LONG-TERM FISCAL IMPLICATIONS OF AGING: THE CASE OF MOLDOVA

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SUMMARY

Moldova's population is shrinking and aging rapidly. In line with a scenario developed by the Center for Demographic Research, population is expected to count 1.96 million in 2040. The share of population aged 60+ is set to rise from 25% in 2023 to 29% in 2030 and 33% in 2040. According to Moldova's National Transfer Accounts, the population aged 60+ absorbs 40% of the public outflows and contributes only 20% to the inflows. If the 2019-2022 age-specific trends in and profile of public flows prevail in the next one-and-half decade, this may lead to severely negative consequences for the public finance, with the debt-to-GDP ratio exceeding 80% by 2040. The policy scenario in which the Government relies on tax policy alone to control the rise of debt-to-GDP ratio up to 50% only requires a growth in budgetary revenues from the current 28% of GDP to about 34% by 2040. Considering permanent changes in the demographic structure and competitiveness implications, such a policy is infeasible. Stimulating the employment while keeping taxation constant but without addressing productivity is not a feasible response either. A combination of labor productivity growing faster, of full employment of NEET youth and of steady growth in labor employment of working age adults, especially of women, is a more adequate responses to fiscal challenges posed by Moldova's demographic aging.

Keywords: demographic aging, national transfer accounts, inter-generational economy, fiscal sustainability.

INTRODUCTION

As Moldova's demographic aging continues, significant policy questions emerge regarding the long-term fiscal implications of this trend. What budgetary impacts can be anticipated from the increasing demand for pensions and healthcare for the older people? Will the demographic pressures place an excessive burden on the national budget? What options are available to the government to address these challenges?

In this policy-oriented paper, we integrate the results of the Moldovan National Transfer Accounts (NTA) with demographic and economic projections to assess the impacts of aging on the public budget expenditures, revenues, deficits and public debt. By doing so, we provide a significant empirical contribution to the policy debate on the fiscal impact of aging in Moldova. Our methodological approach is similar to that used in case of El Salvador (Pena, 2019). However, we explicitly model a labor and productivity-based production function, incorporate age-specific employment rates and adopt a different scenarios design.

Section 2 of the study provides an overview of the economic literature on the fiscal consequences of aging. Section 3 discusses key insights from the Moldovan NTA and demographic projections. Section 4 explains the modeling approach and the construction of scenarios. Section 5 presents the results and examines their sensitivity to alternative assumptions regarding demographic and economic perspectives. The final section concludes with a discussion of policy implications.

LITERATURE REVIEW

With many countries experiencing demographic aging, the fiscal impact of aging has become an important topic in the contemporary economic literature. It identifies three main mechanisms through which aging influences fiscal sustainability.

First, increased life expectancy and declining birth rates lead to rising dependency ratios, meaning fewer workers support a growing number of retirees. In Moldova, the migration of the working-age population further exacerbates the naturally rising dependency ratio. These demographic transformations contribute to straining pension systems, especially those based on pay-as-you-go (PAYG) model. Because of the rising dependency, these systems may become unsustainable, leading to larger budget deficits and potential insolvency (Lee & Mason, 2011). Alternatively, a PAYG system might remain sustainable only by continuously reducing the pension-wage replacement rates, which undermines financial incentives for personal contributions and encourages informal work arrangements – a pattern which has been pervasive in Moldova over the past three decades.

Second, since older individuals require more medical care than the younger ones, population aging typically drives up public and private healthcare costs. This feature has been empirically observed in Moldova as well (Gagauz & Prohnitchi, 2022). This places additional burden on public healthcare systems, potentially leading either to higher taxes or to reallocation of government spending from other areas, such as education or infrastructure, or a combination of the two, in order to cover the rising health expenditures (Breyer et al., 2010).

Third, reduction in the working-age population can lead to a slowdown in economic growth, further exacerbating fiscal pressures. In this framework, a smaller labor force results in lower productivity and reduced tax revenues, undermining efforts to maintain fiscal balance. However, this channel is not univocally validated in

the economic literature. For instance, (Borsch-Supan, 2013) finds that statistical evidence on this issue is not necessarily convincing. Some authors, such as (Lindh & Malmberg, 1999), find that older workers may indeed be less productive than the prime-age adults, but they are not necessarily much less productive than the youngest cohorts. This concurs with simulation results of (Bloom, Canning, & Fink, 2011) who find that that OECD countries are likely to see modest – albeit not catastrophic – declines in the rate of economic growth due to demographic aging over the period 2005-2050. However, in certain countries, such as Bulgaria, even under the most optimistic assumptions, it is evident that demographic transformations will exert sustained fiscal pressure and will significantly depress economic growth (World Bank, 2013). The magnitude and duration of this demographic stress makes Bulgaria a particularly relevant comparator for Moldova.

To mitigate the economic challenges associated with aging, policy analysts, such as (OECD, 2013) suggest a policy mix that includes raising the retirement age, promoting higher immigration, and encouraging higher labor force participation among older individuals. Other sources, such as (Groupoftwenty, 2019), advocated for shifting the tax burden from labor to consumption and, in some cases, adjusting the overall tax burden. Reviewed studies consistently emphasize that proactive policy adjustments are crucial for addressing the fiscal challenges posed by aging populations, with a focus on sustainability and economic resilience.

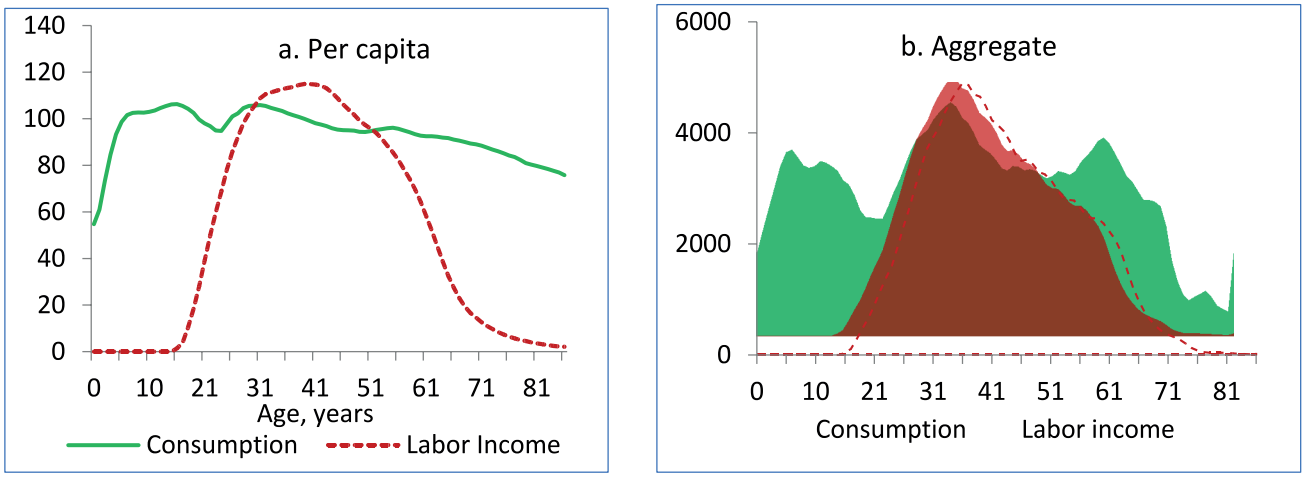
DEMOGRAPHIC PROJECTIONS AND NTA DATA

We use a set of demographic projections developed by the Center for Demographic Research (CDR) at the National Institute for Economic Research of Moldova (CDR, 2024). CDR projections include three scenarios. According to the "low" scenario, Moldova's population will decline to 1.84 million by 2040 (from 2.42 million in 2023), with the proportion of the population aged 60+ rising to 33.7% (from 25.2% in 2023). In the "medium" scenario, the population is expected to reach 1.96 million by 2040, with the share of population aged 60+ at 33.1%. The "high" scenario is slightly more optimistic, projecting a population of 2.1 million and a share of older people of 31.3% by 2040.

The most updated published results for Moldovan NTA refer to 2021 (Prohnițchi, 2023). For this article, the author has developed a 2022 NTA. According to the NTA, the lifecycle surplus in Moldova begins relatively late in life – around the age of 30 - and lasts only until the early 50s (Figure 1, panel a). Furthermore, the overall surplus created by productive generations is quite shallow (Figure 1, panel b.).

Figure 1

Per capita and aggregate age profile of consumption and labor income, th. MDL, year 2022



Source: estimated by author.

To finance current consumption, generations at deficit rely on intra-temporal transfers from surplus generations or on inter-temporal transfers based on own assets. The deficit / surplus is financed / used in line with the following accounting equation (United Nations, 2013):

$$C\text{-}Y_L=(YN_A - S)+(\tau_g^+ - \tau_g^-) + (\tau_f^+ - \tau_f^-) \quad \text{(eq.1)}$$

where:

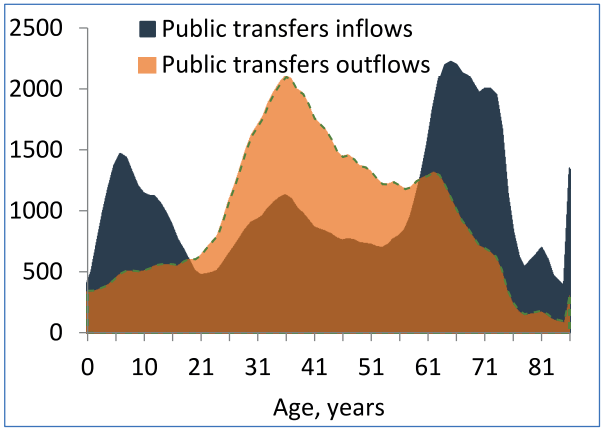
- C – consumption of public and private goods and services;
- Y_L – labor income;
- YN_A – net income from owned assets;
- S – savings;
- τ_g^+ – public transfers received (public inflows, such as pensions, public health-care, public education, etc.);
- τ_f^+ – private transfers received (private inflows);
- τ_g^- – public transfers sent (public outflows, mainly referring to taxes);
- τ_f^- – private transfers sent (private outflows).

Equation 1 applies equally to individual ages, to age-groups or to the entire population. International evidence suggests that public transfers tend to favor older generations (Lee & Mason, 2011). Moldova confirms this pattern, as the main contributors of the public transfers are generations aged from early 20s to late 50s which finance 70% of the outflows (Figure 2). The population aged 60+ receives more than 40% of total inflows (and contributes around 20% to total outflows).

It is worthwhile noting that in the period 2019-2022 the share of those aged 60+ in total public inflows has grown slowly but steadily, from 39.5% in 2019 to 40.6% in 2021, 40.7% in 2021 and 40.8% in 2022. As shown in the Figure 3, pensions and health-related transfers represent the main types of public inflows that older generations benefit of and which are the main drivers behind their recently growing share in public inflows.

Figure 2

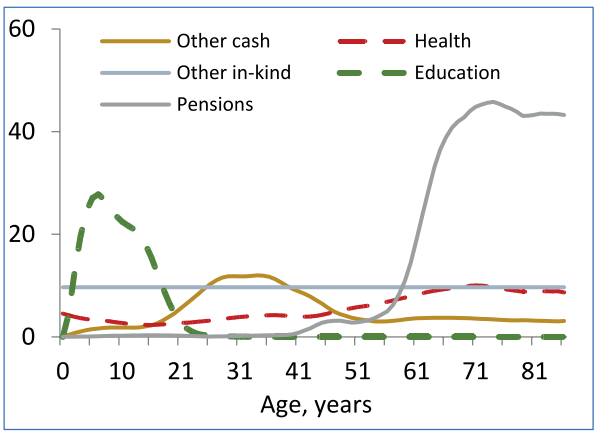
Age profile of the aggregate public transfer flows, th. MDL, year 2022



Source: estimated by author.

Figure 3

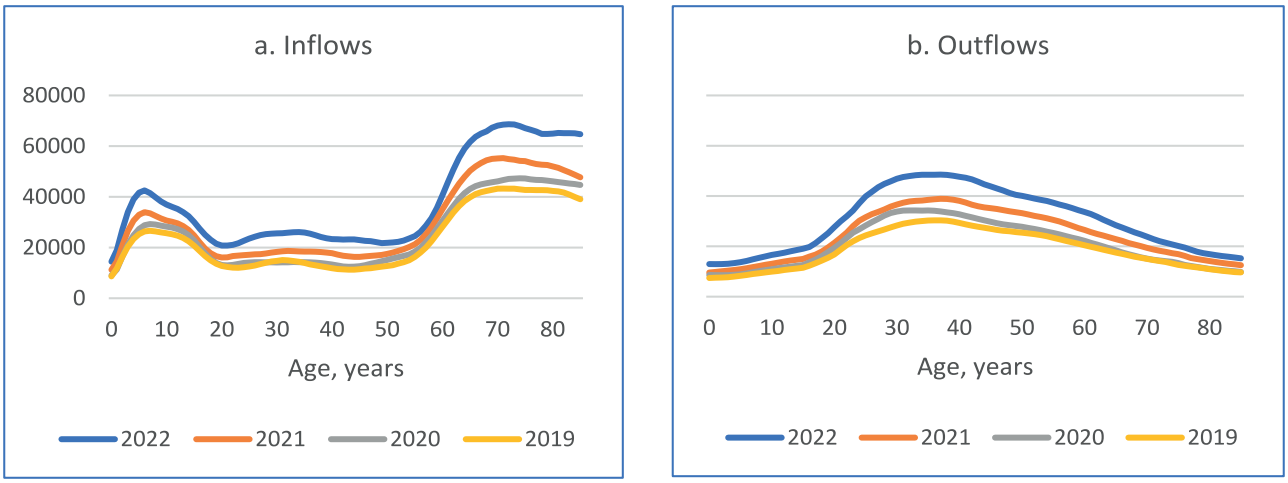
Age profile of the per capita public transfer inflows by type, th. MDL, year 2022



Source: estimated by author.

Figure 4

Per capita age profiles of public transfer flows by year, MDL



Source: estimated by author.

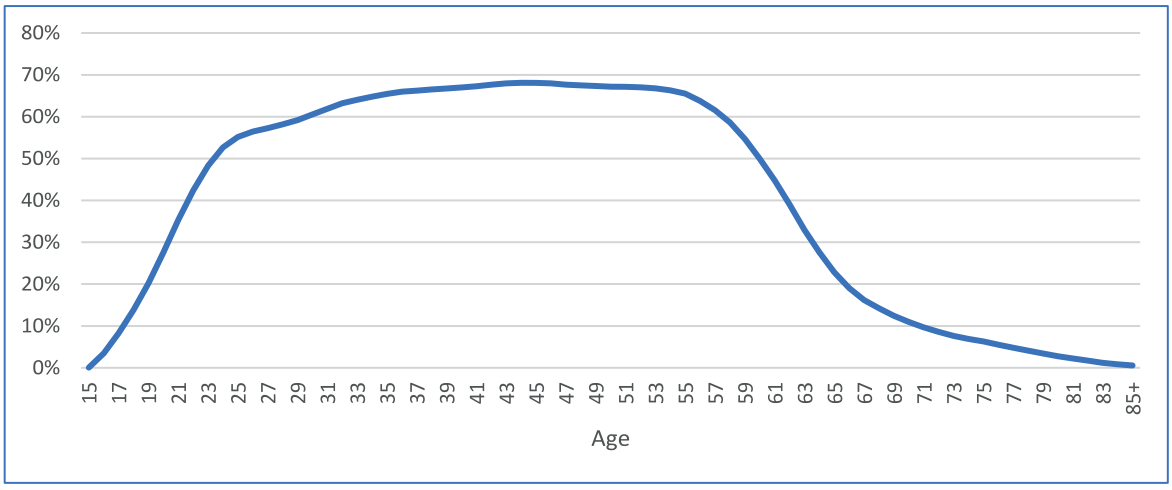
According to Moldova's NTA series for 2019-2022, the shape of the per capita age profiles of the public transfers inflows (Figure 4, panel a.) and outflows (Figure 4, panel b.) has remained rather stable. A significant shift, though, is a sizeable upward movement of the age profiles for both types of flows. These shifts are due to underlying inflation pressures leading to automatic indexation of benefits (inflows) and tax contributions (outflows), but also due to growing nominal and real economic indicators. At the same time, no significant cross-age shifts have taken place over the 4-year time period.

Yet, the sizeable vertical displacement of the age profile of public inflows for older generations which is easy to be spotted in the left panel of the Figure 4, gives rise to questions related to the long-term sustainability of the public flows. This concern is particularly relevant considering the demographic aging expected to accelerate in the next decade or so. In conducting our projections, we assume that the shape of the age profiles of public flows remains constant, but the profiles continue rising uniformly due to inflation and economic growth.

A key element used in our projections is the age-specific employment rate (ASER). We estimated the ASER using the same data source used for deriving the NTA – the Households Budget Survey (NBS, 2024). To smooth out the inevitable statistical noise, we use the average ASER for the period 2019-2022 so that to get the "well-behaved" curve illustrated in Figure 5.

Figure 5

Age-specific employment rate in Moldova, %, average 2019-2022



Source: estimated by author.

MODELLING APPROACH AND SCENARIOS

Our projections horizon is the year 2040. Following the approach proposed by (Pena, 2019), the value of national public current expenditures for each period t over the projections' period is determined as a sum of the public transfer inflows of five components which are typically included in the NTA: education, health, pensions, other in-kind transfers and other cash transfers.

$$E^t = \sum_{i=1}^{5} C_i^t \qquad \text{(eq.2)}$$

For each component, the aggregate value of inflow is determined as the sum over all ages v of the nominal per capita age-specific inflows multiplied by population of age v:

$$C_i^t = \sum_{v=0}^{85+} \alpha_{v,i}^{t-1} * g_{v,i} * cpi^t * P_v^t \qquad \text{(eq.3)}$$

Where:

- $\alpha_{v,i}^t$ – value of age-specific public inflows for the age v in the period t; initial values are the 2022 values taken from NTA;
- $g_{v,i}$ – real growth rate of the age-specific public inflow component i for age v; these rates are calibrated based on the 2019-2022 NTA and are assumed constant for all scenarios (calibrated constants or averages of age-specific constants used in simulations are provided in Table 1);
- cpi^t – consumers price index in period t; year-specific values are constant for all scenarios, declining from 104.8% in 2023 to 103.5% in 2040, for an average of 104.0% for the entire period;
- P_v^t – population of age v in period t, according to the CDR demographic projections.

Table 1

Constants used in simulations, all in %

Constant	value
Average consumers price index	104.3
Average GDP deflator index	103.9
Real growth rate of per capita expenditure for education for 1-7 years age group	5.0
Real growth rate of per capita expenditure for education for 8-22 years age group	1.1
Real growth rate of per capita expenditure for education for 23+ years age group	0.0
Real growth rate of per capita expenditure for health, average for all ages	6.0
Real growth rate of per capita expenditure for pensions for ages 62 and below	0.0
Real growth rate of per capita expenditure for pensions for ages 63+	3.6
Real growth rate of per capita expenditure for other in-kind transfers for all ages	6.0
Real growth rate of per capita expenditure for other cash transfers for all ages	4.0
Baseline real growth rate of per capita public outflows, average for all ages	4.0
Public debt interest rate	2.4

Source: calibrated by the author.

Nominal value of overall public outflows (budgetary revenues) is determined by summing up the age-specific per capita outflows multiplied by population and augmented by real growth parameter and inflation rate.

$$R^t=\sum_{v=0}^{85+} \beta_v^{t-1} * gr_v^o * grad_s * cpi^t * P_v^t \quad \text{(eq.4)}$$

Where:

- β_v^t – age-specific outflows for the age v in period t; initial values of the parameter for the year 2022 are taken from the NTA;
- gr_v^o – real growth rate of the age-specific public outflows for the age v calibrated according to the NTA for the period 2019-2022;
- $grad_s$ – growth-adjusting parameter in the scenario s; this parameter changes only in the "fiscal" scenarios; values of all parameters by scenarios are presented in Table 2.

We determine the value of nominal and public debt as:

$$GDP^t=GDP^{t-1} * G^t * def^t \quad \text{(eq.5)}$$

$$D^t=D^{t-1} (1+rn^t)-PS^t (1+\frac{rn^t}{2}) \quad \text{(eq.6)}$$

$$PS^t=\sum_{v=0}^{85+} \sum_i (R^t-C_i^t) \quad \text{(eq.7)}$$

Where:

- GDP^t – nominal GDP in the period t, the initial value in 2023 is MDL 300.5 billion;
- G^t – real growth rate of the GDP in the period t;
- def^t – GDP deflator index for the period t; this is constant in all scenarios, and varies from 104.4% in 2024 to 103.4% in 2040 for an average of 103.9%;
- D^t – value of public debt in period t; the initial value for 2023 is set at MDL 102.2 billion, in line with the public debt reports released by the Government;
- rn^t – effective nominal interest rate on public debt; this is constant in all scenarios and is assumed to decline from the calibrated value of 5.2% in 2023 to 2.5% in 2040;
- PS^t – primary balance in period t.

Real growth rate of the GDP is determined by growth rate of the number of workers L^t and worker's productivity growth rate w^t (equation 8). This is essentially a production function approach with only one factor. On its turn, is determined by the product of age-specific employment rate ($aser_{v,s}^t$) and population P_v^t summed over all ages from 16 to 85+ (equation 10).

$$G^t=l^t * w^t \quad \text{(eq.8)}$$

$$l^t=L^t/L^{t-1} \quad \text{(eq.9)}$$

$$L^t=\sum_{v=16}^{85+} aser_{v,s}^t * P_v^t \quad \text{(eq.10)}$$

The parameter can vary by scenario s.

In order to assess the impact of the aging itself, one needs a "baseline" scenario in which the declining population would remain structurally stable (i.e., does not get older). Many combinations of fertility rate, age-specific migration rates and age-specific mortality rates – which are not subject of our enquiry - can lead to such evolution. In our baseline, the population declines to 1.96 million by 2040 ("medium" scenario) but the average age stays constant at 40.2 years. This artificial – and admittedly concocted - demographic scenario is called "stable" in the simulations (Table 2). Yet it is necessary for evaluating the impact in a counterfactual framework. We develop three impact scenarios – called "Low normal", "Medium normal" and "High normal", based on the corresponding CDR demographic projections (Table 2). The word "normal" in scenarios' names refers to economic evolution, with the annual labor productivity expected to grow by 4% per year, just as in the "stable" scenario. A key question pertaining to the impact scenarios is whether the fiscal impact does significantly depend on which of the three CDR demographic projections eventually materializes.

Table 2

Parameters values by scenario, %

			Parameter			
			Demographic projection	2040 implicit average employment rate, %	Annual labor productivity growth rate, %	Public outflows adjustment parameter
Scenarios	**Baseline**		Stable	45.8	4	1.000
	Impact	Low normal	CDR low	40.9	4	1.000
		Medium normal	CDR medium	40.8	4	1.000
		High normal	CDR high	41.2	4	1.000
	Policy	Fiscal normal	CDR medium	41.2	4	1.009
		Fiscal slow	CDR medium	41.2	3	1.011
		Employment normal	CDR medium	71.2	4	1.000
		Employment fast	CDR medium	59.8	5	1.000

Source: author's assumptions.

We also run four policy scenarios, in which demographic conditions evolve along the CDR "medium" projection. In fact, these policy scenarios are simulated as goal-seeking scenarios, in which the goal is the level of the debt-to-GDP ratio.

The "fiscal normal" policy scenario asks how much, other conditions being equal, should the public outflows increase in order for Moldova to meet by 2040 the same level of debt/GDP as in the baseline.

To check the sensitivity of results of the "fiscal normal" scenario to changes in economic conditions, the "fiscal slow" scenario asks the same question, but assumes that the productivity will grow 3% per year, instead of 4%.

"Employment normal" policy scenario asks how much should the employment rate grow under normal fiscal and economic conditions in order for the Government to meet the same target of the debt-to-GDP ratio.

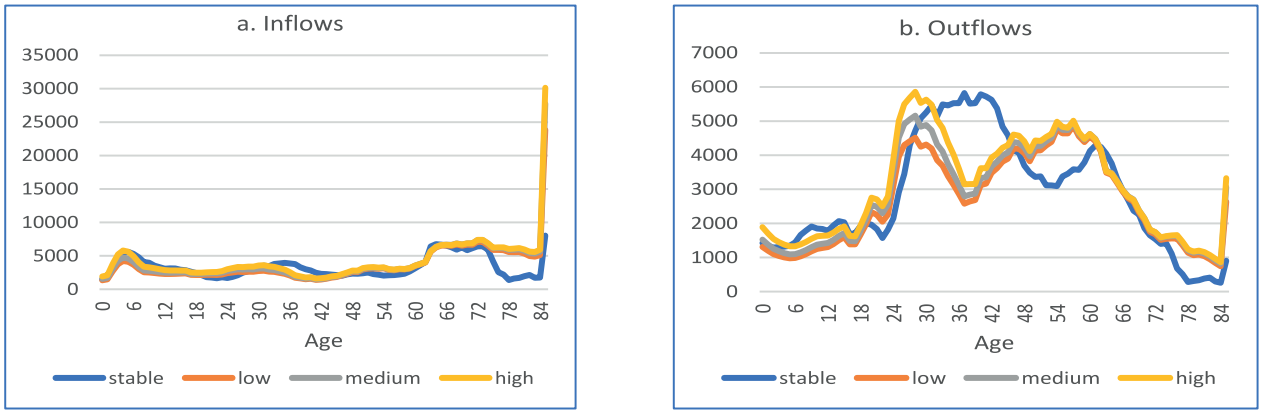
"Employment fast" scenario is similar to the "employment normal" scenario, but assumes a higher growth rate for the productivity parameter (5% instead of 4%). The purpose of this scenario is, again, to evaluate the sensitivity of results with respect to future economic conditions.

SIMULATION RESULTS

Simulation results show that the expected demographic aging will trigger significant structural shifts in the aggregate public inflows, with the older population absorbing significantly larger proportion of the public resources (Figure 6.a). According to the baseline scenario, in the year 2040 the share of the population aged 60+ in total public inflows is 40.5%. Even in case of the demographically most favorable evolution (the CDR "high" scenario), this share gets to 50.9% by year 2040. In the "medium" scenario, the share is 53.1%, while in the "low" scenario – 53.7%. At the same time, the fiscal burden on the older people, as measured by their share in public outflows, will increase slower: from 19.2% in the baseline, to 22.2% in the "high", to 23.7% in the "medium" and to 24.4% - in the "low" scenario. These figures clearly tell that, under the assumption of stable age profiles of future per capita inflows, the fiscal impact differences among the three demographic scenarios should be rather negligible.

Figure 6

Simulated aggregate age profiles of total public flows by scenario in 2040, billion MDL



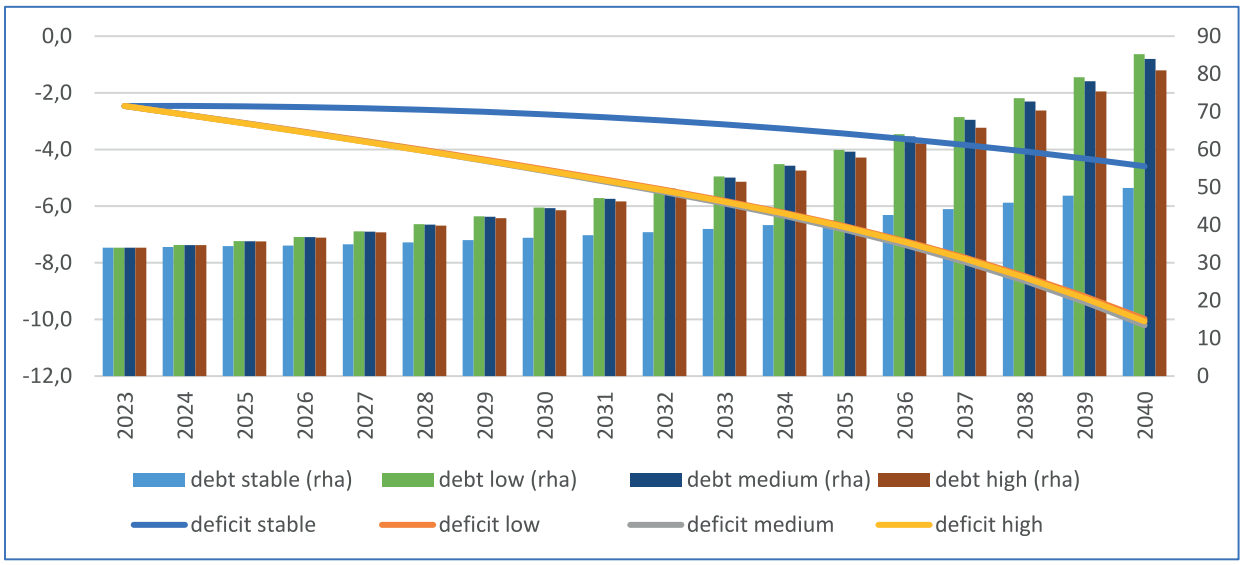
Source: simulation results.

On the background of stable per capita outflows, the budgetary expenditures relocations caused by aging result in a continuously worsening deficit-to-GDP ratio (Figure 7, the lines series). Independently of the demographic scenario, the fiscal impact is significant and lasting; in 2040, the average deficit in the three demographic scenarios is 10% of GDP, compared to only 4.6% in the baseline.

Reflecting chronic primary deficits caused by demographic aging, the burden of the public debt should be expected to grow strongly. In the baseline scenario the debt-to-GDP grows up to 50% by 2040. Compared to this rather moderate growth, in the "high" scenario the debt/GDP ratio gets to 81.0%, in the "medium" one – to 84.0%, while in the "low" one – 85.3% (Figure 7, bars series).

Figure 7

Simulated evolution of the public budget deficit and public debt by scenario, % of GDP



Source: simulation results.

It is clear that which scenario exactly of demographic aging materializes causes little difference to the magnitude of impact on public debt. In all cases the debt level will be quite above the IMF 70% benchmark of debt distress (International Monetary Fund, 2023) and even more so above the Maastricht convergence criteria benchmark of 60% used by Euro-area members (European Council, 2024). This worsening of fiscal stance is largely the consequence of rapid growth in pensions and health-services demand determined by growth of the underlying receiving population.

Turning to the policy scenarios, recall that the "fiscal normal" policy scenario assumes the "medium" demographic evolution and asks by how much should the public outflows (i.e. budgetary revenues) grow for the public debt not to exceed the baseline ceiling of 50%. Simulations suggest that in order to meet this

target, the level of taxes (as measured by share of total NTA public outflows to GDP) must increase from 28.5% in 2023 to 34% in 2040. By any accounts, this is a significant growth in the tax burden which, if pursued, may involve multiple negative consequences, including loss of country's attractiveness for foreign investment, depressed incentives for labor and negative feedback impact on the underlying model assumptions regarding the hypothesized growth in labor productivity.

Should the economy annual growth rate slow down a bit, the required growth in fiscal burden would be even larger. Simulation results of the "fiscal slow" scenario show that public outflows must increase up to 41.1% by 2040, which certainly is not an actionable policy target.

In the "employment normal" scenario, the 2040 target of 50% debt-to-GDP ratio requires a significant growth of total employment rate from the current value of 40% up to 71.2%. In light of the expected demographic structure, attaining such a level of employment is hardly feasible, considering that it involves a significant increase in youth and older people employment. Assuming a maximum possible employment rate of 97% for the adult population in the age category 23-62 years, attaining the overall employment rate target of 71.2% would require all adults being employed at maximum level and the youth aged 15 to 22 years to increase employment rate from the current average of 20% to 44% by 2040. At the same time, the employment rate of retired population aged 63+ will need to grow from 15% to 35%. In line with official statistical figures, the rate of youth 15-24 "not in employment, education or training" (the NEET group) represents about 14% of this population (NBS, 2024). Considering this, doubling the youth employment rate looks achievable only at the expense of education enrollment rate and with long-term losses in human capital quality. In case of population aged 60+, achieving a 35% employment rate is challenging for reasons related to health conditions and productivity losses caused by age-related factors.

However, should firms and government undertake more labor productivity-enhancing investments ("employment fast" scenario), the situation would change significantly. If the labor productivity grows by 5% rather than the 4% in the normal case, the 50% debt-to-GDP target rate is achievable with a steady growth of employment rate from the initial 40% to 60% in 2040. For instance, this can be achieved if the employment rate of the youth aged 15-22 years expands from 20% to 30% (and thus completely using up the labor potential of the NEET youth) and if the adults in the age category 23-62 increase their employment rate from 64% to 90%. In this scenario, there is no need for any increase in the employment rate of the older generation compared to the baseline.

CONCLUSION

As population 60+ accounts for a significant bulk of the public transfers to the population and a disproportionately small share in total taxes raised per economy, the demographic aging of Moldova has significant fiscal long-term implications.

Growing needs for pensions and healthcare services are expected to lead to exceedingly high fiscal imbalances. The mere continuation of the 2019-2022 trends in public outflows and inflows, coupled with demographic aging perspectives, will lead to a series of chronic budgetary deficits that will likely send the public debt above 80% of GDP by the year 2040. The impact on debt does not vary greatly from "low" to "medium" to "high" demographic scenario underlying the economic projections.

Even a significant increase in the fiscal burden, while reducing the pace of debt growth, does not appear to eliminate entirely the imbalance. Simulations show that in order to meet the 50% debt-to-GDP benchmark, the share of budgetary revenues would need to increase from 28% to 34% of GDP by 2040. Such a tightening of the fiscal policy looks politically infeasible and economically counter-productive. Any external shock abating even mildly the economy from its growth trajectory would require even higher tax burden.

At the same time, a policy option stimulating the growth in employment alone but not addressing the labor productivity is not a feasible response either. Under constant taxation conditions, meeting the target of 50% of the debt-to-GDP ratio would require a boost in employment rate from 40% in 2023 to 71% in 2040. This would require all adults being in employment, the youth employment rising from 20% to 40% rate and the retired people employment rate rising from 15 to 35%. Under any of the three demographic scenarios, this policy is exceedingly burdensome and hardly feasible, especially considering associated losses in the youth educational enrollment and in the welfare of older generations that such a policy would entail.

Achieving long-term debt sustainability looks more realistic by adopting a policy mix stimulating both an accelerated growth in labor productivity and a more feasible path of gains in employment rate. With the labor productivity growing at an annual rate of 5% (instead of 4%) and with the employment rate expanding linearly from 40% in present to 60% in 2040, the debt sustainability objective looks well within reach.

Such a policy mix would require, *inter alia*, incentives for the youth to leave their NEET status, such as indemnities for territorial and inter-sectorial labor mobility, and more adequate career advisory services preventing them from entering the NEET group.

In case of adults, the employment policy should target especially rural women willing to pursue their professional plans rather than performing home-related work. Rural women employment rate is only 37% compared to 45% of rural men; and in case of rural population aged 25-34 years, the employment rate of women is only 42% compared to 53% of men. As empirical evidence suggests, two key barriers undermining rural women employment is poor quality (rather than lack) of childcare services and the outright lack of care services for older generations (German Economic Team, 2023). Addressing these constraints is in itself an investment endeavor creating jobs both directly (educators, teachers, caregivers, administrative staff) but more so indirectly, by allowing an earlier and broader return of women to labor market.

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