Environment, Society and Business Review (ESBR) Vol. 1, No. 1 (February 2026) | pp. 1-17| DOI: https://doi.org/10.66776/ESBR.2026.1.1.1-17
ISSN: 3152-8716

UNLOCKING THE ECONOMIC GROWTH IN SUB-SAHARAN AFRICAN NATIONS: FRESH EVIDENCE FROM A NEWLY DEVELOPED MMQR APPROACH

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Article type: Original Research
Received: 05 August 2025 | Accepted: 18 November 2025 | Published online: 02 March 2026

Abstract

Understanding the drivers of economic growth in Sub-Saharan Africa (SSA) is critical for effective policy design. Using panel data for 18 SSA countries from 1990 to 2022, this study examines how broad money, domestic credit, population, and human capital are associated with growth. We apply the Method of Moments Quantile Regression (MMQR) to capture heterogeneity across the conditional distribution of growth. The results indicate that broad money, domestic credit, and human capital are positively related to growth across the lower, middle, and upper quantiles (Q1–Q9), suggesting that financial deepening and skills accumulation support performance under both weaker and stronger growth conditions. In contrast, population is negatively linked to growth in the lower to middle quantiles (Q1–Q7), implying that demographic pressures can constrain outcomes when growth is modest. Among the explanatory variables, human capital shows the largest effect size. Overall, the findings offer policy-relevant guidance for SSA economies on strengthening human-capital formation and improving the effectiveness of financial intermediation to sustain growth.

Keywords: *Economic Growth; Broad Money; Domestic Credit; MMQR; Sub-Saharan African nations.*

1. Introduction

Economic growth remains a highly significant and intriguing topic within the discipline of economics. The significance of economic growth cannot be overlooked. It is crucial for attaining economic, social, and even political advancement. Countries that experience robust and prolonged economic growth are capable of substantially reducing poverty rates (Bouznit et al., 2023; Sasmal & Sasmal, 2023). Economic development is not only a panacea; rather, it greatly facilitates the deployment of governmental initiatives that complement its effects and fix its faults, even if its direct beneficial impacts are minor. It comes as no surprise, then, that a huge amount of talent and effort is required to understand the process of economic growth (Delalibera & Ferreira, 2019). The current increase in scholarly investigation on economic growth and the policy emphasis on growth that reduces poverty are two clear illustrations of its central importance in both research and policy domains.

The association between broad money and EG is a subject of significant dispute in the study fields, but it is receiving more and more attention in the current literature (Kong, 2021). According to macroeconomic theory, a surge in the supply of money leads to a drop in the interest rate. In the loanable fund market, lower interest rates increase the rate of borrowing, accelerating investment and leading to an increase in total demand. This process may result in economic growth. Therefore, this study employs the panel data of 18 African Nations to

check the impact of broad money on their EG. This is central to studying this relationship because it will help the government, policymakers, and other stakeholders who have crucial roles to play in the growth of these African nations.

Deposit money banks primarily engage in the provision of loans and advances to the productive sector to enhance productivity. Loans may be described as a sum of money that is given with the agreement to repay both the original amount and the additional cost (interest) at a certain period in the future, which can vary from a single day to multiple years. The importance of bank credit is crucial in fueling economic growth. For example, most of the businesses in Nigeria are unable to obtain credit from banks due to inadequate accounting records, insufficient managerial skills, lack of creditworthiness, and inability to generate sufficient income to repay loans by the maturity date, which is necessary for a sustainable intermediation process. Resultantly, it hampers the efforts of businesses to contribute to the national exchequer. Thus, it is crucial to investigate the relationship between bank credit and the economic growth of 18 African nations so that policymakers may come up with policies to formulate a mechanism to grant loans to businesses to fuel economic progress.

Another important factor in stimulating economic growth is human capital. A multitude of development economists discuss the significance of human capital for economic progress, in addition to the role played by other forms of capital. Thumrongvit et al. (2013) emphasized the significance of human capital development as a fundamental factor in generating new ideas in the endogenous growth hypothesis. According to Lucas Jr (1988), human capital is considered one of the components involved in production. Thus, it is crucial to determine the impact of human capital on the economic growth of 18 African nations.

The study of economic growth is an interesting field for several compelling reasons (Farhidi, 2023). Despite the significant relevance and importance of the problems being addressed, there remain numerous uncertainties and substantial hurdles in this domain. Consequently, it has garnered considerable intellectual engagement and is expected to persist in attracting such effort in the future. For this reason, the current study contributes in several different ways. Its primary objective is to investigate the role that human capital plays in supporting economic growth. In the second step of our research, we investigate how bank credit and broad money influence economic growth. Panel data from 18 SSA nations is assembled to investigate the relationship between human capital, population, bank credit, broad money, and economic growth. Third, we employed the newly developed Method of Moment Quantile Regression (MMQR) to estimate the effect in quantile forms. In addition, we intend to provide some policy suggestions for the selected African nations, taking into consideration the stage of development.

The rest of the paper follows as section 2 presents the broad review of existing literature, section 3 presents data and econometric methods used, and section 4 presents the results and discussion. Finally, section five presents the conclusion, including policy recommendations.

2. Theoretical and Empirical Literature Review

An established observation in the macroeconomic literature on population increase is the lack of a strong impact of overall population expansion on economic growth (Befikadu, 2023). In

the 1960s and 1970s, the first studies in this field typically found that overall population expansion did not have a major impact. However, other scholars believe that a rapid rise in population has a beneficial impact on economic growth (Maestas et al., 2023). This outcome was counterintuitive in multiple aspects. At the time, there was a prevalent presence of neo-Malthusian anticatalyst arguments, primarily advocated by individuals who were not economists (Kuznets, 1967). Additionally, Li et al. (2023) had previously identified various ways in which population growth was expected to limit economic progress. Economists gained greater influence than Kuznets (1967) and introduced fresh concepts on how population increase may potentially trigger development in the long run. They also provided new empirical data on this matter. The research has found that rapid population increase in less developed countries has detrimental economic implications (Bucci, 2023). However, there is also significant variation in the results due to different approaches used.

Empirical investigations were conducted to ascertain the influence of population expansion on economic growth. While many studies focused on nations within a certain sub-region, others examined chosen countries, primarily those in the developing category, across different continents or regions worldwide. The methodology utilized in several research was similar, with descriptive analysis, causality, and static or dynamic panel analysis being commonly applied. The study aims to address a clear deficiency, as none of the previous investigations was conducted for African countries. Thus, the role of population growth in fueling economic growth in the context of SSA nations is largely unknown, which justifies further investigation.

H1: Population growth positively affects economic growth.

Moreover, monetary policy has a crucial role in stimulating economic growth in any country, notwithstanding the ongoing dispute in economics over the function of money in the economy. The Monetarists assert that monetary policy exerts an influence on prices, while having no impact on actual gross domestic product (GDP) or unemployment. In contrast, the Keynesians argue that alterations in the money supply result in fluctuations in actual production and prices. Multiple studies have explored the correlation between money and economic growth in both developed and developing nations. For example, Bouznit et al. (2023) suggested that the quantitative theory of money holds in the Czech Republic, as there is a robust and reciprocal relationship between money supply and real GDP.

The SSA countries have the difficulty of depending too much on foreign funding, which puts them under greater scrutiny from international financial markets or donors to adhere to the agreed-upon conditions. The lack of development in the bond market in SSA greatly diminishes domestic savings (Wanyama, 2017). The underdevelopment of bond markets in these countries is a concern for research and policy implications due to their economic impact. McMillan (2021) argues that the African continent is seeing a rising population of impoverished individuals, necessitating a 7% increase in economic growth to reverse this trend. To significantly decrease dependence on foreign funding, it is imperative to increase Africa's investment rate to a level exceeding 25%. Thus, it is crucial to investigate the impact of broad money on the economic growth of 18 SSA countries.

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H2: Broad money positively affects economic growth.

Additionally, the existing body of research examining the impact of human capital on economic growth is extensive and diverse, encompassing several studies employing time series, panel, and cross-sectional methods. Empirical studies have utilized different metrics to assess the impact of human capital on economic progress. Several of these studies utilized education as a metric for human capital, while others used health as a measure. Additionally, other research adopted composite indexes that incorporated both education and health in their calculations. Sairmaly (2023) demonstrated that there is a significant and statistically favorable correlation between trade openness and human capital with economic growth in Southern Asia.

The Solow model introduced human capital development as a component of production, which accounts for technical progress (Bouznit et al., 2023). The incorporation of human capital as a decisive element in fostering growth demonstrates the potential for economic advancement in Africa through increased investments in the education and healthcare sectors. The Solow model has faced criticism over the classification of technical advancement as an external component, as well as the omission of human capital as a production factor in its initial formulation. Economic progress is positively influenced by the advancement of human capital, achieved through increased investment in education and healthcare. Human capital development, thus, may act as an engine of economic growth in SSA nations. Therefore, it is crucial to investigate this relationship in African nations.

H3: Human capital has a positive impact on economic growth.

Furthermore, domestic credit serves as a significant gauge for assessing the progress of the banking industry and the overall financial growth of a nation. Reny and Joan (2022) demonstrated that there is a direct and positive link between domestic credit and economic growth in Kenya throughout the period from 1966 to 2005. An empirical study conducted by Alam et al. (2023) revealed that bank credit has a substantial influence on economic growth at the regional level in Romania. Their analysis indicated that a one-unit increase in bank credit will result in a 1.47-unit increase in economic growth. Based on the influence of bank credit on economic growth, it was determined that for bank credit to result in increased growth, robust institutions, specifically financial institutions, are necessary. These institutions would oversee bank lending and ensure that the allocated credit is utilized in productive sectors, thereby preventing moral hazard issues.

Okwu et al. (2020) discussed the ideal financial structure and compared its impact on the economic progress of Germany and the United Kingdom. Subsequently, discussions regarding the most effective financial framework to enhance long-term EG have focused on four distinct perspectives: bank-centric, market-centric, financial service-centric, and financial law-centric (Rahman et al., 2023). Nevertheless, there is no consensus on the precise value of the ideal threshold, particularly when it comes to domestic lending. In a recent study, Alam et al. (2023) discovered a favorable correlation between domestic credit

and economic development. Their investigation encompassed 100 nations from 1990 to 2012. Furthermore, their research emphasized that trade openness has a favorable impact on economic growth, but inflation has a negative one. Nevertheless, the causal relationship between domestic credit and economic development has not yet been established.

H4: Domestic credit positively affects economic growth.

3. Methodology

3.1 Data

This research investigates the link between broad money, domestic credit, population, human capital, and economic growth in SSA nations. The basic economic model of this research is presented as follows:

$$EG_{it} = \delta_0 + \delta_1 BM_{it} + \delta_2 DC_{it} + \delta_3 POP_{it} + \delta_4 HC_{it} + \gamma_{it} \quad (1)$$

Where in eq (1), the EG refers to the economic growth, BM stands for the broad money, POP stands for the population, and HC stands for human capital. Moreover, δ_0 is intercept, δ_1 to δ_5 stands for the coefficients of variables in the case of broad money, domestic credit, population, human capital, and education, respectively. i refers to the SSA nations in this case, nations include Egypt, South Africa, Morocco, Ghana, Senegal, Burkina Faso, Madagascar, Malawi, Burundi, Nigeria, Algeria, Kenya, Tunisia, Mali, Niger, Mauritius, Togo, and Gambia. t stands for the time period (1990-2022). Finally, γ_{it} refers to the error term, referring to the facets not considered in this research model study. Table 1 and Figure 1 present the variables' characteristics.

Table 1. Data Summary

Variables	Abb	Measurement	Source
Broad Money	BM	"Broad money (% of GDP)"	
Domestic Credit	DC	"Domestic credit to private sector by banks (% of GDP)"	
Population	POP	Population, total	WDI
Human Capital	HC	Life expectancy at birth, total (years)	
Economic growth	EG	GDP per capita (constant 2015 US$)	

Source: Author's compilation. Note: Data is retrieved from "WDI= World Development Indicators. https://databank.worldbank.org/reports.aspx?source=World-Development-Indicators"

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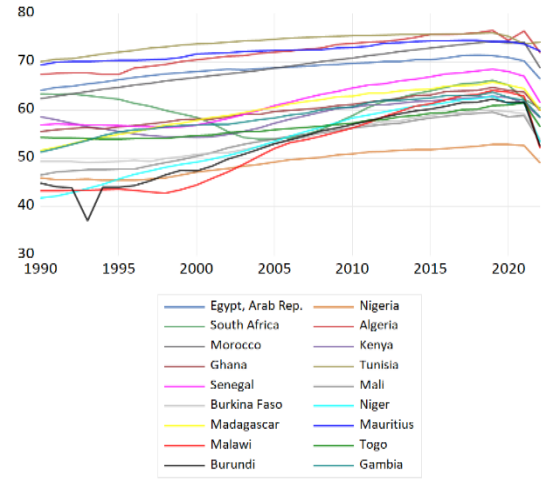
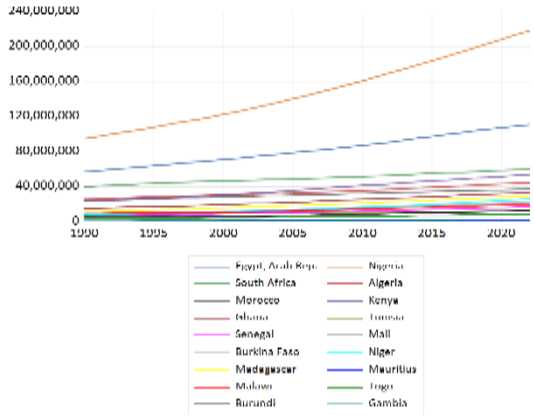
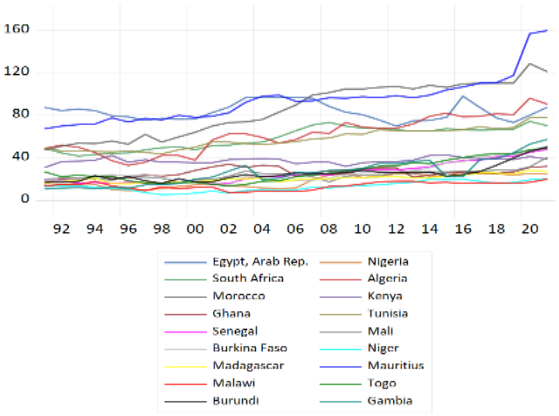


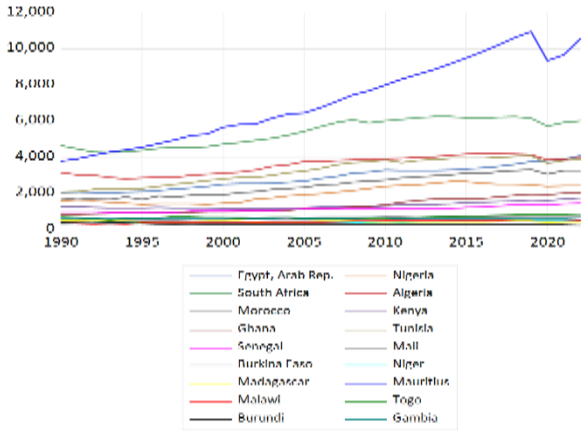
Population



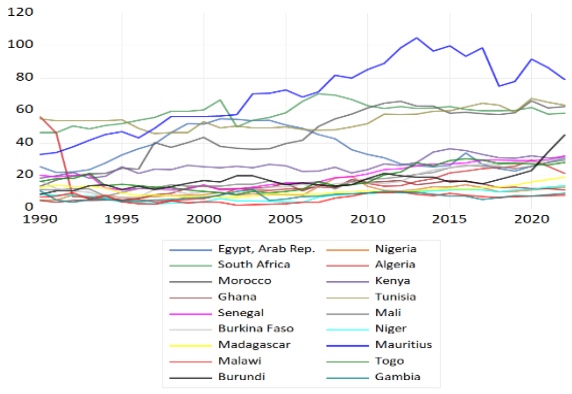
Human Capital



Broad Money



Economic Growth



Bank Credit

Figure 1. Graphical Representation of Variables

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3.2 Model Estimation

The econometric model estimation is categorized into two stages:

Stage 1: Preliminary tests

In stage (1), first, the Cross-sectional Dependence (CD) test is employed to identify cross-sectional dependence in panel data. Second, based on the estimates of CD test outcomes, this research used the "second-generation unit root test" to assess the stationarity of the variables employing CIPS and CADF unit root tests. Third, the Slop Heterogeneity test is employed to estimate the heterogeneity in the slopes of variable coefficients. Finally, this research uses the Westerlund cointegration (Westerlund & Edgerton, 2007) test to determine the long-term relationship between the different aspects of the study. The equation used to estimate the Westerlund cointegration test is as follows:

$$\Delta Y_{it} = \emptyset' d_t + a_i\left(y_{i,t-1} - \gamma_i' X_{i,t-1}\right) + \sum_{j=1}^{pi} a_i \, \Delta y_{i,t-j} + \sum_{-qi}^{pi} \vartheta_i \, \Delta X_{i,t-j} \tau_{i,t} \qquad (2)$$

The G_a and G_t components of this test are responsible for determining the extent of the long-term connection with one or more than one additional components. Estimating the degree of cointegration between the cross sections is the second component, which consists of P_a and P_t. In the form of an equation, both components are expressed as stated below:

$$G_a = \frac{1}{N}\sum_{i=1}^{N} \frac{\check{a}}{SE(\check{a}_i)} \qquad (3)$$

$$G_t = \frac{1}{N}\sum_{i=1}^{N} \frac{\check{a}}{\check{a}_i(1)} \qquad (4)$$

$$P_t = \frac{\check{a}_i}{SE\check{a}} \qquad (5)$$

$$P_a = T\check{a} \qquad (6)$$

Stage 2: Econometric model estimation

The groundbreaking work by Koenker and Bassett Jr (1978) in the domain of quantile regression using panel data facilitated the estimation of conditional quantiles of the distribution, which deviated from the previous emphasis on average estimation in earlier studies (Sharif et al., 2018). Quantile Regression (QR) is distinguished by its semiparametric nature, enabling it to function independently of distributional assumptions and demonstrate robustness to data anomalies. Binder and Coad (2011) argue that the validity of QR is unaffected even if there is no conditional mean link between the variables being studied. The main approach used in this work to capture the varying characteristics of the described aspect was the MMQR technique (Machado & Silva, 2019). The methodology used in this research has several advantages in efficiently examining the impact of individual effects and

endogeneity within the parameters (Samour et al., 2024). Shang et al. (2024) performed research that proposes the MM-QR, a statistical technique, as a viable tool for analyzing the impact of heterogeneity across different quantiles. The conditional quantile model includes estimates of the modified location and scale parameters.

$$Y_{it} = \delta_i + X_{it}'a + \left(\mathrm{B}_i + \mathrm{Q}_{it}'\sigma\right)\omega_{it}0.75em \quad (7)$$

The probability that the random variable $\left(B_i + Q'_{it}\sigma\right) > 0$ and equal to one. However, the parameters to be estimated are denoted as δ_i, α, B_i and σ. The variables δ_i and B_i represent the fixed effects of the model, while Q_{it} refers to the differentiable transformation of the m-dimensional vector X. Mathematical definition of a concept can be expressed as follows:

$$S_c = S_c(X), c = 1,2,3 \ldots., m \quad (8)$$

The subsequent approach is utilized to make estimations within the quantile context.

$$Q_y\left(\mathcal{T}/_{X_{it}}\right) = (\delta_i + B_i(q(\mathcal{T})) + X_{it}'a + Q_{it}'\sigma_q(\mathcal{T}) \quad (9)$$

In equation 9, the symbol X_{it} represents the vector containing predictor variables. The facet representing the conditional quantile distribution of the endogenous variable is located on the left-hand side of equation 9. The individual effects estimation method is distinct from other techniques, such as LS-fixed effects, due to its exclusion of an intercept term. It is anticipated that the variables will demonstrate time-invariance, wherein the distinctions among the units are assumed to remain consistent. The quantiles of the data set are obtained by minimizing the given solution.

$$min_q \sum_i \sum_t \vartheta_{\mathcal{T}}(Z_{it} - (\mathrm{B}_i + \mathrm{Q}_{it}'\sigma_q)q) \quad (10)$$

Finally, this study utilizes a heterogeneous panel causality test, which has become popular due to the research conducted by Dumitrescu and Hurlin (2012), to uncover the causative links.

4. Results and discussion

4.1 Descriptive statistics outcomes

The results of the descriptive statistics are shown in Table 2. The outcomes reveal that the mean and median of economic growth, broad money, domestic credit, population, and human capital are 7.118, 40.655, 25.040, 16.582, 60.412, and 7.043, 28.686, 16.289, 16.616, 59.995, respectively.

Table 2: Descriptive Statistics

	GDP	BM	DC	POP	HC
Mean	7.118	40.655	25.040	16.582	60.412
Median	7.043	28.686	16.289	16.616	59.995

Std. Dev.	0.941	28.206	20.877	1.182	8.566

Source: Outcome retrieved from EViews 13 and compiled by author; Note: EG = Economic Growth; BM = Broad Money; DC = Domestic Credit; POP = Population; HC = Human Capital

Moreover, the outcomes of the CD test are depicted in Table 3. The outcomes depict that there is cross-sectional dependence in the data of SSA nations, suggesting the use of the second-generation unit root test. The outcomes of the unit root estimators are presented in Table 4. The outcomes of both tests show the mixed order of stationarity at I(0) and I(1).

Table 3: CD Outcomes

Variable	CD-test	P-value
BM	43.74	0.000
DC	29.24	0.000
POP	69.86	0.000
HC	61.24	0.000
GDP	33.87	0.000

Source: Outcome retrieved from Stata 17 and compiled by author; Note: EG = Economic Growth; BM = Broad Money; DC = Domestic Credit; POP = Population; HC = Human Capital

Table 4: Unit Root Results

Variables	CIPS		CADF			
	Level	1st diff.	Level		1st Difference	
	T-statistics	T-statistics	T statistics	P-value	T statistics	P-value
GDP	-1.645	-4.574	-1.645	0.714	-4.574	0.000
BM	-2.319	-	-2.319	0.007	-	-
DC	-2.237	-	-2.237	0.017	-	-
POP	-2.612	-	-2.612	0.000	-	-
HC	-2.266	-	-2.266	0.013	-	-

Source: Outcome retrieved from Stata 17 and compiled by author; Note: EG = Economic Growth; BM = Broad Money; DC = Domestic Credit; POP = Population; HC = Human Capital; Critical Value = -2.36, -2.2, and -2.11 at "1%, 5%, and 10% significance level, respectively."

Additionally, the heterogeneity outcomes are present in Table 5. The SH test outcomes affirm the existence of slope heterogeneity in the slope of variable coefficients. Moreover, the results of the Westerlund Cointegrating test are shown in Table 6. The findings suggest that the variables under investigation exhibit cointegration, indicating a long-term association.

Table 5: Slope Heterogeneity

(Pesaran, Yamagata. 2008)			Blomquist, Westerlund. 2013.		
	Delta	p-Value		Delta	p-Value
	2.243	0.025		3.452	0.001
adj.	2.538	0.011	adj.	3.906	0.000

Source: Outcome retrieved from Stata 17 and compiled by the authors

Table 6: Westerlund Cointegration

Statistic	Value	Z-value	P-value	Robust P-value
Gt	-5.505	-11.474	0.000	0.000

Ga	-7.822	5.267	1.000	0.950
Pt	-17.082	-5.285	0.000	0.000
Pa	-8.877	3.2	0.999	0.580

Source: Outcome retrieved from Stata 17 and compiled by the authors

Moreover, the outcomes of MMQR are presented in Table 7. The outcomes of MMQR evidenced that broad money is positively and significantly related to EG in lower quantile i.e. q1 (0.005), q2(0.006), q3(0.007), in middle quantiles, i.e. q4(0.007), q5(0.008), q6(0.008), and upper quantiles, i.e. q7(0.009), q8(0.010), q9(0.011). It is evidenced that an increase in broad money will increase the EG in SSA nations. Moreover, from the outcome, it is found that the magnitude of effect increases from the lower to the middle and upper quantiles. This suggests that as broad money increases, its effect will increase in the long run. The outcomes are in line with (Bouznit et al., 2023; Thumrongvit et al., 2013). Hence, broad money is crucial since it offers the necessary liquidity and financial resources for both businesses and individuals to engage in economic activities. Within SSA nations, where traditional banking services may be limited in some areas, a significant share of economic transactions relies on tangible cash and easily accessible types of money. The presence of this liquidity facilitates the efficient operation of everyday business operations, encourages commerce, and enables investment in both the formal and informal segments of the economy.

Table 7: Method of Moments Quantile Regression Estimations

Variables	Coefficient	Std. err.	P Value
	Quantile 1		
BM	0.005	0.002	0.021
DC	0.022	0.002	0.000
POP	-0.141	0.030	0.000
HC	1.394	0.260	0.000
	Quantile 2		
BM	0.006	0.002	0.003
DC	0.021	0.002	0.000
POP	-0.119	0.026	0.000
HC	1.553	0.226	0.000
	Quantile 3		
BM	0.007	0.002	0.000
DC	0.020	0.002	0.000
POP	-0.097	0.023	0.000
HC	1.709	0.202	0.000
	Quantile 4		
BM	0.007	0.002	0.000
DC	0.019	0.002	0.000
POP	-0.080	0.022	0.000
HC	1.824	0.189	0.000
	Quantile 5		
BM	0.008	0.002	0.000
DC	0.017	0.002	0.000
POP	-0.063	0.021	0.003

HC	1.945	0.181	0.000
	Quantile 6		
BM	0.008	0.002	0.000
DC	0.016	0.002	0.000
POP	-0.044	0.021	0.035
HC	2.081	0.180	0.000
	Quantile 7		
BM	0.009	0.002	0.000
DC	0.015	0.002	0.000
POP	-0.025	0.022	0.242
HC	2.212	0.187	0.000
	Quantile 8		
BM	0.010	0.002	0.000
DC	0.013	0.002	0.000
POP	0.001	0.024	0.974
HC	2.397	0.208	0.000
	Quantile 9		
BM	0.011	0.002	0.000
DC	0.012	0.002	0.000
POP	0.025	0.027	0.356
HC	2.566	0.233	0.000

Source: Outcome retrieved from Stata 17 and compiled by author; Note: EG = Economic Growth; BM = Broad Money; DC = Domestic Credit; POP = Population; HC = Human Capital

Furthermore, domestic credit by banks is significantly related to EG in lower quantile i.e. q1(0.022), q2(0.021), q3(0.020), in middle quantiles, i.e. q4(0.019), q5(0.017), q6(0.016), and upper quantiles, i.e. q7(0.015), q8(0.013), q9(0.012). It is evidenced that an increase in credit issued by domestic banks will increase the EG in SSA nations. Moreover, from the outcome, it is found that the magnitude of effect decreases from the lower to the middle and upper quantiles. The outcomes are in line with (Aryestya & Marta, 2022; Olannye et al., 2023; Ozili et al., 2023). Domestic finance allows enterprises of any size to expand operations, invest in technology, and boost productivity. This financial aid helps enterprises streamline operations, increase output, and create jobs, boosting the economy. Domestic financing also promotes entrepreneurship and SME development. SSA SMEs' access to credit allows them to innovate, diversify, and create jobs, decreasing poverty and boosting economic growth.

On the other hand, the outcomes of MMQR evidenced that population growth is negatively related to EG in lower quantile i.e. q1(-0.141), q2(-0.119), q3(-0.097), in middle quantiles, i.e. q4(-0.080), q5(-0.063), q6(-0.044), and in only quantiles of upper quantiles, i.e. q7(-0.025). However, in two quantiles of upper quantiles, i.e. q8(0.001), q9(0.025), the population has a significantly positive link with EG. It suggests that the population does not positively affect the EG of the SSA in the short and medium terms. Whereas, in the long run, population growth has positive and significant effects. Moreover, it evidenced the decrease of up to q7, and it becomes positive in q8 and q9. The outcomes are in line with (Bucci, 2023; Leitão et al., 2023; Ntiamoah et al., 2023). Rapid population expansion in the area strains governments' and economies' ability to provide education, healthcare, and infrastructure. Resource pressure may slow human capital development and labor efficiency, stifling

economic progress. Urbanization and informal settlements may worsen with unrestrained population increase. Insufficient infrastructure during quick urbanization may lead to overcrowding, poor sanitation, and restricted access to critical services, which can lower economic productivity and well-being. Short- and medium-term population growth strategies must be developed by the government. Sustainable population growth, education, healthcare, and equitable economic development should be policy priorities. This will unlock the full benefits of a well-managed population.

Moreover, the outcomes of MMQR evidenced that human capital is positively and significantly associated with EG in lower quantile i.e. q1(1.394), q2(1.553), q3(1.709), in middle quantiles, i.e. q4(1.824), q5(1.945), q6(2.081), and upper quantiles i.e. q7(2.212), q8(2.397), q9 (2.566). It is evidenced that an increase in human capital will increase the EG in SSA nations. Moreover, from the outcome, it is found that the magnitude of effect decreases from the lower to the middle and upper quantiles. The outcomes are in line with (Almutairi, 2024; Bouznit et al., 2023; Wirajing et al., 2023). Knowledgeable workers operate more efficiently. Individuals with suitable skills and expertise may work more effectively, increasing output and EG. Human capital investment in Africa may boost productivity and competitiveness. Farming, manufacturing, and services dominate this area. In addition, human capital boosts innovation and technology. Education helps workers adapt to new technology, participate in R&D, and make meaningful contributions. SSA countries must value human capital to boost economic prosperity. That requires long-term plans to create a skilled workforce and human capital in regional countries. Regional governments should also promote education, vocational training, healthcare, and skills development. This will help them maximize their human resources and support sustained economic growth and population well-being.

Table 8: Panel Causality outcomes

Null Hypothesis:	W-Stat.	Zbar-Stat.	P-Value
BM ≠ GDP	3.482	2.369	0.018
GDP ≠ BM	6.001	6.906	0.000
DC ≠ GDP	4.079	3.444	0.001
GDP ≠ DC	10.043	14.187	0.000
POP ≠ GDP	8.494	11.397	0.000
GDP ≠ POP	11.236	16.335	0.000
HC ≠ GDP	4.815	4.770	0.000
GDP ≠ HC	4.901	4.925	0.000

Source: Outcome retrieved from EViews 13 and compiled by author; Note: EG = Economic Growth; BM = Broad Money; DC = Domestic Credit; POP = Population; HC = Human Capital

In addition, the Dumitrescu Hurnlin Panel Causality Test (DHPCT) was used in this research project to provide a robustness check on the findings that were acquired via the use of MMQR. The findings of the DHPCT are shown in Table 8, which may be seen here. The DHPTC hypothesis affirms that there is a bidirectional association between broad money,

domestic credit, population, human capital, and economic growth in the case of SSA economies.

Table 9: Hypotheses Results

Hypotheses	Statement of hypotheses	Accepted/Rejected
H1	Broad money positively and significantly affects EG	Accepted
H2	Bank Credit positively and significantly affects EG	Accepted
H3	Population growth positively and significantly affects EG	Rejected
H4	HC positively and significantly affects EG	Accepted

5. Conclusion

The economic situation in SSA nations is complex and multifaceted. According to the International Monetary Fund (IMF), countries are still emerging from the COVID-19 pandemic and have been hit by many sluggish factors. Based on this, this research investigates the effect of broad money, domestic credit by banks, population, and human capital on the economic growth of the SSA nations. This research employed MMQR to investigate the link between the facets of this research quantile by quantile, ranging from low, medium, and upper quantiles. The outcome of MMQR suggests that broad money and domestic credit affect the EG of SSA nations positively. However, pollution growth hampers the EG in the lower and middle quantiles, but later in the last two quantiles, it boosts the economic growth. Moreover, the research findings of MMQR reveal that HC enhances the EG of the region.

Based on this research, the following policy recommendations and implications are suggested. Policymakers should give utmost importance to ensuring the consistent and foreseeable availability of money. This involves abstaining from excessive monetary growth or devaluation of currency, since these acts might lead to inflation and economic instability. Instead, they should aim for prudent monetary policies that ensure a consistent and continuous growth of the money supply. Moreover, the governments and policymakers of SSA nations are suggested to manage interest rates efficiently, promote financial inclusion and literacy, strengthen banking regulation, and work on efforts to combat money laundering and financial fraud. Secondly, create and support credit reporting systems that allow lenders to accurately assess the creditworthiness of borrowers. A reliable credit information system has the capacity to reduce information imbalance and encourage responsible lending. Moreover, support non-banking financial institutions and expand access to financial services, facilitate collateral alternatives, and ease the process of doing business. Third, allocate resources towards educational and training initiatives aimed at cultivating a proficient staff with the ability to proficiently oversee credit operations, evaluate risk, and provide financial services. Fourth, execute and advocate for the implementation of family planning and fertility control initiatives aimed at tackling the substantial population growth rates seen in socioeconomically disadvantaged parts of the population. Lowering fertility rates may effectively control population expansion, alleviate strain on resources, and promote economic

advancement. Finally, alleviate gender inequalities in education via the implementation of policies that facilitate the enrollment and persistence of girls and women in educational institutions. Promote cultural and social changes to promote gender equality in education.

6. Limitations

This research study uses data ranging from 1990 to 2022, due to the unavailability of data before 1990 and after 2022. This research study is confined to SSA nations. Additionally, this research uses some variables of study based on the availability of data. Hence, based on this, future research can be initiated using more recent data and other econometric models such as CSARDL. Additionally, in future, the researchers can employ other variables than those in this research to enhance and modify the model of this research. Finally, this model of research can be employed in other economies and regions other than SSA nations to validate the outcomes of this research.

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