYG financing gap over their entire career. In the context of an already-deteriorating C/P ratio, late entry of each cohort is structurally additive to the long-run deficit.

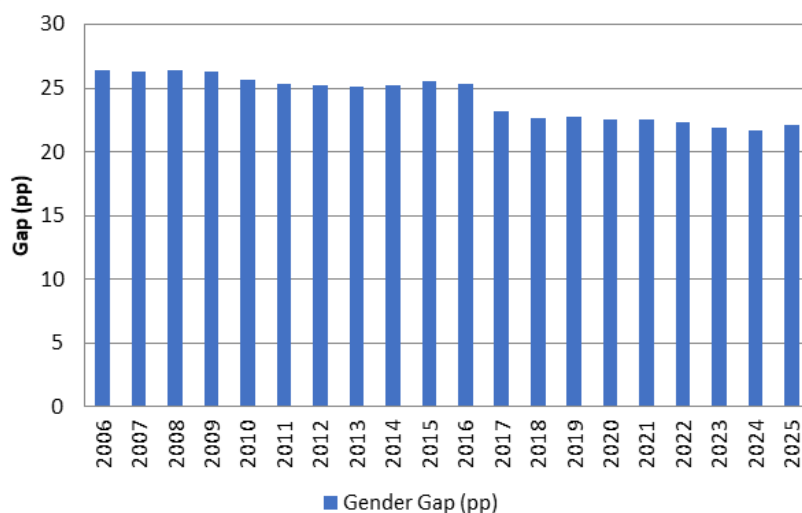
Figure 5 translates the demographic projections into the metric most directly relevant for PAYG financing: the size and internal composition of the 15–64 working-age population across selected years to 2070.

The gender gap in economic activity — an underutilized resource

The most consequential structural feature of North Macedonia's labour market for long-run pension sustainability is the persistently large gender gap in labor market participation. In 2025, the male participation rate (15+) stood at 63.7% against a female rate of 41.6% — a gap of 22.1 percentage points that has narrowed only modestly from 26.4 percentage points in 2006.

Figure 5 shows the pace of convergence has been insufficient to constitute a structural offset to demographic ageing. The female inactivity rate of 58.4% reflects intersecting factors — caregiving responsibilities, cultural norms, incomplete childcare coverage, and wage discrimination that reduces the return to employment — that are well-documented and not self-correcting (Petreski et al., 2025).

Figure 5: Gender participation gap (male minus female, percentage points) 2006–2025



Source: SSO Labour Force Survey

The scale of the untapped reserve is significant. If female activity converged halfway toward male levels — from 41.6% to 52.6% — approximately 95,000 additional women would enter economic activity, of whom roughly 53,000 would become employed formal-sector workers, generating approximately 5.4 billion MKD in additional annual PDIF contribution income at current wages. Unlike demographic improvements, which require generational time, female labour market activation is achievable within a policy cycle of 10–15 years with sustained institutional investment.

The net fiscal impact, however, depends on the quality of female employment. Women who enter late, exit early for caregiving, or work part-time at low wages accumulate thinner contribution records — generating smaller near-term revenue gains while still accruing future pension entitlements. The adequacy dimension compounds this: women typically earn lower average wages and accumulate shorter contribution periods than men, yet draw pensions for longer due to higher longevity. The resulting combination of lower entitlements and longer benefit duration makes women disproportionately exposed to old-age poverty risk and reliant on minimum pension guarantees and survivor benefits — a structural expenditure pressure on the PDIF that persists regardless of future participation trends.

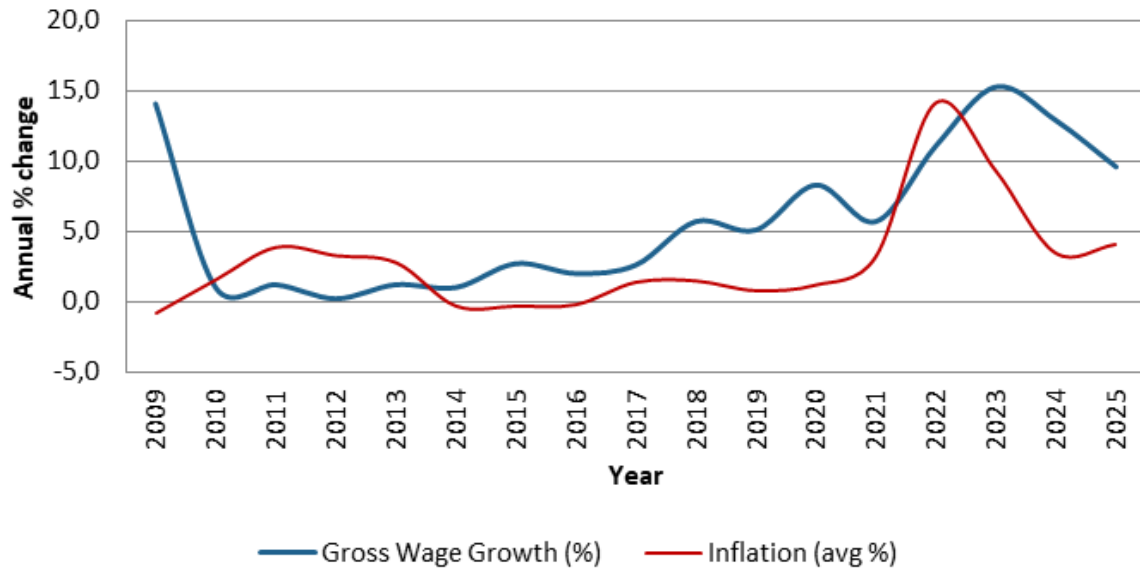
Wages, Inflation and the Indexation Nexus

Average gross wages grew modestly over 2011–2019 — averaging around 3.5% annually in nominal terms — before accelerating sharply in the post-pandemic period, reaching double-digit growth in 2022–2024 driven by inflationary shocks, demand effects, minimum wage increases, and public sector pay adjustments (Figure 6). The 2022 peak was largely offset by inflation that reached 14.2% that year, producing the only episode of negative real wage growth in the series, before real wages recovered strongly as inflation moderated through 2024–2025.

Wage growth has a dual effect on pension finances. Higher wages raise contribution revenues, improving the PAYG income side — but under the restored 50% wage + 50% CPI indexation formula operative from 2023, they simultaneously trigger faster pension benefit indexation. The net fiscal effect of this asymmetry is constrained by the C/P ratio: with around 610 thousand formal contributors against around 349 thousand pensioners, the same nominal driver raises revenues on a larger base but raises expenditures at a higher rate per unit. The revenue effect modestly exceeds the expenditure effect at current

ratios — but the margin narrows as the C/P ratio declines, and reverses as it falls below approximately 1.4.

Figure 6: Gross wage and inflation growth 2009–2025



Source: SSO

The 2022–2023 inflation shock illustrated the sensitivity of this balance: the CPI-only formula then in force dampened expenditure growth during the inflation peak, while the restoration of the wage component in 2023 produced compounded expenditure acceleration that significantly exceeded contribution revenue growth. With inflation moderating through 2024–2025 while nominal wages remain elevated, the Swiss formula continues to drive indexation well above the rate at which the contributor base is expanding.

An additional risk element is the GDP bonus clause introduced in 2023, which triggers a further pension increase when real GDP growth exceeds 4%. This creates a pro-cyclical ratchet: pension levels rise permanently in good years with no compensating adjustment in downturns. Applied to a pensioner stock of around 349,000, each bonus year represents a permanent increase in the expenditure base.

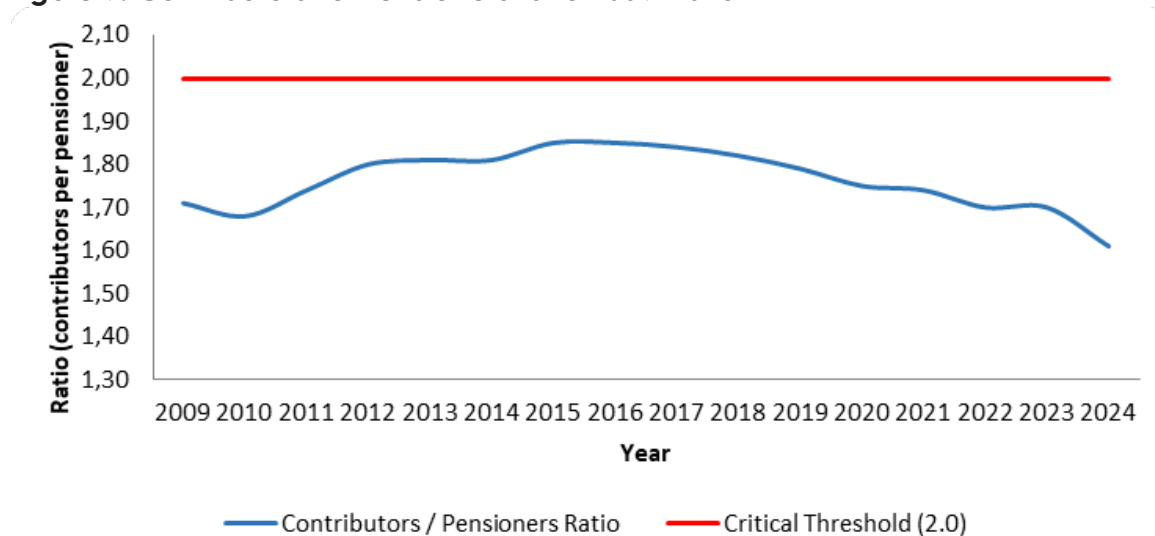
4.3 Pension system — trends

Total pension recipients grew by around 25% between 2009 and December 2025, reaching approximately 349,000. Growth has been structurally concentrated in old-age pensions — driven by the retirement of the demographically large post-war cohorts — which now represent nearly 72% of all recipients, up

from 54% in 2009. Disability pensions contracted by roughly half over the same period, reflecting tightened eligibility criteria, while survivor pensions remained broadly stable. The compositional shift toward old-age pensions raises average expenditure per pensioner independently of indexation, since old-age pensions are systematically above the system average.

The contributors-to-pensioners (C/P) ratio — the number of active insured persons per pension recipient — is the most direct system-level sustainability indicator. Figure 7 documents its trajectory from 2009 to 2025.

Figure 7: Contributors-to-Pensioners ratio 2009–2025



Source: PIIF Annual Reports 2009–2024

The ratio stood at 1.71 in 2009 — already below the conventional 2.0 sustainability threshold — recovered briefly to 1.80 in 2012–2013 during the post-crisis employment expansion, and has since declined to 1.61 in 2024. With 556,294 registered contributors against 345,794 pensioners, the system requires external budget financing simply to maintain current benefit levels. As the OADR rises toward 65.8% by 2070 under the Baseline, the C/P ratio is projected to fall toward 0.9–1.0, at which point the contributory architecture persists in form but not in substance. The rate of deterioration compounds this concern: the C/P ratio has declined by 0.20 over eleven years (2013–2024), a trajectory that implies crossing 1.40 around 2033 — a level at which the PAYG financing model becomes arithmetically incoherent without structural reform.

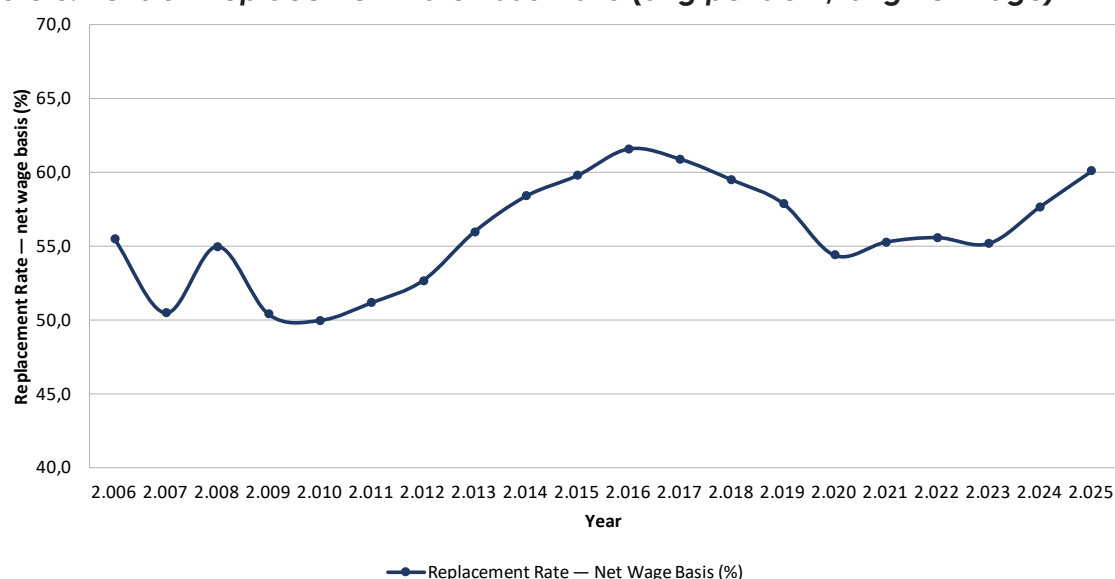
Average Pension and the Replacement Rate

The average monthly pension grew from 10,057 MKD in 2009 to 27,167 MKD in December 2025, a 170% nominal increase. However, this trajectory reflects a series of ad-hoc political decisions rather than a coherent adequacy frame-

work: fixed nominal top-ups of 600–722 MKD were applied in 2014–2016 and 2020, followed by increases of 2,500 MKD each in September 2024 and March 2025.

Figure 8 plots the replacement rate — average monthly pension as a share of average net monthly wage — over the full 2006–2025 period on a consistent net-wage basis.

Figure 8: Pension Replacement Rate 2006–2025 (avg pension / avg net wage)



Source: PDIF Annual Reports 2006–2013 (official series); PDIF Monthly Reports and MoF–SSO net wage data.

The replacement rate fell from 61.7% in 2001 to a trough of around 50% in 2009–2010, recovered to 55% by 2013, and has since fluctuated with indexation policy and wage dynamics. The acceleration of nominal wage growth in 2023–2024 (15.3% and 12.9%, respectively) outpaced pension indexation, compressing the replacement rate before the 2024–2025 flat increases partially reversed the movement.

The dynamics reveal a structural tension between fiscal sustainability and adequacy. The replacement rate at any point reflects the accumulated outcome of statutory indexation cycles and discrete interventions — neither of which is anchored to an explicit adequacy target. The adequacy challenge is not that pension levels are too low in absolute terms, but that the mechanism determining them is discretionary rather than rules-based: when wages accelerate, the replacement rate compresses; when political pressure builds, flat increases reset the base upward. This cycle — compression followed by discrete correction

— is itself the structural problem, because each correction permanently raises the expenditure base without a corresponding improvement in the system's long-run financing capacity.

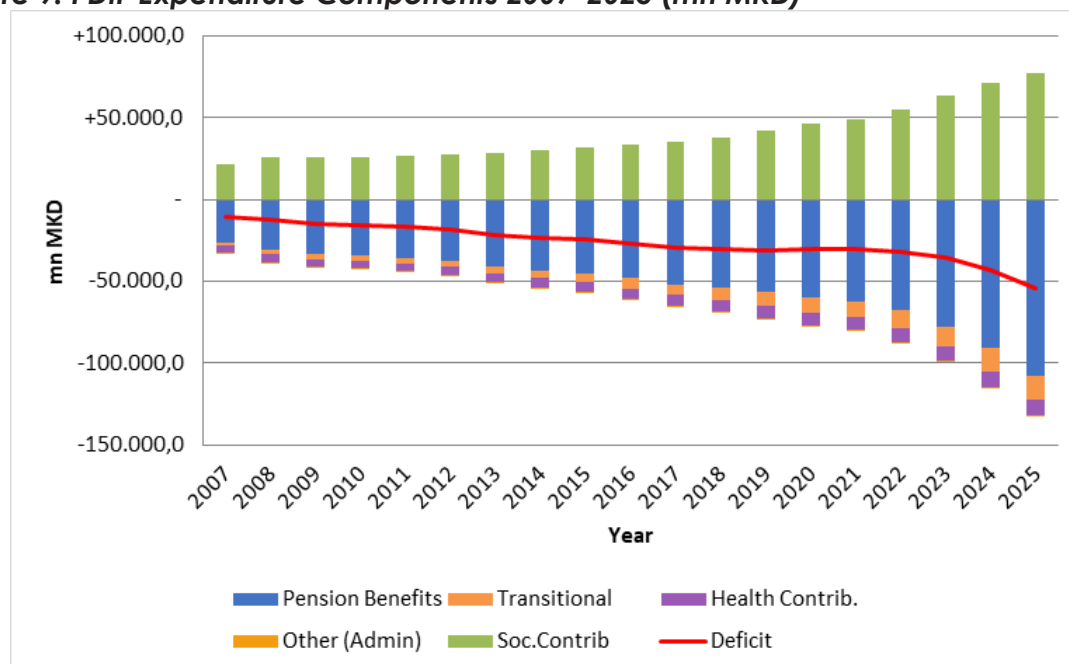
4.4 Fiscal Sustainability

The convergence of the demographic, labour market, and pension system trends documented in the preceding sections manifests fiscally in a persistently widening gap between PDIF's own contribution revenues and its expenditure obligations. This gap is financed by an open-ended state budget transfer whose trajectory constitutes the most direct single measure of pension system fiscal (un)sustainability.

Own social contribution revenues are the primary financing source of the PDIF PAYG pillar, collected from active insured persons after deducting the 6 percentage points diverted to individual second-pillar accounts.

Figure 9 shows the expenditure components. Total PDIF expenditure in 2025 was composed of pension benefits (78.7%), second-pillar transitional costs (11.2%), health contributions for pensioners (paid by PDIF to the Health Insurance Fund) (7.1%), and administrative costs (0.6%). Against own contribution revenues, this produces a structural deficit — defined as the gap between the three core expenditure obligations and own social contribution revenues — of 54,404 million MKD, equivalent to 5.2% of GDP.

Figure 9: PDIF Expenditure Components 2007–2025 (mn MKD)

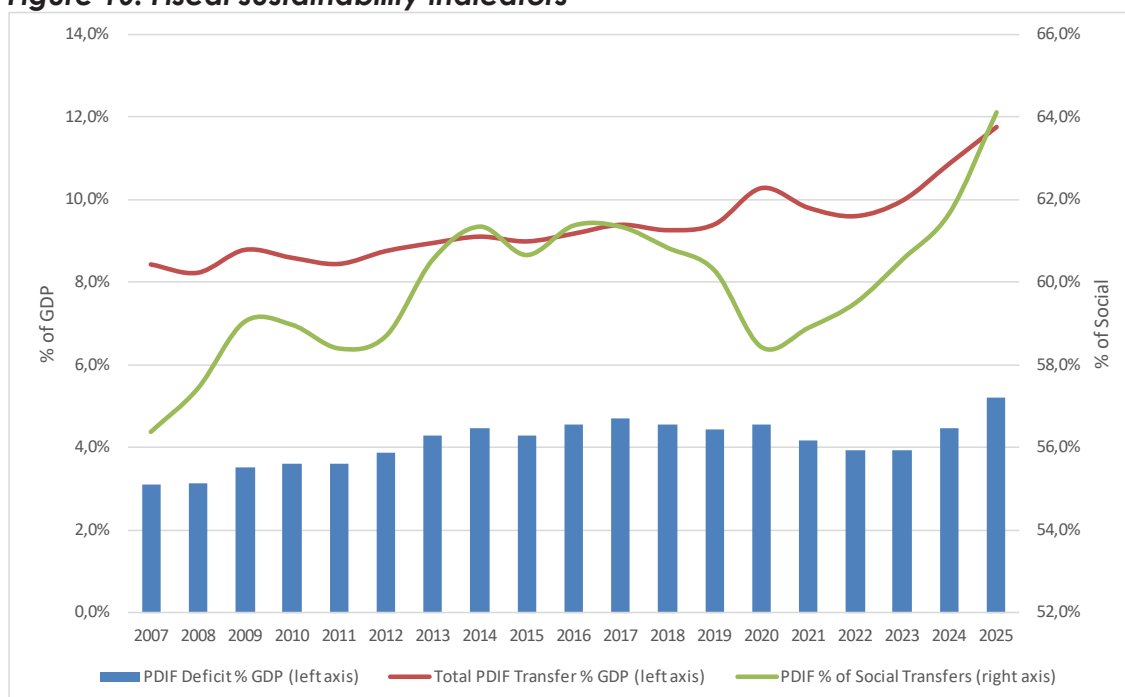


Source: PDIF Annual reports

Figure 10 tracks three relative indicators that remove nominal scale effects. The structural deficit as a share of GDP stood at 3.1% in 2007 and rose gradually to 4.7% by 2017, driven by the contribution rate cut of 2009–2010, growing second-pillar transitional costs, and ad hoc top-ups from 2014. The 2022–2023 moderation is largely a denominator effect: high nominal GDP growth during the inflation period inflated the GDP denominator while CPI-only indexation contained expenditure — an appearance of fiscal improvement without structural change. The sharp acceleration to 5.2% by 2025 reflects the simultaneous impact of the restored Swiss formula, the 2024–2025 flat increases, and the reversal of formalisation gains that compressed contribution revenues.

Total pension expenditure as a share of GDP followed a similar trajectory, rising from 9.7% in 2007 to 12.7% in 2025. The crowding-out ratio — the PDIF transfer's share of total social transfers from the state budget, rose from 56.4% in 2007 to 64.1% in 2025, compressing fiscal space for other social protection programs, including childcare infrastructure, active labour market programmes, and formalisation incentives: precisely the instruments that could partially offset pension sustainability pressures.

Figure 10: Fiscal sustainability indicators

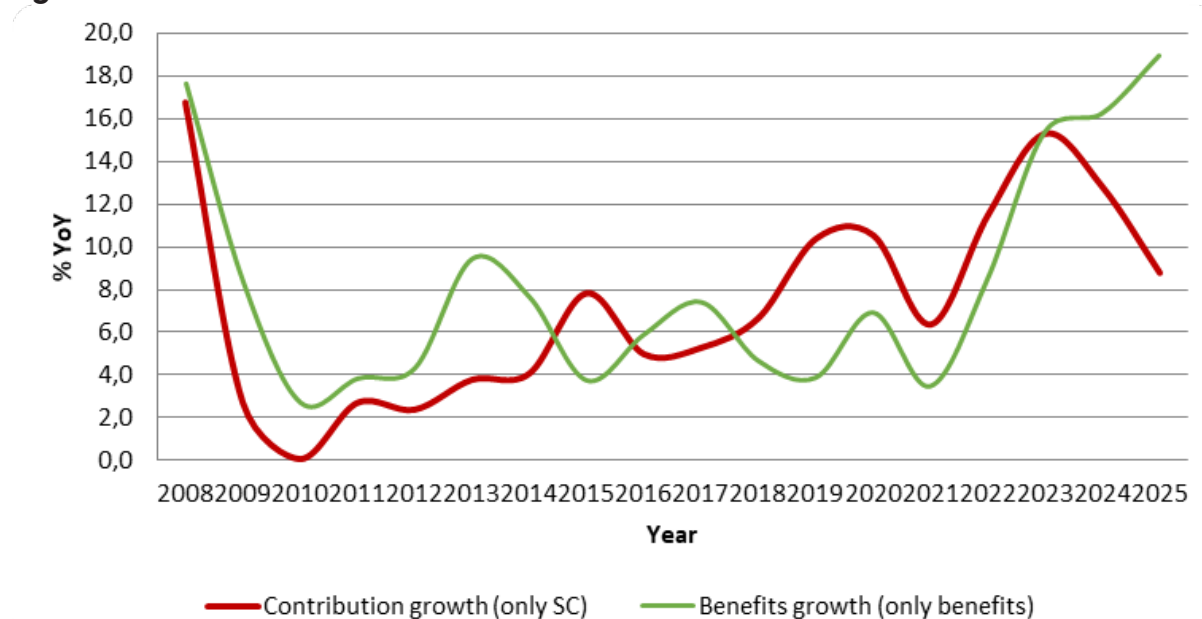


Source: PDIF Annual reports, MoF

Figure 11 places the fiscal deterioration in its most direct analytical frame: are pension benefit expenditures growing faster than contribution revenues? For most of 2008–2021, the two series tracked broadly together, with contribution

revenues occasionally outpacing pension benefits — in years when employment expanded and, from 2019, when the contribution rate increase took effect — producing temporary deficit relief. From 2023 onward: pension benefits accelerated sharply while contribution revenue growth remained subdued or, in 2025, turned negative as formalisation gains reversed.

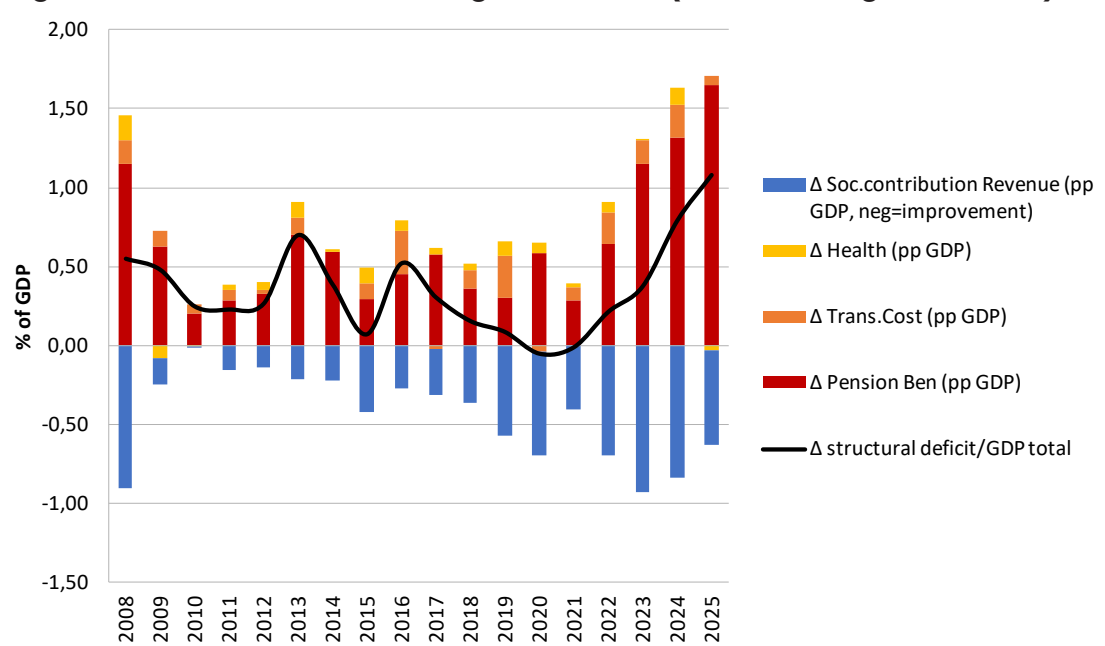
Figure 11: Pension benefits vs Contribution Revenue Growth % YoY



Source: PDIF Annual reports, MoF

Figure 12 shows the annual change in each component of the structural pension deficit expressed as percent of GDP — that is, how much each component increased or decreased in absolute terms relative to the size of the economy compared to the prior year. The social contribution revenue bars are shown with a negative sign by construction: a positive revenue growth reduces the deficit, so negating it makes the direction intuitive — a larger negative bar means revenues grew more strongly and absorbed more fiscal pressure.

Figure 12: Structural Deficit Change Attribution (annual change, % of GDP)



Source: PDIF Annual Reports 2009–2024

Two structural patterns emerge. First, pension benefit growth is the dominant positive contributor to deficit widening in virtually every year — transitional costs and health contributions, while consistently positive, are smaller in GDP terms. Second, the revenue effect has been the primary stabilising force in years of fiscal improvement: notably 2015, 2019, and 2020–2021, when contribution revenue growth driven by employment expansion and the contribution rate increase outpaced pension expenditure growth and temporarily reduced the structural pension deficit as a share of GDP.

The post-2022 deterioration is visible as a structural break: pension benefit additions to the deficit reach 1.1–1.6% of GDP annually in 2023–2025, while the revenue offset — though positive — shrinks to around 0.6–0.9% of GDP, insufficient to absorb the expenditure shock. This acceleration is policy-driven rather than demographic: the pensioner count grew modestly throughout 2022–2025, while pension benefit growth accelerated sharply due to the compounding of inflation-linked indexation, the restoration of the Swiss formula during a period of double-digit wage growth, and the ad hoc flat increases of 2024–2025. Revenue growth, while supported by rising wages and employment, could not absorb expenditure increases of this magnitude — confirming that the structural pension deficit is primarily sensitive to indexation policy decisions.

5 Methodology and data sources

5.1 Analytical approach

This paper constructs the Pension System Sustainability Model for North Macedonia (PSSM-MK), an aggregate, scenario-based fiscal projection tool designed to quantify the long-run budgetary consequences of demographic ageing and to evaluate the fiscal impact of alternative parametric reform packages. The model operates on an annual time step over the horizon 2025-2070, consistent with the projection period adopted by the European Commission's 2024 Ageing Report (European Commission, 2024).

The methodological choice of an aggregate approach is deliberate. Aggregate accounting models can yield robust results on pension sustainability, with the advantage of being closely calibrated to the legal structure of a specific pension programme. A transparent aggregate framework is further justified for a policy instrument intended for use by government ministries, the pension fund, and EU accession monitoring bodies — audiences for whom interpretability and replicability carry greater decision-making value than the precision achievable only with individual-level microdata. This approach is consistent with the PROST framework of the World Bank (2024), which models contributions, entitlements, revenues, and expenditures over a long horizon with the explicit objective of bridging quantitative and qualitative policy analysis.

PSSM-MK is positioned as a complement to the existing microsimulation literature on the Macedonian pension system, most notably Petreski and Petreski (2021), who construct the MK-PENS dynamic microsimulation model using individual-level records. The two instruments occupy different analytical spaces: MK-PENS provides individual-level adequacy and distributional analysis, while PSSM-MK provides system-level fiscal sustainability assessment under multi-scenario demographic and policy paths. The model is classified as an aggregate deterministic PAYG balance-sheet model with exogenous demographic, labour market and macroeconomic assumptions, methodologically analogous to the EC AWG country models (European Commission, 2024).

5.2 Model architecture

PSSM-MK architecture separates five functional layers: demographic inputs, labour market projections, contribution revenue, pension expenditure, and fiscal balance.

The five modules and their interconnections are as follows. The demographic module (M1) ingests SSO population projections for 2022-2070 across three scenarios and feeds the working-age population series to the labour market module (M2). M2 projects activity rates, formal and informal employment, and wages, which supply the contribution revenue module (M4). In parallel, the macroeconomic module (M3) provides GDP, CPI, and wage growth paths to the expenditure module (M5). M5 projects the pensioner stock, average pension, indexation adjustments, and transitional and health costs. Both M4 and M5 feed the fiscal balance module (M6), which produces the structural deficit, the implied budget transfer, and the net present value of the cumulative fiscal gap.

5.3 Core accounting identities and projection logic

Revenue side

Annual PAYG contribution income is computed as:

$$R_t = F_t \times W_t \times 12 \times t / 100 \times k$$

where F_t is the number of formally employed persons in year t ; W_t is the average gross monthly wage; $t = 18.8\%$ is the total statutory pension contribution rate; and $k = 0.8312$ is a coverage and compliance calibration factor.

The calibration factor reflects the heterogeneity of the actual contributory base: not all formally employed persons contribute on the full average gross wage, due to the presence of self-employed, agricultural workers, benefited-service categories, and partial-year employment. The factor is calibrated to the official 2025 PDIF own-revenues, which implies an effective contribution yield of approximately 15.6% of the average gross wage bill rather than the statutory 18.8%. This calibration ensures consistency between the model's projected revenue path and the observed fiscal base, while preserving the transparency of using the statutory rate as the reference point for scenario analysis — including Scenario S1, which raises the contribution rate and whose revenue

effect is scaled by the same factor. Formal employment F_t is projected from the working-age population through activity and employment rates, allowing Scenario S3 (female activation) and Scenario S4 (formalisation) to be implemented as direct shifts in the respective rate parameters without modification of the core revenue identity.

Expenditure side

Total PDIF expenditure is decomposed into three structurally distinct components plus a residual administrative cost:

$$E_t = E^{\text{pen}}_t + E^{\text{trans}}_t + E^{\text{health}}_t + E^{\text{admin}}_t$$

This decomposition is important because each component follows a different trajectory. Pension benefit expenditure - the dominant item, representing 81.2% of total PDIF outlays in 2025 - is:

$$E^{\text{pen}}_t = N_t \times P_t \times 12 / 1,000,000$$

where N_t is total pension recipients and P_t is the average monthly pension in MKD. The pensioner stock grows annually by a scenario-specific net new-pensioner flow, calibrated at 4,400 persons per year under the central case consistent with SSO Baseline cohort projections. The average pension evolves according to the active indexation rule. Under the baseline and most reform scenarios (S0, S1, S3, S4), the Swiss formula operative under the 2023 Law applies:

$$P_t = P_{t-1} \times (1 + 0.5 \times dw_t + 0.5 \times pi_t)$$

where dw_t is nominal wage growth and pi_t is CPI inflation. Scenarios S2 and S5, which evaluate a return to CPI-only indexation, apply:

$$P_t = P_{t-1} \times (1 + pi_t)$$

Macroeconomic assumptions

The paths for dw_t , pi_t , W_t , and nominal GDP follow a two-stage approach. For 2026–2030, real GDP growth and CPI inflation are taken directly from official forecasts: real GDP growth from the IMF Article IV Consultation Staff Report for North Macedonia (April 2025, Country Report No. 25/101), reflecting a gradual moderation as the public investment cycle fades and external demand normalises; CPI inflation from the Ministry of Finance Medium-Term Fiscal Strategy (May 2026), declining from 4.5% in 2026 to 2.1% by 2030 as the post-2022 cost-push shock dissipates. Nominal net wage growth for 2026–2030 is likewise

sourced from the MoF Fiscal Strategy, reflecting the expected deceleration in wage pressures as the exceptional public-sector and minimum wage adjustments of 2023–2025 are not repeated. The gross wage for contribution revenue purposes is derived from the net wage by applying the inverse of the calibrated net-to-gross ratio (0.676).

From 2031 onward, the model applies long-run structural assumptions: real GDP growth at 3.5% per annum (the potential growth), CPI inflation at 2% consistent with the National Bank's inflation goal, and nominal gross wage growth at 6% — reflecting continued productivity convergence toward EU income levels and a tightening formal labour market as the working-age population contracts. This implies a long-run real wage growth of approximately 3.8%, treated as a central assumption rather than a forecast. The replacement rate is computed as the ratio of average monthly pension to average monthly net wage — where net wage equals 67.6% of gross throughout the projection horizon.

Transitional costs and the second pillar

Transitional costs (E^{trans}) arise because the 6 percentage points of contributions diverted to individual second-pillar accounts are no longer available to finance first-pillar pension payments, while second-pillar members retain a (reduced) first-pillar entitlement. The budget must cover this financing gap. Crucially, the trajectory of transitional costs is non-monotonic: it rises as the share of second-pillar members in the active workforce grows, reaching a peak around 2040–2045, then tapers as the first cohorts of second-pillar members reach retirement and draw an increasing share of their pension income from accumulated funded accounts, thereby reducing their first-pillar claim. The model captures this trajectory directly in the expenditure module.

Health contributions — channelled to the Health Insurance Fund — are projected at their historical ratio to pension benefits (approximately 8–9%), and the administrative residual at under 1%.

An important caveat applies when interpreting the long-run deficit projections. A straightforward extrapolation of the old-age dependency ratio overstates first-pillar pressure in the later projection period, because it treats every future pensioner as a full first-pillar beneficiary. In reality, post-2003 insured persons — a growing share of new retirees from roughly 2040 onward — draw part of their retirement income from the funded second pillar, reducing the average first-pillar benefit per retiree. The model captures this through a downward ad-

justment to the average first-pillar pension applied progressively from 2041 onward, reaching its full value of 18.3% by 2070. This 18.3% figure is derived directly from the statutory accrual rate differential embedded in the Law for Pension and Insurance Fund Article 119: first-pillar-only insured persons (pre-2003) accrue pension rights at 1.80% per year of service, while mandatory second-pillar members accrue first-pillar rights at only 1.47% per year (the rate in force from 2020). The difference $(1.80 - 1.47) / 1.80 = 18.3\%$, represents the legislated reduction in first-pillar entitlement for second-pillar members, whose funded account is designed to compensate for this reduction. The offset is phased in linearly between 2041 and 2070 to reflect the gradual transition as post-2003 cohorts grow as a share of the total pensioner stock. Individual funded-account accumulation and absolute payout levels are not projected in this aggregate model; only the first-pillar reduction is captured.

Defining the deficit: why structural rather than the narrow PAYG gap

The PDIF's own reporting distinguishes three components of the state budget transfer: coverage of regular statutory obligations, transitional costs arising from second-pillar contribution diversion, and the residual current deficit — defined by the Fund as the gap between own contribution revenues and pension benefit payments alone. Under this narrow definition, transitional costs and statutory obligations are treated as separate and analytically distinct items, excluded from the headline deficit figure.

This paper deliberately adopts a broader definition — the structural deficit (D3 in the model), which aggregates all three components. The rationale is fiscal rather than accounting: transitional costs, while conceptually temporary, represent a real and binding fiscal obligation on the state budget throughout the entire projection horizon to 2070. From the perspective of the Ministry of Finance, it is immaterial whether a budget transfer to PDIF covers a pension payment or a transitional cost — both constitute budget expenditure that must be financed through taxation or borrowing. Treating transitional costs as outside the deficit would systematically understate the fiscal burden of the pension system during precisely the period when that burden is most acute. The structural deficit D3 therefore provides a more complete and policy-relevant measure of the total fiscal cost of the pension system, and a more meaningful basis for evaluating the fiscal relief achievable under alternative reform scenarios.

Fiscal balance and budget transfer

The annual PDIF structural deficit ($D3_t$) and the implied state budget transfer are defined as:

$$D3_t = (E^{\text{pen}}_t + E^{\text{trans}}_t + E^{\text{health}}_t) - R_t$$

$$T_t = D3_t \times 1.08$$

The 1.08 multiplier reflects administrative and non-contributory statutory obligations borne by the state budget over and above the three core expenditure components -- including transfers from the Ministry of Defence for pensions under the Law on Service in the Defense and other minor legal obligations -- calibrated to the historical ratio between the official budget transfer and $D3$ in PDIF Annual Reports for 2006-2025. The present value of the cumulative fiscal gap over the projection horizon is computed at a 3% real discount rate, providing a summary sustainability indicator comparable across scenarios.

5.4 Reform Scenarios

Seven scenarios are evaluated, ranging from the status quo to two combined multi-instrument packages.

Table 2: Reform scenarios

Scenario	Description
S0 — Status quo	Current law, no reform: contribution rate 18.8%, Swiss-formula indexation (50% wage + 50% CPI), retirement age 64M/62F, activity and formality rates held at 2025 observed levels.
S1 — Contribution increase	Total contribution rate raised from 18.8% to 20.8%, phased linearly over 2026-2030.
S2 — CPI-only indexation	Return to CPI-only formula (as in 2020-2022); wage component suspended. Applied from 2026.
S3 — Female activation	Female activity rate rises from 41.6% (2025) to 55.0% by 2035 (half-convergence toward EU average). Employment and contribution rates held constant.
S4 — Formalisation	Informality falls from 13.5% (2025) to 5.0% by 2030. Formal employment rises proportionally.
S5 — Combined (with ret. age)	Retirement age +1 year (M/F), contribution rate raised to 20%, CPI-only indexation, female activation to 52%, formalisation to 6%. New-pensioner flow reduced to reflect the retirement-age delay.
S6 — Combined (no ret. age)	Identical to S5 in every parameter except retirement age, held unchanged at 64M/62F. Isolates the marginal contribution of the retirement-age instrument.
S7 — Combined (Swiss indexation)	Identical to S6 in every parameter except indexation: restores the 50% wage + 50% CPI (Swiss) formula in place of CPI-only. Designed to isolate the fiscal cost of adequacy preservation within the combined package.

Results are reported for the Baseline demographic path as the central case.

5.5 Data Sources

The model draws exclusively on official, publicly available data. Historical series run from the earliest available observation through December 2025, drawing on the PDIF Annual Report for 2025 published in May 2026. Projection inputs are drawn from the most recent official publication available as of May 2026.

Population and labour market data are sourced from the State Statistical Office (SSO). Demographic inputs include population by broad age group, the old-age dependency ratio, the ageing index, total fertility rate, and natural population increase from SSO's demographic indicators series (2003–2022), as well as the official SSO population projections (2022–2070). The model uses the Baseline demographic scenario as the central projection path; the Risk and Optimistic scenarios are referenced in the descriptive analysis but not carried through the simulation. Labour market variables — employment, activity rates, unemployment, and the formal/informal employment split — are drawn from the SSO Labour Force Survey (2006–2025), with wage data from the same source. A structural break applies from 2017 onward due to revised methodology and post-Census 2021 rebenchmarking; figures before and after 2017 are not strictly comparable.

Pension system administrative data are sourced from PDIF Annual Reports (2007–2025), providing pensioner counts by type, average pension levels, the contributors-to-pensioners ratio, and verified own revenues and expenditure components including pension benefits, second-pillar transitional costs, health contributions, and administrative costs. The 2025 values are used directly as the model's base-year calibration. Fiscal data, including social contribution revenues and the state budget transfer series, are drawn from Ministry of Finance publications and annual budget execution reports for 2006–2025.

The macroeconomic projection path for 2026–2070 is calibrated in two stages. For 2026–2030, real GDP growth is drawn from the IMF Article IV Consultation Staff Report for North Macedonia (April 2025, Country Report No. 25/101), while CPI inflation and nominal wage growth are sourced from the Ministry of Finance Medium-Term Fiscal Strategy (May 2026, Table 2). From 2031 onward, the model applies the long-run structural assumptions documented in the core accounting section.

The legal parameter inputs: contribution rates, indexation formulas, retirement ages, accrual rates, and second-pillar diversion rules, are drawn directly from the Law on Pension and Disability Insurance and its successive amendments (Official Gazette 98/2012, 267/2020, 79/2023), and from the Law on Contributions from Compulsory Social Insurance (Official Gazette 247/2018) for contribution rate changes.

5.6 Limitations

Four principal limitations apply to PSSM-MK.

- The model is deterministic: uncertainty in demographic and macroeconomic projections is represented through discrete scenarios rather than stochastic simulation, which means the range of outcomes is bounded by the scenario assumptions rather than a full probability distribution.
- The second pillar is captured through its contribution-diversion effect on PAYG revenues and its offsetting effect on long-run first-pillar obligations, but individual funded-account accumulation and absolute payout levels are not projected.
- Pensioners are modelled as an aggregate stock; the disability, survivor, and old-age type split is not projected forward, although the compositional shift toward old-age pensions is reflected in the average-pension trajectory.
- Behavioural responses to reform: labour supply adjustments, informal-sector transitions, early-retirement decisions, are not modelled endogenously. These are standard limitations of aggregate fiscal models and do not affect the primary purpose of the tool, which is fiscal sustainability assessment under legislated and hypothetical parametric changes.

6 Results

6.1 Baseline trajectory: a system under compounding fiscal stress

Under the status-quo scenario, current legislation maintained without reform — the structural pension deficit follows a non-linear trajectory over the 2025–2070 horizon. Starting from 5.2% of GDP in 2025, the deficit rises to a peak of approximately 6.6% of GDP around 2035–2037, before gradually declining toward 2.7% of GDP by 2070. This trajectory reflects the interplay of three structural forces moving at different speeds.

The initial rise is driven by the compounding of the restored Swiss indexation formula — operating on a growing pensioner stock during a period of strong nominal wage growth — combined with rising second-pillar transitional costs. Transitional costs stood at approximately 1.4% of GDP in 2025 and rise progressively through the late 2030s as the post-2003 workforce cohort expands as a share of active insured persons, reaching a modelled peak around 2042 before tapering as first cohorts of second-pillar members draw increasing shares of pension income from their funded accounts. The concentration of rising transitional costs alongside accelerating demographic deterioration — the C/P ratio falling below 1.3 simultaneously — defines the 2038–2048 period as the highest-risk fiscal window of the entire projection horizon.

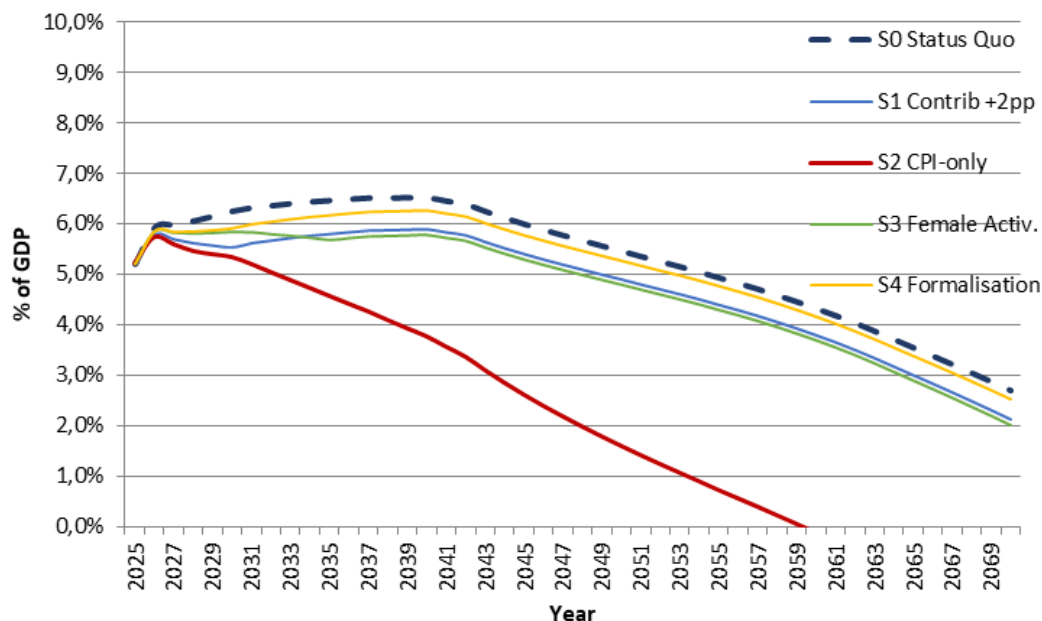
The subsequent moderation in deficit/GDP after the mid-2030s peak therefore reflects two forces: the structural tapering of transitional costs, and the mechanical effect of the indexation formula on the GDP ratio. In absolute terms, the pension deficit continues to grow throughout the horizon under S0 — it is only relative to GDP that it appears to moderate.

6.2 Single instruments

Figure 13 places the four single-instrument scenarios against the status-quo baseline. The ranking by fiscal impact is unambiguous: CPI-only indexation (S2) dominates all other individual instruments by a wide margin, female labour market activation (S3) is the most valuable labour-market lever, the

contribution rate increase (S1) offers modest but immediate revenue relief, and formalisation (S4) delivers the smallest fiscal effect of any scenario.

Figure 13 Structural Deficit % GDP, 2025–2070 (S0 vs Single Instruments)



Source: PIIF Annual reports, SSO, IMF, Ministry of Finance, own calculations.

S2 achieves its dominance through a compounding mechanism: suspending the wage component of the indexation formula keeps each year's pension growth below wage growth, and because this lower growth rate applies to a stock of approximately 349,000 pensioners, the annual saving accumulates progressively. By 2040 the S2 deficit is 3.8% of GDP against S0's 6.5% — a gap of 2.7 percentage points — widening further until the S2 trajectory turns negative after 2060, implying a structural surplus. The fiscal power of this instrument is therefore disproportionate to its apparent modesty: it does not reduce any pensioner's current pension, but progressively widens the gap between pension levels and wages — a gap that becomes the adequacy crisis documented in Section 6.4.

S1 and S3 produce broadly similar near-term profiles: both reduce the deficit by approximately 0.7–0.8 percentage points of GDP by 2030, but through entirely different mechanisms. S1 acts on the revenue side from the first year, while S3 builds gradually as newly activated women accumulate contribution records. S4 generates the smallest effect — reflecting the limited size of the informal workforce relative to the demographic shock — though its importance for distributional and labour-market reasons extends beyond its direct fiscal contribution.

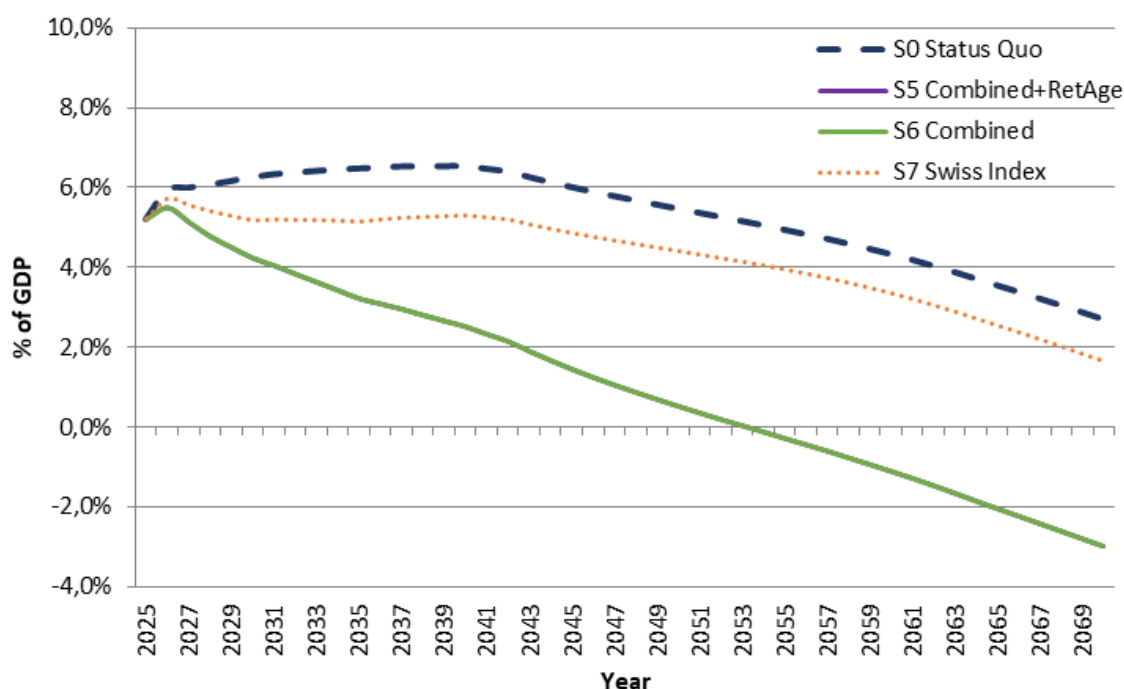
6.3 Combined packages

Figure 14 shows the combined packages against the status-quo baseline. The contrast with the single-instrument scenarios is stark: S5 (contribution increase, CPI-only indexation, female activation, formalisation, and retirement age extension) and S6 (identical but without retirement age adjustment) reduce the deficit to approximately 4.2% of GDP by 2030 and below 0.5% by 2050, before turning negative — implying a structural surplus — after 2055. S7 (identical to S6 but retaining the Swiss indexation formula) follows a substantially higher trajectory, remaining above 4% of GDP through 2040 and reaching 1.7% by 2070.

The non-linearity of the combined packages is the central quantitative finding. The combined effect of S5 and S6 substantially exceeds the arithmetic sum of the individual instruments because the components interact: CPI-only indexation reduces the per-pensioner expenditure base, the contribution rate increase raises revenue per contributor, female activation expands the contributor base, and formalisation reduces leakage. Each force amplifies the others across the revenue-expenditure interface, producing a compounding improvement in deficit/GDP that accelerates through the 2030s and 2040s as the demographic and transitional cost pressures peak and then subside.

The gap between S5 and S6 — which isolates the contribution of the retirement age instrument — is negligible in the short term and remains modest throughout the horizon. Near-term relief comes overwhelmingly from indexation and the contribution rate increase, both of which act immediately on the full existing stock of pensioners and contributors. The retirement age extension affects only the annual new-pensioner inflow, an effect that accumulates slowly. Given that retirement age adjustment is the most politically contested parameter in the Macedonian context, S6 demonstrates that a fiscally robust combined package is achievable without it, at a cost of less than 0.2 percentage points of deficit/GDP across the projection horizon.

Figure 14: Pension Deficit % GDP — S0 vs Combined Packages



Source: PIIF Annual reports, SSO, IMF, Ministry of Finance, own calculations.

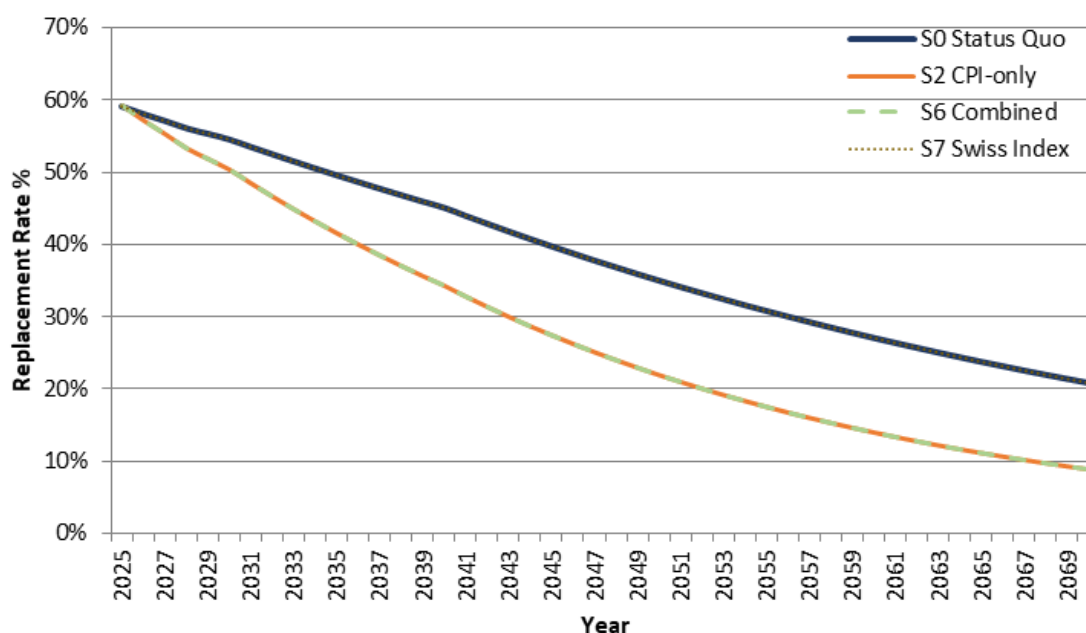
6.4 Adequacy and labour market dimension

Figure 15 makes the adequacy-sustainability tension explicit by plotting the replacement rate for S0, S2, S6, and S7.

Three qualifications frame the interpretation. First, the replacement rate shown is a first-pillar aggregate measure, average monthly pension as a share of average monthly net wage — and does not capture the second-pillar funded income that post-2003 insured cohorts will draw upon retirement from approximately 2040 onward, for the reasons documented in the model specification (Section 5). The adequacy risk therefore falls disproportionately on pre-2003 insured persons and on groups with thin contribution records and low wages who have limited or no second-pillar accumulation. Second, the aggregate replacement rate is a system-level sustainability indicator rather than a typical individual outcome: at the 1.47% accrual rate and a pension basis of approximately 80% of average gross wage, the individual first-pillar replacement rate relative to net wage ranges from approximately 26% at 15 years of service to approximately 70% at 40 years — outcomes substantially higher than the aggregate model average, which reflects the full pensioner stock including existing pensioners accrued under older parameters, shorter-service retirees,

and disability and survivor pension recipients, compressed further by rapid wage growth in the denominator. The reported aggregate trajectory reflects primarily the indexation gap between pension growth and wage growth, not a deterioration in per-year-of-service entitlement. Third, the replacement rate trajectory is determined entirely by the indexation formula: scenarios with Swiss indexation share the same replacement rate path, while scenarios with CPI-only indexation follow a steeper compression path.

Figure 15: Replacement Rate — S0, S2, S6, S7



Source: PIIF Annual reports, SSO, IMF, Ministry of Finance, own calculations.

Under S0, the replacement rate falls from 59.1% in 2025 to 35.0% by 2050 and 20.8% by 2070. A system-level aggregate of 35% by 2050, declining further to 20.8% by 2070, remains a serious adequacy concern even accounting for the second pillar, because it implies that the first-pillar component falls far below the ILO 40% adequacy floor — and the extent to which second-pillar income compensates depends on individual accumulation, investment returns, and annuitisation conditions not determined by current legislation. This trajectory is historically the trigger for the discretionary top-ups documented in Section 4, which permanently reset the expenditure base upward and negate the fiscal consolidation the formula was meant to deliver.

Under S2, the adequacy trajectory is more severe: the replacement rate falls to 21.9% by 2050 and 8.8% by 2070. S2 achieves its fiscal gains — reducing the deficit to 1.6% of GDP by 2050 against S0's 5.5% — entirely through ben-

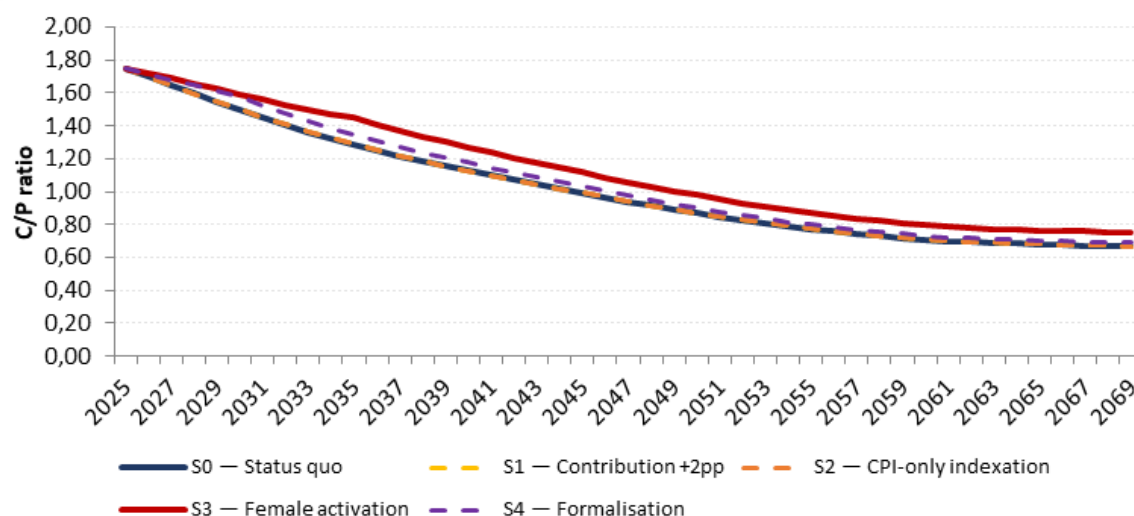
efit compression relative to wages, a politically incoherent position without a compensating minimum pension guarantee. S6 and S7 illustrate the trade-off in its starkest form: both are combined packages identical in every parameter except indexation. Under S6 (CPI-only), the deficit falls to 0.5% of GDP by 2050 while the replacement rate compresses to 21.9%; under S7 (Swiss formula), the deficit remains at 2.7% of GDP while the replacement rate holds at 35.0%. The difference — approximately 2.2 percentage points of GDP by 2050 — is the measured annual fiscal price of maintaining Swiss indexation, a gap that widens progressively as the pensioner stock grows.

No scenario simultaneously achieves fiscal sustainability and socially viable replacement rates. The system faces a genuine dual constraint, and resolving it requires instruments outside the parametric space modelled here: a minimum pension guarantee calibrated to a subsistence threshold, or differentiated indexation triggers linked to the fiscal position — none of which are currently embedded in legislation.

The contributors-to-pensioners ratio. The contributors-to-pensioners (C/P) ratio deteriorates continuously under S0, falling from 1.75 in 2025 to 1.50 by 2030, 1.29 by 2035, and crossing below 1.0 around 2046 — the threshold at which there are fewer formal contributors than pension recipients. By 2070, the ratio reaches approximately 0.67 under the Baseline demographic path — a level at which the PAYG system's capacity to self-finance through contributions is severely compromised, making continued and growing budget support structurally inevitable without reform.

The labour-market scenarios (S3 female activation, S4 formalisation) are the only instruments that directly improve the C/P ratio. S3 keeps the ratio above 1.0 approximately two years longer than S0, and sustains a material advantage throughout the projection. S4 adds a smaller but complementary effect. Critically, even the combined packages (S5, S6) — which include both labour-market measures — cannot prevent the C/P ratio from falling below 1.0, confirming that no parametric package operating within the existing architecture can neutralise the arithmetic of demographic ageing. The C/P ratio falls below 1.0 under all scenarios, differing only in the timing — ranging from approximately 2044 under S5 to 2046 under S0.

Figure 16. Contributors-to-Pensioners Ratio by Scenario, 2025–2070 (selected scenarios)

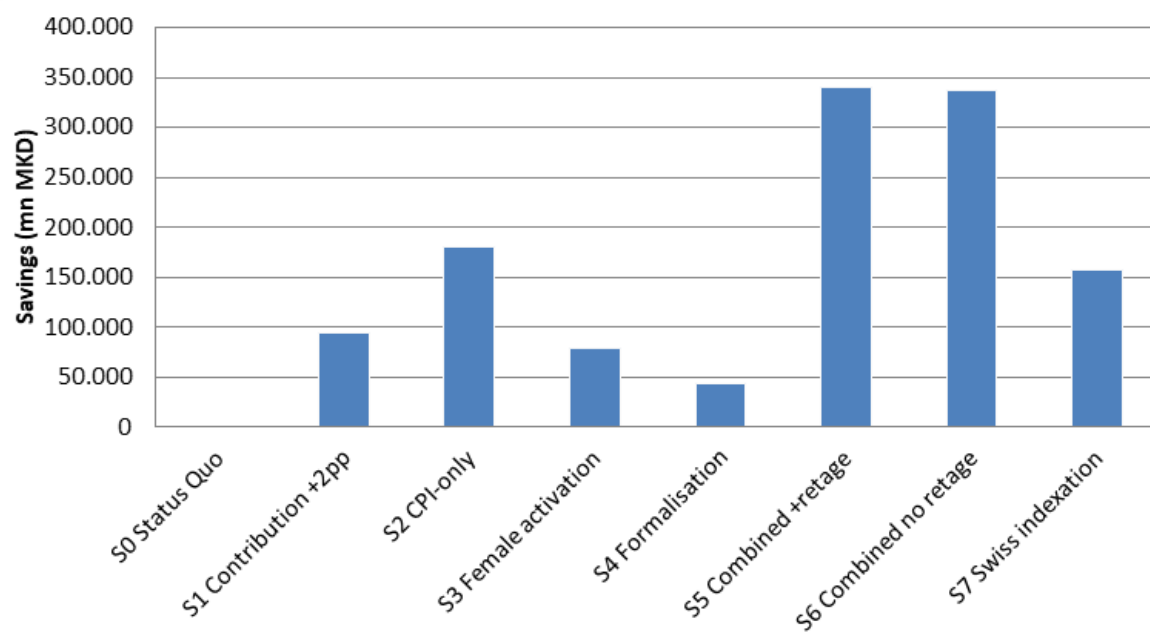


Source: PIIF Annual reports, SSO, IMF, Ministry of Finance, own calculations.

6.5 Short-run reform dividend

Figure 17 translates the scenario comparison into its most policy-relevant short-run metric: the cumulative reduction in budget transfers to PDIF over the first decade of reform (2026–2035), expressed against the status-quo baseline. Expressed relative to GDP, the decade savings under S5 and S6 amount to approximately 30–31% of GDP cumulatively, roughly three to four times the savings of the next-best single reform (S2, approximately 14.5% of GDP over the decade).

Three findings stand out. First, combined packages decisively outperform any single instrument: the non-linearity of stacking revenue-side and expenditure-side instruments produces compounding gains that no single-pillar reform can replicate. Second, within the combined packages, the retirement age instrument (the S5–S6 difference) contributes only modestly in this horizon, near-term relief comes overwhelmingly from indexation and the contribution rate increase. Third, S7, the adequacy-preserving variant — generates decade savings comparable to S2 alone, because the contribution increases and activation components are preserved while the indexation switch accounts for the gap between S7 and S6. The fiscal price of adequacy preservation, measured in foregone decade savings, is approximately 13–14% of GDP over the first ten years of reform. Figure 17. Cumulative Transfer Savings vs S0, 2026–2035 (mn MKD)



Source: PIIF Annual reports, SSO, IMF, Ministry of Finance, own calculations.

7 Conclusion and policy recommendations

This paper has constructed and applied the Pension System Sustainability Model for North Macedonia (PSSM-MK), an aggregate fiscal projection tool designed to quantify the long-run budgetary consequences of demographic ageing and to evaluate the fiscal impact of seven alternative parametric reform scenarios over the 2025–2070 horizon. The analysis integrates demographic evidence, labour market data, pension system administrative records, and official macroeconomic projections into a transparent accounting framework, identifying both the scale of the structural financing challenge and the instruments available to address it. Three structural conclusions emerge.

First, the sustainability challenge is not a future projection but a present reality. The ageing index crossed 100 in 2021. The contributors-to-pensioners ratio has been below the conventional 2.0 threshold since at least 2009, standing at 1.61 in 2024. The structural deficit reached 5.2% of GDP in 2025, up from levels that already required the state budget transfer to grow from 8.97% to 10.88% of GDP between 2006 and 2024 — reflecting structural breaks accumulated over two decades of incremental parametric adjustments insufficient to close the financing gap. The system is, in functional terms, no longer a purely contributory PAYG scheme: while contributions continue to determine benefit levels and eligibility, a substantial and growing share of financing has shifted to general tax revenues.

Second, the fiscal trajectory is unsustainable under any demographic scenario. The structural deficit is projected to rise from 5.2% of GDP in 2025 to approximately 6.6% by the mid-2030s under the status quo, before moderating mechanically as pensions lose ground relative to wages — a moderation that reflects adequacy erosion rather than structural fiscal improvement.

Third, the simulation results establish a binding adequacy–sustainability tension that no single parametric instrument resolves. CPI-only indexation (S2) reduces the deficit to 1.6% of GDP by 2050 against S0's 5.5%, but drives the replacement rate to 21.9% by 2050 — below the ILO 40% adequacy floor and historically the trigger for discretionary top-ups that permanently reset the expenditure base. The combined packages — S5 (contribution increase, CPI-only indexation, female activation, formalisation, and retirement age extension) and S6 (iden-

tical but without retirement age adjustment) — reduce the deficit to below 0.5% of GDP by 2050, but retain the low replacement rates generated by CPI indexation. Scenario S7 — identical to S6 but retaining the Swiss indexation formula — demonstrates that sustaining adequate replacement rates costs approximately 2.2 percentage points of GDP annually by 2050 relative to S6, a gap that widens progressively as the pensioner stock grows.

No scenario simultaneously achieves both fiscal sustainability and socially viable replacement rates within the parametric space modelled here — but this finding should not be read as a counsel of despair. The combined packages demonstrate that disciplined parametric reform can reduce the structural deficit from 5.2% of GDP to below 0.5% within a generation, substantially extending the fiscal sustainability window and creating the conditions under which a broader architectural reconsideration becomes feasible. The central policy implication is that parametric reform is necessary but not sufficient: it buys time and reduces adjustment costs, and that time should be used to develop the complementary instruments.

Policy Recommendations

The evidence base assembled in this paper supports a structured reform agenda across three time horizons. The recommendations are grounded directly in the simulation results and the structural diagnostic of Section 4; they do not constitute a complete reform plan but identify the priority instruments and their sequencing logic.

General principles

Reform must be multi-instrument from the outset: combining revenue-side and expenditure-side instruments generates non-linear fiscal gains that no single measure can replicate, and distributes the adjustment burden rather than concentrating it on one group.

Indexation must be rule-bound. Legislation should prohibit pension adjustments outside the statutory formula except under a predefined fiscal trigger mechanism subject to parliamentary approval. The GDP bonus clause should be suspended or replaced by a symmetric adjustment mechanism that allows downward as well as upward correction.

Adequacy must be addressed through structural instruments, not discretionary

increases. A minimum pension guarantee calibrated to a subsistence threshold — rather than the current administratively set floor — would protect the most vulnerable retirees while leaving the indexation formula intact, and would remove the political pressure that has historically produced discretionary top-ups.

Short-run priorities (2025–2030)

Indexation reform with a fiscal sustainability trigger. The most robust design is a mixed formula with an automatic trigger: CPI-only when the structural deficit exceeds a defined GDP threshold, 50% wage + 50% CPI when it falls below. Adjustment is automatic and rules-based, removing discretion from the political cycle.

Contribution rate increase, phased over five years. A phased increase from 18.8% to 20.0% over 2026–2030 — consistent with the rate applied in the combined package scenarios (S5, S6, S7) — distributed symmetrically between employer and employee, accompanied by a review of contribution burdens for low-wage workers to avoid incentivising informality at the margin.

Formalisation incentives. The near-term package should include digitised labour inspection, reduced employer contribution burdens for low-wage workers and small enterprises, and simplified compliance procedures — addressing the post-2021 reversal of formalisation gains, which underscores that this objective requires sustained institutional effort rather than one-off interventions.

Medium- and long-run structural measures (2030–2045)

Female labour market activation. Sustained institutional investment in child-care and old-age long term care infrastructure, flexible working legislation, targeted programmes for inactive women in rural and peri-urban areas, and career re-entry support. Near-term indexation reform is a precondition: it releases fiscal space from pension crowding-out that is currently constraining precisely these investments.

Voluntary extended employment beyond statutory retirement age. A legislative framework codifying the right of workers to continue employment — by mutual agreement with the employer — for up to three or four years beyond the statutory retirement age. The arrangement must be worker-initiated, with

independent oversight mechanisms, anonymous complaint channels, and periodic audit of extension agreements to prevent administrative manipulation in either direction.

Youth employment and early career formalisation. Active labour market programmes targeting the 15–24 cohort: vocational training, subsidised first employment, internship formalisation, and administrative simplification for first-time insured persons.

Additional measures not modelled in PSSM-MK

Several soft measures would complement the parametric package without requiring structural reform. Their fiscal impacts are not quantified in PSSM-MK but are consistent with the model's structural findings.

Demographic and labour market monitoring as a policy trigger. North Macedonia has no formal mechanism linking demographic projections to pension parameter review. The European Commission's Ageing Report cycle, which North Macedonia participates in as an accession candidate, provides an existing institutional framework for embedding periodic parameter reviews. Domestic legislation could establish that if the OADR exceeds 40% (expected before 2045 under the Baseline), a mandatory parliamentary review of the indexation formula, retirement age schedule, and contribution rate is triggered, with government required to present reform options with quantified fiscal impacts within 12 months.

The evidence assembled in this paper collectively supports treating the current period as the critical structural reform juncture. The demographic window in which the working-age population is still large enough to absorb higher contribution burdens without excessive per-worker impact is estimated to close around 2035. The reform space that exists today is substantially greater than the space that will exist in a decade — when the contributor shortage is arithmetically locked in, the deficit is materially larger, and the political economy of adjustment is correspondingly harder. The cost of delay is not linear; it compounds.

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