Original Research Article

**Relationship between Population and Economic Growth in Kenyan Counties**

**Abstract**

The debate on the relationship between population growth and economic growth is inconclusive. The study provides insights into the long-run, as well as the causal relationships between population growth and economic growth, at a more localized level. The findings can aid in economic planning by highlighting areas where population growth may either spur or hinder economic growth in Kenya. The purpose of this study is to close that knowledge gap by utilizing panel data from 47 county governments in Kenya from 2014 to 2022. The Granger Wald causality test of the Generalized method of moments (GMM) framework was performed to investigate the corresponding causality effect. Generally, the results of the Pedroni cointegration method show that there is a long-run relationship between population and economic growth. The findings of the Granger Wald causality test indicate that, for Kenyan counties, there is a bidirectional Granger causal relationship between population and economic growth. Population growth could be beneficial or detrimental to economic growth and economic growth could impact population growth. The study recommends the adoption of population policies and socioeconomic development policies that are mutually reinforcing.

**Keywords**: Population growth; economic growth; panel causality; panel cointegration

**1 Introduction**

The complex relationship between population growth and economic development has been a focal point of extensive scholarly inquiry, yielding diverse and often inconclusive findings. Classical economists, such as Malthus (1798), argue that population growth positively influences economic expansion by augmenting labour supply and enhancing consumption demand. Conversely, modern growth theories highlight the importance of human capital, technological advancements, and robust institutional frameworks as critical determinants of economic outcomes (Muhammad, 2025). A body of literature suggests that accelerated population growth may impede economic progress by exerting strain on resources and elevating dependency ratios (Ella, 2025). In contrast, some researchers contend that population growth can stimulate innovation and foster economies of scale (National Research Council, 1986).

Globally, high-income countries have largely reaped the benefits of stable population growth in tandem with significant technological advancements and capital accumulation (Baffour Gyau et al., 2025). In stark contrast, numerous developing nations encounter substantial challenges in transforming demographic expansion into sustained economic growth, often hindered by structural inefficiencies, pervasive unemployment, and pronounced inequality (Marslev & Whitfield, 2025). Africa, characterized by rapid population growth and food insecurity, exemplifies this dichotomy, where economic disparities persist across the continent (Delaney, 2015; Simane et al., 2025). Given Africa's demographic trajectory, policymakers must prioritize investments in human capital development, industrialization, and regional integration to facilitate meaningful economic progress (Chowdhury et al., 2025). Notably, some African nations, such as Rwanda and Botswana, have successfully navigated a transition from population-driven growth to sustained economic development through strategic investments in education, governance reforms, and private-sector initiatives (Muzioreva & Gumbo, 2024). Kenya serves as a case study in this context, experiencing significant demographic and economic transformations at both national and subnational levels, marked by considerable disparities in growth across its 47 counties (Okutse & Athiany, 2025).

Twelve years ago, the Kenyan electorate chose to decentralize governance, marking the beginning of a new leadership framework with 47 governors and their teams assuming authority in newly established counties. These county governments have since sought to establish a cooperative relationship with the national government regarding the distribution of power and revenue. However, they have faced political, fiscal, rapid population growth and administrative challenges in their efforts to deliver services to the Kenyan people (Gisore, 2021). County Governments play a crucial role in augmenting public finance, supporting the development of infrastructure and influencing population policies and planning. Kenya's counties exhibit varying demographic and economic profiles, underscoring the disparities in population growth, economic dynamics, and overall development outcomes. Population growth patterns across counties are inconsistent, with certain regions experiencing considerable increases attributed to urbanization and the proliferation of economic opportunities (Okutse & Athiany, 2025). In contrast, others exhibit slower growth rates due to environmental challenges and socioeconomic barriers (Kibet et al., 2019). Urbanized counties such as Nairobi, Kiambu, and Nakuru have experienced pronounced population increases, primarily fueled by urban expansion, industrial growth, and employment opportunities (Rebecah, 2023). These counties benefit from relatively developed infrastructure, diversified economic activities, and enhanced market access, thereby attracting both internal migrants and foreign investments. Conversely, arid and semi-arid counties, including Turkana, Marsabit, and Samburu, have encountered stagnant population growth due to adverse climatic conditions, limited infrastructural development, and low economic activity (Ogeya et al., 2018). Consequently, population growth in these regions has not corresponded with substantial economic expansion, as evidenced by Gross County Product (GCP) metrics (KNBS, 2023).

Economic growth across counties has also demonstrated significant variance, with urban and industrialized regions contributing disproportionately to the national GDP relative to rural and agriculture-dependent areas. Nairobi, for instance, remains the economic hub of Kenya, accounting for approximately 27% of the national GDP in 2022 (KNBS, 2023). The county's economic framework is predominantly driven by sectors such as financial services, infrastructure, manufacturing, trade, and real estate. Nevertheless, agricultural productivity is vulnerable to external shocks, including climate change, land fragmentation, and market inefficiencies, which present challenges for sustainable economic growth in the long term.

The impact of population growth on economic development at the county level is contingent upon factors such as labour market capacity, public service provision, and resource allocation. Rapid population growth in counties such as Nairobi and Mombasa has generated substantial challenges, including urban congestion, inadequate housing, and heightened pressure on social services (Oluchiri, 2025). While some counties have adeptly harnessed population growth for economic advancement, others grapple with issues such as high unemployment rates, low productivity, and infrastructural deficits (Kipkogei et al., 2025). A nuanced understanding of the interplay between population growth and economic growth at the subnational level is vital for policymakers, particularly in the context of devolution initiatives aimed at promoting equitable resource distribution and fostering regional economic development.

**2 Literature Review**

Endogenous growth theory, as articulated by Romer (1986) and Lucas (1988), posits that economic growth is fundamentally driven by factors such as human capital, technological innovation, and knowledge accumulation. This theory asserts that population growth can exert a positive influence on economic development, contingent upon investments in education, research, and innovation. In contrast to traditional economic growth models, endogenous growth theory emphasizes the significance of policy and institutional frameworks in sustaining long-term economic growth trajectories (Mierau & Turnovsky, 2012)

The Solow-Swan growth model (Solow, 1956) contends that economic growth is primarily fueled by capital accumulation, expansion of the labour force, and technological progress. Although population growth enhances the labour supply, unchecked growth may lead to capital dilution, ultimately resulting in diminished per capita income. This model underscores the critical roles of savings, investment, and technological advancement in fostering sustained economic growth.

Unified Growth Theory, developed by Galor and Weil (2000), integrates elements from Malthusian theory, demographic transition theory, and endogenous growth theory. It elucidates the process through which economies transition from stagnation to sustained growth, driven by technological advancements that enhance productivity and living standards. The theory posits that as societies evolve from agrarian to industrial economies, fertility rates decline, human capital accumulation escalates, and economic performance improves.

Decentralization can be a crucial strategy for delivering services at the sub-national level of government. According to Tiebout (1956), the theory of decentralization involves the distribution of resources, decision-making, enhancement of public services and service delivery, as well as facilitating information exchange. Musgrave (1959), in his theory of finance, argues that decentralization boosts a nation's productive capacity by increasing efficiency, enhancing accountability, reducing corruption, decreasing bureaucracy, and minimizing conflicts between government officials and civil servants. Fiscal decentralization, in this context, refers to the transfer of fiscal powers and responsibilities from the central government to sub-national governments, emphasizing the importance of financial decentralization in achieving the optimal supply of local public goods, ultimately contributing to human development and economic growth (Gisore, 2021). Furthermore, decentralization can help manage population imbalances in various ways. For example, decentralization reforms in many states have positively impacted the reduction of spatial inequalities and promoted rural development (Faye et al., 2024).

Empirical studies have provided substantial insights into the relationship between population and economic performance. Barro (1996), in his analysis of 98 countries, identified a negative correlation between higher population growth rates and per capita income, particularly in developing nations. In a similar vein, Kelley and Schmidt (2005) examined data from 88 countries and concluded that rapid population growth impeded economic development by diminishing capital accumulation and elevating dependency ratios. Overall, the evidence suggests that economic growth will not automatically lead to improved population health (Lange & Vollmer, 2017). Economic growth generally leads to a population increase due to factors like improved access to healthcare, better living standards, increased life expectancy, and migration to areas with more job opportunities, which can result in higher birth rates and lower mortality rates.

Sachs and Warner (1997) investigated the phenomenon of economic stagnation in Africa, suggesting that rapid population growth was a contributing factor to the sluggish pace of economic development, attributable to inadequate infrastructure and limited job creation opportunities. Gyimah-Brempong and Wilson (2004) further explored the relationship between fertility rates and economic growth in Sub-Saharan Africa, revealing that elevated birth rates increased dependency ratios, thereby constraining savings and investment.

In a study focused on Kenya, Thuku et al. (2013) found that rapid population growth resulted in resource depletion and high unemployment, which hindered growth in per capita income. Conversely, KIPPRA (2021) assessed population trends and economic performance in Kenya, revealing that counties experiencing significant urban population growth, such as Nairobi and Nakuru, witnessed marked economic expansion attributed to increased labour supply and heightened consumer demand. Additionally, the World Bank (2023) indicated that urban counties contribute more substantially to GDP than their rural counterparts, reflecting disparities in labour productivity and access to economic opportunities.

**3 Methodology**

**3.1 Data Description**

The study examines and analyzes the relationship between population growth and economic growth in Kenya. In this context, population dynamics are represented by the population growth rate, while economic growth is denoted by the growth rates of the Gross County Product (GCP), which reflects the gross domestic product per county. The analysis is conducted at the subnational level to guide population policies and resource allocation aimed at enhancing economic development. The study utilizes annual panel data from 47 counties covering the period from 2014 to 2022, resulting in a total of 423 observations. Employing panel data enables a more robust analysis by combining time series data across different counties, thus enhancing the statistical power of Granger-type causality tests. Data on county population estimates were obtained from annual statistical abstracts reports, while the county economic growth (Gross County Product) data was obtained from the 2019 and 2023 Kenya National Bureau of Statistics (KNBS) reports. This database is widely recognized as a consistent and reliable resource for studies on economic development in Kenya.

**3.2 Model Specification**

The study establishes its theoretical framework based on endogenous growth theory, originally introduced by Romer (1986) and later refined by Jones (1995) to address the counterfactual implication that economic growth rates are solely dependent on population size. In this modified model, the growth rate of the economy is linked to the growth rate of the population. This logically suggests a positive correlation between the growth of per capita income and the population growth rate (Cayssials et al., 2024). Endogenous growth models allow for demographics to influence per capita macroeconomic outcomes. According to endogenous growth theory, economic growth is primarily driven by a country's population growth, labour force, and internal innovation (Mierau & Turnovsky, 2012). In this context, the population growth rate is treated as an endogenous factor, meaning that policy changes can influence the long-run growth rate of the economy through their effects on fertility. However, because the mechanism by which policy impacts growth is fertility, the effects of such policies on long-run growth can often contradict conventional wisdom (Jones, 1998).

Furthermore, Mierau and Turnovsky (2012) extend the single-sector endogenous growth model to allow for a general demographic structure. The model considers a closed economy that is populated by overlapping generations of individual consumers that differ only in their age. The production sector comprises many individual firms that exert productive externalities on each other so that, in equilibrium, the aggregate economy sustains endogenous growth. The study strategy is to establish how counties exert population growth effects on each other so that the aggregate economy sustains a balanced growth path.

The general growth function deriving from this endogenous theoretical model as explained by Mierau and Turnovsky (2012) and Cayssials et al. (2024) states that population is a function of economic growth.

$GCP = ƒ\left( POP\right),$ (1)

In this study, economic growth is characterized by the GCP growth rate (*GCP*), which captures economic growth at the sub-national level. The exogenous variable population is denoted by the population (POP) growth rate as captured in theory.

Based on that, the specified model for this study is depicted in Equation 2:

$GCP\_{it} =α+δ\_{1}POP\_{it}+ ε\_{it},$(2)

Where economic growth (GCP) is the GCP growth rate is the dependent variable and the POP-Population growth rate is the independent variable. Further, δ represents the model coefficient for the independent variable, indicating the autonomous variable, ε is the error term in the model subscript t is the time dimension, and i is the county dimension.

**3.3 Data Analysis**

The study utilizes a three-stage panel analytical framework proposed by Mahmoud (2007), Anagnostou et al. (2016) and Brida et al. (2024) to explore the causal relationship between population growth and economic growth (GCP) through panel data within a heterogeneous model. In the first stage, the analysis begins by assessing the order of integration for both POP and GCP. To enhance the reliability of these tests, we will employ recently developed panel unit root techniques, particularly considering the relatively short time frame of the individual series. In the second stage, we apply a heterogeneous panel cointegration test to investigate the long-term relationships among the variables after confirming their order of integration. Finally, in the third stage, we evaluate short-run cointegration using heterogeneous panel causality to ascertain the direction of causation between the two variables, as assuming a homogeneous panel in the presence of heterogeneous county effects could result in biased inferences.

**3.3.1 Heterogeneous Panel Unit Root Test**

Panel unit root tests are regularly employed to assess the order of integration in the variables within a dataset. Recent literature indicates that these panel-based unit root tests exhibit greater power compared to tests conducted on individual time series. Among the various panel unit root tests developed in the literature, the Levin, Lin, and Chu (LLC) test (2002) and the Im, Pesaran, and Shin (IPS) test (2003) stand out as the most commonly used. Both tests are grounded in the Augmented Dickey-Fuller (ADF) principle (Anagnostou et al., 2016). However, the LLC test assumes homogeneity in the dynamics of the autoregressive coefficients across all members of the panel, whereas the IPS test is more flexible, accommodating heterogeneity in these dynamics. Given the brief duration of the individual series, we have greater confidence in implementing the more robust IPS panel test.

The specification for the IPS unit root test is as follows:

$∆X\_{it}=α\_{i}+β\_{i}X\_{t-1}+\sum\_{j=1}^{k}γ\_{i,j }∆X\_{t-j}+ ε\_{it},$(3)

Where Δ is the first difference operator, is the dependent variable, and is the stochastic term.

**3.3.2. Heterogeneous Panel Cointegration**

Once the integration of order one is confirmed, the subsequent step is to conduct a cointegration analysis to determine whether a long-run relationship exists among the set of integrated variables under consideration. Cointegration suggests a long-term equilibrium relationship among economic variables. Acknowledging the limitations of traditional methodologies, this study employed two types of heterogeneous panel cointegration tests advanced by Pedroni (1999). These tests not only utilize panel data to address the issue of small sample sizes but also allow for variability across individual cross-sections by accommodating heterogeneity in both the intercepts and slopes of the cointegrating equation.

**3.3.3 Heterogeneous Panel with Cross-sectional Dependence**

Panel-data models often show significant cross-sectional dependence in errors due to common shocks, unobserved components, spatial dependence, and idiosyncratic pairwise dependence in disturbances (Pesaran et al., 2008; Baltagi, 2020). Cross-sectional dependence (CD) can lead to bias in test results. When dealing with short dynamic panel-data models, if there is cross-sectional dependence in the disturbances, all estimation procedures that rely on the GMM, such as Arellano and Bond (1991), become inconsistent as N (the cross-sectional dimension) increases for a fixed T (the panel's time dimension). Testing for cross-sectional dependence is necessary when N is big and T is small, as this is the most prevalent scenario in panels. To confirm, the study will use the Pesaran (CD) test as well as the Breusch-Pagan Lagrange multiplier test. To correct this, the study should ideally use panel robust standard errors created by Driscoll and Kraay (1998), which can handle various types of spatial dependence as well as heteroskedasticity and autocorrelation issues.

**3.3.4 Heterogeneous Panel Causality**

Pedroni's heterogeneous panel cointegration method focuses solely on detecting the existence of long-run relationships between variables. While the tests can indicate whether such long-run links are present or absent, they do not reveal the direction of causality when the variables are found to be cointegrated. Traditionally, causality is examined using the standard two-step Engle and Granger (1969) causality procedure. However, in a panel context, conventional estimation techniques can lead to inconsistent parameter estimates due to measurement errors and omitted variable issues. The long-run equilibrium coefficients can be estimated by using system estimators such as Vector autoregression (VAR) estimated with the Generalized Method of Moments (GMM) (Anagnostou et al., 2016). The economic literature outlines various estimation methods suitable for time series data models that encounter expected endogeneity challenges. Among these, the most widely used econometric approach for estimating dynamic panel models is the GMM developed by Arellano and Bond (1991), which employs lagged independent variables as internal instruments. The GMM technique's primary advantages include its ability to manage endogeneity concerns surrounding regressors and eliminate country-fixed effects along with unobserved heterogeneity (Mahmoud, 2007). Consequently, this study utilized the GMM model framework and employed the Granger-Wald test to establish causality. In addition, J-tests or Sargan or Hansen tests for over-identifying restrictions were conducted to verify the validity of the exclusion restrictions within the GMM.

**4 Results and Discussion**

**4.1 Panel Unit Root Test**

The analysis begins with an examination of the statistical properties of the data series employed. Initially, the order of integration (stationarity) for both the population and economic growth series is assessed using the Im, Pesaran, and Shin Wald statistics (IPS). The lag lengths for these series were determined based on the Akaike Information Criteria (AIC). The results of the unit root test are presented in Table 1.

**Table 1: Results of Panel Unit Root Test**

|  |  |  |  |
| --- | --- | --- | --- |
| Variables | Level | First difference | Decision  |
| Statistics | Prob. | Statistics | Prob. |
| GCP |  1.7696 | 0.9616 | -9.5792\*\*\* | 0.0000 | I(1) |
| POP |  0.9365 | 0.8255 | -7.4563\*\*\* | 0.0000 | I(1) |
| Note: \*\*\* significant at a 1% level Null hypothesis: The variable has a unit root |

The results of the IPS test indicate that all series analyzed at their original levels do not reject the null hypothesis of a unit root for the individual series. However, when examining the first differences of all series, the null hypothesis of unit roots is firmly rejected at the 1% significance level. This evidence strongly submits that the series is stationary only after taking the first difference. In summary, the IPS unit root analysis confirms that both population and economic growth exhibit non-stationarity at level I(1).

**4.2 Panel Data Cointegration Test**

To determine whether a long-run relationship exists between population and economic growth, the next step in assessing the relationship between these two variables is to test for cointegration after confirming that both are integrated of the first order. The study employed Pedroni's heterogeneous panel test to investigate the long-term association between them. The findings of the heterogeneous panel cointegration test, using the Pedroni methodology, are presented in Table 2.

**Table 2: Results of Cointegration Tests**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Test statistics  | Statistics | Prob. | Weighted Statistics | Prob. | Decision  |
| Panel v-Statistic |  0.6566 |  0.2557 | -3.0009 |  0.9987 | No cointegration  |
| Panel rho-Statistic | -7.0380\*\*\* |  0.0000 | -3.9261 |  0.0000 | cointegration  |
| Panel PP-Statistic | -26.2031\*\*\* |  0.0000 | -15.5911 |  0.0000 | cointegration  |
| Panel ADF-Statistic | -4.5905\*\*\* |  0.0000 | -5.9985 |  0.0000 | cointegration  |
|  |  |  |  |  |  |
| Group rho-Statistic | -0.6147 |  0.2694 |  |  | No cointegration  |
| Group PP-Statistic | -22.7690\*\*\* |  0.0000 |  |  | cointegration  |
| Group ADF-Statistic | -7.3175\*\*\* |  0.0000 |  |  | cointegration  |
| Note: \*\*\* significant at a 1% level  Null hypothesis: No cointegration |

Five of seven of Pedroni's statistics significantly reject the null hypothesis of no cointegration, as evidenced by the test results presented in Table 2. This indicates that population and economic growth are likely to move together in the long run. In other words, after controlling for country-specific variables, there remains a long-term steady-state correlation between these two variables within the panel of Kenyan counties. Given the established cointegration relationship, the study can conclude that a long-run association exists between the two variables, despite their non-stationarity.

**4.3 Panel Causality Test**

After establishing the long-run relationship among the study variables, the research advances to test for causality. The long-run equilibrium coefficients were estimated by using system estimators such as Vector autoregression (VAR) estimated with GMM, and the Granger-Wald test was utilized to assess causality. The results of the causality test are shown in Table 3.

**Table 3: Results of Granger Causality Wald Test**

|  |  |
| --- | --- |
| **Estimated coefficient**  | **Dependent variables** |
|  | GCP  | POP  |
| GCP-1 | -0.1025 \*\* (0.0439)  | -0.0011\*\*\*(0.0018) |
| POP-1 |  0.1355(0.4764)  | -0.0458\*\* (0.0196) |
| GCP-2 |  0.1722\*\*(0.0391)  | -0.0005\*\*\*(0.0016) |
| POP-2 | -0.8747 (0.4764)  | -0.0172\*\* (0.0196) |
| **Wald Causality Test** |  |  |
| Null hypothesis | POP does not cause GCP | GCP does not cause POP |
| 9.2717\*\*(0.0259) | 26.9241 \*\*\*(0.0001) |
| Wald lag length |  8.2710\*\*(0.0160) | 9.2527\*\*\*(0.0098) |
| Sargan or J-Test’s P-value | (0.2610) | (0.4239) |
| Pesaran CD  | 18.3465\*\*\*(0.0000) | 19.2063\*\*\*(0.0000) |
| Note: \*\*\* and \*\* signifies significance at a 1% and 5% level; 2 lags |

The research utilized the Granger-Wald test to determine the causal association between population (POP) and economic growth (GCP). The results indicate that the Wald test rejects the null hypothesis of no causation at the 5% significance level, suggesting that causality in the GCP equation flows from POP to GCP. Additionally, the findings imply a reciprocal causal relationship, as the Wald test also rejects the null hypothesis of no causality in the POP equation at a 1% significance level. Hence, we can conclude that there is evidence of a two-way causality between population and economic growth within the Kenyan counties. The findings indicated that county-level economic growth was heavily dependent on population increase at the subnational level between 2014 and 2022, and vice versa. This implies on one hand, rapid population growth acts as a catalyst for consumerism, leading to heightened demand which, in turn, enhances economic growth at the subnational level. On the other hand, while economic growth can create conditions that potentially lead to population growth, it's not a direct cause and effect. Factors like increased demand for goods and services and higher incomes can influence fertility rates and migration patterns, but other factors like mortality rates and access to health care also play a significant role (Ngounou et al. 2025; Lange & Vollmer, 2017). The finding agrees with Simon (2014), Sverdlik (2025) and Chowdhury et al. (2025) conclusions that at the subnational level, a growing population can drive technological advancement, workforce and economies of scale, leading to higher output in Kenyan counties. Further, Ngounou et al. (20250 and Lange and Vollmer (2017) established that economic growth can also lead to population expansion by improving healthcare, reducing mortality rates, and increasing life expectancy. When an economy grows, governments and households invest more in healthcare and education, resulting in better living conditions and higher fertility rates in some regions. Additionally, economic prosperity attracts migration, as individuals move to areas with better job opportunities, as seen in counties like Nairobi and Mombasa (Reyes-Carranza & Muthama, 2025); however, the relationship is complex and can vary depending on the stage of economic development and government policies in a region.

**4.4 Robustness Analysis**

The tests conducted to determine the appropriate lag length and suitable estimation instruments are summarized in the accompanying table (Table 3). Initially, the optimal lag structure was identified using the Wald test, which rejected the hypothesis of no second lag in both the GCP and POP equations, supporting the use of two lag structures. Cross-section dependence was tested using the Pesaran cross-sectional dependence (CD) test of independence. From the result, cross-sectional dependence was a problem, since a P-value of 0.0000 was below 0.0500 in the two models. The null hypothesis of cross-section dependence was accepted, this result justifies that the panel data set has cross-section dependence. According to Pesaran, if cross-sectional dependence is present, it can be necessary to employ heterogeneous estimation techniques, as relying solely on homogeneous estimators can lead to biased and inconsistent results. Consequently, the study employed the GMM model which is capable of dealing with unobserved panel heterogeneity. Subsequently, the Sargan or J-test was employed to validate the choice of instruments in the estimation model. The computed p-values for the Sargan or J-test concerning the over-identifying restrictions in the GMM for the two models were 0.423 and 0.261, indicating that the models are appropriate, as optimal values fall between 0.20 and 0.30, thereby confirming the validity of the over-identifying restrictions. Consequently, the study proceeded to make a conclusion based on the above model output.

**5 Conclusion and Recommendations**

**5.1 Conclusion**

This study aims to assess the influence of population on economic growth utilizing a production function approach grounded in an endogenous model. It examines the role of population in economic growth by analyzing panel data from 47 subnational governments in Kenya over the period from 2014 to 2022. Upon establishing a long-run relationship among the variables, panel long-run estimates are derived using both the GMM and the Granger-Wald test methodologies. The results from the Granger-Wald causality test reveal a bi-directional causality between population and economic growth. The analysis concludes that at the subnational level in Kenya, population expansion can be beneficial for the economy by fostering higher economic growth, and conversely, economic growth can spur population expansion. As a result, counties cannot decrease their population without impacting economic development. Equally, the reciprocal relationship underscores the complex interplay between population and economic growth.

**5.2 Recommendations**

For policymakers at the subnational level, implementing a thoughtfully designed population growth strategy, coupled with institutional and policy reforms, appears to be a sound approach. While economic progress can drive population growth, unplanned urbanization and resource limitations may result in challenges such as congestion, insufficient housing, and environmental degradation in counties. Therefore, it is essential to implement sustainable policies that ensure economic growth lead to improved living standards without overtaxing resources. This reciprocal relationship highlights the necessity for balanced policy interventions that foster economic expansion while effectively managing population growth. By investing in education, healthcare, and industrialization, Kenyan counties can harness their demographic potential to achieve sustained economic prosperity. Counties should also implement population management strategies, including family planning programs and incentives for balanced regional development, to alleviate excessive pressure on resources. Moreover, fostering economic diversification through industrialization and digital innovation will create more job opportunities, ensuring that economic growth leads to sustainable improvements in living standards across all county governments.

In light of the critical role that social and economic development plays in addressing population-related issues, it is imperative to recognize the significant influence of demographic factors on development planning and strategy formulation. The successful pursuit of development objectives hinges on an integrated approach—one that holistically considers the intricate interconnections between population dynamics, resource availability, environmental sustainability, and overarching developmental goals. Consequently, both national and subnational policies, plans, and programs must be crafted with this integrated perspective, prioritizing initiatives that effectively merge population considerations with development strategies. This alignment is essential for fostering sustainable, equitable growth and addressing the multifaceted challenges posed by population changes. To realize these objectives, it is essential for subnational governments to fully consider population trends when developing their plans and programs. The emerging perspective is that population growth should be stabilized, and development improved, by addressing some of the underlying causes of these issues.

**Disclaimer (Artificial intelligence)**

Authors hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

Competing Interests

Authors have declared that no competing interests exist.

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