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Growth and Strife: A Malthusian Perspective on Population and Political Instability in Developing Countries (1960–2022)

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Abstract

This study, based on the Neo-Malthusian framework, examines the association between population growth, resource scarcity, and political instability in 128 developing countries from 1960 to 2022. Results show that rapid population growth is associated with higher levels of political instability. This association appears stronger in low-income countries, which generally exhibit weaker institutions, limited fiscal capacity, and lower carrying capacity that coincide with greater sociopolitical tensions and inequalities. In contrast, high-income developing countries tend to show greater resilience, associated with stronger governance and technological adaptability. The findings highlight the importance of policies that strengthen governance, enhance resource management, and promote sustainable development to address potential instability risks associated with demographic pressures.

Keywords: population growth; political instability; developing countries; neo-Malthusian; governance; resource scarcity; carrying capacity

1. Introduction

The relationship between population growth, resource scarcity, and political instability has long interested researchers across disciplines such as economics, political science, and environmental studies. Building on the foundational ideas of Thomas Malthus [1], who argued that unchecked population growth would inevitably outpace resource availability, this study examines how Malthusian dynamics manifest in the modern era, with a particular focus on the developing world. While Malthus' theory has been criticized for its simplicity and failure to account for technological advances that mitigate scarcity, its fundamental premise—that rapid population growth exacerbates resource scarcity and stresses socio-political systems [2,3]—may still remain relevant in explaining today's challenges related to population pressure [4].

Since the mid-20th century, developing countries have undergone profound demographic transformations. According to the World Bank [5], their combined population rose from approximately 2 billion in 1960 to over 6 billion in 2022. This rapid increase, shaped by high fertility rates, reductions in mortality, and delayed demographic transitions



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relative to the developed world, has placed growing demands on both physical resources and institutional systems [6]. However, demographic expansion has not always been matched by proportional improvements in resource availability, technological capacity, or infrastructure development. As a consequence, demand for essential commodities—such as arable land, freshwater, and energy—has in many settings exceeded sustainable supply. This imbalance has sometimes constrained governments' ability to ensure equitable access to basic goods and services. In such contexts, resource competition and institutional stress may interact with existing vulnerabilities, potentially complicating governance and increasing the likelihood of political frictions [6].

The Sahel region offers a striking and instructive example of these dynamics. Its population expanded from roughly 30 million in 1950 to about 135 million in 2022, and projections suggest that it may exceed 300 million by 2050 [7]. This rapid demographic growth has been accompanied by heightened pressure on fragile ecosystems, including deforestation, overgrazing, and unsustainable agricultural practices that contribute to desertification and land degradation. In addition, reliance on limited water resources—exacerbated by prolonged droughts and other climate-related stressors—has made it increasingly difficult for communities to sustain livelihoods. Lake Chad, for instance, has contracted by more than 90 percent since the 1960s, substantially reducing local economic activity and compounding livelihood insecurity [7,8]. While population growth is by no means the sole factor underlying such environmental and social challenges, it has interacted with climatic, economic, and governance factors in complex ways that have occasionally coincided with increased social tensions and political volatility.

These interconnected demographic and environmental pressures have significant implications for political governance. States play a central role in mediating the effects of population growth and resource demand through policy design, institutional capacity, and social management [9,10]. Effective governance can help mitigate pressures by promoting equitable resource allocation, encouraging sustainable development, and strengthening infrastructure resilience. Yet, in contexts where resource constraints persist or worsen amid continuing population growth, governments often face mounting challenges in maintaining stability. Competition for scarce goods and unequal access to critical resources may contribute to localized grievances, population displacements, or broader social unrest. While these outcomes vary substantially across countries, the cumulative strain produced by rapid demographic growth and resource limitations can, in certain conditions, be linked to increased political fragility.

In this respect, the possible association between Malthusian population dynamics and political instability in the developing world warrants systematic empirical investigation. The notion that population pressures may interact with structural and institutional weaknesses to influence stability outcomes is neither uniform nor deterministic; rather, it depends on varying national capacities, governance quality, and levels of economic development. Some countries have managed to accommodate demographic growth through technological adaptation and effective policy reform, while others have struggled to absorb the accompanying social and environmental pressures. Understanding this variation is therefore vital for illuminating the broader relationship between population change and political outcomes in the post-1960 developing world. Accordingly, this study explores how Malthusian dynamics—particularly the interactions between population growth and resource scarcity—may be associated with levels of political instability across developing countries between 1960 and 2022 under a cross-national time-series framework. Specifically, it examines two primary questions:

- (1) To what extent is population growth statistically associated with political instability across developing countries?

- (2) Does this association differ between lower-income and higher-income developing countries, reflecting potential heterogeneity by level of economic development?

The remainder of this paper is organized as follows: Section 2 reviews the theoretical perspectives and related empirical literature; Section 3 presents the data, model, and methodological framework; Section 4 reports and interprets the empirical results; and Section 5 concludes with implications for policy and future research.

2. Literature Review

2.1. Malthusian View on Population Growth and Critiques

Thomas Malthus' [1] seminal work, *An Essay on the Principle of Population*, laid the foundation for understanding the relationship between population growth and resource scarcity. Malthus argued that population, if unchecked, grows exponentially while food production and other resources grow linearly. This imbalance, he claimed, would inevitably lead to the "Malthusian trap" driven by resource scarcity, famine, and political turmoil. Malthus' theory emphasizes the limits of natural resources in sustaining unchecked demographic expansion, asserting that population growth would outpace food supply unless controlled by "positive" checks (e.g., famine, disease, war) or "preventive" checks (e.g., delayed marriage, reduced fertility). While Malthus' ideas have been influential, they have also faced significant criticism. Key critiques focus on his failure to anticipate technological advancements and the transformative role of human ingenuity in resource management. Technological innovations, particularly in agriculture, such as the Green Revolution, have dramatically increased food production, challenging the inevitability of Malthusian crises [11].

While Malthus' ideas [1] have been influential in shaping the understanding of the relationship between population growth and resource scarcity, they have also faced significant criticism, particularly from the Cornucopian perspective, which is closely aligned with the work of Ester Boserup. Malthus failed to anticipate the transformative role of human ingenuity and technological advancements in overcoming resource limitations. Boserup's [11] theory of agricultural intensification forms a central pillar of the Cornucopian argument, asserting that population growth is not a threat but a catalyst for innovation. Specifically, Boserup [11] suggested that population pressure itself drives societies to develop more efficient agricultural methods, such as the adoption of high-yield crops, improved irrigation systems, and mechanization, enabling them to meet growing resource demands and avoid the Malthusian trap. By framing resource scarcity as a challenge that spurs innovation rather than an insurmountable limit, Boserup directly challenges Malthus' assumption of fixed resource constraints.

2.2. Application of Malthusian Framework in Contemporary Context

Neo-Malthusianism revisits and expands on Malthus' original concerns, adapting them to modern environmental challenges. While some modern theorists acknowledge the temporary benefits of technological advances, as emphasized by Cornucopians, they maintain that population growth is ultimately constrained by the carrying capacity of the planet, a principle that remains central to Neo-Malthusian thought [2,12].

Although the Malthusian framework has been widely used to explain population growth in the pre-industrial revolution context [13,14], scholars have increasingly applied its principles to address modern economic and environmental challenges. For instance, in pre-industrial societies, population growth was primarily constrained by food production capacity, as initially proposed by Malthus. However, the framework has been expanded in contemporary contexts to include the complex interplay between population growth, resource consumption, and environmental degradation. Unlike pre-industrial societies,

where food production was the main limiting factor, modern applications of the Malthusian framework consider a broader range of resource constraints, such as energy supply [15], water scarcity [16], and the effects of climate change. Such expansions illustrate the continuing relevance of Malthusian principles in analyzing resource challenges associated with population growth in the modern era.

Furthermore, Neo-Malthusian ideas have increasingly been applied to understanding the socio-political implications associated with population pressure, particularly in developing countries. A recurring theme is that population growth may be linked with increasing resource scarcity, which in turn tends to be associated with a higher probability of socio-political tensions or unrest. Urdal [17] found that in India (1956–2002), regional population pressure on natural resources was statistically associated with an increased risk of political violence, particularly armed conflict, under conditions of land scarcity and declining agricultural wages. Similarly, Østby et al. [18] observed that in provinces of Indonesia, high population growth was correlated with a greater likelihood of routine violence, particularly when combined with pronounced horizontal inequalities between religious groups, which appeared to reinforce social segmentation and grievances. Likewise, Adanu [19] finds that countries with high population density are associated with more frequent violent conflict events, where population densities exceeding 2293 persons per square kilometer were linked to increased conflict risks. The same study also shows that institutional quality, particularly the strength of corruption control, mitigates the conflict-enhancing associations of oil production and lower income levels. These findings underscore the continued relevance of Neo-Malthusian principles in explaining the socio-political patterns associated with population growth, particularly in resource-constrained and institutionally fragile contexts.

However, the broader body of empirical evidence regarding Neo-Malthusian claims remains mixed and context-dependent. For instance, Buhaug and Urdal [20] found no consistent evidence of statistical association between rapid urban population growth and higher risk or frequency of political violence in cities. Instead, their results indicated that urban social disorder was more closely correlated with economic shocks, weak political institutions, and ongoing civil conflict. Similarly, Urdal [21] found only limited and inconsistent relationships between population pressure, resource scarcity, and the likelihood of armed conflict. Although high population growth and land scarcity occasionally exhibited a positive correlation with conflict, these associations lacked robustness across time, space, or datasets. These mixed findings suggest that Neo-Malthusian ideas have been widely tested in contemporary developing-country contexts to assess their relevance to different forms of socio-political conflict—with results offering partial, and at times contradictory, evidence of association rather than direct causation within the framework.

Taken together, the evidence indicates that Neo-Malthusian relationships are best understood as conditional associations rather than linear or deterministic causal mechanisms. Population growth can, under certain economic, environmental, and institutional contexts, coincide with resource scarcity and social tension; however, these links depend on a range of mediating variables such as governance capacity, economic inequality, and environmental management. The Neo-Malthusian framework therefore continues to provide a useful analytical lens for examining the associations among population dynamics, resource stresses, and socio-political change, while acknowledging the diversity and complexity of these relationships in the modern developing-country context.

2.3. Literature Gap and Research Contribution

Although Neo-Malthusian ideas have been widely examined in modern contexts, much of the existing literature relies heavily on case studies, limiting the generalizability

of findings across developing countries. Studies like Urdal [17] and Østby [18] offer valuable insights into specific regions, such as India and Indonesia. However, their case-specific focus makes it difficult to draw broader conclusions about the relationship between population pressure, resource scarcity, and socio-political outcomes in other parts of the developing world. Moreover, such case studies often focus on specific instances of conflict or unrest that may be shaped by unique historical, cultural, or institutional factors, limiting cross-regional comparability. This narrow focus restricts the identification of broader patterns or trends that may be applicable across developing countries.

To move beyond these case-specific limitations, the present study undertakes a cross-national, time-series analysis covering a large sample of developing countries over multiple decades. This design enables the examination of both temporal and spatial variations in population growth and political instability, thereby capturing long-term trends that single-country studies cannot reveal. By employing panel data techniques, the study systematically tests whether increases in population pressure are associated with heightened risks of political instability, while accounting for economic, institutional, and demographic heterogeneity across countries. This comparative framework allows for the identification of broader, generalizable associations between population dynamics and political outcomes, offering a more robust empirical basis for understanding Neo-Malthusian mechanisms across the developing world.

Furthermore, much of the existing literature focuses on specific forms of socio-political conflicts—such as social unrest [20] or ethnoreligious violence [18] while overlooking broader and more structural dimensions of political stability. Political instability is a complex, multifaceted concept that extends beyond visible episodes of violence, encompassing deeper structural issues such as government effectiveness, regime durability, large-scale internal displacement, and the gradual erosion of state authority. By focusing predominantly on acute and easily measurable events such as armed conflict or riots, many studies may fail to capture the slower, systemic pathways through which population pressure undermines political stability. In contrast, the present study moves beyond a single-dimensional conception of political instability by adopting a multidimensional analytical perspective that captures the interplay between violent, non-violent, and institutional forms of domestic conflict. This broader approach recognizes that political instability manifests not only through overt episodes of violence but also through subtler forms of institutional disruption and governance erosion. By incorporating these multiple dimensions, the study provides a more holistic understanding of how population pressure interacts with diverse expressions of political instability across developing countries.

Another notable gap in the literature is the lack of comparative studies that differentiate among groups of developing countries based on their varying levels of economic, institutional, and governance development. Most research treats the developing world as a homogeneous category, overlooking substantial differences in countries' capacities to address population-related pressures through effective policy design and resource management. By explicitly accounting for heterogeneity across developing countries at different levels of economic development, the present study offers deeper insights into how structural capacity and resource constraints condition the association between population growth and political instability, thereby advancing comparative research within the Neo-Malthusian framework. This heterogeneity-based approach not only highlights the uneven vulnerability of developing countries to demographic pressures but also underscores the role of economic development as a mitigating or amplifying factor shaping this association across the developing world.

Building on these conceptual and empirical extensions, the study directly responds to the key limitations identified in the existing literature by integrating a cross-national, multi-

dimensional, and heterogeneity-sensitive approach. This design enables a more systematic examination of how population growth is associated with political outcomes under varying economic contexts, contributing both theoretical refinement and empirical breadth to the Neo-Malthusian debate. Hence, to address these gaps, this study sets out two overarching research objectives: (1) to assess whether population growth is associated with greater political instability in developing countries, and (2) to examine whether this association between population growth and political instability is more pronounced in poorer developing countries compared to their relatively wealthier counterparts. By addressing these objectives, the study seeks to provide a more comprehensive understanding of Malthusian dynamics and their implications for political outcomes across the developing world.

2.4. Mechanisms and Research Hypothesis

The relationship between population growth and political instability (H1) is theorized to operate through the mechanism in which rapid demographic expansion places substantial pressure on natural resources, infrastructure, and governance, especially in developing countries. Malthus [1] contended that unchecked population growth inevitably outpaces resource availability, resulting in scarcity and socio-political stress. In contemporary contexts, Neo-Malthusian perspectives argue that the persistent mismatch between population growth and resource supply exacerbates socio-economic inequalities and intensifies competition over essential resources such as food, water, and arable land. These pressures, in turn, heighten grievances among marginalized groups [2,12]. As population growth increases the demand for these essential resources, institutional capacities are often overwhelmed, reducing governments' capacity to manage these demands effectively [6]. This strain on governance results in reduced provision of public services, erosion of institutional legitimacy, and widespread dissatisfaction. Collectively, these dynamics increase the likelihood of political instability, including dysfunction of the state, civil unrest, and violent conflict.

H1. *Higher population growth increases the likelihood of political instability in developing countries.*

The second hypothesis (H2) extends this argument by proposing that the destabilizing effects of population growth are more pronounced in poorer developing countries than in their relatively wealthier counterparts. As Adanu [19] notes, poorer developing countries often lack the institutional and financial capacity to manage the challenges posed by rapid population growth effectively. As population growth accelerates, these countries are more likely to exceed their carrying capacity—the ability of their ecosystems and institutions to meet population needs sustainably. Limited access to resources such as arable land, freshwater, and energy—combined with weak governance and inadequate infrastructure—exacerbates the socio-political consequences of resource scarcity. This strain on carrying capacity intensifies competition over dwindling resources, deepens inequalities, and fosters grievances that can escalate into political instability [18]. In contrast, relatively wealthier developing countries are more likely to possess governance systems and technological advancements that enable them to expand or enhance their carrying capacity. These countries are better equipped to mitigate the pressure of population growth through effective policy interventions, investments in infrastructure, and innovations in resource management—such as agricultural intensification. These strategies enable relatively wealthier developing countries to manage population–resource dynamics better and reduce the risks of political instability [19]. This disparity underscores the hypothesis that poorer developing countries—with their limited institutional and resource capacities—are more vulnerable to the destabilizing effects of population growth as they approach or exceed their carrying capacity, whereas wealthier counterparts tend to be more resilient.

H2. *The effect of higher population growth on political instability is more pronounced in poorer developing countries compared to relatively wealthier developing countries.*

3. Methods

3.1. Study Focus

This study employs a cross-national time-series (CNTS) approach to examine the association between population growth and political instability. The temporal scope covers 1960–2022, a period chosen for its consistent and comprehensive data availability across countries for both variables. The analysis focuses on developing countries, following the International Monetary Fund’s classification of emerging and developing economies, a standard widely adopted in the comparative political economy literature (e.g., [22–24]).

The focus on developing countries is motivated by the distinct demographic and governance dynamics that characterize these contexts. Developing economies typically experience higher population growth rates, which can place pressure on limited economic resources, infrastructure, and administrative capacity—factors commonly associated with heightened political instability. By concentrating on this country group, the study aims to explore how variation in population growth correlates with patterns of political instability and to identify structural and institutional conditions under which this association becomes more pronounced.

The sample comprises 128 developing countries, yielding an unbalanced panel of 3425 country-year observations covering the period 1960–2022. The panel is unbalanced due to variations in data availability across countries and years, largely resulting from gaps in official reporting and differences in the timing of data collection. In particular, many of the World Bank and related macroeconomic indicators begin at different starting years for different countries, which naturally contributes to uneven coverage across the sample. No imputation, interpolation, or outlier adjustment procedures were applied, as the analysis relies entirely on available country-year observations. This approach was adopted to maintain transparency and consistency with the original data sources, ensuring that the results reflect observed rather than estimated values. Such treatment of missing data follows common practice in cross-national time-series analyses, where differences in data availability are viewed as part of the underlying empirical reality of developing countries (e.g., [22,25,26]). Nonetheless, we acknowledge that the unbalanced nature of the panel may limit comparability across countries and slightly reduce statistical efficiency. However, because missingness is primarily associated with data reporting differences rather than outcome variation, it is unlikely to introduce systematic bias into the estimated associations.

3.2. Key Variables

The independent variable—population growth—is measured as the annual percentage change in a country’s de facto population, incorporating births, deaths, and net migration, using data from the World Bank [5]. This indicator provides a valid and comparable measure of demographic change across countries and time because it accounts for both natural and migratory population movements rather than relying solely on crude birth or death rates. Expressing population change in percentage terms standardizes differences in country size and ensures that the measure reflects true relative growth dynamics rather than absolute population levels, capturing demographic trends that are empirically and conceptually consistent with global population statistics frameworks.

The dependent variable—political instability—is measured using the Domestic Conflict Index developed by the Cross-National Time-Series (CNTS) dataset [27]. Conceptually, political instability refers to the frequency and intensity of events that disrupt or threaten the continuity, legitimacy, and effective functioning of political institutions. The

CNTS Domestic Conflict Index compiles commonly used indicators of domestic conflict in the political economy literature (e.g., [28,29]) and provides a standardized measure across countries and years. The index provided by the CNTS dataset [27] combines eight components—anti-government demonstrations, riots, strikes, government crises, purges, assassinations, revolutions, and guerrilla warfare—that together capture a wide spectrum of political unrest through constructing a weighted version of this index, assigning the following weights: assassinations (25), strikes (20), guerrilla warfare (100), government crises (20), purges (20), riots (25), revolutions (150), and anti-government demonstrations (10). For each country-year, the value of each component is multiplied by its weight; the results are summed, multiplied by 100, and divided by 8 to produce the composite score.

This weighted composite provides a comprehensive measure that integrates both violent and non-violent manifestations of domestic conflict, aligning conceptually with Margolis [30], who defines political instability as encompassing disruptions in formal political structures—such as government crises and purges—and societal responses, including riots, demonstrations, and revolutions, that challenge state authority. The inclusion of guerrilla warfare and assassinations further captures the overlap between formal authority and violent dissent. Taken together, the components of the CNTS Domestic Conflict Index offer a nuanced operationalization of political instability that reflects both elite-driven and mass-based sources of regime disruption within each country-year.

In addition, we also control for a range of factors that may influence the relationship between population growth and political instability identified in the literature. These control variables include:

- **Economic Development:** Measured by GDP per capita in current USD, this variable reflects the overall level of a country's economic well-being. Higher economic development is often associated with greater political stability, as it enables governments to invest in infrastructure, education, and public services, reducing grievances and fostering social cohesion.
- **Democracy:** Based on the average score of the V-DEM dataset in line with existing literature [31,32], ranging from 0 (no democracy) to 5 (full democracy), across five key aspects—electoral, liberal, participatory, deliberative, and egalitarian—this variable captures the level of democratization. These aspects reflect different dimensions of democracy, such as the protection of civil liberties (liberal), equal access to political power (egalitarian), inclusive participation (participatory), free and fair elections (electoral), and reasoned, informed debate in decision-making processes (deliberative). Democratic regimes may result in better political stability than authoritarian systems by balancing accountability, representation, and societal expectations [33]
- **Elections:** The presence of elections is measured as a binary variable in a country-year (1 = election held, 0 = no election), capturing whether a legislative or national leader election took place [23]. This variable is included because electoral periods often heighten political competition and tensions, increasing the likelihood of political instability, especially in contexts with highly contested outcomes.
- **Natural Resources:** This variable is measured by resource rents as a percentage of GDP, serving as a proxy for natural resource dependency. Resource wealth can have dual effects: it may stabilize political systems by providing financial resources for governance or destabilize them through mismanagement, corruption, or the so-called “resource curse,” where heavy reliance on natural resources undermines long-term political stability [34].
- **Military Spending:** Measured as a percentage of GDP, this variable reflects a government's allocation of resources toward internal security or conflict preparedness—factors that can significantly influence political stability. While higher military spending may

deter unrest and strengthen state control, it can also signal underlying instability, divert resources from essential social services, or exacerbate tensions in fragile political environments [35].

- **Foreign Aid:** Total foreign aid received (sourced from the OECD Development Assistance Committee database) is included as a variable, reflecting the external financial support provided to a country. Foreign aid can influence political stability in multiple ways: it may support governance reforms, strengthen institutions, and provide resources for development, thereby reducing instability [36]. However, it can also create dependency, distort domestic policies, or fuel corruption and elite capture, particularly in countries with weaker accountability mechanisms [37].
- **Urbanization:** The share of people living in urban areas—as defined by national statistical offices—expressed as a percentage of the total population. A country with higher rates of urbanization is more likely to exhibit greater political stability, as concentrated populations in urban centers foster stronger state presence, administrative control, and economic interdependence between citizens and institutions. Together, these factors enhance the government’s capacity to manage public demands, deliver public goods, and maintain social order, thereby strengthening the durability of political stability [38].

These variables capture institutional, economic, and structural factors that potentially influence political stability across countries, although omitted-variable bias still cannot be entirely ruled out.

3.3. Empirical Modeling

To assess the baseline association between population growth and political instability, the study employs a two-way fixed-effects (2WFE) regression model, which accounts for unobserved heterogeneity across both countries and years. Country fixed effects control for time-invariant national characteristics, such as geography and institutional history, while year fixed effects capture global shocks, including economic crises and technological diffusion. The Hausman test supports the use of the fixed-effects model over the random-effects specification at below the 5% significance level, indicating that unobserved country-specific effects are correlated with the explanatory variables and that the fixed-effects approach is more appropriate for producing consistent estimates. The baseline model is specified as:

$$PolStability_{it} = a_0 + a_1 PopGrowth_{it} + a_2 X_{it} + \tau_i + \mu_t + \epsilon_{it} \quad (1)$$

where

- $PolStability_{it}$ is the dependent variable (political instability) for country i and year t ,
- $PopGrowth_{it}$ is the key explanatory variable of population growth,
- X_{it} represents the set of independent variables mentioned in Section 3.2.
- τ_i is the year-fixed effect,
- μ_t is the country-fixed effect,
- ϵ_{it} is the error term.

Following the baseline regression results addressing H1, we conducted a heterogeneity analysis to test H2 by splitting the sample into relatively poorer and wealthier developing countries. A common method to distinguish income groups is based on the World Bank’s [5] income classification, which categorizes countries into four income groups: “Low-Income,” “Lower-Middle-Income,” “Upper-Middle-Income,” and “High-Income.” For this analysis, the “poorer” country-year group comprises countries classified as Low-Income and Lower-Middle-Income, while the “richer” country-year group comprises Upper-Middle-Income

and High-Income countries. Because countries may transition between income groups (e.g., from lower-middle-income to upper-middle-income) during the study period, a single country can appear in multiple subgroups across different years. As a result, the total number of country appearances in subgroup analyses may exceed the number of unique countries in the baseline sample. This dynamic classification approach reflects the nature of countries' economic trajectories and allows the heterogeneity analyses to more accurately capture these temporal changes [39].

3.4. Robustness Checks

To ensure robustness, four complementary estimation strategies were employed:

- An alternative dependent variable: The Political Stability and Absence of Violence/Terrorism Index from the Worldwide Governance Indicators (WGI) [40], which is widely used in the existing literature (e.g., [41,42]), was adopted for sensitivity analysis to ensure that the results are not driven by the specific operationalization of political instability.
- Additional covariates to mitigate potential omitted-variable bias. These include income inequality (measured by the post-distribution Gini coefficient of household income), colonization status (a binary variable indicating whether a country was historically colonized), and ethnic fractionalization (an index measuring the probability that two randomly selected individuals belong to different ethnic groups). These variables capture long-term institutional, socioeconomic, and structural factors that may covary with both population growth and political stability. However, they were not included in the baseline model, as their inclusion substantially reduced the number of observations, potentially compromising cross-national and temporal coverage.
- Panel-Corrected Standard Errors (PCSEs) and Feasible Generalized Least Squares (FGLS): These estimation techniques were employed to mitigate heteroskedasticity and serial correlation in the panel [43,44]. Addressing these issues is essential because cross-national panel data often exhibit non-constant error variances across countries and temporal dependence within countries, which can bias standard errors and lead to inefficient or misleading statistical inferences. Using PCSEs and FGLS therefore helps mitigate contemporaneous correlation and heteroskedastic error structures, enhancing the reliability and efficiency of coefficient estimates in long time-series, cross-sectional datasets.
- System Generalized Method of Moments (System GMM): This estimator was employed to mitigate potential endogeneity and dynamic feedback in the relationship between population growth and political instability, using lagged levels and differences in endogenous regressors as instruments [45,46]. System GMM is particularly suitable for panels with a large number of countries and moderate time periods, enabling consistent estimation in the presence of unobserved country-specific effects, reverse causality, and autocorrelation. By exploiting both cross-sectional and temporal variations while controlling for potential endogeneity, this approach strengthens the causal inference and robustness of the empirical results.

Together, these robustness checks provide reassurance that the observed association is not unduly influenced by measurement choices, model specifications, or estimation techniques. The consistency of the results across alternative approaches suggests a stable and robust association between population growth and political instability in developing countries. All variables employed in the analysis are summarized in the descriptive statistics reported in Table 1, which provides a clear overview of their distribution, range, and variability across the sample.

Table 1. Descriptive Statistics.

Variable	Details	Mean	SD	Min	Max	Source
Population Growth	The annual population growth rate for year t is the percentage increase in the midyear population from year $t - 1$ to year t , calculated using the exponential growth formula.	1.67	1.36	−3.85	11.79	[4]
Political Instability	Composite index weighted by conflict-related events: Assassinations ($\times 25$), Strikes Political Instability ($\times 20$), Guerrilla Warfare ($\times 100$), Government Crises ($\times 20$), Purges ($\times 20$), Riots ($\times 25$), Revolutions ($\times 150$), Anti-Government Demonstrations ($\times 10$). Sum of weighted events $\times 100 \div 8$.	5092.79	44,348.36	0.00	1,707,875.00	[27]
Political Stability	Index of political stability and absence of violence/terrorism; higher values indicate greater political stability.	−0.46	0.9500	−3.31	1.38	[40]
Economic Development	Level of GDP per Capita in current US Dollars (logged).	7.02	1.41	3.13	11.59	[4]
Democracy	A continuous variable (ranging from 0 to 1) representing the level of democracy, calculated as the average of five V-DEM democracy scores for each country-year.	0.26	0.19	0.04	0.84	[31]
Election	A binary variable indicating whether a legislative or executive election is being held nationally in a given year (1 = election held, 0 = no election).	0.24	0.43	0.00	1.00	[31]
Natural Resource	A proxy to measure the level of natural resource dependency by calculating the natural resource rent value relative to the national GDP.	8.14	11.19	0.00	71.34	[4]
Military Spending	A proxy to measure the level of militarization by calculating the military spending expenditure relative to the national GDP.	2.45	2.56	0.00	34.38	[4]
Foreign Aid	Foreign aid refers to the country-year's amount of foreign aid received in either the form of concessional loans (after accounting for repayments) and grants from other countries and multilateral institutions (in \$10,000 USD) (logged).	4.37	2.90	−4.61	10.27	[4]
Urbanization	The share of people living in urban areas—as defined by national statistical offices—expressed as a percentage of the total population.	50.05	25.01	2.08	100	[4]
Income Inequality	Gini Coefficient in household income post-redistribution—ranges from 0 (perfect equality) to 100 (perfect inequality).	41.43	7.40	20.40	65.20	[47]
Colonized	Indicates whether a country was historically colonized by a foreign power. Binary variable: 1 = Former colony, 0 = Never colonized.	0.79	0.41	0	1	[48]
Ethnic Fractionalization	Measures the probability that two randomly selected individuals belong to different ethnic groups. Reflects the level of ethnic diversity. Index between 0 and 1 (higher values $\rightarrow$ greater ethnic diversity).	0.48	0.27	0	0.89	[49]

4. Results

4.1. Baseline Results

The baseline estimation (Table 2, Model 1) reveals a positive and statistically significant association between population growth and political instability ($\beta = 1777.63$, $p < 0.05$). A one-percentage-point increase in population growth corresponds to an estimated 1778-unit increase in political instability across the 128 developing countries in the sample from 1960 to 2022. The positive sign and significance of the coefficient indicate that population growth remains a meaningful factor associated with variations in political instability across developing countries. The results provide empirical support for Hypothesis 1, confirming a consistent and statistically significant association between the two variables in the baseline specification.

Table 2. Regression Results of Population Growth on Political Instability (Part I).

	Model 1	Model 2 ^	Model 3 ^^	Model 4
Population Growth	1777.63 ** (829.52)	1870.65 ** (960.67)	1651.69 * (853.15)	−0.03 ** (0.01)
Economic Development	3212.08 *** (949.93)	1925.48 (1467.84)	4544.15 *** (1545.83)	0.08 *** (0.02)
Democracy	−10,275.04 (7243.63)	−20,184.40 * (10,573.97)	5210.23 (9707.37)	−0.28 * (0.16)
Election	−2135.54 (2018.51)	−3185.50 (2528.90)	−1106.54 (3276.74)	0.06 ** (0.03)
Natural Resource	−43.5212 (102.50)	−60.70 (130.39)	−49.9012 (155.34)	−0.00 (0.00)
Military Spending	−516.95 (435.99)	−634.71 (575.47)	−700.64 (765.92)	0.01 (0.01)
Foreign Aid	1045.22 *** (340.31)	1824.01 *** (663.55)	1299.01 *** (377.97)	0.00 (0.01)
Urbanization	37.11 (54.56)	−22.79 (71.10)	301.56 *** (86.89)	0.00 (0.00)
Countries	128	110	58	122
N	3425	2540	873	1606
R ²	0.01	0.02	0.01	0.09

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. ^ Only include country-year samples that are classified as Low or Lower-Middle Income. ^^ Only include country-year samples that are classified as Upper-Middle or High Income. ^^ Model 4 uses Political Stability as the dependent variable (see Table 1). Models 1–3 use Political Instability as the dependent variable.

4.2. Heterogeneity Analysis

Model 2 in Table 2 restricts the analysis to low- and lower-middle-income developing countries. The estimated coefficient for population growth is positive and statistically significant ($\beta = 1870.65$, $p < 0.05$), indicating that a one-percentage-point increase in population growth is associated with an approximate 1871-unit rise in political instability. The relatively stronger magnitude of this coefficient, compared with the baseline, highlights that the association between demographic expansion and instability is particularly pronounced in poorer developing economies. This result reflects that political instability in lower-income contexts tends to be more sensitive to demographic pressures, where limited institutional and fiscal capacity may constrain effective management of rapid population growth.

In Model 3, which covers upper-middle- and high-income developing countries, the relationship remains positive but slightly weaker ($\beta = 1651.69$, $p < 0.10$). While the direction of association mirrors that in Model 2, the effect size is smaller, indicating that relatively more affluent developing countries exhibit a weaker link between population growth and political instability compared to their poorer counterparts. This finding supports Hypothe-

sis 2, showing that the association between the two variables diminishes as countries move to higher income levels.

4.3. Alternative Dependent Variable

Model 4 employs the Political Stability and Absence of Violence/Terrorism Index from the Worldwide Governance Indicators (WGI) as an alternative dependent variable to test robustness. The results remain consistent in direction and significance: population growth has a negative and statistically significant effect ($\beta = -0.036$, $p < 0.01$), indicating that higher population growth rates are associated with lower political stability. This robustness check strengthens confidence in the main findings, demonstrating that the observed association persists across alternative operationalizations of the dependent variable.

4.4. Additional Covariates

Table 3 presents the regression results after introducing additional covariates to account for potential omitted-variable bias. The inclusion of income inequality, colonization status, and ethnic fractionalization slightly alters the sample composition, reducing the number of observations from ranging from 1582 to 3214 due to missing data for these variables. Across all model specifications, population growth remains positively and significantly associated with political instability. In Model 1 and Model 2, a one-percentage-point increase in population growth corresponds to an estimated 1233- to 1968-unit rise in political instability ($p < 0.05$). In Model 3 and Model 4, where ethnic fractionalization is also included, the association remains statistically significant though smaller in magnitude, with a change of approximately 282 to 410 units of instability per one-percentage-point increase in population growth ($p < 0.01$). It is important to note that Model 2 is estimated using a random-effects specification, as colonization status is a time-invariant variable that would otherwise be absorbed by the country-fixed effects in a two-way fixed-effects (2WFE) model. The use of random effects in this case allows the inclusion of colonial history while maintaining comparability with the baseline estimations. Overall, consistent with the baseline results, population growth is associated with an increase in political instability across developing countries, even after incorporating additional covariates to mitigate—though not fully eliminate—potential omitted-variable bias.

Table 3. Regression Results of Population Growth on Political Instability (Part II).

	Model 1	Model 2 ^	Model 3	Model 4 ^
Population Growth	1232.98 ** (610.98)	1967.73 ** (790.70)	282.20 ** (135.19)	410.44 *** (114.57)
Economic Development	1959.50 *** (708.44)	2584.70 *** (870.91)	−204.27 (141.25)	198.18 (140.62)
Democracy	−8565.71 ** (4285.15)	−11,329.21 * (6597.96)	−1198.60 (1029.22)	−2281.08 *** (820.89)
Election	−387.64 (1402.43)	−2119.20 (1935.71)	−66.68 (358.74)	−2.89 (261.65)
Natural Resource	−83.77 (70.30)	−85.59 (95.63)	−12.25 (16.35)	−2.91 (13.17)
Military Spending	−275.20 (297.72)	−503.55 (394.22)	−62.94 (73.26)	10.57 (54.16)
Foreign Aid	1183.10 *** (241.67)	1403.25 *** (323.76)	101.40 * (58.50)	113.37 ** (46.37)
Urbanization	16.18 (35.50)	20.60 (50.03)	24.28 *** (8.16)	3.14 (7.11)

Table 3. *Cont.*

	Model 1	Model 2 ^	Model 3	Model 4 ^
Income Inequality	−436.30 *** (129.75)		221.99 (763.82)	−27.53 (32.41)
Colonized		−8419.61 (5209.49)		−122.50 (632.32)
Ethnic Fractionalization			221.99 (763.82)	493.74 (961.36)
Countries	128	128	114	108
N	2032	3214	2654	1582
R ²	0.02	0.02	0.02	0.02

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. ^ The model is estimated using random effects because the colonization variable is time-invariant and therefore cannot be included in a fixed-effects specification, as it would be absorbed by the country effects.

4.5. Alternative Empirical Modeling

Robustness was further examined through three complementary estimation techniques—Panel-Corrected Standard Errors (PCSEs), Feasible Generalized Least Squares (FGLS), and System Generalized Method of Moments (System GMM)—as presented in Table 4. Across all specifications, population growth continues to exhibit a positive and statistically significant association with political instability, confirming the robustness of the main results. Under the PCSE and FGLS estimators, the coefficient for population growth remains substantial and significant, ranging from 1778 to 2521 units, suggesting that higher population growth rates are systematically associated with elevated levels of political instability. These results reinforce the consistency of the findings under alternative estimation methods that account for heteroskedasticity, contemporaneous correlation, and serial dependence in the panel data structure.

Table 4. Alternative Empirical Modeling Regression Results of Population Growth on Political Instability.

	PCSE	FGLS	System GMM
L. Political Instability			0.44 *** (0.10)
Population Growth	1777.63 ** (786.19)	2521.36 *** (649.43)	1638.77 ** (728.87)
Economic Development	3212.08 *** (1184.71)	1833.35 *** (623.46)	1409.40 *** (589.04)
Democracy	−10,275.04 (7454.88)	−11,019.44 ** (4535.84)	−7227.67 ** (3488.51)
Election	−2135.54 (1597.44)	−1979.58 (1777.42)	−1289.07 * (775.74)
Natural Resource	−43.52 (65.10)	−200.27 *** (75.12)	−106.32 * (61.30)
Military Spending	−516.95 * (279.77)	−511.22 (311.33)	−368.96 ** (161.92)
Foreign Aid	1045.22 ** (506.34)	1926.99 *** (273.89)	1133.42 ** (449.32)
Urbanization	37.11 (63.30)	12.09 (35.33)	10.79 (24.00)
AR(1) p -value			0.00
AR(2) p -value			0.48
Sargan p -value			0.18
Hansen p -value			0.86
Countries	128	128	128
N	3425	3425	3375
R ²	0.01		

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. PCSE, Panel-Corrected Standard Errors; FGLS, Feasible Generalized Least Squares (FGLS); System GMM, System Generalized Method of Moments.

In the System GMM model, which further addresses potential endogeneity and dynamic feedback, a one-percentage-point increase in population growth is associated with a 1638-unit rise in political instability ($p < 0.05$). The Arellano–Bond AR(1) test rejects the null of no first-order serial correlation ($p = 0.00$), while the AR(2) test fails to reject the null of no second-order autocorrelation ($p = 0.48$), confirming that the model residuals are appropriately specified. The Sargan ($p = 0.18$) and Hansen ($p = 0.86$) over-identification tests both support the validity of the chosen instruments, indicating that the instruments used are not correlated with the error term and that the model is not over-fitted. Collectively, these diagnostic results suggest that the System GMM estimator effectively mitigates—although cannot entirely rule out—endogeneity concerns by controlling for unobserved heterogeneity, feedback effects, and reverse causality. Taken together, the results consistently indicate that population growth is positively associated with political instability across all modeling strategies, underscoring the robustness of this relationship.

5. Discussion and Conclusion

5.1. Interpretation of the Results

The existing literature on Neo-Malthusian ideas often relies heavily on case studies and focuses narrowly on specific forms of conflict, neglecting broader structural dimensions of political instability. Moreover, comparative analyses that account for economic and governance variations among developing countries remain limited, frequently treating these nations as a homogeneous group despite significant contextual differences. To address these gaps, this study examines whether population growth is potentially associated with political instability in developing countries (H1) and explores whether this association is likely to be stronger in poorer developing nations compared to wealthier ones (H2). The empirical results indicate positive statistical associations consistent with both hypotheses: population growth appears to coincide with higher levels of political instability, and this association tends to be more substantial in lower-income developing countries.

The observed relationship between population growth and political instability (H1) may reflect the increasing pressures that expanding populations place on natural resources, infrastructure, and governance systems. As Malthus [1] argued, rapid demographic growth could outpace the availability of essential resources such as food, water, and arable land, possibly contributing to conditions of scarcity and socio-political stress. These potential resource constraints may, in turn, be linked to socioeconomic inequalities and heightened grievances, particularly among marginalized groups [2,12]. In developing countries, institutional capacities may not be sufficient to absorb such pressures, which could result in reduced effectiveness in governance, gradual deterioration in public service provision, and declining institutional legitimacy. These challenges are potentially connected with growing dissatisfaction and an elevated likelihood of political instability, including civil unrest, governance weakness, and episodes of conflict [6].

The heterogeneity analysis lends support to Hypothesis 2 (H2), suggesting that the association between population growth and political instability appears more pronounced in poorer developing countries. These countries often face lower institutional and financial capacity—reflecting limited carrying capacity—to manage and respond effectively to the challenges associated with rapid population growth. Limited access to critical resources, coupled with weak governance systems and inadequate infrastructure, may intensify competition over scarce resources and contribute to greater inequality and socio-political stress [18]. Such pressures could push these countries closer to or even beyond their carrying capacity—conditions that are associated with a higher probability of instability.

In contrast, wealthier developing countries generally appear to demonstrate greater resilience, benefiting from relatively stronger governance systems, more developed infras-

structure, and higher technological capacity. These advantages may expand their effective carrying capacity and help them manage the pressures stemming from population growth more efficiently. Through innovations such as agricultural intensification, infrastructure investment, and effective policy interventions, wealthier developing countries could be better positioned to mitigate the challenges linked to rapid demographic change and reduce potential exposure to instability [19]. This disparity underscores the potential vulnerability of poorer developing countries, reflected in the stronger and statistically significant associations between population growth and political instability observed in these contexts.

Overall, the results point toward the possibility of broader Malthusian dynamics, in which rapid population growth is associated with increased resource pressures and governance challenges—particularly in poorer developing countries. These findings should be interpreted as indicative rather than definitive evidence, emphasizing the potential mechanisms through which demographic pressures might interact with institutional and resource constraints. They highlight the importance of policy responses that aim to strengthen governance capacity, enhance resource management, and promote sustainable and inclusive development. Without such efforts, rapid population growth may continue to be linked with higher risks of political instability in vulnerable regions; however, this association remains conditional on context, warranting further research and more nuanced empirical investigation.

5.2. Policy Implications

The findings of this study underscore the need for thoughtful and inclusive policy responses to manage the challenges associated with rapid population growth—particularly in poorer developing countries, where limited economic capacity amplifies vulnerability to social and political strains. Rather than framing population growth as inherently destabilizing, governments should focus on strengthening institutional capacity and governance quality in ways that uphold social equity, human dignity, and community resilience. Improved governance mechanisms that ensure efficient, transparent, and equitable resource allocation are central to mitigating potential sources of instability—especially in densely populated and economically constrained regions. Investments in decentralized governance structures can further enhance local responsiveness to demographic pressures in critical areas such as housing, healthcare, and resource distribution while ensuring participatory and accountable decision-making processes.

At the same time, governments should develop inclusive dialog platforms and conflict-prevention mechanisms to mediate emerging tensions over scarce resources, such as land and water—issues that often lie at the heart of population-related disputes. Building these mechanisms into local governance systems can reduce the risk of escalation and promote social cohesion. Yet, development organizations and international partners also have an important role in facilitating cross-sectoral collaboration that addresses the intersection between population dynamics, resource management, and institutional stability. Programs promoting sustainable agricultural practices, water and energy security, and climate-resilient livelihoods can help alleviate resource pressures, strengthen local economies, and enhance environmental stewardship. These efforts should be integrated with rights-based demographic and social development initiatives, including expanded access to family planning, reproductive healthcare, and education, particularly for women and underserved populations. Integrating demographic considerations into national and regional development strategies—such as aligning infrastructure investment and labor market planning with projected population growth patterns—can strengthen the adaptive capacity of both states and communities.

Crucially, the study's findings highlight that the association between population pressure and political instability is conditioned by a country's level of economic development. Therefore, policymaking should pay close attention to structural inequalities that influence how demographic changes translate into political outcomes. Targeted investments in education, employment creation, and social protection systems can buffer the effects of demographic stress and reduce grievance accumulation. Ensuring equitable access to essential services—such as clean water, healthcare, and support for smallholder farmers—can enhance both social cohesion and public trust in institutions. Taken together, these strategies reflect the study's broader implication: that effective management of population pressure depends not only on controlling demographic growth but also on strengthening the economic and institutional foundations that mediate its political consequences. By promoting fairness, sustainability, and participatory governance, developing countries can transform demographic change from a potential source of instability into an opportunity for resilient, inclusive, and equitable development.

5.3. Limitations and Future Research

While this study offers useful insights into the associations between population growth and political instability in developing countries, several limitations should be acknowledged. First, the analysis relies on cross-national time-series data, which, although comprehensive, may obscure important subnational and regional variations. Population growth and resource pressures can differ substantially between rural and urban areas or among regions with distinct socioeconomic and political contexts. As a result, national-level estimates may not fully capture local dynamics where demographic changes interact with governance and institutional capacity in more complex and multidimensional ways. Future research could therefore benefit from subnational or micro-level analyses that capture these spatial variations and provide a more detailed understanding of how demographic pressures correspond with local patterns of political stability, development, and resource governance.

Second, although this study includes several key control variables—such as economic development and governance capacity—unobserved structural and contextual factors may also influence the relationships examined. Cultural norms, historical trajectories, and geopolitical conditions may shape both population growth and political stability in ways not fully captured here. While this study expands its model by incorporating additional controls for urbanization, socioeconomic inequality, colonial legacy, and ethnic fractionalization, the possibility of omitted-variable bias cannot be entirely ruled out. Future studies should also incorporate these structural and contextual dimensions more explicitly—by integrating measures of colonial legacies, cultural heterogeneity, regional alliances, and historical governance patterns—to better illuminate how long-term institutional trajectories and sociopolitical contexts condition the demographic–instability nexus. Furthermore, future research could explore the relationship between demographic expansion and the collapse of colonial systems in the regions studied, the geography of their evolving foreign economic relations, and the correlation of population growth in these territories with economic development trends in Western states. Recognizing that human resources are the foundational resource for nature and economic life, future analyses might also consider whether population growth serves not only as a stressor but as a potential stabilizing force that promotes resilience and long-term societal sustainability.

Moreover, while the use of the System Generalized Method of Moments (System GMM) helps to mitigate endogeneity concerns, issues of simultaneity and reverse causality cannot be entirely ruled out. Population growth and political instability may influence one another in reciprocal ways. Political instability can reduce fertility, limit access to healthcare,

and increase emigration, thereby affecting population dynamics, while instability may simultaneously impair agriculture, infrastructure, and institutional performance, contributing to resource stress and migration. Likewise, resource scarcity might affect population change by influencing fertility, mortality, and mobility. Although the System GMM reduces estimation bias, it does not completely eliminate these feedback effects. The results should therefore be interpreted as associational rather than causal, and future research could employ quasi-experimental approaches or panel vector autoregression models to explore these interdependent and potentially bidirectional links more rigorously.

Likewise, an important conceptual “black box” remains in understanding how population growth relates to political instability. While the analysis identifies a statistical association between the two, the intervening mechanisms that connect demographic change with political outcomes are not directly measured. Neo-Malthusian perspectives posit that rapid population growth increases pressure on resources and weakens governance capacity, yet how these pressures translate into political instability remains unclear. Future research could open this black box by incorporating mediating variables—such as arable land per capita, water stress, food price fluctuations, or ecological degradation—to assess whether resource scarcity functions as the primary channel linking demographic pressure to instability or whether broader institutional and structural dynamics—such as corruption, rent-seeking, and inequalities associated with upward wealth redistribution—play a more decisive role. At the same time, scholars should consider alternative frameworks emphasizing adaptation and innovation, notably the Boserupian and Cornucopian views. Empirically measuring how resource-induced pressure translates into technological or institutional innovation—through indicators such as agricultural productivity gains, renewable energy adoption, or policy reforms—would help directly test this mechanism. Investigating both scarcity-driven and innovation-driven pathways would thus enable a more comprehensive understanding of the complex relationship between population growth, resource dynamics, and political stability.

Fifth, this study focuses on developing countries, and the results may not be generalizable to high-income contexts where demographic and institutional trajectories differ substantially. Many advanced economies are now experiencing population aging or decline, which introduces distinct sociopolitical and economic challenges, such as labor shortages, fiscal strain on welfare systems, and intergenerational inequality. Future comparative research could examine how decreasing population pressures influence political stability in developed contexts and how these trajectories compare to the dynamics observed in rapidly growing developing regions. Such comparative work would provide a more comprehensive and global understanding of how demographic change interacts with governance and political outcomes.

Sixth, an additional limitation concerns the large-N design used in this study. While the cross-national, longitudinal approach enables broad generalization, it overlooks vital country- and region-specific dynamics. The finding that population growth is more strongly associated with political instability in poorer developing countries offers valuable comparative insight but does not reveal which specific contexts experience the most acute demographic pressures or instability risks. To address this limitation, future small-N research, particularly country-level or micro-regional case studies using process tracing, could investigate how population pressures interact with governance, resource management, and local social conditions over time. Such approaches would uncover the concrete mechanisms and contextual factors shaping these associations and explain why similar structural environments may yield different political outcomes. Integrating these detailed insights from small-N analysis with patterns identified through large-N research would

produce a more balanced and nuanced understanding of how demographic change relates to political instability across diverse settings.

Another limitation concerns the measurement of political instability. This study employs a composite indicator that assigns weights to various forms of unrest: assassinations (25), strikes (20), guerrilla warfare (100), government crises (20), purges (20), riots (25), revolutions (150), and anti-government demonstrations (10), based on the CNTS dataset [28]. While this provides a broad aggregate measure, it remains abstract and may obscure important differences in the nature and intensity of instability. Distinct forms of unrest arise from diverse socioeconomic causes and have varying political implications. A single composite index can therefore blur distinctions between low-intensity mass movements and elite-driven or regime-threatening events. Future research should disaggregate these components to explore how demographic pressures relate to specific types of unrest—distinguishing, for instance, between mass-based episodes (protests, strikes, riots) and elite-driven ones (coups, purges, leadership crises)—and consider additional indicators of fragility such as state capacity, regime durability, or institutional trust. Such analysis would clarify whether population growth is more closely linked to popular mobilization, elite fragmentation, or regime vulnerability.

The final limitation concerns the aggregated measure of population growth, which treats demographic change as a uniform process across countries and time. This approach overlooks the possibility that different rates of population growth or decline may affect political stability in distinct ways. Future research could quantify how incremental changes in population size—such as one-percent increases or decreases—correlate with variations in political stability, allowing for a more precise understanding of the magnitude and direction of this relationship. Testing these differences empirically would also help determine whether political systems respond linearly to demographic change or whether threshold effects exist, where very high growth or steep decline might exert disproportionately stronger impacts on stability. Moreover, future studies should explore how these demographic shifts interact with existing economic and political institutions and whether such interactions influence different forms of political instability—for example, mass movements, elite conflicts, or regime destabilization—in distinct ways. This would further refine our understanding of how the scale, pace, and institutional context of population change shape political outcomes across varying settings.

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datasets covering the period 1960–2022. Income Inequality: Available for download from the World Inequality Database <https://wid.world> (accessed on 18 December 2025). Colonized (Historical Colonization Data): Sourced from the dataset European Overseas Colonies by Colonizer provided by Our World in Data <https://ourworldindata.org/grapher/european-overseas-colonies-by-colonizer> (accessed on 18 December 2025). Ethnic Fractionalization: Accessible through the dataset archived at Harvard Dataverse <https://doi.org/10.7910/DVN/4JQRCL> (accessed on 18 December 2025).

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References

1. Malthus, T.R. *An Essay on the Principle of Population*; The Lawbook Exchange: London, UK, 1826.
2. Ehrlich, I.; Lui, F. The Problem of Population and Growth: A Review from Malthus to Contemporary Models of Endogenous Population and Endogenous Growth. *J. Econ. Dyn. Control* **1997**, *21*, 205–242. [\[CrossRef\]](#)
3. O’Sullivan, J.N. Demographic Delusions: World Population Growth Is Exceeding Most Projections and Jeopardising Scenarios for Sustainable Futures. *World* **2023**, *4*, 545–568. [\[CrossRef\]](#)
4. Montano, B.; García-López, M. Malthusianism of the 21st Century. *Environ. Sustain. Indic.* **2020**, *6*, 100032. [\[CrossRef\]](#)
5. World Bank. *World Development Indicators*; World Bank: Washington, DC, USA, 2024.
6. Alexandratos, N. Countries with Rapid Population Growth and Resource Constraints: Issues of Food, Agriculture, and Development. *Popul. Dev. Rev.* **2005**, *31*, 237–258. [\[CrossRef\]](#)
7. Brottem, L.V. Pastoral Resource Conflict in the Context of Sudano-Sahelian Security Crises: A Critical Review of Research. *Afr. Secur.* **2020**, *13*, 380–402. [\[CrossRef\]](#)
8. Dieng, A. The Sahel: Challenges and Opportunities. *Int. Rev. Red Cross* **2022**, *103*, 765–779. [\[CrossRef\]](#)
9. Aisen, A.; Veiga, F.J. Does Political Instability Lead to Higher Inflation? A Panel Data Analysis. *J. Money Credit Bank.* **2006**, *38*, 1379–1389. [\[CrossRef\]](#)
10. Wang, K.-H.; Liu, L.; Adebayo, T.S.; Lobont, O.-R.; Claudia, M.N. Fiscal Decentralization, Political Stability and the Resource Curse Hypothesis. *Resour. Policy* **2021**, *72*, 102071. [\[CrossRef\]](#)
11. Boserup, E. *The Conditions of Agricultural Growth: The Economics of Agrarian Change Under Population Pressure*; George Allen & Unwin: London, UK, 1965.
12. Collins, P. Population Growth the Scapegoat? Rethinking the Neo-Malthusian Debate. *Energy Environ.* **2002**, *13*, 401–422. [\[CrossRef\]](#)
13. Lee, H.F.; Yue, R.P.H. Ocean/Atmosphere Interaction and Malthusian Catastrophes on the Northern Fringe of the Asian Summer Monsoon Region in China, 1368–1911. *J. Quat. Sci.* **2020**, *35*, 974–986. [\[CrossRef\]](#)
14. Zhang, D.D.; Lee, H.F.; Wang, C.; Li, B.; Pei, Q.; Zhang, J.; An, Y. The Causality Analysis of Climate Change and Large-Scale Human Crisis. *Proc. Natl. Acad. Sci. USA* **2011**, *108*, 17296–17301. [\[CrossRef\]](#)
15. Peura, P. From Malthus to Sustainable Energy—Theoretical Orientations to Reforming the Energy Sector. *Renew. Sustain. Energy Rev.* **2013**, *19*, 309–327. [\[CrossRef\]](#)
16. Kipping, M. Can “Integrated Water Resources Management” Silence Malthusian Concerns? The Case of Central Asia. *Water Int.* **2008**, *33*, 305–319. [\[CrossRef\]](#)
17. Urdal, H. Population, Resources, and Political Violence: A Subnational Study of India, 1956–2002. *J. Confl. Resolut.* **2008**, *52*, 590–617. [\[CrossRef\]](#)
18. Østby, G.; Urdal, H.; Tadjoeddin, M.Z.; Murshed, S.M.; Strand, H. Population Pressure, Horizontal Inequality and Political Violence: A Disaggregated Study of Indonesian Provinces, 1990–2003. *J. Dev. Stud.* **2011**, *47*, 377–398. [\[CrossRef\]](#)
19. Adanu, K. Population, Institutions, and Violent Conflicts—How Important Is Population Pressure in Violent Resource-Based Conflicts? *Peace Econ. Peace Sci. Public Policy* **2023**, *29*, 249–277. [\[CrossRef\]](#)
20. Buhaug, H.; Urdal, H. An urbanization bomb? Population growth and social disorder in cities. *Glob. Environ. Change* **2013**, *23*, 1–10. [\[CrossRef\]](#)
21. Urdal, H. People vs. Malthus: Population Pressure, Environmental Degradation, and Armed Conflict Revisited. *J. Peace Res.* **2005**, *42*, 417–434. [\[CrossRef\]](#)
22. Ko, J.; Leung, C.K.; Chen, X. Economic Crises and Happiness: Empirical insights from 134 countries (2008–2019). *Dev. Sustain. Econ. Financ.* **2025**, *6*, 100040. [\[CrossRef\]](#)

23. Ko, J.; Lee, H.F.; Leung, C.K. War and Warming: The effects of climate change on military conflicts in developing countries (1995–2020). *Innov. Green Dev.* **2024**, *3*, 100175. [\[CrossRef\]](#)
24. Mark, B.S.; Ye, H.-J.; Foote, A.; Crippin, T. It's a Hard-Knock Life: Child Labor Practices and Compliance with IMF Agreements. *Soc. Sci.* **2021**, *10*, 171. [\[CrossRef\]](#)
25. Seti, T.M.; Mazwane, S.; Christian, M. Financial Openness, Trade Openness, and Economic Growth Nexus: A Dynamic Panel Analysis for Emerging and Developing Economies. *J. Risk Financ. Manag.* **2025**, *18*, 78. [\[CrossRef\]](#)
26. Sherry, H.; Zeaiter, H. IMF Conditionality and Government Education Spending: The Case of 10 MENA Countries. *Economies* **2024**, *12*, 234. [\[CrossRef\]](#)
27. Banks, A.S.; Wilson, K.A. *Cross-National Time-Series Data (CNTS)*; Databanks International: Jerusalem, Israel, 2024.
28. Ko, J.; Lee, H.F.; Leung, C.K. How IMF Conditionalities Contribute to Political Destabilization: Evidence from 167 Countries, 1980–2019. *Emerg. Mark. Financ. Trade* **2025**, *in press*, 1–28. [\[CrossRef\]](#)
29. Reinsberg, B.; Stubbs, T.; Bujnoch, L. Structural Adjustment, Alienation, and Mass Protest. *Soc. Sci. Res.* **2023**, *109*, 102777. [\[CrossRef\]](#)
30. Margolis, J.E. Understanding Political Stability and Instability. *Civ. Wars* **2010**, *12*, 326–345. [\[CrossRef\]](#)
31. Coppedge, M.; Gerring, J.; Knutsen, C.H.; Krusell, J.; Medzihorsky, J.; Pernes, J.; Skaaning, S.E.; Stepanova, N.; Teorell, J.; Tzelgov, E.; et al. The Methodology of “Varieties of Democracy” (V-Dem). *Bull. Sociol. Methodol.* **2019**, *143*, 107–133. [\[CrossRef\]](#)
32. Ko, J.; Leung, C.K. From Ballots to Readiness: Global Evidence on Democracy's Influence on Climate Change Adaptation Readiness. *Environ. Sociol.* **2025**, *in press*, 1–23. [\[CrossRef\]](#)
33. Feng, Y. Democracy, Political Stability and Economic Growth. *Br. J. Political Sci.* **1997**, *27*, 391–418. [\[CrossRef\]](#)
34. Auty, R. *Sustaining Development in Mineral Economies: The Resource Curse Thesis*; Routledge: London, UK, 1993.
35. Ko, J.; Michaelowa, A. Defending the Wrong Front: Militarization's Impact on Adaptation to Climate Change in 150 Countries (1995–2020). *Mitig. Adapt. Strateg. Glob. Change*, 2026; manuscript under review.
36. Ko, J.; Leung, C.K.; Yu, C. Reinforcing Inequalities: A Critical Examination of International Sanctions and Bureaucratic Decline in the Global South. *Res. Global.* **2024**, *9*, 100258. [\[CrossRef\]](#)
37. Ravetti, C.; Sarr, M.; Swanson, T. Foreign Aid and Political Instability in Resource-Rich Countries. *Resour. Policy* **2018**, *58*, 277–294. [\[CrossRef\]](#)
38. Anthony, R.M. Urbanization and Political Change in the Developing World: A Cross-National Analysis, 1965–2010. *Urban Aff. Rev.* **2014**, *50*, 743–780. [\[CrossRef\]](#)
39. Ko, J.; Leung, C.K. Gender Inequality and ESG Performance: A Global Analysis of Governance, Environmental, and Social Outcomes in 97 Countries. *Innov. Green Dev.* **2025**, *4*, 100272. [\[CrossRef\]](#)
40. Kaufmann, D.; Kraay, A. *Worldwide Governance Indicators (WGI): Political Stability and Absence of Violence/Terrorism*; World Bank: Washington, DC, USA, 2023.
41. Wang, Y.Z.; Ahmad, S. Green Process Innovation, Green Product Innovation, Leverage and Corporate Financial Performance. *Heliyon* **2024**, *10*, e25819. [\[CrossRef\]](#)
42. Allard, G.; Martinez, C.A.; Williams, C. Political Instability, Pro-Business Market Reforms and Their Impacts on National Systems of Innovation. *Res. Policy* **2012**, *41*, 638–651. [\[CrossRef\]](#)
43. Xiao, Q.; Fei, L. How Does Climate Vulnerability Impact Green Innovation? *Innov. Green Dev.* **2024**, *3*, 100169. [\[CrossRef\]](#)
44. Wang, J.Z.; Feng, G.F.; Chang, C.P. How Does Political Instability Affect Renewable Energy Innovation? *Renew. Energy* **2024**, *230*, 120800. [\[CrossRef\]](#)
45. Arellano, M.; Bover, O. Another Look at the Instrumental Variable Estimation of Error-Components Models. *J. Econom.* **1995**, *68*, 29–51. [\[CrossRef\]](#)
46. Blundell, R.; Bond, S. Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. *J. Econom.* **1998**, *87*, 115–143. [\[CrossRef\]](#)
47. World Inequality Database (WID). *World Inequality Data Portal*; World Inequality Lab: Paris, France, 2025; Available online: <https://wid.world> (accessed on 11 December 2025).
48. Becker, B. Gapminder, Population v7 (2022)—With Major Processing by Our World in Data. In *European Overseas Colonies by Colonizer [Dataset]*; Our World in Data: Oxford, UK, 2023; Available online: <https://ourworldindata.org/grapher/european-overseas-colonies-by-colonizer> (accessed on 11 December 2025).
49. Drazanova, L. *Historical Index of Ethnic Fractionalization Dataset (HIEF), Version 2*; Harvard Dataverse: Cambridge, MA, USA, 2019. [\[CrossRef\]](#)

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