Social and Economic Determinants of Birth Rates in 2023: A Cross-Country Linear Regression Analysis

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Abstract. Fertility decline poses significant challenges for demographic and fiscal sustain- ability globally. This study examines the relative importance of social versus economic determinants of cross-country birth rate variation in 2023, a critical post-pandemic period. Using cross-sectional data for 65 countries and log-linear regression with heteroskedasticity-robust standard errors, we find that demo- graphic structure and mortality conditions—maternal age, age dependency ratio, child mortality, and crude death rate—are the primary drivers of fertility differ- ences. Economic indicators (GDP per capita, government revenue and spending) exhibit no independent effects once social factors are controlled. Results suggest that addressing fertility decline requires long-term demographic policies rather than short-term fiscal interventions.

Keywords: Fertility, Demographic Transition, Fiscal Policy, Cross-Country Analysis.

1 Introduction

Birth rates play a central role in shaping population growth, labour force dynamics, dependency ratios, and public finance sustainability. Recent cross-country data reveal substantial differences in fertility, reflecting variations in social structures, maternal characteristics, child mortality, and economic conditions. Previous studies have documented long-term fertility decline, but trends vary significantly between countries, demonstrating the influence of both social and economic factors

The year 2023 provides a critical backdrop for this analysis, as countries navigated post-pandemic economic adjustments while experiencing delayed childbearing, declining child mortality, and population ageing. Short-term economic fluctuations and long-standing social determinants may have influenced fertility in distinct ways, contributing to observed cross-country differences. National-level analysis is therefore crucial to identify patterns relevant for policy and planning.

Despite extensive research on fertility, many studies examine social or economic determinants in isolation, limiting understanding of how these factors jointly shape

birth rates. This gap is particularly important in 2023, a period of post-pandemic economic recovery and demographic transition. Understanding the combined effects of social and economic determinants is essential for developing integrated strategies to support sustainable population growth, maternal and child health (SDG 3), economic stability (SDG 8), and equitable outcomes across socio-economic groups (SDG 10).

Building on the identified research gap, this study seeks to systematically assess the relative influence of both social and economic determinants on fertility outcomes. Specifically, it investigates the extent to which maternal age, age dependency ratios, and child mortality (social factors) and GDP per capita growth, government revenue, and government consumption spending (economic factors) contribute to cross-country variation in birth rates in 2023. By addressing this question, the study aims to clarify how these factors jointly shape fertility patterns during a period of post-pandemic adjustment and economic uncertainty.

This study aims to systematically assess the relative influence of social and economic determinants on national birth rates in 2023. Specifically, it investigates how maternal age, age dependency ratios, child mortality (social factors), and GDP per capita growth, government revenue, and government consumption spending (economic factors) contribute to cross-country variation in fertility. The analysis seeks to provide policy-relevant insights aligned with SDG 3 (Good Health and Well-Being), SDG 8 (Decent Work and Economic Growth), and SDG 10 (Reduced Inequalities).

By combining social and economic determinants in a unified analytical framework, this study offers updated evidence for governments and policymakers. Insights from the analysis can guide maternal and child health initiatives (SDG 3), inform economic and workforce planning (SDG 8), and support interventions to reduce socio-economic inequalities in fertility outcomes (SDG 10). This integrated approach helps ensure sustainable demographic and socio-economic development in the Philippines and comparable national contexts.

2 Literature Review

Theoretical frameworks for fertility generally fall into two categories: economic optimization and demographic transition.

Economic Theories of Fertility. The economic approach, formalized by Becker, conceptualizes childbearing as a household optimization problem involving a "quantity-quality" trade-off [4]. Parents maximize utility subject to income and time constraints, where rising opportunity costs of childrearing lead to fewer, higher-investment children. While early studies found a negative income-fertility relationship, recent evidence suggests this association may flatten or reverse at high levels of development, particularly where policies support work-family balance [5]. However, the

efficacy of aggregate fiscal spending remains debated, with targeted family support often proving more effective than general public expenditure [6].

Demographic and Mortality Determinants. Demographic transition theory posits that fertility decline follows improvements in survival. The "fertility insurance hypothesis" argues that falling child mortality reduces the need for precautionary births [7]. Additionally, momentum effects from age structure—captured by dependency ratios—play a crucial role. Countries with younger populations (higher dependency ratios) naturally exhibit higher birth rates due to the size of the reproductive cohort [8].

The Post-Pandemic Gap. The COVID-19 pandemic introduced a significant shock to fertility, with initial declines driven by uncertainty and health risks [9]. However, as the crisis evolved into 2023, the interaction between lingering economic disruption and pre-existing demographic trends remains under-researched. This study fills that gap by jointly analyzing these factors in a unified econometric framework.

3 Data and Methodology

3.1 Data Sources and Sample

This study constructs a cross-sectional dataset for the year **2023** using harmonised national-level indicators compiled by **Our World in Data (OWID)**, which aggregates and standardises data from international sources including the **World Bank, International Monetary Fund (IMF)**, and the **Penn World Table** [10, 11]. After excluding observations with missing values, the final sample consists of **65 countries.**

The analysis examines cross-country variation in birth rates using a set of social, demographic, and economic indicators. The dependent and explanatory variables are defined as follows:

- Dependent Variable: Crude Birth Rate (CBR)
- Social/Demographic: Average age of mothers, Age dependency ratio, Child mortality rate, and Crude death rate.
- Economic/Fiscal: GDP per capita, Government revenue (% of GDP), and Government consumption spending (% of GDP).

3.2 Econometric Specification

The analysis begins with a baseline **Ordinary Least Squares (OLS)** regression. Diagnostic testing, however, indicates functional form misspecification **(Ramsey RESET test, p = 0.032)**. To address this issue, a **log-linear specification** is adopted, which improves model fit and allows coefficients to be interpreted as elasticities or semi-elasticities. The preferred model is specified as:

$$ln(BirthRate) = \beta_0 + \beta_1(AvgAgeMothers) + \beta_2(AgeDependency) + \beta_3\ ln(ChildMortality) + \beta_4(CrudeDeathRate) + \beta_5\ ln(GDPpc) + \beta_6(FiscalVars) + \varepsilon$$

Variables that are strictly greater than zero, namely child mortality and GDP per capita, are log-transformed.

Robustness Strategy. Visual inspection of scale-location plots indicated the presence of heteroskedasticity. Although the Breusch-Pagan test did not formally reject homoskedasticity ($p = 0.170$), the low power of such tests in cross-sectional samples motivated the use of Heteroskedasticity-Robust Standard Errors (HC1) for all hypothesis testing. This ensures valid inference without altering coefficient estimates.

4 Results

4.1 Model Diagnostics

The log-linear specification significantly improved model validity. The Ramsey RESET test for the log-linear model failed to reject the null hypothesis of correct specification ($p = 0.169$), confirming that the logarithmic transformation adequately captured nonlinearities. The model explains a substantial proportion of variation, with an Adjusted R^2 of 0.896.

4.2 Model Diagnostics

Table 1 presents the results of the preferred log-linear model with robust standard errors.

Table 1. Log-Linear Regression Results (Robust SE)

Variable	Coefficient	Robust SE	t-value	p-value	Interpretation
(Intercept)	2.532	0.612	4.13	<0.001	
Avg Age Mothers	-0.052	0.021	-2.49	**0.016**	-5.2% per year
Age Dependency	0.022	0.005	4.43	**<0.001**	+2.2% per unit
ln(Child Mortality)	0.233	0.052	4.46	**<0.001**	Elasticity: 0.23
Crude Death Rate	-0.074	0.020	-3.73	**<0.001**	-7.4% per uni
ln(GDP per	0.034	0.069	0.49	0.627	Not significant

Capita)					
Gov Revenue (%GDP)	0.002	0.006	0.37	0.711	Not significant
Gov Spending (%GDP)	-0.003	0.006	-0.42	0.675	Not significant

Note: n = 65. Significance: p<0.05 is bolded.

Social and Demographic Determinants. Demographic fundamentals are the dominant drivers of fertility. The **Age Dependency Ratio** is the strongest predictor; a one-unit increase is associated with a 2.2% increase in birth rates, reflecting the momentum of younger population structures. **Maternal Age** exhibits a significant negative semi-elasticity (-5.2%), confirming that delayed childbearing significantly suppresses period fertility. **Child Mortality** shows a positive elasticity of 0.23, supporting the insurance hypothesis. Notably, the **Crude Death Rate** has a robust negative effect (-7.4%), indicating that high overall mortality (often associated with aging or health crises) reduces fertility when controlling for child survival.

Economic and Fiscal Variables. Once demographic factors are controlled, economic variables show no statistical significance. **GDP per capita** (p=0.627) and fiscal measures (Revenue, Spending) do not independently explain fertility variation in 2023. This suggests that the impact of economic development on fertility is mediated entirely through structural changes in health and demographics, rather than through direct short-term income effects.

5 Conclusion

This study provides robust empirical evidence that fertility differences across countries in 2023 were driven primarily by demographic structure and mortality conditions, rather than by income levels or fiscal capacity. Using a robust log-linear framework, we demonstrate that age dependency, maternal age, and mortality rates explain nearly 90% of the cross-country variation in birth rates.

The lack of significance for government spending and revenue suggests that aggregate fiscal capacity alone is insufficient to influence fertility outcomes in the short run. Policy efforts to address declining birth rates are unlikely to succeed through generic fiscal expansion. Instead, policymakers should focus on long-term structural interventions—such as improving child survival, supporting work-life balance to mitigate the costs of delayed childbearing, and adapting to aging population

structures. Future research should extend this analysis to panel data to better capture the dynamic lags between economic shocks and fertility responses.

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