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DEMOGRAPHIC DIVIDEND AND LABOUR MARKET DYNAMICS: AN EMPIRICAL ANALYSIS OF SOCIO-ECONOMIC TRANSITION AND POLICY IMPLICATIONS

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Introduction. Despite macroeconomic improvements, Georgia has faced a persistent negative demographic dividend that has held back economic growth over the past two decades. This study combines dependency ratios, unemployment, self-employment, and informal employment characteristics using an innovative algorithm. Considering its unique informal sector, this approach provides a more realistic picture of Georgia's demographic and economic dynamics.

Aim and tasks. This study aims to empirically assess the impact of the demographic situation in Georgia on labour market dynamics and the socio-economic transition using a modified algorithm, regression analysis, and CGE modelling to identify necessary reforms and develop evidence-based policy recommendations to facilitate the realisation of the demographic dividend.

Results. The study confirms that, despite GDP and wage growth, Georgia has experienced a persistently negative demographic dividend over the past two decades. Traditional dependency ratios fail to reflect the specifics of Georgia's highly informal and underemployed labour market. Regression analysis and the Granger causality test show that dependent unemployment and cost increases are the key drivers behind the negative trend. Empirical data show a decline in net demographic returns: -€35.96 million (2002-2012) and -€89.91 million (2013-2023), indicating that employees are unable to pay dependent expenses, especially in 2022. Regression (R^2 = 96%) confirmed the negative impact of dependency burden and expenses, while the falling birth rate had only a weak offsetting effect. Granger tests revealed that the size of the dependent population, food expenditures and mortality rates predict future dividend values, confirming the relevance of the planning model. Evidence strongly suggests that without structural reforms in labour, social, and health policies and productivity boosts, Georgia's demographic trends will continue to hinder economic growth rather than support it.

Conclusions. The study concludes that without targeted reforms in the labour market, healthcare, and economic planning, Georgia will not be able to turn demographic changes into economic benefits. The presented model emphasises the influence of demographic factors on socio-economic development and the importance of aligning demographic trends with effective economic policies.

Keywords: demographic dividend, economic development, labour, regression analysis, employment.

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1. Introduction.

Demographic changes and economic development are interlinked and significant in the context of high mortality rates and an ageing population, which may be associated with several unresolved issues. High mortality rates are a negative phenomenon that has negative economic consequences and leads to significant economic losses, especially when the number of economically active citizens decreases.

Demographic and economic policies aim to develop practical measures for the economic consequences of such losses. Each area has different demographic features, which are determined by local socio-economic factors that tend to cause declining populations. This demographic change provides a background understanding of demographic dividends and links economic and demographic factors.

Despite the neo-Malthusian hypothesis (Malthus, 2023) that uncontrolled population growth can lead to shortages, empirical studies have shown that the real cause of economic growth is not material but human capital and technological progress (Ludwig et al., 2012). According to this theory, demographic pressure leads to institutional, technological and political changes. Different demographic regimes exist worldwide, and demographic transition theory explains how the population changes over time (Bloom, & Sevilla, 2001; Caldwell, 2004). According to the Keynesian economic growth model, savings are the key to long-term development. This can be achieved by increasing income and reducing expenditures while the population prospers. The mechanism that creates a demographic dividend is the economic mechanism that stimulates savings and economic growth.

2. Literature Review.

Economic theories have consistently emphasised the role of demographic processes in ensuring economic development. However, demographic growth, as opposed to the population's age structure, has often been seen as a driver of economic growth. Demography is considered one of the most important social determinants closely related to economic development and the labour market (Bloom et al., 2003; Caldwell, 2004).

Human capital development is closely linked to both economic and demographic changes. Recent studies on the determinants of economic growth have focused on the potential to generate a demographic dividend. According to some researchers, changes in the demographic profile, such as a decrease in the birth rate, contribute to improving the economic conditions of individual citizens.

However, another school of thought argues that this trend could hinder economic progress. This is because a declining labour force increases the “dependent” population, placing a heavy fiscal burden on both families and the state (Sinding, 2009).

Based on existing research, rapid population growth may burden society. An increase in the world’s population at such a high growth pace will lead to extensive consumption of the global resources. Reducing the population cannot be considered a state-policy initiative. This issue should instead be addressed through rational population planning. If the opposite is considered, economic advancement will be hindered again because of the low labour pool and the high dependency ratio.

Cylus and Al Tayara (2021) and Shahidi et al. (2019) argue that a rising trend in the labour force dependency ratio does not directly lead to a reduction in economic growth. Governments should focus on formulating policies that enhance healthcare and education systems, support infrastructure development, and ensure macroeconomic stability (Zhou et al., 2023). In turn, these measures can stimulate economic growth by facilitating capital accumulation within the economy.

Economists and social theorists have debated the economic impact of population change for decades (Headey & Hodge, 2009; Maestas et al., 2023). According to David et al. (2001), these questions can be explained by three different positions: population structure is unaffected by economic growth, population growth constraints, or support for economic development. Adopting measures to bring demographic dividends to developing countries is important because no economic measure can simultaneously produce funds to finance economic growth and solve social issues.

The evaluation of successfully applied economic and demographic policies relies on understanding the idea of the "demographic dividend" by Chandrasekhar et al. (2006) and Lee and Mason (2006). This dividend is an economic growth mechanism that correlates with specific country's demographic conditions.

Despite numerous studies on the relationship between demographic processes and economic growth, the question remains: What mechanisms will help maximise the demographic dividend in low fertility conditions, population ageing, and migration? This study develops strategies for managing demographic factors to avoid resource depletion and ensure sustainable economic progress through investments in human capital, health, and infrastructure, considering the characteristics of industrial companies as factors of national competitiveness.

3. Methodology.

3.1. Demographic Dividend Mechanism and Modified Calculation Approach.

The demographic dividend mechanism measures Georgia's economic and demographic characteristics. As mentioned, the birth rate in Georgia fell during 2001–2006, seemingly opening the door to the beginning of the first demographic dividend. The regularity of the demographic dividend is interrupted by the simultaneous increase in the mortality rate, which mainly impacts the working population's 25–64 age groups.

The demographic data indicate the following:

1. A low labour force participation rate among the economically active population.

2. A disproportionately high share of employment concentrated in the food industry.

3. Between 2001 and 2005, there was an increase in the proportion of the population aged 0–24 years in the deceased's age structure.

The modified algorithm was chosen to calculate the demographic dividend because it can include age and employment status dependencies (Krishnamurty, & Kumar, 2015).). Unlike the traditional model, this approach considers both demographic pressure and the structure of the labour market.

The dismissal of the traditional demographic dividend is explained by the specifics of the Georgian labour market, namely the prevalence of informal employment and underemployment.

The traditional approach, focused on formal labour force participation and strict age ratios, does not adequately reflect the economic burden borne by the labour force in these circumstances. Therefore, the proposed adjustment modifies the calculation of the demographic dividend by including the self-employed and the unemployed in the composition of dependents, which more accurately reflects the economic pressures faced by the Georgian labour force.

The adjustment factor (K) for the age group 65+ considers state pension payments that partially cover the pension costs. The K-factor was calculated as the ratio of the average pension to the average monthly cost. This adjustment provides an accurate assessment of the financial burden on the elderly and allows for a more accurate determination of their care costs.

3.2. Two-Stage Empirical Analysis.

In order to evaluate the potential for a demographic dividend, the analysis was divided into two phases: Stage I (2002–2012) and Stage II (2013–2023), as outlined in Table 1.

Table 1. Demographic and Economic Indicators in Georgia, 2002–2023.

Period	Birth Rate (%)	Mortality Rate (%)	Economically Active Population ('000)	Employment ('000)	GDP per Capita (Euro)	Sustaining Wage (Euro)
2002–2007	11.6–12.1	11.7–12.9	2,113.3–1,911.9	1,878.0–1,618.0	2811.5–1528.3	49.6–51.95
2008–2012	12.1–14.6	13.0–13.5	1,908.7–1,988.2	1,577.3–1,643.5	1886.3–3161.3	50.09–67.8
2013–2018	13.7–14.3	13.2–12.8	1,654.7–1,641.4	1,659.4–1,706.6	2411.5–3506.6	45.39–52.8
2019–2023	13.7–11.4	12.5–13.2	1,605.2–1,551.6	1,694.2–1,283.7	4112.7–6689.2	61.37–87.11

Source: based on The National Bank of Georgia (2024) and the National Statistics Office of Georgia (2024).

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Statistics on the demographics of the first stage during 2002–2012 show that the birth rate increased from 11.6% to 11.8% since 2006. According to the demographic dividend theorem, if all other factors remain constant, reducing the birth rate should allow employed workers to save (Weintraub, 1962). During 2002–2012, the labour market was characterised by self-employed workers whose poor incomes were below the subsistence level, and part of the active population was unemployed, thus adding to the dilemma. To illustrate the income, employment, and expenditure dynamics across the analysed periods, Table 2 presents the key indicators relevant to the formation of Georgia's demographic dividend from 2002 to 2023.

Table 2. Indicators of Demographic Dividend Formation in Georgia, 2002–2023.

Period	Employed Population ('000)	Average Monthly Income per Head (Euro)	Self-Employed Population ('000)	Self-Employed Income (Euro)	Average Expenditure (Euro)
2002–2007	654–608	7.70–14.7	1136–1007	1.15–5.5	27.6–39.4
2008–2012	608–668	18.3–31.1	1007–956	5.9–7.7	44.41–66.5
2013–2018	684–798	25.6–41.4	952–928	6.9–8.5	51.1–66.9
2019–2023	801–870	42.7–59.6	909–412	9.6–15.9	71.7–103.4

Source: based on the National Statistics Office of Georgia (2024).

Given the prevailing conditions, a modification was added to the demographic dividend algorithm to account for the unemployed proportion of the economically active population as part of the "feeding" population (Ogawa et al., 2021). Consequently, the demographic dividend declined to a negative value. Nevertheless, it is crucial to maintain a pragmatic perspective to identify the potential complications (Krishnamurty & Kumar, 2015).

A proven algorithm was used to calculate the demographic dividend, with an adjustment to include the costs associated with catering to the 65+ demographic to strengthen the conclusion. Specifically, a portion of pensioner expenses are covered by state pensions.

Therefore, the ratio between the number of expenses and pension amount was used to calculate the average value of the adjustment coefficient (K).

The algorithm is structured as follows (Formula 1).

$$DD = [E \times (W - C)] + [SE \times (I - C)] - [P_{0-14} \times C] - [(P_{65} \times C) \times K] - (U \times C) \quad (1)$$

Where, DD – Demographic Dividend; E – Number of Employed Individuals; W – Average Monthly Wage of Employed; C – Average Monthly Consumption or Expenditure per Person; SE – Number of Self-Employed Individuals; I – Average Monthly Income of Self-Employed; P_{0-14} – Population aged 0-14; P_{65} – Population aged 65; K – Adjustment Coefficient (determined by dividing the average pension by the average expenditure); U – Number of Unemployed Individuals.

Financial factors are analysed for different ages to assess the demographic dividend and its economic implications, focusing on income, expenditure and consumption patterns.

– The calculation involved determining the average monthly expenses and wages of employed individuals and the average income and expenses of self-employed individuals for the age groups (15+ and 65).

– For the population aged 0-14 years, the average "feeding" expenses were calculated based on standard consumption patterns. For individuals over 65 years, expenses were estimated by applying the pension-to-expenditure coefficient, which adjusts for pension payments and the average costs of elderly care at different stages.

Thus, considering the actual circumstances, the demographic dividend formula adopts the following structure:

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1. Demographic Dividend Calculation (I Stage: 2002-2012).

The demographic dividend for the period 2002-2012 was calculated using a formula that considers various factors affecting the economic contribution of the population. After applying the appropriate adjustments and coefficients, the demographic dividend result was determined to -52,704,389.36 EUR.

The calculation showed a lack of dividend production during 2002–2012. This is due to the socioeconomic context: even when adjusted to the poverty line, the employer's salaries were insufficient to support the unemployed, and state pensions (ranging from 4.66 to 33.30 EUR) were inadequate. The initial stage reflected the demographic shift and economic transformation of Georgia.

Since 2012, a shift in social and economic policy has been underway to increase the birth rate, improve healthcare, fund education, secure the state pension system, and reduce the proportion of pensioners employed by implementing a self-sustaining pension model (Tsintsadze et al., 2022).

2. Demographic Dividend Calculation (II Stage: 2013–2023).

The concept of a second demographic dividend, where pension savings are built over working years, is more feasible than the first one. Although demographic and economic indicators improved, employment rose, unemployment declined, and per capita income remained at least half of per capita expenditure.

Similarly, food costs per person still exceeded subsistence levels, preventing the realisation of a second demographic dividend. The average incomes for employed and self-employed individuals showed a consistent upward trend (Table 2). However, despite a 3% increase in the birth rate since 2007, the size of the 0–14 age group has remained virtually unchanged. This suggests the ongoing challenges in reducing child mortality in the country. Analysing Georgia's economic and demographic indicators makes it possible to assess whether a country's demographic dividend is influenced by savings accumulation and declining birth rates.

The evaluation reveals that, based on these factors, the demographic dividend for the given period is negative, amounting to -93,040,922.39 EUR.

This suggests that the country has not yet fully realised the potential benefits of its demographic changes, highlighting the need for targeted economic and demographic policies to reverse this trend. The demographic dividend also shows that Georgia is still in a stage of demographic transition; therefore, the increase in the birth rate is not among the leading determinants of savings. Although the increased wages of the hired workforce were of utmost importance, the determinants of dividend creation are not exclusive.

The demographic dividend has had a negative two-decade trend and is continuously decreasing. The demographic dividend was still negative as the nation's socioeconomic and demographic policies did not impact dividends. This was attested to because wage increases could not exceed the necessary cost of living.

4. Results.

The study uses regression analysis to identify the determinants that are the strongest contributors to the algorithm components. It is possible to identify barriers to saving generation in terms of variations in these determinants and take appropriate remedial steps. Average data values were used to calculate the demographic dividends for stages I and II.

The annual demographic dividend was calculated to obtain precise results from the regression analysis. According to the calculations, dividends show a steady downward trend, peaking in 2023 (Fig. 1). Although it is impossible to quantify the original demographic dividend because of the country's transitional economy and demographic environment, indicators from both phases were included in the regression analysis. According to the findings, Georgia has been unable to realise demographic dividends despite implementing more effective social policy strategies since 2012.

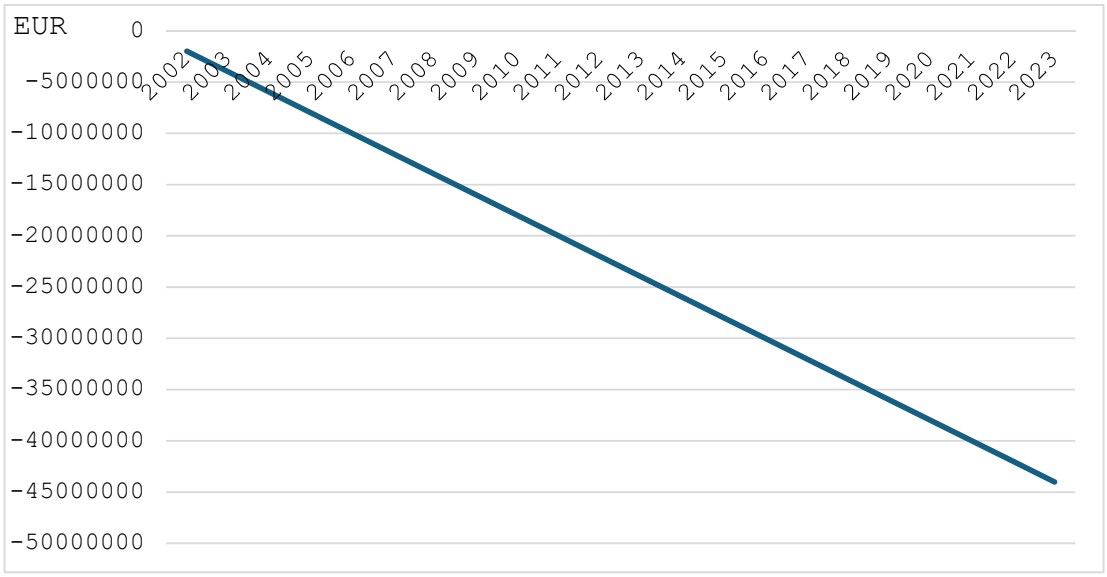

Fig. 1. Annual Demographic Dividend in Georgia (2002–2023), in Euros (EUR).
Source: based on National Statistics Office of Georgia (2024).

A regression analysis was conducted to examine the reciprocal relationship between demographic structure and economic development using the following variables:

- Dependent variable: demographic dividend (including per capita expenditures and income);
- Independent variable X_1: total population to be supported (ages 0-14, 65+, self-employed, and unemployed);
- Independent variable X_2: monthly food expenditure per capita multiplied by two;
- Independent variable X_3: birth rate.

The regression model is specified as follows:

$$Y = \beta_1 X_1 + \beta^2 X_2 + \beta_3 X_3 + \beta_3 X_4 \qquad (2)$$

Statistical analysis was performed using EViews software. Prior to the regression, multicollinearity diagnostics were conducted by calculating variance inflation factors (VIF) for the independent variables (Table 3). All VIF values were below 10, indicating no significant multicollinearity among the variables.

Table 3. Variance Inflation Factors.

Sample: 2001- 2022

Included observations: 22

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
X1	22829.60	831.2713	3.674382
X2	3.86E+10	13.90242	2.439741
X3	6.90E+13	164.3407	2.048178
X4	2.19E+14	508.6545	2.210742
C	5.78E+16	784.4162	NA

Source: based on EViews Software Results.

The regression model was estimated using the acquired results. The calculated R2 value of 95.8 signifies the statistical significance of the chosen variables. Furthermore, the t-statistic and its associated p-value suggest the rejection of the null hypothesis. This verifies that the chosen variables have an impact on the development of demographic dividends (Table 4). The research findings were assessed for reliability using the Granger causality test, and the results are presented in Table 5.

Table 4. Regression Analysis Results for Dependent Variable Y Using Least Squares Method.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X1	204.8687	151.0947	1.355896	0.0129
X2	227,097.4	196,516.4	11.55615	0.0000
X3	19,686,508	8,304,444	2.370599	0.0298
X4	-11,712,355	14,797,634	-0.791502	0.0396
C	-422,000,000	240,000,000	-1.754639	0.0973
R-squared	0.960112	Mean dependent var		3.55E+08
Adjusted R-squared	0.950726	S.D. dependent var		1.81E+08
S.E. of regression	40,248,390	Akaike info criterion		38.05575
Sum squared resid	2.75×10^{16}	Schwarz criterion		38.30372
Log likelihood	-413.6133	Hannan-Quinn criter.		38.11417
F-statistic	102.2973	Durbin-Watson stat		2.730466
Prob(F-statistic)	0.000000			

Source: based on EViews Software Results.

This test helps determine whether one time series can predict the other. Based on these outcomes, the explanatory variables can be interpreted as follows:

– *X1* denotes that the aggregate-fed population is an independent variable that influences future values of the demographic dividend, as determined by the Granger test.

– *X2* determines that the impact of the monthly expenditure per head of the population being fed on the values of the demographic dividend is beyond dispute, as it is feasible to generate savings through expenditure reductions under other conditions, specifically when the monthly income per head remains constant.

– *X3* represents the fertility rate and holds paramount significance within the framework of demographic dividend formation. Under all other circumstances, a decline in the fertility rate should encourage individuals to allocate their income towards savings.

– *X4* captures the nation's age structure, which is determined by the mortality rate, which is proportional to the number of economically active individuals required to generate gross domestic product.

Table 5. Pairwise Granger Causality Tests.

Lags: 2

Null Hypothesis	Obs	F-Statistic	Prob.
X1 does not Granger Cause Y	20	5.15231	0.0198
Y does not Granger Cause X1		1.36274	0.2859
X2 does not Granger Cause Y	20	6.72014	0.0082
Y does not Granger Cause X2		2.32372	0.1321
X3 does not Granger Cause Y	20	1.10643	0.0563
Y does not Granger Cause X3		4.45264	0.0303
X4 does not Granger Cause Y	20	5.66177	0.0147
Y does not Granger Cause X4		0.76882	0.4810

Source: based on EViews Software Results.

It was concluded as a result of the inquiry that the construction of the demographic dividend algorithm depends on the indicators used in it. Regularity in statistical data analysis rules out the possibility of analysing demographic dividends in Georgia.

In summary, economic and demographic transitions have not been observed in Georgia. Because of the adverse socioeconomic environment, the birth rate was reduced, and this was not due to the population's desire to save. An increase in mortality rate is due to reasons such as the lack of proper healthcare infrastructure, the high cost of services, and low-income earners' refusal to eat biologically necessary foodstuffs, among other factors.

The Granger test established that the considered variables determine the demographic dividend prediction. The forecasted birth rate (Figure 3) and mortality rate (Figure 4) are presented, indicating that the demographic transition in Georgia is likely to occur against the backdrop of declining trends in both rates.

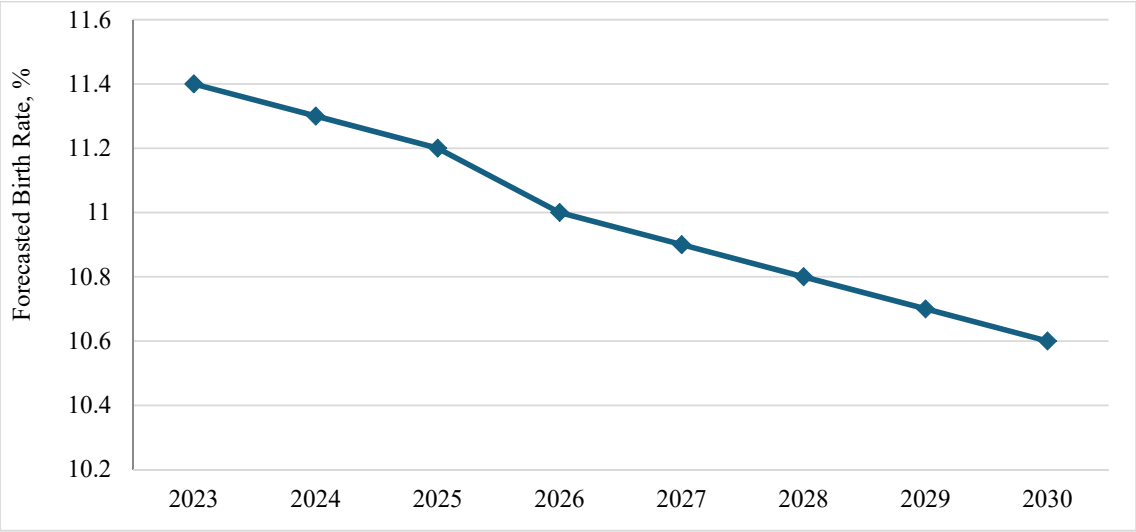

Fig. 2. Forecasted Birth Rate in Georgia (2023–2030), %.

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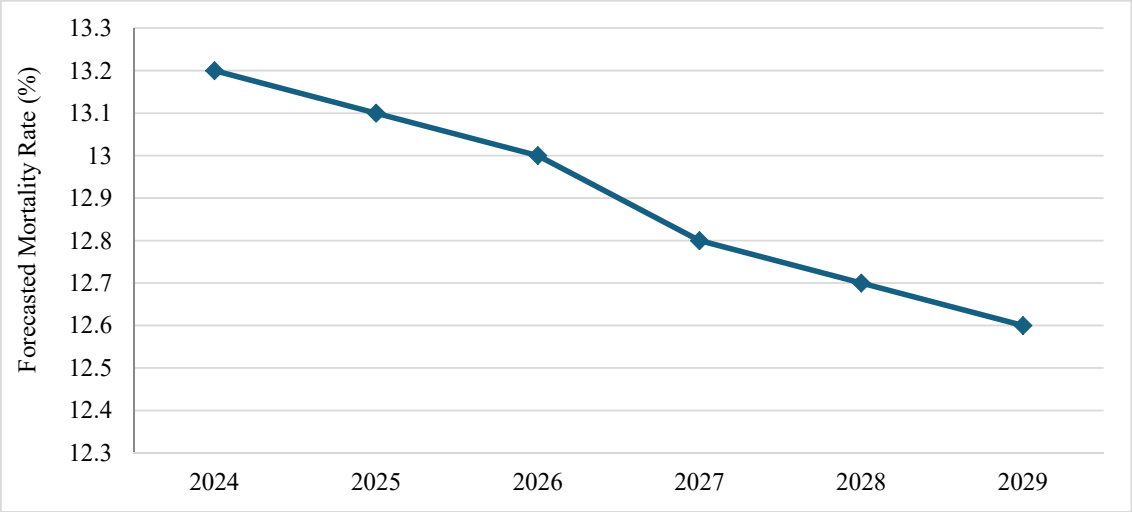

Fig. 3. Forecasted Mortality Rate in Georgia (2024-2029), %.

The prognosis regarding the demographic and economic transition is bleak, as the escalation in the birth rate will lead to heightened transaction costs for the population. The social welfare and social costs of the state will diminish. Despite Georgia's modest population, economic growth necessitates investment, which, as the nation's principal source of capital, will generate losses and profits for the budget. Presently, a significant proportion of domestic investments is supported by foreign capital, the returns of which are exported from the country. Substantial expenses are associated with childrearing, including food, medical care, and the optimal spiritual and physical development of children.

Therefore, the birth and death rate data for Georgia and other developing nations indicate that these regions are not yet prepared to undergo a demographic transition, and an economic transition will inevitably follow.

5. Conclusions.

This study presents a comprehensive empirical analysis of the correlation between demographic shifts and economic development in Georgia from 2002 to 2023. Despite structural changes in the economy and deliberate policy efforts to improve demographic and socioeconomic indicators, Georgia has not realised a positive demographic dividend.

The main reasons remain persistently high unemployment, insufficient wage growth compared to increased costs, and a high burden on the working population from young and old groups. The modified algorithm for calculating the demographic dividend, which counts the unemployed and adjusts for pension expenditures, consistently produced negative values in both the periods studied (2002-2012 and 2013-2023).

Furthermore, Georgia will face a deepening demographic transition in the coming years, expressed in a steady decline in the birth rate (from 11.4% to 10.6%) and a persistently high mortality rate (from 13.2% to 12.6%), which leads to a natural population decline and requires comprehensive socio-economic solutions. This suggests that demographic transition has not translated into economic savings or productivity gains, primarily because it has not led to favourable employment, income, and health outcomes. Regression and causality analyses also confirm that the level of expenditure, dependency ratio, and fertility rate are statistically significant factors influencing demographic dividends.

Despite the positive dynamics of certain demographic indicators, these improvements were not enough to overcome structural problems in the labour market and social protection system.

The Georgian economy has demonstrated stable growth in recent years, the GDP per capita has increased by 3.5 times. This growth has not been accompanied by a demographic dividend. This indicates that economic development is uneven, and a significant part of the population remains vulnerable.

Demographic dividends remain an unrealised resource rather than a driving force for development. This may be due to low fertility and high unemployment. As a result, the spread of informal employment leads to negative or unrealised demographic gains. Thus, families can create financial safety nets and mitigate demographic changes by encouraging savings and investment. It is imperative to delineate several recommendations, including:

– Promote labour force participation, improve job quality, and address youth and elderly unemployment.

– Adapting economic policies to demographic trends, such as population ageing and declining fertility, requires integrating social, demographic and economic factors into a unified strategy to improve decision-making effectiveness.

– Investing in the health of children aged 0-14 creates the foundation for future productive workforce and demographic benefits.

– Stimulates domestic investment and reduces capital outflow, creating favourable conditions for developing local businesses.

– Restructure the structure of social spending to more effectively support vulnerable groups without undermining the financial stability of the budget.

6. Limitations.

Although this study offers a comprehensive analysis, it also has several limitations.

First, the estimation of the demographic dividend is constrained by the difficulty in accurately determining the full extent of the informal employment sector in Georgia. Despite assumptions about the inclusion of the self-employed population, the informal economy remains underrepresented in official statistics, which may lead to an underestimation of its contribution to the labour market.

Second, some data used in assessments and econometric modelling are based on averages or expectations. This may distort the real situation and reduce the accuracy of individual conclusions.

Third, the results are highly context-dependent and may not reflect all internal changes within a single country or broader regional characteristics of the South Caucasus. These limitations highlight the need for future research to rely on more detailed and disaggregated data and include qualitative characteristics better to understand social, economic, and demographic processes.

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