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Macroeconomic determinants of economic growth: Empirical validation on the case of African countries

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Abstract

Economic growth remains a critical objective for African countries, given the continent's unique developmental challenges and opportunities. This study investigates the macroeconomic determinants of economic growth in 54 African countries over the period 1999–2023, employing a comprehensive panel data approach. By analyzing a wide range of variables—including domestic investment, labor force dynamics, trade openness, urbanization, financial development, energy use, consumption, digitalization, and natural resource rents—the study provides a holistic understanding of the drivers of economic growth in Africa. The findings reveal that domestic investment, final consumption expenditure, and exports are the most significant drivers of growth, underscoring the importance of capital accumulation, domestic demand, and trade in fostering economic expansion. However, the study also highlights challenges related to import dependency, weak labor force contributions, and the limited impact of financial development, urbanization, and digitalization. Additionally, the positive association between carbon dioxide emissions and growth raises important questions about the trade-offs between economic development and environmental sustainability. The study concludes with policy recommendations tailored to the African context, emphasizing the need for investment in infrastructure, human capital, and technology, as well as sustainable development and regional integration. By adopting a nuanced and context-specific approach to economic policy, African countries can unlock their growth potential and achieve sustainable and inclusive development.

Keywords: Domestic investment, Economic growth, Africa, Energy use, Digitalization, Environmental sustainability, Panel data analysis, Financial development, Macroeconomic determinants, Trade openness, Urbanization.

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1. Introduction

Economic growth remains one of the most critical objectives for policymakers and researchers worldwide, as it is intrinsically linked to poverty reduction, improved living standards, and sustainable development. For African countries, achieving sustained and inclusive economic growth is particularly urgent, given the continent's unique developmental challenges and opportunities. Africa is home to some of the world's fastest-growing economies, yet it continues to face persistent issues such as poverty, inequality, and underdevelopment. The continent's vast natural resources, youthful and rapidly growing population, and increasing integration into global markets present significant opportunities for growth. However, these opportunities are often undermined by structural bottlenecks, macroeconomic instability, and external vulnerabilities. Understanding the macroeconomic determinants of economic growth in Africa is therefore essential for designing effective policies that can unlock the continent's potential and ensure long-term development.

The importance of economic growth for development cannot be overstated. Growth generates the resources needed to invest in critical sectors such as infrastructure, education, and healthcare, which are essential for improving productivity and human capital [1, 2]. Moreover, growth creates employment opportunities, reduces poverty, and enhances overall welfare. For African countries, where poverty and unemployment rates remain high, achieving sustained economic growth is a matter of urgency. However, the path to growth is complex and multifaceted, influenced by a wide range of macroeconomic factors, including investment, labor force dynamics, trade, urbanization, financial development, energy use, consumption, digitalization, and natural resource rents. Identifying and understanding these determinants is crucial for formulating policies that can foster growth and development.

Africa's unique context adds another layer of complexity to the study of economic growth. The continent is characterized by significant diversity in terms of economic structures, resource endowments, and demographic trends. Some countries are resource-rich, relying heavily on oil, minerals, or agricultural exports, while others have more diversified economies. Urbanization rates vary widely, with some countries experiencing rapid urban growth and others remaining predominantly rural. These variations imply that the determinants of growth may differ across countries, necessitating a nuanced and context-specific approach to analysis. Furthermore, Africa's integration into the global economy has increased in recent decades, exposing its economies to external shocks such as fluctuations in commodity prices, trade disruptions, and financial volatility. Understanding how these factors interact to influence growth is therefore critical for both academics and policymakers.

Despite the growing body of literature on economic growth, significant gaps remain, particularly in the context of African countries. Much of the existing research has focused on developed economies or global samples, with limited attention to the unique characteristics and challenges of African economies. While some studies have examined growth determinants in Africa, the results are often conflicting, highlighting the need for further empirical validation. For instance, some studies emphasize the role of gross fixed capital formation (a measure of domestic investment) as a key driver of growth [3, 4] while others highlight the importance of trade openness [5] or labor force dynamics [6]. These discrepancies may be due to differences in methodologies, data sources, or sample periods, underscoring the need for a more rigorous and comprehensive analysis.

Another limitation of the existing literature is the relatively narrow focus on specific determinants of growth, such as investment or trade, without considering the broader macroeconomic environment. Economic growth is influenced by a wide range of factors, including labor force dynamics, urbanization, financial development, energy use, consumption, digitalization, and natural resource rents. Ignoring these factors can lead to incomplete or misleading conclusions. For example, while investment in physical capital is often cited as a critical driver of growth, its impact may be limited in the absence of complementary factors such as human capital development, financial inclusion, and technological innovation [7]. Similarly, trade openness can enhance growth by facilitating access to foreign markets and technology, but its benefits may be offset by external vulnerabilities or unfavorable terms of trade [8].

Moreover, many studies rely on cross-sectional data or short time series, which may not capture the dynamic nature of growth processes. Panel data analysis, which combines cross-sectional and time-series data, offers a more robust approach to understanding growth determinants; yet, it has been underutilized in the African context. This study addresses these gaps by employing a comprehensive panel data approach, covering a wide range of African countries over an extended period. This allows for a more nuanced analysis of growth determinants, taking into account both cross-country variations and temporal dynamics.

The primary objective of this study is to identify and empirically validate the macroeconomic determinants of economic growth in African countries. Specifically, the research seeks to answer the following questions: What are the key macroeconomic factors that influence economic growth in Africa? How do these factors interact with each other to shape growth outcomes? And what are the policy implications of these findings for African policymakers? To address these questions, the study employs a panel data approach, covering a wide range of African countries over an extended period.

This allows for a more comprehensive and nuanced analysis of growth determinants, taking into account both cross-country variations and temporal dynamics.

The study focuses on a broad set of macroeconomic determinants, including gross fixed capital formation (as a measure of domestic investment), labor force dynamics, trade openness (measured by exports and imports of goods and services), urbanization (measured by urban population), financial development (measured by broad money), environmental factors (measured by carbon dioxide emissions and energy use), consumption expenditure, digitalization (measured by internet use), and natural resource rents. By considering these diverse factors, the study aims to provide a holistic understanding of the drivers of economic growth in Africa.

In addition to identifying the key determinants of growth, the study also aims to contribute to the ongoing debate on the role of macroeconomic policies in fostering growth. For example, while investment in physical capital is often cited as a critical driver of growth, its impact may be enhanced by complementary factors such as financial development and technological innovation [7, 9]. Similarly, urbanization can facilitate growth by promoting agglomeration economies and increasing labor productivity, but its benefits may be offset by challenges such as congestion and environmental degradation [10]. By examining the interplay between these factors, the study seeks to provide insights into how macroeconomic policies can be designed to support growth.

This study makes several important contributions to the literature on economic growth. First, it provides a comprehensive and up-to-date analysis of growth determinants in Africa, using recent data and advanced econometric techniques. By focusing exclusively on African countries, the study addresses a significant gap in the literature and provides insights that are directly relevant to the continent's development challenges. Second, the study adopts a holistic approach, considering a wide range of macroeconomic factors and their interactions. This allows for a more nuanced understanding of growth processes and avoids the pitfalls of oversimplification. Third, the study contributes to the methodological literature by demonstrating the advantages of panel data analysis for studying growth determinants. The use of fixed effects and random effects models, as well as robustness checks, ensures that the findings are reliable and robust. Finally, the study has important policy implications. By identifying the key drivers of growth in Africa, it provides valuable guidance for policymakers seeking to design effective growth strategies. The findings highlight the importance of investment, trade openness, and macroeconomic stability, as well as the need for complementary policies in areas such as financial development, urbanization, and digitalization. The study also underscores the role of external factors, such as global commodity prices and trade policies, in shaping growth outcomes. These insights can inform policy decisions at both the national and regional levels, helping to create an enabling environment for growth and development.

The remainder of the paper is structured as follows. Section 2 provides a review of the theoretical and empirical literature on economic growth, with a focus on the African context. Section 3 outlines the methodology, including the data sources, model specification, and estimation techniques. Section 4 presents empirical results and discusses their implications. Section 5 explores the implications of the findings, while Section 6 concludes the paper with a summary of the main findings and suggestions for future research.

2. Literature Survey

The literature survey provides a comprehensive review of existing studies on the macroeconomic determinants of economic growth, with a particular focus on the African context. This section synthesizes findings from a wide range of empirical studies, covering diverse regions and methodologies, to identify the key factors influencing economic growth. The review highlights the role of variables such as energy consumption, trade openness, investment, financial development, urbanization, and environmental factors in shaping economic outcomes. By examining both global and region-specific studies, this survey aims to contextualize the unique challenges and opportunities faced by African countries in achieving sustainable economic growth.

2.1. Empirical Studies

Wahyuningsih [11] examines GDP determinants in BRICS countries (1992-2021), highlighting the positive effects of energy consumption, labor force, and investment on GDP using the FMOLS method. Mohsin et al. [12] explore the asymmetric relationship between CO2 emissions, trade, and GDP in Pakistan (1990-2019), finding that trade and tourism impact CO2 emissions, with implications for policymakers. Susilo et al. [13] analyze energy consumption's effect on GDP in 11 Asian countries (1994-2021), revealing significant positive impacts from various energy types [14]. Assess Morocco's energy-growth relationship (1971-2021) using the Maximum Entropy Bootstrap method, with results supporting bidirectional causality. Widianingsih [15] identifies renewable energy, especially wind and solar, as key to reducing carbon emissions globally (2010-2020) [16]. Find that natural resources, FDI, and renewable energy boost economic growth in ASEAN countries (2000-2021), while CO2 has a negative effect. Halmuratov et al. [17] investigate Uzbekistan's energy and trade openness impacts (1990-2023), noting energy consumption's positive effect on GDP. Ahmad et al. [18] reveal that financial development and trade openness promote GDP growth in D-8 countries, though renewable energy's effects are more complex. Fikri and Rhalma [19] find that in Morocco, renewable energy and CO2 emissions positively affect economic growth, but government spending has a negative impact (1993-2020). Seriram et al. [20] highlight the positive role of hydroelectric power in Malaysia's economic growth, with long-term benefits for both the economy and sustainability (1988-2022).

Muhammad et al. [21] found that energy consumption, particularly from hydroelectric, nuclear, and thermal sources, boosts economic growth in Pakistan but negatively affects environmental quality. They recommend promoting renewable energy to mitigate environmental damage. Similarly, Satrianto and Ikhsan [22] showed that renewable energy and environmental quality fosters economic growth in developing countries, while traditional energy consumption does not. Their findings stress the importance of expanding renewable energy infrastructure.

In Saudi Arabia, Haque and Tausif [23] highlighted a link between energy consumption patterns and economic fluctuations, with energy use rising as per capita income increases. The study suggests incorporating these patterns into energy policy design. Mombekova et al. [24] observed that while economic growth drives energy consumption, population growth had a minimal effect, indicating varying impacts across regions. Kusumawardani and Agusti [25] found that energy security positively affects growth in ASEAN countries, though efficiency remains a concern, calling for stronger energy policies.

Effiong and Hosu [26] discovered that in Central Africa, both energy consumption and CO2 emissions drive economic growth, contributing to ongoing energy and environmental policy debates. In contrast, Shadab and Alam [27] revealed that high-tech exports positively affect the UAE's economic growth, while renewable energy consumption has a negative impact, suggesting that boosting high-tech exports could drive long-term development.

Belloumi and Aljazea [28] found an asymmetric relationship between energy consumption and economic growth in the MENA region. Energy-saving policies benefit long-term growth but only in the short run for specific countries. Azwardi et al. [29] argued that corruption hampers green growth in high-income countries, highlighting the need for stronger anti-corruption measures. Alsabhan and Alabdulrazag [30] found that energy consumption positively influences growth in Saudi Arabia, with education, employment, and trade liberalization playing significant roles.

Ibyzhanova et al. [31] found that energy production is a key driver of economic growth in Turkic Republics, though foreign trade had no significant impact. Hussein et al. [32] emphasized the importance of energy consumption and globalization in driving growth in Somalia, while noting that environmental pollution hinders it. Lukhmanova et al. [33] highlighted a strong relationship between energy consumption and economic growth in Kazakhstan, especially due to oil, while the effect was not significant in Azerbaijan, pointing to structural differences between countries.

Khang [34] showed that investment in agriculture, forestry, and fisheries significantly contributes to economic growth in Vietnam, highlighting agriculture's role in long-term growth. [35] found that public investment has a lasting impact on growth in ASEAN countries, advocating for better investment efficiency and attracting FDI. Wang and Yu [36] found that digital financial inclusion drives inclusive growth in China, emphasizing the role of expanding digital services and innovation.

Wehncke, et al. [37] showed that FDI positively influences growth in non-crisis periods but loses effectiveness during crises, stressing the importance of stable investment strategies. Mogota and Djekonbe [38] found that renewable energy and FDI positively affect economic growth in Sub-Saharan Africa, suggesting that policies should promote both to foster growth. Goldman and Zhang [39] demonstrated that quantitative easing policies increase savings among wealthier households, indirectly boosting growth. Goldman and Zhelyazkova [40] found a non-linear relationship between CO2 emissions and GDP growth in Europe, showing the complexity of balancing economic growth with environmental sustainability.

Choe [41] examined the causal relationship between domestic investment and economic growth across 80 countries from 1971 to 1995 using a Panel VAR model. The findings indicate that domestic investment does not Granger-cause economic growth. [42] investigated the labor force-growth nexus in Côte d'Ivoire (1965–2014) using Toda-Yamamoto Granger causality tests, revealing no significant impact of labor force on growth. In contrast, Paudel and Perera [43] identified a long-run positive cointegration relationship between these variables in Sri Lanka (1950–2006) through cointegration analysis. The role of financial development in growth has yielded mixed findings. Beck and Levine [44] demonstrated that financial development spurs growth by easing financing constraints for small firms. Similarly, Shahbaz et al. (2017) confirmed its positive effect in China and India (1970–2013), while Andreasen and Valenzuela [45] echoed this for 27 developed and developing nations. However, Naceur and Ghazouani [46], analyzing 145 African and Asian countries (1960–2011) with a GMM-system approach, found that banking structure development hindered economic activity. This aligns with Dahmani et al. [47] who, using Panel CS-ARDL for MENA countries (1980–2018), reported adverse effects. Divergently, Lonzo and Kabwe [48] observed a positive growth impact in the Democratic Republic of Congo (2001–2012), whereas Ngongang [49] found no linkage in 21 Sub-Saharan African countries (2000–2014). Taxation's effects also vary. Amin et al. [50] linked taxation to long-term growth in China and Pakistan (1986–2015) via ARDL and cointegration analysis. Conversely, Gurdal et al. [51] detected no short- or long-run relationship for G7 nations (1980–2016).

Research consistently highlights digitization's positive long-term impact on economic growth, though short-term effects vary. Salahuddin et al. [52] found a significant long-term link in Australia, while Tripathi and Inani [53] observed short-term drawbacks in Sub-Saharan Africa. Rahimi and Rad [54] confirmed digitization as a growth driver in developing nations, with no reverse effect. Pradhan et al. [55] identified a bidirectional relationship in OECD countries, whereas Choi and Yi [56] and Choi and Yi [57] reinforced digitization's growth-enhancing role across global samples. Saidi and Mongi [58] further supported unidirectional causality in high-income economies. Overall, digitization fosters long-term growth, but its immediate effects depend on regional and structural factors.

Bakari and Sofien [59] explored trade openness, foreign direct investment (FDI), and domestic investment in Asian developing countries and found that domestic investment positively impacts growth, while FDI and exports have a negative effect. Saleem et al. [60] examined the relationship between exports and economic growth in Pakistan (1973–2020), revealing a long-run asymmetric unidirectional causality, highlighting exports' significant role in driving economic growth. Similarly, Sunde et al. [61] found a positive long-run impact of exports on Namibia's growth (1990–2020) using cointegration and ARDL models. Mamun and Kabir [62] reinforced these findings for Bangladesh (1976–2019), demonstrating exports' favorable influence on long-term growth.

Shabbir et al. [63] identified a positive short- and long-run impact of domestic investment on Pakistan's growth (1980–2017). Conversely, Mohammed and Nasiru [64] reported a negative effect in Nigeria (1981–2018), challenging conventional expectations. Tougem et al. [65], however, confirmed a positive relationship in Cameroon (1990–2018). Amade et al. [66] emphasized domestic investment's substantial role in Nigeria (1981–2018), advocating for optimized local investment policies. Ogunjinmi [67], however, noted a negative long-run effect in Nigeria (1981–2019), underscoring context-specific dynamics. Meyer and Sanusi [68] further diverged, finding growth-driven investment causality in South Africa (1995–2016). Zhu et al. [69] analyzed Asian economies (1981-2016) using VECM and fixed

effects models, confirming exports' strong positive impact on economic growth in the region.

Seo et al. [70] and Mehmood and Siddiqui [71] established the positive impact of ICT and telecommunications investments on growth. Cheng et al. [72] reinforced this, showing ICT diffusion as a significant growth stimulant. Toader et al. [73] confirmed ICT's positive effect in EU countries, while Bahrini and Qaffas [73] highlighted digitalization's growth-enhancing role in MENA and SSA regions (2007–2016). Castellacci [74] further validated digitalization as a growth source across 131 countries (1985–2004). Collectively, these studies underscore technology's transformative potential in economic development. However, [75] showed that digitalization and trade openness positively contribute to economic growth in Asia's richest economies. Bakari [76] also reported that digitalization and patents positively impact Romania's growth, suggesting that technology adoption fosters economic progress.

For the United States, Bakari and Tiba [77] identified key long-term growth determinants such as consumer spending, population, domestic investment, FDI inflows, and exports, while FDI outflows, military spending, taxes, and imports had no significant long-term effects, highlighting the complexity of growth factors.

In a study of 52 African countries, Bakari [78] found that domestic investment, exports, natural resources, and consumption expenditure positively impact growth, while labor force, imports, and energy use have negative effects. The study stresses the need for policies that support investment and resource use while managing labor and trade dynamics.

Bakari [79] also emphasized the role of researchers in economic growth, noting that scientific contributions and technological progress significantly impact global development. In Greece, Bakari [80] found no long-term causality between exports, investment, and growth, while Yedder et al. [81] found that in North Africa, neither domestic investment nor exports drives long-term growth, although imports have a positive effect. Similarly, studies on Albania [82] and Angola

[83] suggest that domestic investment and exports do not significantly boost economic expansion.

Bakari et al. [84] confirmed that domestic investment positively impacts growth in MENA countries, while innovation and R&D show no significant effects. In contrast, in developed countries, innovation is a key growth driver, as shown by Bakari [85]

Bakari [86] found that in Latin America and the Caribbean, domestic investment and financial development foster growth, but corruption control has no significant impact. In the U.S., Othmani et al. [87] found no long-term link between patents, domestic investment, and growth, suggesting alternative growth drivers.

Bakari [88] discovered that in Australia, domestic investment positively affects GDP in the long run, while exports do not necessarily enhance investment. However, studies in Argentina [89] and Arab countries [90] suggest that domestic investment has no significant long-term effect on growth, though a short-term bidirectional relationship exists, indicating that the impact of investment varies by region and timeframe.

El Weriemmi and Bakari [91] found that agricultural exports positively impact economic growth in upper-middle-income countries, emphasizing the importance of capital investment and labor. Similarly, Othmani et al. [92] observed that food exports contribute to long-term growth in Italy, although their share has declined over time. Gafsi and Bakari [93] further highlighted that agricultural exports and financial development promote growth in East Asia and Pacific countries, stressing the need for policies supporting sustainable agriculture.

In North African countries, El Weriemmi and Bakari [94] reported that CO2 emissions and exports positively affect economic growth, while domestic investment has a negative impact. In the G7 countries, Gafsi and Bakari [95] found that renewable energy and CO2 emissions contribute to long-term prosperity, though no short-term relationship was observed. These findings highlight the importance of balancing growth with environmental sustainability. Mabrouki [96] studied the effect of patents on economic growth in Scandinavian countries (1990–2019) using panel cointegration and CS-ARDL analysis. Results showed that patents positively impact long-term economic growth. Gafsi and Bakari [97] showed that in Sub-Saharan Africa, these imports significantly boost growth by improving agricultural productivity, emphasizing the need for policies that promote trade and investment in agricultural value chains.

Gyedu et al. [98] emphasize the role of innovation, measured through R&D, patents, and trademarks, in driving GDP per capita growth, with stronger effects in G7 countries compared to BRICS nations. Tawiah et al. [99] find that renewable energy consumption and economic development positively influence green growth, while trade openness and energy consumption have adverse effects. Nathaniel et al. [100] reveal that energy use drives economic growth in Africa, but CO2 emissions negatively impact growth over time. Ning et al. [101] highlight the potential of green bonds to support sustainable financing and green growth by removing barriers to energy efficiency projects.

Abbasi et al. [102] identify energy consumption, industrial growth, urbanization, and CO2 emissions as key determinants of economic growth in Pakistan, emphasizing the need for integrated energy policies. Zahoor et al. [103] show that clean energy investment boosts economic growth and reduces CO2 emissions in China, while financial development and urbanization contribute to growth at the expense of environmental sustainability. Xu et al. [104] find that globalization, sound regulatory control, and political stability positively influence economic growth in Asia [105] stress the importance of balancing energy affordability, security, and sustainability to promote growth while maintaining environmental sustainability.

Batrancea et al. [106] identify bank capital and financial stability as key drivers of economic growth in non-BCBS countries, particularly in emerging markets. Van et al. [107] reveal a positive relationship between financial inclusion and economic growth, especially in low-income countries. Sufyanullah et al. [108] find that urbanization and economic growth increase CO2 emissions in Pakistan, highlighting the need for energy-efficient policies. Odhiambo [109] shows that FDI has a stronger positive impact on economic growth in low-income Sub-Saharan African countries compared to middle-income ones.

Akash et al. [110] demonstrate that international trade and capital flows are closely integrated with GDP growth in developing economies. Kyara et al. [111] confirm that tourism development drives economic growth in Tanzania. Shahzad et al. [112] find that export quality, economic complexity, and institutional quality positively impact long-term growth in developed economies. Hu et al. [113] show that renewable energy and technological innovation boost economic growth while reducing CO2 emissions in India. Asteriou et al. [114] reveal that increased government debt negatively affects economic growth in Asia.

Hunjra et al. [115] highlight the positive impact of financial development, natural resource abundance, and trade openness on sustainable economic development in middle-income countries. Tenaw and Beyene [116] confirm a modified Environmental Kuznets Curve (EKC) in sub-Saharan Africa, indicating that economic growth can coexist with environmental sustainability. Fratila et al. [117] show that maritime transport and related investments positively correlate with economic growth in the EU, despite environmental challenges. Spyromitros and Panagiotidis [118] find that corruption generally hinders economic growth, with varying effects across regions.

Maneejuk and Yamaka [119] reveal nonlinear effects of higher education on economic growth in ASEAN-5 countries, emphasizing its importance for future growth. Nguyen et al. [120] find a positive linear relationship between financial development and economic growth in emerging markets, with bidirectional causality. Ojekemi et al. [121] show that renewable energy, exports, and technological innovation mitigate carbon emissions in BRICS economies, while economic growth and imports exacerbate them. Zhang et al. [122] highlight the digital economy's role in boosting economic growth through industrial upgrading and employment in Belt and Road countries.

Hobbs et al. [123] reveal a long-term relationship between FDI, trade, and economic growth in Albania, with unidirectional causality from growth to exports and FDI. Wang et al. [124] find that renewable energy positively impacts economic growth in OECD countries, particularly when political and composite risks are low. Abendin and Duan [125] show that the digital economy enhances the positive impact of trade on economic growth in Africa. Rao et al. [126] find that FDI positively influences growth in South-East Asia and South Asia, while foreign aid negatively impacts FDI and growth.

Adeleye et al. [127] reveal that ICT adoption enhances the impact of trade on growth in Africa, with varying effects across sub-regions. Usman et al. [128] show that ICT significantly contributes to economic growth and energy efficiency in India, suggesting its potential for other South Asian countries. Chandana et al. [129] find that capital expenditure positively impacts economic growth in Nigeria, while recurrent expenditure does not. Khan et al. [130] highlight the role of renewable energy in improving environmental quality and reducing health-related costs in Central Europe.

Batrancea et al. [106] identify imports, exports, gross capital formation, and FDI as key drivers of GDP growth in Africa. Gyimah et al. [131] show a feedback effect between renewable energy consumption and economic growth in Ghana. Ahmad et al. [132] reveal that digital financial inclusion and human capital significantly contribute to economic growth in China. Ifediora et al. [133] find that financial inclusion, particularly availability and penetration, positively impacts economic growth in sub-Saharan Africa.

Rahim et al. [134] show that human capital development mitigates the negative impacts of natural resource dependence in the Next Eleven countries. [135] reveal a negative correlation between GDP growth and carbon emissions in BRICS and OECD regions. Xiaoman et al. [136] find that natural resource abundance and economic globalization improve environmental quality in MENA countries, while trade openness and urbanization exacerbate degradation. Mohsin et al. [12] show that external debt negatively impacts economic growth in South Asia, while external debt stock has a positive effect. Iqbal et al. [137] find that CO2 emissions, renewable energy, exports, FDI, and savings positively impact economic growth in BRICS countries, while interest rates and trade openness have negative effects. Nepal et al. [138] highlight the role of FDI in reducing energy use and carbon emissions in India. Galvan et al. [139] show that FDI, GDP growth, and trade significantly affect CO2 emissions in middle-income Latin American countries. Arvin et al. [140] emphasize the importance of harmonizing ICT, FDI, and trade policies for long-term growth in G-20 countries.

Elfaki et al. [141] find that industrialization, energy consumption, and financial development positively impact economic growth in Indonesia, while trade openness has a negative effect. Wang and Zhang [142] show that trade openness reduces carbon emissions in high-income countries but increases them in low-income countries. Chen et al. [143] reveal that trade openness and economic growth reduce energy intensity in China. Kong et al. [144] find that trade openness significantly promotes economic growth quality in China. Banday et al. [145] show that FDI and trade openness positively impact long-term growth in BRICS countries.

Di Clemente et al. [146] reveal that urbanization drives economic development in early stages but becomes negligible in highly urbanized countries. Pradhan et al. [147] emphasize the importance of co-developing urbanization, transportation, and ICT policies for economic growth in G-20 countries. Nathaniel et al. [100] find that electricity consumption positively impacts economic growth in Nigeria, while urbanization inhibits growth. Liang et al. [148] show that economic development drives urbanization in China, with limited feedback effects on growth. Adeneye et al. [149] reveal long-run relationships between carbon emissions, energy consumption, urbanization, and economic growth in Asia. Byaro and Rwezaula [150] show that technological innovation and urbanization positively impact economic growth in Tanzania. Gross and Ouyang [151] find that urbanization due to migration correlates with economic growth, while natural increase does not. Vu et al. [152] highlight the role of natural resources and innovation in economic recovery in Asia, with financial development and eco-innovation enhancing sustainability.

2.2. Originality and Value Added in This Literature Review

This literature review distinguishes itself through several original and innovative aspects, contributing significant

value to the existing body of research on economic growth determinants. One of its most notable features is its '*holistic approach*', which examines a broad spectrum of macroeconomic factors influencing economic growth. While traditional studies often focus on a narrow set of variables, such as investment, exports, or energy consumption, this review expands the scope to include both conventional and contemporary determinants. These include 'digitalization', 'renewable energy adoption', and 'environmental factors' like CO2 emissions, which have gained prominence in recent years due to their growing relevance in global economic discourse [153, 154]. By integrating these diverse dimensions, this review offers a more comprehensive and nuanced understanding of the multifaceted drivers of economic growth, particularly in the context of developing economies. A second key contribution of this review is its strong *emphasis on the African context*, a region that has historically been underrepresented in global economic literature. While much of the existing research focuses on developed economies or emerging markets like the BRICS nations (Brazil, Russia, India, China, and South Africa), this review synthesizes findings from studies specifically focused on African countries. It highlights the unique characteristics of African economies, such as their heavy reliance on *natural resource rents, the challenges of rapid urbanization, and the persistent gaps in financial inclusion and technological development* [155, 156]. By doing so, this review addresses a critical gap in the literature, which has often overlooked the distinct growth dynamics and policy challenges faced by African nations. This focus is particularly timely, given the continent's growing economic potential and its increasing integration into the global economy. Third, this review incorporates recent studies published up to 2023, ensuring that it captures the latest developments in the field of economic growth. This is especially important in a rapidly evolving global landscape where new factors, such as *the rise of the digital economy, the transition to renewable energy, and the urgent need to address climate change*, are reshaping growth trajectories [101, 157]. By including cutting-edge research, this review provides an up-to-date perspective on the challenges and opportunities facing African economies. For instance, it explores how digitalization is transforming productivity and innovation across the continent, while also examining the dual role of renewable energy in promoting sustainable growth and mitigating environmental degradation [103, 153]. This contemporary focus ensures that the review remains relevant to policymakers and researchers seeking to address the most pressing issues of our time. Finally, this review stands out for its exploration of the 'complex interactions' between different growth determinants. While many studies analyze variables in isolation, this review emphasizes the interconnectedness of factors such as urbanization, natural resource dependence, and environmental sustainability. For example, it examines how urbanization can simultaneously drive growth through agglomeration economies and increased labor productivity, while also posing challenges such as congestion, pollution, and infrastructure deficits [100, 156]. Similarly, it investigates the resource curse phenomenon, where natural resource abundance can either fuel growth or hinder it, depending on the quality of institutions and the effectiveness of resource management [155, 158]. By highlighting these interactions, the review provides a more nuanced understanding of the trade-offs and synergies that policymakers must navigate to achieve sustainable and inclusive growth.

This literature review makes a significant contribution to the field by adopting a holistic approach, focusing on the African context, incorporating recent studies, and exploring the complex interactions between growth determinants. It addresses critical gaps in the existing literature, which often lack a comprehensive focus on Africa, overlook emerging factors like digitalization and renewable energy, and fail to account for the interplay between variables. By offering a more integrated and up-to-date perspective, this review provides valuable insights for researchers, policymakers, and development practitioners seeking to understand and address the unique challenges and opportunities of economic growth in Africa. Its emphasis on both traditional and contemporary factors, combined with its focus on the African continent, ensures that it remains a relevant and impactful resource in the ongoing discourse on global economic development.

2.3. Gaps in Other Literature Reviews

Despite the valuable contributions of existing literature reviews, several significant gaps remain, which this study seeks to address. One of the most notable limitations of previous reviews is their limited geographical scope. Many studies focus predominantly on developed economies or emerging markets, such as the BRICS nations (Brazil, Russia, India, China, and South Africa), while largely neglecting the unique characteristics and challenges of African economies [155, 158]. This omission is particularly problematic because the determinants of economic growth in Africa often differ markedly from those observed in other regions. Factors such as heavy reliance on natural resources, low levels of industrialization, and institutional weaknesses including governance challenges and limited financial inclusion play a critical role in shaping growth trajectories in Africa [100, 156]. By focusing on Africa, this review fills a crucial gap in the literature, offering insights that are directly relevant to policymakers and researchers working on the continent.

A second major gap in existing literature reviews is their narrow focus on a limited set of variables. Many studies concentrate on traditional determinants of growth, such as investment, exports, and energy consumption, while overlooking other critical factors that have gained prominence in recent years [153, 154]. In the African context, for example, digitalization, rapid urbanization, and environmental sustainability are increasingly recognized as key drivers of economic growth. Digitalization, in particular, has the potential to transform productivity and innovation across the continent, while urbanization presents both opportunities (e.g., agglomeration economies) and challenges (e.g., congestion and environmental degradation) [103, 156]. Similarly, environmental issues, such as CO2 emissions and the transition to renewable energy, are critical to achieving sustainable growth in Africa [101]. By broadening the scope of analysis to include these often-neglected dimensions, this review provides a more comprehensive understanding of the factors influencing economic growth in Africa.

A third limitation of existing literature reviews is their tendency to ignore the complex interactions between variables. Many studies analyze growth determinants in isolation, failing to account for the ways in which different

factors interact to shape economic outcomes. For instance, few studies explore how digitalization can amplify the impact of investment on growth by improving efficiency and fostering innovation [153]. Similarly, the relationship between CO2 emissions and economic growth is often examined without considering how environmental degradation can limit long-term productivity gains and undermine sustainable development [100, 154]. By integrating these interactions, this review offers a deeper and more nuanced understanding of the mechanisms underlying economic growth, particularly in the African context. This approach allows for a more holistic analysis, which is essential for designing effective policies that address the interconnected challenges facing African economies.

Finally, many existing literature reviews rely on outdated data or less robust methodologies, which limits their relevance in a rapidly evolving economic context. The global economy has undergone significant transformations in recent years, driven by technological advancements, the rise of the digital economy, and the urgent need to address climate change [101, 157]. However, many studies continue to rely on data and methodologies that do not fully capture these developments. This review, by contrast, draws on recent studies published up to 2023 and employs advanced econometric techniques to provide more current and reliable insights. For example, it incorporates the latest research on the role of renewable energy in promoting sustainable growth, as well as the impact of digitalization on productivity and innovation in Africa [103, 153]. By leveraging up-to-date data and robust methodologies, this review ensures that its findings are relevant to policymakers and researchers seeking to address the most pressing economic challenges of our time. This literature review addresses several critical gaps in the existing body of research. By focusing on the African context, broadening the scope of analysis to include emerging determinants of growth, exploring the complex interactions between variables, and leveraging recent data and advanced methodologies, it provides a more comprehensive and nuanced understanding of economic growth dynamics. These contributions are particularly valuable in the context of Africa, where the unique challenges and opportunities require tailored policy responses. By filling these gaps, this review not only advances the academic discourse on economic growth but also offers practical insights for policymakers and development practitioners working to promote sustainable and inclusive growth in Africa.

3. Empirical Methodology

This section outlines the empirical methodology employed to investigate the macroeconomic determinants of economic growth in African countries. The study utilizes a panel data approach, which allows for the examination of both cross-sectional and time-series variations across a sample of 54 African countries over the period 1999–2023.

3.1. Data Sources and Variables

The data for this study are meticulously sourced from several reputable international databases, ensuring the reliability and comprehensiveness of the dataset. These sources include the World Bank's World Development Indicators (WDI), the International Monetary Fund (IMF), and the African Development Bank (AfDB). The dataset encompasses a wide array of macroeconomic variables, which are transformed into logarithmic form to linearize the relationships between variables and mitigate potential issues of heteroscedasticity. This transformation is particularly useful in economic growth studies, as it allows for the interpretation of coefficients in terms of elasticities, providing a clearer understanding of the proportional relationships between the variables.

Economic growth, the dependent variable in this study, is measured by the logarithm of GDP (constant 2015 US$), denoted as Log(Y). This metric serves as a comprehensive indicator of the overall economic performance of the countries under examination. The independent variables, also transformed into logarithmic form, encompass a diverse set of macroeconomic indicators that are both theoretically and empirically linked to economic growth. These variables have been carefully selected based on their relevance to the African context and their prominence in the economic growth literature [159, 160].

Gross fixed capital formation (DI), measured as the logarithm of gross fixed capital formation (constant 2015 US$), represents domestic investment. According to the Solow-Swan growth model [1, 161] investment in physical capital is a critical driver of economic growth. In the context of African countries, where infrastructure gaps are prevalent, domestic investment is expected to play a significant role in fostering economic expansion [162]. The total labor force (L), measured in logarithmic form, captures the human capital component of the production function. Endogenous growth theories [7, 163] emphasize the importance of human capital in driving long-term economic growth. In Africa, where the population is young and rapidly growing, the labor force is expected to have a positive impact on economic growth, provided that adequate employment opportunities and skill development are available [164].

Final consumption expenditure (FCE), measured as the logarithm of final consumption expenditure (constant 2015 US$), reflects the demand-side contribution to economic growth. Higher consumption typically stimulates economic activity by increasing demand for goods and services, which in turn encourages production and investment. In African economies, where domestic demand is a significant driver of growth, this variable is expected to have a positive relationship with GDP [159]. Financial development (FD), proxied by the logarithm of broad money (constant 2015 US$), facilitates economic growth by improving access to credit, reducing transaction costs, and enhancing the efficiency of resource allocation [9]. In Africa, where financial inclusion remains a challenge, the development of financial systems is expected to have a positive impact on economic growth [160].

Imports (M), measured as the logarithm of imports of goods and services (constant 2015 US$), capture the impact of international trade on economic growth. Imports can have both positive and negative effects on growth. On the one hand, imports of capital goods and technology can complement domestic production and enhance productivity. On the other hand, excessive reliance on imports can lead to trade deficits and hinder domestic industries. The net effect of imports on

economic growth in African countries is therefore an empirical question [165]. Exports (X), measured as the logarithm of exports of goods and services (constant 2015 US$), are expected to positively influence economic growth by providing access to foreign markets, generating foreign exchange, and fostering technological spillovers [166]. In Africa, where many economies are heavily reliant on commodity exports, the role of exports in driving growth is particularly significant.

Urbanization (URB), measured as the logarithm of the total urban population, is expected to promote economic growth through agglomeration economies and increased labor productivity [156]. In Africa, where urbanization rates are rising rapidly, the relationship between urbanization and economic growth is of particular interest. However, the benefits of urbanization may be offset by challenges such as congestion, inadequate infrastructure, and environmental degradation [167]. Natural resource rents (NR), measured as the logarithm of total natural resource rents (constant 2015 US$), capture the contribution of natural resources to economic growth. Natural resource rents can have a positive impact on growth, particularly in resource-rich African countries. However, the resource curse hypothesis suggests that the benefits of natural resources may be contingent on institutional quality and resource management [155]. The study will explore whether natural resource rents contribute to or hinder economic growth in the African context.

Carbon dioxide emissions (CO2), measured as the logarithm of total CO2 emissions (excluding land use, land-use change, and forestry), measure the environmental impact of economic activities. While economic growth often leads to increased CO2 emissions, the relationship between emissions and growth is complex. The Environmental Kuznets Curve (EKC) hypothesis suggests that emissions may initially rise with growth but eventually decline as countries adopt cleaner technologies and policies [154]. In Africa, where environmental sustainability is a growing concern, the relationship between CO2 emissions and economic growth is a critical area of investigation [168]. Energy use (EU), measured as the logarithm of energy use per $1,000 GDP (constant 2021 PPP), captures the role of energy in economic growth. Energy is a critical input in production processes, and its availability and efficiency are key determinants of economic performance. The relationship between energy use and growth is expected to be positive, though subject to diminishing returns [169]. In Africa, where energy access remains a significant challenge, the role of energy use in driving growth is particularly important [170].

Digitalization (I), measured as the logarithm of internet users, captures the impact of information and communication technologies (ICT) on economic growth. Digitalization is expected to enhance productivity and innovation, thereby promoting growth [153]. In Africa, where digital transformation is rapidly unfolding, the role of digitalization in driving economic growth is a key area of interest [171]. These variables collectively provide a comprehensive framework for analyzing the macroeconomic determinants of economic growth in African countries, taking into account both traditional and contemporary factors that influence economic performance.

The dataset covers 54 African countries, including: Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Congo (Democratic Republic), Congo (Republic), Côte d'Ivoire, Djibouti, Egypt, Equatorial Guinea, Eritrea, Eswatini, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, São Tomé and Príncipe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, Sudan, Tanzania, Togo, Tunisia, Uganda, Zambia, and Zimbabwe. This comprehensive coverage ensures that the analysis captures the diversity of economic structures, resource endowments, and developmental trajectories across the continent. By employing this extensive dataset and a robust set of macroeconomic variables, the study aims to provide a nuanced understanding of the factors driving economic growth in Africa. The use of logarithmic transformations and advanced econometric techniques ensures that the analysis is both rigorous and insightful, offering valuable policy implications for African policymakers and contributing to the broader literature on economic growth. The general form of the econometric model is specified as follows:

$$\log(Y_{it}) = \beta_0 + \beta_1 \log(DI_{it}) + \beta_2 \log(L_{it}) + \beta_3 \log(FCE_{it}) + \beta_4 \log(FD_{it}) + \beta_5 \log(M_{it}) + \beta_6 \log(X_{it}) + \beta_7 \log(URB_{it}) + \beta_8 \log(NR_{it}) + \beta_9 \log(CO2_{it}) + \beta_{10} \log(EU_{it}) + \beta_{11} \log(I_{it}) + \epsilon_{it}$$

Where (Y_{it}) represents GDP for country (i) at time (t), (β_0) is the intercept, (β_1) to (β_{11}) are the coefficients of the independent variables, and (ϵ_{it}) is the error term.

3.2. Estimation Techniques

The estimation techniques employed in this study are designed to rigorously analyze the macroeconomic determinants of economic growth across African countries using a static gravity model of panel data. This approach is particularly well-suited for examining cross-country and temporal variations in economic growth, as it allows for the incorporation of both fixed and random effects, while accounting for potential heterogeneity and cross-sectional dependence in the data [11, 172-183]. The estimation process involves several systematic steps to ensure the robustness and reliability of the results.

3.2.1. Descriptive Statistics

The first step in the estimation process involves presenting descriptive statistics for all variables included in the model. This includes calculating the mean, median, maximum, minimum, and standard deviation for each variable. Descriptive statistics provide a preliminary overview of the data distribution, helping to identify potential outliers, anomalies, or data irregularities. This step is crucial for understanding the basic characteristics of the dataset and ensuring

that the variables are appropriately scaled and transformed for analysis [184, 185].

3.2.2. Correlation Analysis

Next, a correlation analysis is conducted to examine the relationships between the independent variables and to check for multicollinearity. High correlation between independent variables can lead to biased and inefficient estimates, as it becomes difficult to isolate the individual effect of each variable on the dependent variable. By identifying highly correlated variables, researchers can take steps to address multicollinearity, such as removing or combining variables, to ensure the robustness of the regression results [186, 187].

3.2.3. Cross-Sectional Dependence Test

Given the panel nature of the data, it is essential to test for cross-sectional dependence, which can arise due to unobserved common factors or spatial spillovers across countries. The Friedman [188] test is applied to detect cross-sectional dependence. If present, cross-sectional dependence can lead to inefficient estimates and incorrect inferences. Addressing this issue is critical for ensuring the validity of the regression results [189, 190].

3.2.4. Slope Homogeneity Tests

To determine whether the relationship between the variables is consistent across countries, slope homogeneity tests are conducted. The tests proposed by Pesaran and Yamagata [191] and Blomquist and Westerlund [192] are used to assess whether the slope coefficients are homogeneous across the panel. If the null hypothesis of slope homogeneity is rejected, it suggests that the relationship between the variables varies across countries, necessitating the use of heterogeneous panel models to capture these differences [193, 194].

3.2.5. Static Gravity Model Estimation

The core of the estimation process involves applying the static gravity model to analyze the determinants of economic growth. Three different estimation approaches are employed to ensure robustness:

- Panel Least Squares (PLS): This method provides a baseline estimate of the relationship between independent variables and economic growth. While PLS is straightforward, it does not account for unobserved heterogeneity across countries, which can lead to biased estimates [193].
- Fixed-Effects Model: This approach controls for unobserved country-specific effects that are constant over time, such as institutional quality, geographic factors, or cultural differences. By including fixed effects, the model accounts for time-invariant heterogeneity, providing more accurate estimates of the variables of interest [184].
- Random-Effects Model: This method assumes that the unobserved country-specific effects are uncorrelated with the independent variables, allowing for more efficient estimation. The random-effects model is particularly useful when the focus is on generalizing findings beyond the sample countries [185].

3.2.6. Hausman Test

To determine whether the fixed-effects or random-effects model is more appropriate, the Hausman test is conducted. This test compares the coefficients from both models and determines whether the differences are statistically significant. If the test rejects the null hypothesis, it suggests that the fixed-effects model is preferred, as the random-effects model may produce biased estimates due to correlation between the unobserved effects and the independent variables [190, 194].

3.2.7. Diagnostics Tests

The diagnostic tests in this study are crucial for evaluating the robustness and reliability of the econometric model. Key metrics include R-squared, which measures the proportion of variance in the dependent variable explained by the independent variables, and Adjusted R-squared, which adjusts for the number of predictors to provide a more accurate fit [184, 185]. The Standard Error of the Regression estimates the average deviation of observed values from the regression line, with lower values indicating greater precision [186]. The Sum of Squared Residuals reflects the total squared differences between observed and predicted values, where smaller values suggest a better-fitting model [187]. The Log Likelihood statistic, used in maximum likelihood estimation, helps compare model fits, with higher values indicating superior performance [185]. The F-statistic tests the overall significance of the model, with a low Prob(F-statistic) indicating that the independent variables collectively have a significant impact on the dependent variable [184]. Together, these diagnostics ensure the model is well-specified, reliable, and free from major econometric issues, enhancing the credibility of the findings and their policy relevance. relevance.

4. Empirical Results

4.1. Descriptive Statistics

The descriptive statistics (Table 1) provide a summary of the central tendencies and variability of the variables used in the study. The variables include GDP (Y), domestic investment (DI), labor force (L), final consumption expenditure (FCE), financial development (FD), imports (M), exports (X), urbanization (URB), natural resource rents (NR), carbon dioxide emissions (CO2), energy use (EU), and digitalization (I).

Table 1.
Results of descriptive statistics.

	Mean	Median	Maximum	Minimum	Jarque-Bera	Probability
Y	5.05E+10	1.88E+10	3.42E+11	7.03E+08	606.2930	0.000000
DI	1.05E+10	3.56E+09	7.63E+10	77112671	473.7853	0.000000
L	8120587.	5263018.	30992087	130361.0	59.16021	0.000000
FCE	3.91E+10	1.56E+10	3.00E+11	7.34E+08	925.6522	0.000000
FD	2.96E+10	4.89E+09	2.38E+11	96818261	701.4713	0.000000
M	1.41E+10	5.70E+09	9.64E+10	1.60E+08	628.5499	0.000000
X	1.36E+10	5.49E+09	9.32E+10	54580030	773.5156	0.000000
URB	9736716.	6399404.	41780300	162033.8	106.4404	0.000000
NR	6.23E+09	1.49E+09	5.00E+10	522819.1	607.4462	0.000000
CO2	41.18284	6.234800	487.9087	0.106900	2309.209	0.000000
EU	108.2447	80.06667	329.5051	3.937672	148.3578	0.000000
I	2.11E+08	32075730	3.31E+09	50925.14	3716.480	0.000000

The mean and median values for GDP (Y) are 5.05E+10 and 1.88E+10, respectively, indicating that the distribution of GDP across African countries is right-skewed, with a few countries having significantly higher GDP than the majority. Similar patterns are observed for other variables like domestic investment (DI), final consumption expenditure (FCE), and financial development (FD), where the mean values are higher than the medians, suggesting the presence of outliers or highly developed economies within the sample.

The maximum and minimum values for GDP (Y) are 3.42E+11 and 7.03E+08, respectively, highlighting the vast economic disparities among African countries. This wide range is also evident in other variables such as labor force (L), urbanization (URB), and natural resource rents (NR), reflecting the heterogeneity in economic structures and resource endowments across the continent.

The Jarque-Bera test results for all variables are statistically significant (p-value = 0.000000), indicating that the data do not follow a normal distribution. This non-normality suggests that the variables may require transformations or the use of nonparametric methods in the analysis to ensure robust results.

4.2. Correlation Analysis

The correlation matrix provides insights into the relationships between the independent variables and the dependent variable (GDP) in Table 2. High correlations between independent variables can indicate multicollinearity, which may affect the reliability of regression results.

Table 2.
Results of correlation analysis.

	Y	DI	L	FCE	FD	M	X	URB	NR	CO2	EU
Y	1										
DI	0.92	1									
L	0.67	0.58	1								
FCE	0.98	0.86	0.69	1							
FD	0.96	0.88	0.62	0.97	1						
M	0.94	0.92	0.59	0.92	0.90	1					
X	0.92	0.89	0.52	0.87	0.84	0.94	1				
URB	0.86	0.82	0.88	0.85	0.83	0.80	0.75	1			
NR	0.69	0.80	0.41	0.60	0.64	0.70	0.70	0.64	1		
CO2	0.92	0.81	0.53	0.91	0.87	0.88	0.92	0.72	0.52	1	
EU	0.77	-0.68	0.44	0.08	0.01	0.02	0.07	0.26	-0.04	0.16	1
I	0.74	0.69	0.53	0.77	0.79	0.76	0.61	0.66	0.44	0.59	-0.03

GDP shows strong positive correlations with domestic investment (DI, 0.92), final consumption expenditure (FCE, 0.98), CO2 emissions (CO2), financial development (FD, 0.96), and imports (M, 0.94). These high correlations suggest that these variables are likely to be significant drivers of economic growth in African countries. Domestic Investment (DI) is highly correlated with GDP (0.92), final consumption expenditure (FCE, 0.86), and financial development (FD, 0.88), indicating that investment in physical capital is closely linked to overall economic performance and financial sector development.

Labor Force (L) shows moderate correlations with GDP (0.67) and urbanization (URB, 0.88), suggesting that a larger labor force and higher urbanization rates may contribute to economic growth, although the relationship is not as strong as with other variables like investment or consumption. Energy use (EU) has a negative correlation with domestic investment (DI, -0.68) and a weak positive correlation with GDP (0.77). This suggests that while energy use is important for economic growth, excessive reliance on energy may not always translate into higher investment or productivity. Digitalization (I) shows moderate positive correlations with GDP (0.74) and financial development (FD, 0.79), indicating

that the adoption of digital technologies may enhance economic growth and financial inclusion in African countries. Overall, the correlation matrix highlights the interconnectedness of various macroeconomic factors in driving economic growth, while also pointing to potential multicollinearity issues that need to be addressed in the regression analysis.

4.3. Cross-Sectional Dependence Analysis

The results of the cross-sectional dependence test (Friedman test) presented in Table 3 reveal significant interdependence among African countries for all variables examined, as indicated by the statistically significant test statistics at the 1% level. For GDP (Log(Y)), the test statistic of 5.817 suggests that economic growth in one African country is likely influenced by growth in others, potentially due to regional integration, trade relationships, or shared external shocks such as fluctuations in global commodity prices. For domestic investment (Log(DI)), the test statistic of 0.123 indicates that investment patterns in one country may be linked to those in neighboring countries, possibly due to regional investment policies or cross-border capital flows. The high test statistic for the labor force (Log(L)), at 48.692, reflects the influence of regional labor market dynamics, such as migration and shared demographic trends, across African countries. Similarly, the test statistic for exports (Log(X)), at 0.932, suggests that export activities in one country may be affected by trade policies or demand conditions in neighboring economies. For imports (Log(M)), the test statistic of 0.17 indicates that import patterns are also interconnected, likely due to regional trade agreements or shared supply chain networks. The high test statistic for carbon dioxide emissions (Log(CO2)), at 38.708, points to common environmental challenges and shared industrial or energy policies across the continent.

Table 3.
Results of Cross-Sectional Dependence Test of Friedman [188].

	CD-test [188]
Log (Y)	5.817***
Log (DI)	0.123***
Log (L)	48.692***
Log (X)	0.932***
Log (M)	0.17***
Log (CO2)	38.708***
Log (EU)	48.356***
Log (FCE)	1.538***
Log (I)	127.944***
Log (FD)	1.828***
Log (NR)	25.437***

Note: *** indicates the statistical significance level at 1%.

For energy use (Log(EU)), the test statistic of 48.356 highlights the interconnectedness of energy consumption patterns, possibly due to shared energy infrastructure or regional energy policies. The test statistic for final consumption expenditure (Log(FCE)), at 1.538, suggests that consumption patterns in one country may be influenced by economic conditions or consumer trends in neighboring countries. The exceptionally high test statistic for digitalization (Log(I)), at 127.944, reflects the rapid diffusion of digital technologies and shared technological advancements across African economies. For financial development (Log(FD)), the test statistic of 1.828 indicates that financial systems in one country may be influenced by regional financial integration or cross-border banking activities. Finally, the test statistic for natural resource rents (Log(NR)), at 25.437, suggests that resource-dependent economies in Africa may experience shared vulnerabilities or opportunities due to global commodity price fluctuations or regional resource management policies. Overall, the presence of cross-sectional dependence across all variables underscores the interconnected nature of African economies and highlights the need for advanced econometric techniques, such as fixed-effects or random-effects models, to account for these interdependencies and ensure accurate and reliable results. The findings emphasize the importance of regionally coordinated policies to address shared challenges and leverage common opportunities for sustainable economic growth.

4.4. Homogeneity Analysis

The slope homogeneity tests, conducted using the methods proposed by Pesaran and Yamagata [191] and Blomquist and Westerlund [192] assess whether the relationship between the independent variables and GDP is consistent across African countries. The null hypothesis for these tests is that the slope coefficients are homogeneous, meaning that the impact of the independent variables on economic growth is the same across all countries. However, the results strongly reject this hypothesis, indicating significant heterogeneity in relationships.

For the Pesaran and Yamagata [191] test, both the Δ statistic (6.149) and the adjusted Δ statistic (8.527) are statistically significant at the 1% level (p-value = 0.000). This rejection of the null hypothesis suggests that the relationship between the independent variables—such as domestic investment, labor force, trade, and urbanization—and GDP varies significantly across African countries. This variation may stem from differences in economic structures, resource endowments, institutional quality, or levels of development. For example, the impact of domestic investment on growth may be stronger in countries with more developed infrastructure, while the effect of urbanization might differ

depending on the level of industrialization or the quality of urban planning.

Table 4.
Slope homogeneity tests.

Slope homogeneity test [191]		
Slope Homogeneity Tests	**Δ Statistic**	**p-Value**
$\tilde{\Delta}$ test	6.149	0.000
$\tilde{\Delta}_{adj}$ test	8.527	0.000
Slope homogeneity test [192]		
Slope Homogeneity Tests	Δ Statistic	p-Value
$\tilde{\Delta}$ test	8.971	0.000
$\tilde{\Delta}_{adj}$ test	12.440	0.000

Note: The null hypothesis for the slope heterogeneity test is that slope coefficients are homogeneous.

Similarly, the Blomquist and Westerlund [192] test reinforces these findings, with the Δ statistic (8.971) and the adjusted Δ statistic (12.440) also being statistically significant (p-value = 0.000). This further confirms the presence of slope heterogeneity, emphasizing that the determinants of economic growth do not operate uniformly across African countries. For instance, the role of natural resource rents in driving growth may vary depending on whether a country has effective resource management institutions or suffers from the "resource curse." Likewise, the impact of digitalization on growth could differ based on the level of technological infrastructure and digital literacy in each country. These results highlight the limitations of applying a one-size-fits-all approach to economic policy in Africa. Instead, they underscore the need for tailored, country-specific strategies that account for the unique economic, institutional, and structural characteristics of each nation. The findings also suggest that heterogeneous panel models, which allow for country-specific effects, are more appropriate for analyzing economic growth in Africa.

4.5. Estimation of Static Gravity Model

The results from the three models, Panel Least Squares (PLS), Fixed Effects Model, and Random Effects Model provide a comprehensive understanding of the macroeconomic determinants of economic growth in African countries. Each model offers unique insights into how various factors influence GDP, and the consistency (or inconsistency) of these results across models helps identify the most robust drivers of growth, as well as areas where policy interventions may be needed.

The PLS model serves as a baseline estimation, providing an initial overview of the relationship between the independent variables and GDP without accounting for country-specific effects. In this model, several variables stand out as significant drivers of economic growth. Domestic investment (Log(DI)) has a strong positive impact (coefficient = 0.212567, p-value = 0.0000), reflecting the importance of capital accumulation in enhancing productivity and expanding production capacity. Similarly, final consumption expenditure (Log(FCE)) emerges as a major driver of growth (coefficient 0.646549, p-value = 0.0000), highlighting the critical role of domestic demand in stimulating economic activity. Exports (Log(X)) also show a positive and significant effect (coefficient = 0.266563, p-value = 0.0000), underscoring the importance of trade in generating foreign exchange and fostering technological spillovers. However, not all variables contribute positively to growth. Imports (Log(M)) have a negative and significant impact (coefficient = -0.245117, p-value = 0.0000), suggesting that excessive reliance on imports can undermine domestic industries and hinder growth. Digitalization (Log(I)) also shows a negative effect (coefficient = -0.015606, p-value = 0.0000), indicating that rapid adoption of digital technologies without complementary policies may not yield the expected growth benefits. Other variables, such as the labor force (Log(L)) and urbanization (Log(URB)), have weak or insignificant effects, suggesting that their contributions to growth are limited without additional investments in education, skills, or infrastructure.

Table 5.
Results of Static Gravity Model.

Dependent Variable: LOG(Y)						
Methods	**Panel Least Squares**		**Fixed-effect static gravity model**		**Random-effect static gravity model**	
Variable	**Coefficient**	**Prob.**	**Coefficient**	**Prob.**	**Coefficient**	**Prob.**
C	2.533259	0.0000	2.101091	0.0000	2.533259	0.0000
LOG(DI)	0.212567	0.0000	0.222936	0.0000	0.212567	0.0000
LOG(L)	0.024181	0.0809	0.013529	0.3325	0.024181	0.0781
LOG(FCE)	0.646549	0.0000	0.649372	0.0000	0.646549	0.0000
LOG(FD)	0.008459	0.4793	0.004460	0.7193	0.008459	0.4751
LOG(M)	-0.245117	0.0000	-0.227052	0.0000	-0.245117	0.0000
LOG(X)	0.266563	0.0000	0.255140	0.0000	0.266563	0.0000
LOG(URB)	-0.003883	0.7868	-0.008787	0.5497	-0.003883	0.7849
LOG(NR)	0.028175	0.0000	0.032687	0.0000	0.028175	0.0000
LOG(CO2)	0.061067	0.0000	0.045686	0.0001	0.061067	0.0000

LOG(EU)	-0.015269	0.0394	-0.005431	0.4840	-0.015269	0.0376
LOG(I)	-0.015606	0.0000	-0.003657	0.5737	-0.015606	0.0000

The Fixed-Effects Model introduces controls for unobserved country-specific factors, such as institutional quality, geographic characteristics, or cultural differences, offering a more nuanced understanding of the relationships. In this model, the positive effects of domestic investment (Log(DI)) and final consumption expenditure (Log(FCE)) remain robust, with coefficients of 0.222936 (p-value = 0.0000) and 0.649372 (p-value = 0.0000), respectively. This confirms that these factors are key drivers of growth across African countries, even after accounting for country-specific variations. Exports (Log(X)) also retain their positive and significant impact (coefficient = 0.255140, p-value = 0.0000), reinforcing the importance of trade in driving economic growth. However, some variables show different results compared to the PLS model. For instance, the negative effect of digitalization (Log(I)) becomes insignificant (coefficient = -0.003657, p-value = 0.5737), suggesting that the impact of digitalization varies across countries and may depend on factors such as technological infrastructure or digital literacy. Similarly, the labor force (Log(L)) and energy use (Log(EU)), which were marginally significant in the PLS model, become insignificant in the Fixed-Effects Model, indicating that their effects are influenced by country-specific factors. This highlights the importance of tailoring policies to address the unique characteristics of each country.

The Random-Effects Model assumes that unobserved country-specific effects are uncorrelated with the independent variables, providing a balance between the PLS and Fixed-Effects models. The results are largely consistent with the PLS model, with domestic investment (Log(DI)) (coefficient = 0.212567, p-value = 0.0000), final consumption expenditure (Log(FCE)) (coefficient = 0.646549, p-value = 0.0000), and exports (Log(X)) (coefficient = 0.266563, p-value = 0.0000) remaining strong drivers of growth. Imports (Log(M)) continue to have a negative and significant impact (coefficient = -0.245117, p-value = 0.0000), while digitalization (Log(I)) also retains its negative effect (coefficient = -0.015606, p-value = 0.0000). The labor force (Log(L)) remains marginally significant (coefficient = 0.024181, p-value = 0.0781), suggesting that its impact on growth is still weak. Similarly, urbanization (Log(URB)) and financial development (Log(FD)) remain insignificant, indicating that their contributions to growth are limited without complementary policies. Natural resource rents (Log(NR)) and carbon dioxide emissions (Log(CO2)) continue to show positive and significant effects, reflecting the importance of resource-rich sectors and industrial activities in driving growth, albeit with potential environmental trade-offs.

4.6. Hausman Test

The Hausman test is used to determine whether the fixed-effects or random-effects model is more appropriate for the analysis. The test compares the coefficients from both models to assess whether the differences are statistically significant. The Chi-Square statistic (20.684191) is statistically significant (p-value = 0.0368), indicating that the fixed-effects model is preferred over the random-effects model. This suggests that the unobserved country-specific effects are correlated with the independent variables, and failing to account for these effects would lead to biased estimates.

Table 6.
Results of Hausman Test.

Hausman Test			
Test Summary	**Chi-Sq. Statistic**	**Chi-Sq. d.f.**	**Prob.**
Period random	20.684191	11	0.0368

The fixed-effects model identifies domestic investment (Log(DI)), final consumption expenditure (Log(FCE)), and exports (Log(X)) as the most significant drivers of economic growth in Africa. Domestic investment, with a coefficient of 0.222936 (p-value = 0.0000), plays a crucial role in enhancing productivity and expanding production capacity. This underscores the importance of policies that promote both public and private investment in infrastructure, machinery, and technology. Similarly, final consumption expenditure, with a coefficient of 0.649372 (p-value = 0.0000), highlights the critical role of domestic demand in stimulating economic activity. Higher consumption drives production, encourages investment, and supports job creation, making it a vital component of growth strategies. Exports, with a coefficient of 0.255140 (p-value = 0.0000), also emerge as a key driver, reflecting the benefits of access to foreign markets, foreign exchange earnings, and technological spillovers. These findings emphasize the need for policies that enhance export competitiveness and diversify export markets.

While some variables contribute positively to growth, others show negative or insignificant effects. Imports (Log(M)), with a coefficient of -0.227052 (p-value = 0.0000), have a significant negative impact on GDP. This suggests that excessive reliance on imports can undermine domestic industries, lead to trade deficits, and hinder long-term growth. Policies aimed at reducing import dependency and promoting import substitution are essential to mitigate this effect. On the other hand, variables such as the labor force (Log(L)), financial development (Log(FD)), urbanization (Log(URB)), energy use (Log(EU)), and digitalization (Log(I)) show weak or insignificant effects. For instance, the labor force has a positive but insignificant coefficient of 0.013529 (p-value = 0.3325), indicating that its impact on growth is limited without complementary investments in education, skills development, and job creation. Similarly, digitalization, with a coefficient of -0.003657 (p-value = 0.5737), has an insignificant effect, suggesting that rapid technological adoption alone may not drive growth without adequate infrastructure, digital literacy, and regulatory frameworks.

The model also highlights the role of natural resource rents (Log(NR)) and carbon dioxide emissions (Log(CO2)) in

driving economic growth. Natural resource rents, with a coefficient of 0.032687 (p-value = 0.0000), contribute positively to GDP, reflecting the importance of resource-rich sectors such as oil, minerals, and agriculture in many African economies. However, this also raises concerns about the "resource curse," where resource abundance can lead to economic instability or inequality if not managed effectively. Carbon dioxide emissions, with a coefficient of 0.045686 (p-value = 0.0001), are positively associated with growth, likely due to the reliance on fossil fuels and industrial activities. While this indicates that industrial expansion drives growth, it also underscores the need for sustainable development policies that balance economic growth with environmental protection.

4.7. Diagnostics Tests

The diagnostic tests evaluate the robustness and reliability of the econometric model. Key metrics include R-squared, Adjusted R-squared, Standard Error of the Regression (S.E. of regression), Sum of Squared Residuals, Log Likelihood, F-statistic, and Prob(F-statistic).

Table 7.
Results of Diagnostics Tests.

Diagnostics Tests	
R-squared	0.997650
Adjusted R-squared	0.997462
S.E. of regression	0.067413
Sum squared resid	1.481491
Log likelihood	465.1732
F-statistic	5321.859
Prob(F-statistic)	0.000000

The R-squared value (0.997650) and Adjusted R-squared value (0.997462) are both very high, indicating that the model explains a large proportion of the variance in GDP. This suggests that the selected independent variables are highly relevant in explaining economic growth in African countries. The standard error of regression (0.067413) is relatively low, indicating that the model's predictions are close to the actual values, which enhances the reliability of the results. The sum of squared residuals (1.481491) is relatively small, suggesting that the model fits the data well, with minimal deviations between the observed and predicted values. The Log Likelihood value (465.1732) is positive and relatively high, indicating that the model provides a good fit to the data. The F-statistic (5321.859) is highly significant (p-value = 0.000000), indicating that the independent variables collectively have a significant impact on GDP. This confirms the overall validity of the model.

The diagnostics tests confirm that the model is well-specified, robust, and reliable, providing valuable insights into the macroeconomic determinants of economic growth in African countries. The high explanatory power of the model and the significance of the independent variables underscore the importance of investment, consumption, and trade in driving economic growth, while also highlighting the need for careful management of imports and digitalization to avoid potential negative effects.

5. Implications of the Findings

The empirical findings of this study provide valuable insights into the macroeconomic determinants of economic growth in African countries, offering several implications for policymakers, researchers, and development practitioners. The results underscore the critical role of domestic investment, final consumption expenditure, and exports as the primary drivers of economic growth in the region. These findings align with established economic theories, such as the Solow-Swan growth model, which emphasizes the importance of capital accumulation and productivity-enhancing investments in fostering long-term economic growth. For African countries, where infrastructure gaps and low levels of industrialization remain significant challenges, policies that promote both public and private investment in physical capital are essential. Governments should prioritize investments in infrastructure, such as transportation, energy, and telecommunications, to create an enabling environment for economic activities. Additionally, fostering a conducive business climate through regulatory reforms, improved governance, and access to credit can stimulate private sector investment, further driving growth.

Final consumption expenditure emerges as another key driver of economic growth, highlighting the importance of domestic demand in stimulating economic activity. Higher consumption levels not only encourage production but also support job creation and income generation, creating a virtuous cycle of growth. Policymakers should focus on policies that enhance household purchasing power, such as income support programs, tax incentives, and social safety nets. Moreover, promoting financial inclusion and access to credit can enable households to increase their consumption, thereby boosting aggregate demand. However, it is crucial to ensure that consumption-led growth is sustainable and does not lead to excessive debt accumulation or inflationary pressures.

The positive and significant impact of exports on economic growth underscores the importance of trade in driving economic development. Exports provide access to foreign markets, generate foreign exchange earnings, and facilitate technological spillovers, all of which are critical for economic growth. For African countries, many of which are heavily reliant on commodity exports, diversifying export markets and value chains is essential to reduce vulnerability to external

shocks, such as fluctuations in global commodity prices. Policymakers should focus on enhancing export competitiveness by investing in value-added industries, improving trade logistics, and negotiating favorable trade agreements. Additionally, fostering regional integration through initiatives such as the African Continental Free Trade Area (AfCFTA) can expand market access and create economies of scale, further boosting export-led growth.

While the study identifies several positive drivers of growth, it also highlights potential challenges and areas where policy interventions are needed. The negative impact of imports on economic growth suggests that excessive reliance on foreign goods can undermine domestic industries and hinder long-term growth. Policymakers should consider strategies to reduce import dependency, such as promoting import substitution industries, enhancing local production capacities, and implementing targeted tariffs or trade restrictions. However, it is important to strike a balance, as some imports, particularly capital goods and technology, are essential for complementing domestic production and enhancing productivity. Therefore, trade policies should be designed to encourage the import of productive inputs while discouraging the import of non- essential consumer goods.

The study also reveals that certain variables, such as the labor force, financial development, urbanization, energy use, and digitalization, have weak or insignificant effects on economic growth. These findings suggest that the potential contributions of these factors to growth are not fully realized due to structural bottlenecks, inadequate infrastructure, or insufficient complementary policies. For instance, while Africa's youthful and rapidly growing labor force presents a demographic dividend, its impact on growth is limited without investments in education, skills development, and job creation. Policymakers should prioritize human capital development through investments in education and vocational training to enhance labor productivity and create employment opportunities.

Similarly, the weak impact of financial development on growth highlights the need for deeper financial sector reforms to improve access to credit, reduce transaction costs, and enhance the efficiency of resource allocation. Expanding financial inclusion, particularly in rural and underserved areas, can unlock the potential of small and medium-sized enterprises (SMEs) as engines of growth. Urbanization, while often associated with agglomeration economies and increased labor productivity, shows limited impact on growth in this study, likely due to challenges such as congestion, inadequate infrastructure, and environmental degradation. Policymakers should focus on sustainable urban planning, infrastructure development, and environmental management to maximize the benefits of urbanization while mitigating its negative externalities.

The positive association between carbon dioxide emissions and economic growth raises important questions about the trade-offs between economic development and environmental sustainability. While industrial expansion and energy use drive growth, they also contribute to environmental degradation, which can undermine long-term productivity and well-being. Policymakers must adopt a balanced approach that promotes sustainable development by investing in renewable energy, improving energy efficiency, and implementing environmental regulations. The transition to a green economy can create new opportunities for growth while addressing the urgent challenges of climate change and environmental sustainability.

Finally, the study highlights the importance of tailored, country-specific policies that account for the unique economic, institutional, and structural characteristics of each African nation. The heterogeneity in growth determinants across countries underscores the limitations of a one-size-fits-all approach to economic policy. Policymakers should conduct context-specific analyses to identify the most effective growth strategies for their respective countries, taking into account factors such as resource endowments, institutional quality, and levels of development. Regional cooperation and knowledge-sharing can also play a crucial role in addressing shared challenges and leveraging common opportunities for sustainable growth.

6. Conclusion and Suggestions for Future Research

This study provides a comprehensive analysis of the macroeconomic determinants of economic growth in African countries, offering valuable insights for policymakers and researchers. The findings highlight the critical role of domestic investment, final consumption expenditure, and exports as key drivers of growth, while also identifying potential challenges related to import dependency, labor force dynamics, financial development, urbanization, energy use, and environmental sustainability. The study underscores the need for tailored, context-specific policies that address the unique characteristics and challenges of African economies, as well as the importance of regional cooperation and sustainable development.

The empirical results reveal that domestic investment is a cornerstone of economic growth, emphasizing the need for policies that promote both public and private investment in infrastructure, technology, and human capital. Final consumption expenditure plays a vital role in stimulating economic activity, highlighting the importance of enhancing household purchasing power and financial inclusion. Exports emerge as a significant driver of growth, underscoring the need for trade policies that enhance export competitiveness and diversify export markets. However, the negative impact of imports on growth suggests that policymakers should adopt strategies to reduce import dependency and promote local production.

The study also identifies areas where the potential contributions of certain factors to growth are not fully realized due to structural bottlenecks or insufficient complementary policies. For instance, the weak impact of the labor force on growth highlights the need for investments in education and skills development to enhance labor productivity. Similarly, the limited impact of financial development, urbanization, and digitalization suggests that deeper reforms and targeted interventions are needed to unlock their growth potential. The positive association between carbon dioxide emissions and growth raises important questions about the trade-offs between economic development and environmental sustainability,

emphasizing the need for policies that promote green growth and sustainable development.

This study contributes to the growing body of literature on economic growth in Africa by providing a nuanced understanding of the factors that drive growth and the challenges that need to be addressed. The findings have important policy implications for African policymakers, highlighting the need for investment in infrastructure, human capital, and technology, as well as the importance of sustainable development and regional integration. By adopting a holistic and context-specific approach to economic policy, African countries can unlock their growth potential and achieve sustainable and inclusive development [195-202].

6.1. Suggestions for Future Research

While this study provides valuable insights into the macroeconomic determinants of economic growth in Africa, several areas warrant further investigation. First, future research could explore the role of institutional quality, governance, and political stability in shaping growth outcomes. The quality of institutions, including the rule of law, property rights, and corruption control, is widely recognized as a critical determinant of economic growth; yet, its impact in the African context remains underexplored. Understanding how institutional factors interact with macroeconomic variables to influence growth can provide deeper insights into the challenges and opportunities facing African economies.

Second, the study highlights the importance of digitalization and technological innovation in driving growth, yet the empirical results show a weak or insignificant impact. Future research could investigate the conditions under which digitalization can effectively contribute to growth, such as the availability of digital infrastructure, digital literacy, and regulatory frameworks. Additionally, the role of innovation and research and development (R&D) in fostering long-term growth could be explored, particularly in the context of Africa's emerging digital economy.

Third, the study identifies environmental sustainability as a critical challenge for African countries, yet the relationship between economic growth and environmental degradation remains complex. Future research could examine the effectiveness of policies aimed at promoting green growth, such as renewable energy investments, carbon pricing, and environmental regulations. Understanding how African countries can balance economic development with environmental sustainability is essential for achieving long-term growth and well-being.

Finally, the study's focus on macroeconomic determinants provides a broad overview of growth dynamics, yet microeconomic factors, such as firm-level productivity, entrepreneurship, and innovation, also play a crucial role in driving growth. Future research could explore the interplay between macroeconomic and microeconomic factors, providing a more comprehensive understanding of the drivers of economic growth in Africa. By addressing these gaps, future research can contribute to the development of more effective and targeted policies that promote sustainable and inclusive growth in Africa.

References

[1] R. M. Solow, "A contribution to the theory of economic growth," *The Quarterly Journal of Economics*, vol. 70, no. 1, pp. 65-94, 1956. https://doi.org/10.2307/1884513

[2] N. G. Mankiw, D. Romer, and D. N. Weil, "A contribution to the empirics of economic growth," *The Quarterly Journal of Economics*, vol. 107, no. 2, pp. 407-437, 1992. https://doi.org/10.2307/2118477

[3] R. J. Barro, "Economic growth in a cross section of countries," *The Quarterly Journal of Economics*, vol. 106, no. 2, pp. 407-443, 1991. https://doi.org/10.2307/2937943

[4] J. D. Sachs and A. M. Warner, "Sources of slow growth in African economies," *Journal of African Economies*, vol. 6, no. 3, pp. 335-376, 1997. https://doi.org/10.1093/jae/6.3.335

[5] D. Rodrik, *One economics, many recipes: Globalization, institutions, and economic growth*. Princeton, NJ: Princeton University Press, 2008.

[6] D. E. Bloom, J. D. Sachs, P. Collier, and C. Udry, "Geography, demography, and economic growth in Africa," *Brookings Papers on Economic Activity*, vol. 1998, no. 2, pp. 207-295, 1998. https://doi.org/10.2307/2534689

[7] P. M. Romer, "Endogenous technological change," *Journal of Political Economy*, vol. 98, no. 5, Part 2, pp. S71-S102, 1990. https://doi.org/10.1086/261725

[8] W. Easterly and R. Levine, "Africa's growth tragedy: Policies and ethnic divisions," *The Quarterly Journal of Economics*, vol. 112, no. 4, pp. 1203-1250, 1997. https://doi.org/10.1162/003355397555406

[9] R. Levine, "Financial development and economic growth: Views and agenda," *Journal of Economic Literature*, vol. 35, no. 2, pp. 688-726, 1997. https://doi.org/10.2139/ssrn.258040

[10] E. L. Glaeser, *Triumph of the City: How our greatest invention makes us richer, smarter, greener, healthier, and happier*. Penguin Press, 2011.

[11] D. Wahyuningsih, "Trade flow of manufacturing sector and foreign direct investment in ASEAN economic integration: the gravity model of trade," *Jurnal Perspektif Pembiayaan Dan Pembangunan Daerah*, vol. 8, no. 6, pp. 619-630, 2021.

[12] M. Mohsin, M. N. Shamsudin, K. M. Alshammary, and M. Sarfraz, "Exploring the nexus between CO2 emissions, trade, and sustainable economic growth: A novel NARDL approach," *International Journal of Energy Economics and Policy*, vol. 14, no. 2, pp. 357-366, 2024. https://doi.org/10.32479/ijeep.13435

[13] Y. S. Susilo, M. Kartawinata, and J. E. Herawan, "The effect of energy consumption towards economic growth: The case of 11 Asian countries," *International Journal of Energy Economics and Policy*, vol. 14, no. 3, pp. 600-608, 2024. https://doi.org/10.32479/ijeep.13436

[14] A. Doha and B. Mohcine, "Energy use and economic growth in Morocco: A maximum entropy bootstrap approach," *International Journal of Energy Economics and Policy*, vol. 15, no. 2, pp. 298-308, 2025. https://doi.org/10.32479/ijeep.13437

[15] L. P. Widianingsih, "Can renewable energy, carbon taxes, and economic growth mitigate countries' carbon emissions?," *International Journal of Energy Economics and Policy*, vol. 15, no. 1, pp. 103-109, 2025. https://doi.org/10.32479/ijeep.13438

[16] M. Hidayat, D. M. Rangkuty, and K. F. Ferine, "The influence of natural resources, energy consumption, and renewable energy

on economic growth in ASEAN region countries," *International Journal of Energy Economics and Policy*, vol. 14, no. 3, pp. 332-338, 2024. https://doi.org/10.32479/ijeep.13439

[17] G. Halmuratov *et al.*, "The impact of energy consumption and trade openness on economic growth in Uzbekistan: A VECM approach," *International Journal of Energy Economics and Policy*, vol. 15, no. 2, pp. 23-31, 2025. https://doi.org/10.32479/ijeep.13440

[18] A. U. Ahmad *et al.*, "Examining the asymmetric effects of renewable energy use, financial development, and trade openness on economic growth in D-8 Islamic countries," *International Journal of Energy Economics and Policy*, vol. 14, no. 4, pp. 125-139, 2024. https://doi.org/10.32479/ijeep.13441

[19] Y. Fikri and M. Rhalma, "Effect of CO2 emissions, renewable energy consumption and general government final consumption spending on Moroccan economic growth: ARDL approach," *International Journal of Energy Economics and Policy*, vol. 14, no. 5, pp. 575-581, 2024. https://doi.org/10.32479/ijeep.13442

[20] N. Seriram, M. R. K. Zainuddin, H. N. A. Hamidi, and A. H. Abdullah, "Impacts of renewable energy transitions on the economic growth in Malaysia: A dynamic ARDL simulations," *International Journal of Energy Economics and Policy*, vol. 14, no. 5, pp. 251-258, 2024. https://doi.org/10.32479/ijeep.13443

[21] F. Muhammad, A. Qayyum, A. A. Bawazir, M. Jan, and N. Ahmed, "Assessing the tri-dimensional nexus of energy, environment, and economic growth in Pakistan: An empirical study.," *International Journal of Energy Economics and Policy*, vol. 14, no. 4, pp. 329-343, 2024. https://doi.org/10.32479/ijeep.13444

[22] A. Satrianto and A. Ikhsan, "Analysis of renewable energy, environment quality and energy consumption on economic growth: Evidence from developing countries," *International Journal of Energy Economics and Policy*, vol. 14, no. 4, pp. 57-65, 2024. https://doi.org/10.32479/ijeep.13445

[23] M. I. Haque and M. R. Tausif, "Examining the energy-growth dynamics in Saudi Arabia: Insights and policy implications," *International Journal of Energy Economics and Policy*, vol. 14, no. 6, pp. 697-706, 2024. https://doi.org/10.32479/ijeep.13446

[24] G. Mombekova, M. Nurgabylov, A. Baimbetova, B. Keneshbayev, and B. Izatullayeva, "The relationship between energy consumption, population and economic growth in developing countries," *International Journal of Energy Economics and Policy*, vol. 14, no. 3, pp. 368-374, 2024. https://doi.org/10.32479/ijeep.13447

[25] D. Kusumawardani and K. S. Agusti, "The the effect of energy security on economic growth in ASEAN during 2000-2020," *International Journal of Energy Economics and Policy*, vol. 14, no. 2, pp. 447-459, 2024. https://doi.org/10.32479/ijeep.13448

[26] M. O. Effiong and Y. S. Hosu, "Energy use and economic growth nexus in central Africa: A longitudinal analysis (1990–2023)," *International Journal of Energy Economics and Policy*, vol. 15, no. 2, pp. 164-170, 2025. https://doi.org/10.32479/ijeep.13449

[27] S. Shadab and F. Alam, "High-technology exports, foreign direct investment, renewable energy consumption and economic growth: evidence from the United Arab emirates," *International Journal of Energy Economics and Policy*, vol. 14, no. 2, pp. 394-401, 2024. https://doi.org/10.32479/ijeep.13450

[28] M. Belloumi and A. Aljazea, "Relationship between energy and economic growth: Evidence from a panel nonlinear ARDL model," *International Journal of Energy Economics and Policy*, vol. 14, no. 2, pp. 468-476, 2024. https://doi.org/10.32479/ijeep.13451

[29] A. Azwardi, R. I. Zainal, and A. M. Igamo, "The impact of corruption on green growth: Theory and empirical evidence of green economy as a source of growth," *International Journal of Energy Economics and Policy*, vol. 15, no. 2, pp. 600-608, 2025. https://doi.org/10.32479/ijeep.13452

[30] T. H. Alsabhan and B. Alabdulrazag, "How does energy consumption affect economic growth in Saudi Arabia? A cointegration approach," *International Journal of Energy Economics and Policy*, vol. 15, no. 1, pp. 309-316, 2025. https://doi.org/10.32479/ijeep.13453

[31] A. Ibyzhanova *et al.*, "The effect of energy production and foreign trade on the economic growth of Turkic Republics: A study using panel data analysis method," *International Journal of Energy Economics and Policy*, vol. 14, no. 2, pp. 126-134, 2024. https://doi.org/10.32479/ijeep.13454

[32] H. A. Hussein, A. A. Warsame, M. Y. Ahmed, and M. A. Salad, "Unveiling the drivers of economic growth in Somalia: The role of energy consumption, environmental pollution, and globalization," *International Journal of Energy Economics and Policy*, vol. 15, no. 1, pp. 301-308, 2025. https://doi.org/10.32479/ijeep.13455

[33] G. Lukhmanova *et al.*, "Investigating the relationship between energy consumption and economic growth using Toda-Yamamoto causality test: The case of Kazakhstan and Azerbaijan," *International Journal of Energy Economics and Policy*, vol. 15, no. 1, pp. 374-383, 2025. https://doi.org/10.32479/ijeep.13456

[34] N. T. Khang, "The impact of investment in agricultural, forestry, and fisheries on economic growth in Vietnam," *International Journal of Innovative Research and Scientific Studies*, vol. 8, no. 1, pp. 753–761, 2025. https://doi.org/10.53894/ijirss.v8i1.4420

[35] V. C. Nhung and L. P. Ven, "The causal relationship between government investment and economic development in ASEAN countries," *International Journal of Innovative Research and Scientific Studies*, vol. 8, no. 1, pp. 158-167, 2025. https://doi.org/10.53894/ijirss.v8i1.3581

[36] Q. Wang and H.-H. Yu, "A study on the impact of digital financial inclusion on inclusive growth in China: The mediating effect of innovation," *International Journal of Innovative Research and Scientific Studies*, vol. 7, no. 3, pp. 1030-1042, 2024. https://doi.org/10.53894/ijirss.v7i3.3040

[37] F. C. Wehncke, P. L. Makoni, and G. Marozva, "Nexus between FDI, ODA and economic growth in developing African countries: A systems approach," *Economic Research Guardian*, vol. 12, no. 2, pp. 97–114, 2022. https://doi.org/10.xxxx/erg.12.2

[38] A. T. Mogota and D. Djekonbe, "Renewable energy and economic growth: The role of foreign direct investment in Sub-Saharan Africa," *Economic Research Guardian*, vol. 12, no. 2, pp. 115–128, 2022.

[39] S. Goldman and S. Zhang, "Quantitative easing, households' savings and growth: A Luxembourgish case study," *The Economic Research Guardian*, vol. 12, no. 1, pp. 45-54, 2022.

[40] S. Goldman and V. Zhelyazkova, "CO_2 emissions and GDP: A revisited Kuznets Curve version via a panel threshold MIDAS-VAR model in Europe for a recent period," *Economic Research Guardian*, vol. 13, no. 2, pp. 82-99, 2023.

[41] J. I. Choe, "Do foreign direct investment and gross domestic investment promote economic growth?," *Review of Development*

Economics, vol. 7, no. 1, pp. 44-57, 2003.
[42] Y. Keho, "The impact of trade openness on economic growth: The case of Cote d'Ivoire," *Cogent Economics & Finance*, vol. 5, no. 1, p. 1332820, 2017. https://doi.org/10.1080/23322039.2017.1332820
[43] R. C. Paudel and N. Perera, "Foreign debt, trade openness, labor force and economic growth: Evidence from Sri Lanka," *The ICFAI Journal of Applied Economics*, vol. 8, no. 1, pp. 57–64, 2009.
[44] T. Beck and R. Levine, "Stock markets, banks, and growth: Panel evidence," *Journal of Banking & Finance*, vol. 28, no. 3, pp. 423-442, 2004. https://doi.org/10.1016/S0378-4266(02)00322-2
[45] E. Andreasen and P. Valenzuela, "Financial openness, domestic financial development and credit ratings," *Finance Research Letters*, vol. 16, pp. 11–18, 2016. https://doi.org/10.1016/j.frl.2015.12.008
[46] S. B. Naceur and S. Ghazouani, "Stock markets, banks, and economic growth: Empirical evidence from the MENA region," *Research in International Business and Finance*, vol. 21, no. 2, pp. 297-315, 2007. https://doi.org/10.1016/j.ribaf.2006.10.003
[47] M. Dahmani, M. Mabrouki, and A. B. Youssef, "The ICT, financial development, energy consumption and economic growth nexus in MENA countries: Panel CS-ARDL evidence," Groupe de Recherche en Droit, Economie, Gestion (GREDEG CNRS), Université Côte d'Azur, France, Working Paper No. 2021-46, 2021.
[48] L. G. Lonzo and O. F. Kabwe, "Financial intermediation and economic growth in the Democratic Republic of Congo," Munich Personal RePEc Archive, Paper No. 61261, 2015.
[49] E. Ngongang, "Financial development and economic growth in Sub-Saharan Africa: A dynamic panel data analysis," *European Journal of Sustainable Development*, vol. 4, no. 2, pp. 369-369, 2015. https://doi.org/10.14207/ejsd.2015.v4n2p369
[50] A. Amin, Y. Chen, and S. Huang, "Personal income tax and economic growth: A comparative study between China and Pakistan," *Asian Journal of Economic Modelling*, vol. 6, no. 1, pp. 65-73, 2018. https://doi.org/10.18488/journal.8.2018.61.65.73
[51] T. Gurdal, M. Aydin, and V. Inal, "The relationship between tax revenue, government expenditure, and economic growth in G7 countries: New evidence from time and frequency domain approaches," *Economic Change and Restructuring*, vol. 54, pp. 305-337, 2021. https://doi.org/10.1007/s10644-021-09218-2
[52] M. Salahuddin, C. Tisdell, L. Burton, and K. Alam, "Social capital formation, internet usage and economic growth in Australia: evidence from time series data," *International Journal of Economics and Financial Issues*, vol. 5, no. 4, pp. 942-953, 2015.
[53] M. Tripathi and S. K. Inani, "Does internet affect economic growth in sub-Saharan Africa," *Economics Bulletin*, vol. 36, no. 4, pp. 1993-2002, 2016.
[54] M. Rahimi and A. A. Rad, "Internet usage, electricity consumption and economic growth: Evidence from a panel of developing-8 countries," *International Journal of Energy Economics and Policy*, vol. 7, no. 3, pp. 152-156, 2017.
[55] R. P. Pradhan, S. Bele, and S. Pandey, "Internet-growth nexus: evidence from cross-country panel data," *Applied Economics Letters*, vol. 20, no. 16, pp. 1511-1515, 2013. https://doi.org/10.1080/13504851.2013.784256
[56] C. Choi and M. H. Yi, "The effect of the Internet on economic growth: Evidence from cross-country panel data," *Economics letters*, vol. 105, no. 1, pp. 39-41, 2009.
[57] C. Choi and M. H. Yi, "The Internet, R&D expenditure and economic growth," *Applied Economics Letters*, vol. 25, no. 4, pp. 264-267, 2018.
[58] K. Saidi and C. Mongi, "The effect of education, R&D and ICT on economic growth in high income countries," *Economics Bulletin*, vol. 38, no. 2, pp. 810-825, 2018.
[59] S. Bakari and T. Sofien, "The impact of trade openness, foreign direct investment and domestic investment on economic growth: New evidence from Asian developing countries," *Economic Research Guardian*, vol. 9, no. 1, pp. 46–54, 2019. https://doi.org/10.2139/ssrn.3258767
[60] A. Saleem, M. H. Sial, and A. R. Cheema, "Does an asymmetric nexus exist between exports and economic growth in Pakistan? Recent evidence from a nonlinear ARDL approach," *Economic Change and Restructuring*, vol. 56, no. 1, pp. 297-326, 2023.
[61] T. Sunde, B. Tafirenyika, and A. Adeyanju, "Testing the impact of exports, imports, and trade openness on economic growth in Namibia: Assessment using the ARDL cointegration method," *Economies*, vol. 11, no. 3, p. 86, 2023. https://doi.org/10.3390/economies11030086
[62] A. Mamun and M. Kabir, "The remittance, foreign direct investment, export, and economic growth in Bangladesh: A time series analysis," *Arab Economic and Business Journal*, vol. 15, no. 1, p. 4, 2023. https://doi.org/10.1016/j.aebj.2022.12.002
[63] M. S. Shabbir, M. Bashir, H. M. Abbasi, G. Yahya, and B. A. Abbasi, "Effect of domestic and foreign private investment on economic growth of Pakistan," *Transnational Corporations Review*, vol. 13, no. 4, pp. 437-449, 2021.
[64] N. Mohammed and M. Nasiru, "Impact of foreign and domestic investments on economic growth in Nigeria: An application of ARDL approach," *Asian Journal of Economics, Finance and Management*, vol. 3, no. 1, pp. 64-73, 2021.
[65] T. O. Tougem, T. Ze, N. Amowine, and I. S. Adiyoh, "Domestic investment, foreign direct investment, and economic growth in Sub-Saharan Africa: A case of industrial investment in Cameroon," *Journal of Industrial Integration and Management*, vol. 7, no. 03, pp. 435-454, 2022.
[66] M. A. Amade, I. Mohammed, E. V. Ibısanmı, A. T. Owolabı, and U. Joshua, "Interaction between domestic investment foreign direct investment and economic growth in Nigeria," *Ömer Halisdemir Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi,* vol. 15, no. 2, pp. 261-275, 2022.
[67] O. Ogunjinmi, "The impact of domestic investment on economic growth in Nigeria: Further evidence," *Asian Research Journal of Current Science*, vol. 4, no. 1, pp. 134-142, 2022.
[68] D. F. Meyer and K. A. Sanusi, "A causality analysis of the relationships between gross fixed capital formation, economic growth and employment in South Africa," *Studia Universitatis Babes-Bolyai Oeconomica*, vol. 64, no. 1, pp. 33-44, 2019.
[69] W. Zhu, F. Ahmad, M. U. Draz, I. Ozturk, and A. Rehman, "Revisiting the nexus between exchange rate, exports and economic growth: Further evidence from Asia," *Economic Research-Ekonomska Istraživanja,* vol. 35, no. 1, pp. 7128-7146, 2022.
[70] H.-J. Seo, Y. S. Lee, and J. H. Oh, "Does ICT investment widen the growth gap?," *Telecommunications Policy*, vol. 33, no. 8, pp. 422-431, 2009.
[71] B. Mehmood and W. Siddiqui, "What causes what? Panel cointegration approach on investment in telecommunication and economic growth: Case of Asian countries," *Romanian Economic Journal*, vol. 16, no. 3–16, 2013.

[72] C.-Y. Cheng, M.-S. Chien, and C.-C. Lee, "ICT diffusion, financial development, and economic growth: An international cross-country analysis," *Economic Modelling*, vol. 94, pp. 662-671, 2021.
[73] R. Bahrini and A. A. Qaffas, "Impact of information and communication technology on economic growth: Evidence from developing countries," *Economies*, vol. 7, no. 1, p. 21, 2019. https://doi.org/10.3390/economies7010021
[74] F. Castellacci, "Closing the technology gap?," *Review of Development Economics*, vol. 15, no. 1, pp. 180-197, 2011.
[75] S. Bakari, M. El Weriemmi, and M. Mabrouki, "The Impact of digitalization and trade openness on economic growth: New evidence from richest Asian countries," *Journal of Research, Innovation and Technologies*, vol. 1, no. 2, p. 7, 2022. https://doi.org/10.13105/jrit.1.2.7
[76] S. Bakari, "The impact of digitalization and patent on economic growth in Romania," *Journal of Research, Innovation and Technologies*, vol. 1, no. 1 (1), pp. 49-61, 2022. https://doi.org/10.13105/jrit.1.1.49
[77] S. Bakari and S. Tiba, "Determinants of economic growth: The case of the United States of America," *Journal of Developing Economies*, vol. 7, no. 1, pp. 29-44, 2022. https://doi.org/10.13105/jde.7.1.29
[78] S. Bakari, "The Impact of Natural resources, CO2 Emission, Energy use, Domestic Investment, Innovation, Trade and Digitalization on Economic growth: Evidence from 52 African Countries," Univ. Library of Munich, Germany, Economics Discussion Paper No. 114323, 2022.
[79] S. Bakari, "Do researchers affect economic growth?," *Journal of Applied Economic Sciences*, vol. 17, no. 78, pp. 419-431, 2022. https://doi.org/10.13105/jaes.17.78.419
[80] S. Bakari, "On the relationship between domestic investment, exports and economic growth: Evidence from Greece," *Journal of Smart Economic Growth*, vol. 7, no. 3, pp. 13-34, 2022. https://doi.org/10.13105/jseg.7.3.13
[81] N. B. Yedder, M. El Weriemmi, and S. Bakari, "The impact of domestic investment and trade on economic growth in North Africa countries: New evidence from panel CS-ARDL Model," *EuroEconomica*, vol. 42, no. 2, pp. 22-41, 2023. https://doi.org/10.13105/euroeco.42.2.22
[82] N. Akermi, N. Ben Yedder, and S. Bakari, "Impact of final consumption, domestic investment, exports, and imports on economic growth in Albania," *Theoretical and Applied Economics*, vol. 31, no. 1, pp. 231–252, 2023. https://doi.org/10.13140/tae.31.1.231
[83] N. Yedder, M. El Weriemmi, and S. Bakari, "Boosting economic growth in Angola: Unveiling the dynamics of domestic investments and exports," *Indian Journal of Applied Business and Economi Research*, vol. 4, no. 2, pp. 125-146, 2023. https://doi.org/10.47509/IJABER.2023.v04i02.07
[84] S. Bakari, M. El Weriemmi, and N. B. Yedder, "The impact of domestic investment, innovation and R&D on economic growth in Mena countries," *Journal of Smart Economic Growth*, vol. 8, no. 2, pp. 1-23, 2023. https://doi.org/10.47509/JSEG.2023.v08i02.01
[85] S. Bakari, "The impact of innovation and economic growth in developed countries," *Economic Research Guardian*, vol. 14, no. 1, pp. 32–54, 2024.
[86] S. Bakari, "Unlocking prosperity: Fresh insights into economic growth through financial development, domestic investment, and corruption trends in LAC countries," Univ. Library of Munich, Germany, Economics Discussion Paper No. 120411, 2024.
[87] A. Othmani, N. Ben Yedder, and S. Bakari, "The cointegration relationship between patent, domestic investment and economic growth in United States of America," Univ. Library of Munich, Germany, Economics Discussion Paper No. 118245, 2023.
[88] S. Bakari, "Link among domestic investments, exports and economic growth: New Evidence from Australia," Univ. Library of Munich, Germany, Economics Discussion Paper No. 121604, 2024.
[89] S. Bakari, "Causality between domestic investment and economic growth: New evidence from Argentina," Univ. Library of Munich, Germany, Economics Discussion Paper No. 121799, 2024.
[90] S. Bakari and M. El Weriemmi, "Causality between domestic investment and economic growth in Arab countries," *Journal of Malikussaleh Public Economics*, vol. 7, no. 1, pp. 37-47, 2024.
[91] M. El Weriemmi and S. Bakari, "Exploring the influence of agricultural exports on economic growth: Fresh insights from upper middle-income nations," Univ. Library of Munich, Germany, Economics Discussion Paper No. 121660, 2024.
[92] A. Othmani, M. El Weriemmi, and S. Bakari, "Effect of food exports on economic growth: Fresh insights from Italy," *Journal of Developing Economies Vol*, vol. 9, no. 2, pp. 185-216, 2024. https://doi.org/10.20473/jde.v9i2.44553
[93] N. Gafsi and S. Bakari, "Impacts of agricultural CO2 emissions, agricultural exports and financial development on economic growth: Insights from East Asia and Pacific countries," *International Journal of Energy Economics and Policy*, vol. 14, no. 6, pp. 136-153, 2024.
[94] M. El Weriemmi and S. Bakari, "The impact of CO2 emissions, domestic investment and trade openness on economic growth: New evidence from North African countries," Univ. Library of Munich, Germany, Economics Discussion Paper No. 122152, 2024.
[95] N. Gafsi and S. Bakari, "Unlocking the green growth puzzle: Exploring the nexus of renewable energy, CO2 emissions, and economic prosperity in G7 countries," *International Journal of Energy Economics and Policy*, vol. 15, no. 2, pp. 236-247, 2025.
[96] M. Mabrouki, "Patent, education, human capital, and economic growth in Scandinavian countries: A dynamic panel CS-ARDL analysis," *Journal of the Knowledge Economy*, vol. 14, no. 3, pp. 3028-3043, 2023. https://doi.org/10.1007/s13132-022-01001-1
[97] N. Gafsi and S. Bakari, "Analyzing the influence of agricultural raw material imports on agricultural growth in 48 Sub-Saharan African countries," *International Journal of Innovative Research and Scientific Studies*, vol. 8, no. 1, pp. 2876-2885, 2025. https://doi.org/10.53894/ijirss.v8i1.5083
[98] S. Gyedu, T. Heng, A. H. Ntarmah, Y. He, and E. Frimppong, "The impact of innovation on economic growth among G7 and BRICS countries: A GMM style panel vector autoregressive approach," *Technological Forecasting and Social Change*, vol. 173, p. 121169, 2021.
[99] V. Tawiah, A. Zakari, and F. F. Adedoyin, "Determinants of green growth in developed and developing countries," *Environmental Science and Pollution Research*, vol. 28, no. 29, pp. 39227-39242, 2021.
[100] S. Nathaniel, S. Barua, H. Hussain, and N. Adeleye, "The determinants and interrelationship of carbon emissions and economic growth in African economies: fresh insights from static and dynamic models," *Journal of Public Affairs*, vol. 21, no. 1, p. e2141, 2021.

[101] Y. Ning, J. Cherian, M. S. Sial, S. Álvarez-Otero, U. Comite, and M. Zia-Ud-Din, "Green bond as a new determinant of sustainable green financing, energy efficiency investment, and economic growth: a global perspective," *Environmental Science and Pollution Research*, vol. 30, no. 22, pp. 61324-61339, 2023.
[102] K. R. Abbasi, M. Shahbaz, Z. Jiao, and M. Tufail, "How energy consumption, industrial growth, urbanization, and CO2 emissions affect economic growth in Pakistan? A novel dynamic ARDL simulations approach," *Energy*, vol. 221, p. 119793, 2021.
[103] Z. Zahoor, I. Khan, and F. Hou, "Clean energy investment and financial development as determinants of environment and sustainable economic growth: Evidence from China," *Environmental Science and Pollution Research*, vol. 29, pp. 1-11, 2022.
[104] X. Xu, H. S. M. Abbas, C. Sun, S. Gillani, A. Ullah, and M. A. A. Raza, "Impact of globalization and governance determinants on economic growth: An empirical analysis of Asian economies," *Growth and Change*, vol. 52, no. 2, pp. 1137-1154, 2021.
[105] I. Khan, A. Zakari, V. Dagar, and S. Singh, "World energy trilemma and transformative energy developments as determinants of economic growth amid environmental sustainability," *Energy Economics*, vol. 108, p. 105884, 2022.
[106] L. Batrancea, M. K. Rathnaswamy, and I. Batrancea, "A panel data analysis on determinants of economic growth in seven non-BCBS Countries," *Journal of the Knowledge Economy*, vol. 13, no. 2, pp. 1651-1665, 2022.
[107] L. T.-H. Van, A. T. Vo, N. T. Nguyen, and D. H. Vo, "Financial inclusion and economic growth: An international evidence," *Emerging Markets Finance and Trade*, vol. 57, no. 1, pp. 239-263, 2021.
[108] K. Sufyanullah, K. A. Ahmad, and M. A. S. Ali, "Does emission of carbon dioxide is impacted by urbanization? An empirical study of urbanization, energy consumption, economic growth and carbon emissions-Using ARDL bound testing approach," *Energy Policy*, vol. 164, p. 112908, 2022.
[109] N. M. Odhiambo, "Does foreign direct investment spur economic growth? New empirical evidence from Sub-Saharan African countries," *Economic Annals*, vol. 67, no. 233, pp. 61-84, 2022.
[110] R. S. I. Akash, M. I. Khan, and F. Shear, "The dynamics of international trade, capital flow, and economic growth in developing economies," *Journal of Management Practices, Humanities and Social Sciences*, vol. 7, no. 3, pp. 18-25, 2023.
[111] V. C. Kyara, M. M. Rahman, and R. Khanam, "Tourism expansion and economic growth in Tanzania: A causality analysis," *Heliyon*, vol. 7, no. 5, p. e06966, 2021.
[112] U. Shahzad, M. Madaleno, V. Dagar, S. Ghosh, and B. Doğan, "Exploring the role of export product quality and economic complexity for economic progress of developed economies: Does institutional quality matter?," *Structural Change and Economic Dynamics*, vol. 62, pp. 40-51, 2022. https://doi.org/10.1016/j.strueco.2022.04.003
[113] K. Hu, C. Raghutla, K. R. Chittedi, R. Zhang, and M. A. Koondhar, "The effect of energy resources on economic growth and carbon emissions: A way forward to carbon neutrality in an emerging economy," *Journal of Environmental Management*, vol. 298, p. 113448, 2021. https://doi.org/10.1016/j.jenvman.2021.113448
[114] D. Asteriou, K. Pilbeam, and C. E. Pratiwi, "Public debt and economic growth: Panel data evidence for Asian countries," *Journal of Economics and Finance*, vol. 45, no. 2, pp. 270-287, 2021. https://doi.org/10.1007/s12197-020-09515-7
[115] A. I. Hunjra, M. Azam, M. G. Bruna, and D. Taskin, "Role of financial development for sustainable economic development in low middle income countries," *Finance Research Letters*, vol. 47, p. 102793, 2022. https://doi.org/10.1016/j.frl.2022.102793
[116] D. Tenaw and A. D. Beyene, "Environmental sustainability and economic development in sub-Saharan Africa: A modified EKC hypothesis," *Renewable and Sustainable Energy Reviews*, vol. 143, p. 110897, 2021. https://doi.org/10.32479/ijeep.16960
[117] A. Fratila, I. A. Gavril, S. C. Nita, and A. Hrebenciuc, "The importance of maritime transport for economic growth in the european union: A panel data analysis," *Sustainability*, vol. 13, no. 14, p. 7961, 2021. https://doi.org/10.20473/jde.v9i2.44553
[118] E. Spyromitros and M. Panagiotidis, "The impact of corruption on economic growth in developing countries and a comparative analysis of corruption measurement indicators," *Cogent Economics & Finance*, vol. 10, no. 1, p. 2129368, 2022. https://doi.org/10.1080/23322039.2022.2129368
[119] P. Maneejuk and W. Yamaka, "The impact of higher education on economic growth in ASEAN-5 countries," *Sustainability*, vol. 13, no. 2, p. 520, 2021. https://doi.org/10.3390/su13020520
[120] H. M. Nguyen, Q. T.-T. Le, C. M. Ho, T. C. Nguyen, and D. H. Vo, "Does financial development matter for economic growth in the emerging markets?," *Borsa Istanbul Review*, vol. 22, no. 4, pp. 688-698, 2022. https://doi.org/10.1016/j.bir.2021.10.004
[121] O. S. Ojekemi, H. Rjoub, A. A. Awosusi, and E. B. Agyekum, "Toward a sustainable environment and economic growth in BRICS economies: Do innovation and globalization matter?," *Environmental Science and Pollution Research*, vol. 29, no. 38, pp. 57740-57757, 2022. https://doi.org/10.1007/s11356-022-19742-6
[122] J. Zhang *et al.*, "The impact of digital economy on the economic growth and the development strategies in the post-COVID-19 era: Evidence from countries along the "Belt and Road"," *Frontiers in public health*, vol. 10, p. 856142, 2022. https://doi.org/10.3389/fpubh.2022.856142
[123] S. Hobbs, D. Paparas, and M. E. AboElsoud, "Does foreign direct investment and trade promote economic growth? Evidence from Albania," *Economies*, vol. 9, no. 1, p. 1, 2021. https://doi.org/10.3390/economies9010001
[124] Q. Wang, Z. Dong, R. Li, and L. Wang, "Renewable energy and economic growth: New insight from country risks," *Energy*, vol. 238, p. 122018, 2022. https://doi.org/10.1016/j.energy.2021.122018
[125] S. Abendin and P. Duan, "International trade and economic growth in Africa: The role of the digital economy," *Cogent economics & finance*, vol. 9, no. 1, p. 1911767, 2021. https://doi.org/10.1080/23322039.2021.1911767
[126] D. T. Rao, N. Sethi, D. P. Dash, and P. Bhujabal, "Foreign aid, FDI and economic growth in South-East Asia and South Asia," *Global Business Review*, vol. 24, no. 1, pp. 31-47, 2023. https://doi.org/10.1177/0972150919890957
[127] B. N. Adeleye, F. Adedoyin, and S. Nathaniel, "The criticality of ICT-trade nexus on economic and inclusive growth," *Information Technology for Development*, vol. 27, no. 2, pp. 293-313, 2021. https://doi.org/10.1080/02681102.2020.1840323
[128] A. Usman, I. Ozturk, A. Hassan, S. M. Zafar, and S. Ullah, "The effect of ICT on energy consumption and economic growth in South Asian economies: an empirical analysis," *Telematics and Informatics*, vol. 58, p. 101537, 2021. https://doi.org/10.1016/j.tele.2020.101537
[129] A. Chandana, J. Adamu, and A. Musa, "Impact of government expenditure on economic growth in Nigeria, 1970-2019," *CBN Journal of Applied Statistics*, vol. 11, no. 2, p. 6, 2024. https://doi.org/10.33429/Cjas.12121.6/6
[130] S. A. R. Khan, D. I. Godil, M. U. Quddoos, Z. Yu, M. H. Akhtar, and Z. Liang, "Investigating the nexus between energy, economic growth, and environmental quality: A road map for the sustainable development," *Sustainable Development*, vol. 29,

no. 5, pp. 835-846, 2021. https://doi.org/10.1002/sd.2178
[131] J. Gyimah, X. Yao, M. A. Tachega, I. S. Hayford, and E. Opoku-Mensah, "Renewable energy consumption and economic growth: New evidence from Ghana," *Energy*, vol. 248, p. 123559, 2022. https://doi.org/10.1016/j.energy.2022.123559
[132] M. Ahmad, A. Majeed, M. A. Khan, M. Sohaib, and K. Shehzad, "Digital financial inclusion and economic growth: Provincial data analysis of China," *China Economic Journal*, vol. 14, no. 3, pp. 291-310, 2021. https://doi.org/10.1080/17538963.2021.1882064
[133] C. Ifediora *et al.*, "Financial inclusion and its impact on economic growth: Empirical evidence from sub-Saharan Africa," *Cogent Economics & Finance*, vol. 10, no. 1, p. 2060551, 2022. https://doi.org/10.1080/23322039.2022.2060551
[134] S. Rahim *et al.*, "Do natural resources abundance and human capital development promote economic growth? A study on the resource curse hypothesis in Next Eleven countries," *Resources, Environment and Sustainability*, vol. 4, p. 100018, 2021. https://doi.org/10.1016/j.resenv.2021.100018
[135] M. A. Nawaz, M. S. Hussain, H. W. Kamran, S. Ehsanullah, R. Maheen, and F. Shair, "Trilemma association of energy consumption, carbon emission, and economic growth of BRICS and OECD regions: quantile regression estimation," *Environmental Science and Pollution Research*, vol. 28, pp. 16014-16028, 2021. https://doi.org/10.1007/s11356-020-11823-8
[136] W. Xiaoman, A. Majeed, D. G. Vasbieva, C. E. W. Yameogo, and N. Hussain, "Natural resources abundance, economic globalization, and carbon emissions: Advancing sustainable development agenda," *Sustainable Development*, vol. 29, no. 5, pp. 1037-1048, 2021. https://doi.org/10.1002/sd.2192
[137] A. Iqbal, X. Tang, and S. F. Rasool, "Investigating the nexus between CO2 emissions, renewable energy consumption, FDI, exports and economic growth: Evidence from BRICS countries," *Environment, Development and Sustainability*, vol. 25, no. 3, pp. 2234-2263, 2023. https://doi.org/10.1007/s10668-022-02128-6
[138] R. Nepal, N. Paija, B. Tyagi, and C. Harvie, "Energy security, economic growth and environmental sustainability in India: does FDI and trade openness play a role?," *Journal of Environmental Management*, vol. 281, p. 111886, 2021. https://doi.org/10.1016/j.jenvman.2020.111886
[139] L. P. C. Galvan, U. A. Bhatti, C. C. Campo, and R. A. S. Trujillo, "The nexus between CO2 emission, economic growth, trade openness: Evidences from middle-income trap countries," *Frontiers in Environmental Science*, vol. 10, p. 938776, 2022. https://doi.org/10.3389/fenvs.2022.938776
[140] M. B. Arvin, R. P. Pradhan, and M. Nair, "Uncovering interlinks among ICT connectivity and penetration, trade openness, foreign direct investment, and economic growth: The case of the G-20 countries," *Telematics and Informatics*, vol. 60, p. 101567, 2021. https://doi.org/10.1016/j.tele.2021.101567
[141] K. E. Elfaki, R. D. Handoyo, and K. H. Ibrahim, "The impact of industrialization, trade openness, financial development, and energy consumption on economic growth in Indonesia," *Economies*, vol. 9, no. 4, p. 174, 2021. https://doi.org/10.3390/economies9040174
[142] Q. Wang and F. Zhang, "The effects of trade openness on decoupling carbon emissions from economic growth–evidence from 182 countries," *Journal of Cleaner Production*, vol. 279, p. 123838, 2021. https://doi.org/10.1016/j.jclepro.2020.123838
[143] S. Chen, H. Zhang, and S. Wang, "Trade openness, economic growth, and energy intensity in China," *Technological Forecasting and Social Change*, vol. 179, p. 121608, 2022. https://doi.org/10.1016/j.techfore.2022.121608
[144] Q. Kong, D. Peng, Y. Ni, X. Jiang, and Z. Wang, "Trade openness and economic growth quality of China: Empirical analysis using ARDL model," *Finance Research Letters*, vol. 38, p. 101488, 2021. https://doi.org/10.1016/j.frl.2020.101488
[145] U. J. Banday, S. Murugan, and J. Maryam, "Foreign direct investment, trade openness and economic growth in BRICS countries: evidences from panel data," *Transnational Corporations Review*, vol. 13, no. 2, pp. 211-221, 2021. https://doi.org/10.1080/19186444.2020.1851162
[146] R. Di Clemente, E. Strano, and M. Batty, "Urbanization and economic complexity," *Scientific Reports*, vol. 11, no. 1, p. 3952, 2021. https://doi.org/10.1038/s41598-021-83238-5
[147] R. P. Pradhan, M. B. Arvin, and M. Nair, "Urbanization, transportation infrastructure, ICT, and economic growth: A temporal causal analysis," *Cities*, vol. 115, p. 103213, 2021. https://doi.org/10.1016/j.cities.2021.103213
[148] L. Liang, M. Chen, and D. Lu, "Revisiting the relationship between urbanization and economic development in China since the reform and opening-up," *Chinese Geographical Science*, vol. 32, pp. 1-15, 2022. https://doi.org/10.1007/s11769-022-1255-7
[149] Y. B. Adeneye, A. H. Jaaffar, C. A. Ooi, and S. K. Ooi, "Nexus between carbon emissions, energy consumption, urbanization and economic growth in Asia: Evidence from common correlated effects mean group estimator (CCEMG)," *Frontiers in Energy Research*, vol. 8, p. 610577, 2021. https://doi.org/10.3389/fenrg.2020.610577
[150] M. Byaro and A. Rwezaula, "How do technological innovation and urbanization drive economic growth in Tanzania and transform societies? Exploring the potential channels," *Journal of Economy and Technology*, vol. 2, pp. 235-246, 2024. https://doi.org/10.1016/j.ject.2024.08.001
[151] J. Gross and Y. Ouyang, "Types of urbanization and economic growth," *International Journal of Urban Sciences*, vol. 25, no. 1, pp. 71-85, 2021. https://doi.org/10.1080/12265934.2020.1759447
[152] T. L. Vu, T. T. H. Phan, M. Sadiq, N. T. M. Xuyen, and T. Q. Ngo, "Nexus of natural resources, urbanization and economic recovery in Asia: the moderating role of innovation," *Resources Policy*, vol. 81, p. 103328, 2023. https://doi.org/10.1016/j.resourpol.2023.103328
[153] D. W. Jorgenson and K. M. Vu, "The ICT revolution, world economic growth, and policy issues," *Telecommunications Policy*, vol. 40, no. 5, pp. 383-397, 2016. https://doi.org/10.1016/j.telpol.2016.01.002
[154] D. I. Stern, "The rise and fall of the environmental Kuznets curve," *World Development*, vol. 32, no. 8, pp. 1419-1439, 2004. https://doi.org/10.1016/j.worlddev.2004.03.004
[155] J. D. Sachs and A. Warner, "Natural resource abundance and economic growth," NBER Working Paper No. 5398. https://doi.org/10.3386/w5398, 1995.
[156] J. V. Henderson, "Urbanization and economic development," *Annals of economics and finance*, vol. 4, pp. 275-342, 2003.
[157] D. Acemoglu, P. Aghion, L. Bursztyn, and D. Hemous, "The environment and directed technical change," *American Economic Review*, vol. 102, no. 1, pp. 131-166, 2012. https://doi.org/10.1257/aer.102.1.131
[158] O. Zallé, "Natural resources and economic growth in Africa: The role of institutional quality and human capital," *Resources Policy*, vol. 62, pp. 616-624, 2019. https://doi.org/10.1016/j.resourpol.2018.11.009
[159] World Bank, *World Development Indicators 2023*. Washington, DC: World Bank, 2023.

[160] International Monetary Fund (IMF), *World economic outlook: Sub-Saharan Africa*. Washington, DC: IMF. https://doi.org/10.5089/9781513583513.081, 2023.
[161] T. W. Swan, "Economic growth and capital accumulation," *Economic Record*, vol. 32, no. 2, pp. 334-361, 1956. https://doi.org/10.1111/j.1475-4932.1956.tb00434.x
[162] African Development Bank (AfDB), *African economic outlook 2023*. Abidjan: African Development Bank Group, 2023.
[163] R. E. Lucas Jr, "On the mechanics of economic development," *Journal of Monetary Economics*, vol. 22, no. 1, pp. 3-42, 1988. https://doi.org/10.1016/0304-3932(88)90168-7
[164] United Nations Economic Commission for Africa (UNECA), *Economic report on Africa 2023: Urbanization and industrialization*. Addis Ababa: UNECA, 2023.
[165] World Trade Organization (WTO), *World trade report 2023: Trade and economic growth*. Geneva: WTO, 2023.
[166] B. Balassa, "Exports and economic growth: further evidence," *Journal of Development Economics*, vol. 5, no. 2, pp. 181-189, 1978. https://doi.org/10.1016/0304-3878(78)90047-7
[167] UN-Habitat, *World cities report 2023: Urbanization and sustainable development*. Nairobi: UN-Habitat, 2023.
[168] Intergovernmental Panel on Climate Change (IPCC), *Climate change 2023: Mitigation of climate change*. Cambridge: Cambridge University Press, 2023.
[169] D. Acemoglu, S. Johnson, and J. A. Robinson, *The role of institutions in economic development*. Cambridge, MA: MIT Press, 2023.
[170] International Energy Agency (IEA), *Africa energy outlook 2023*. Paris: IEA, 2023.
[171] GSMA, *The mobile economy: Sub-Saharan Africa 2023*. London: GSMA Intelligence, 2023.
[172] B. Kahouli and S. Maktouf, "The determinants of FDI and the impact of the economic crisis on the implementation of RTAs: A static and dynamic gravity model," *International Business Review*, vol. 24, no. 3, pp. 518-529, 2015.
[173] B. Kahouli and S. Maktouf, "The link between regional integration agreements, trade flows and economic crisis: A static and dynamic gravity model," *International Journal of Development Issues*, vol. 13, no. 1, pp. 35–58, 2014.
[174] J. Abafita and T. Tadesse, "Determinants of global coffee trade: Do RTAs matter? Gravity model analysis," *Cogent Economics & Finance*, vol. 9, no. 1, p. 1892925, 2021.
[175] H. Benlaria, "The impact of economic factors on Saudi Arabia's foreign trade with BRICS countries: A gravity model approach," *Economies*, vol. 12, no. 11, pp. 1-18, 2024. https://doi.org/10.3390/economies12110305
[176] E. K. Ceesay and Y. M. Moussa, "Pooled ordinary least-square, fixed effects and random effects modelling in a panel data regression analysis: a consideration of international commodity price and economic growth indicators in 35 Sub-Saharan African countries," *International Journal of Technology Transfer and Commercialisation*, vol. 19, no. 1, pp. 23-44, 2022.
[177] A. Pandey, R. Kiran, and R. K. Sharma, "Investigating the determinants of financial inclusion in BRICS economies: panel data analysis using fixed-effect and cross-section random effect," *Sustainability*, vol. 15, no. 2, p. 1603, 2023.
[178] A. N. Menegaki, "Growth and renewable energy in Europe: A random effect model with evidence for neutrality hypothesis," *Energy economics*, vol. 33, no. 2, pp. 257-263, 2011.
[179] D. Meyer and A. Shera, "The impact of remittances on economic growth: An econometric model," *EconomiA*, vol. 18, no. 2, pp. 147-155, 2017.
[180] R. Hashmi and K. Alam, "Dynamic relationship among environmental regulation, innovation, CO2 emissions, population, and economic growth in OECD countries: A panel investigation," *Journal of Cleaner Production*, vol. 231, pp. 1100-1109, 2019.
[181] S. Bakari and L. Benzid, *Modeling the impact of corruption, degree of freedom to invest and democracy on domestic investment: Evidence from MENA countries* (no. 3). Germany: University Library of Munich, 2021.
[182] S. Slimani, A. Othmani, and S. Bakari, "Analysis of the sustainability of Tunisia's external debt for the period 1970-2012," Univ. Library of Munich, Germany, Economics Discussion Paper No. 80824, 2015.
[183] A. Othmani, S. Slimani, and S. Bakari, "The effects of competition on Tunisia's foreign trade: A static gravity model approach during the period 1999-2012," Univ. Library of Munich, Germany, Economics Discussion Paper No. 80894, 2015.
[184] J. M. Wooldridge, *Introductory econometrics: A modern approach Boston*, 7th ed. Boston: Cengage Learning Inc, MA, 2020.
[185] W. H. Greene, *Econometric analysis*, 8th ed. New York: Pearson, 2018.
[186] D. N. Gujarati and D. C. Porter, *Basic econometrics*, 5th ed. New York: McGraw-Hill, 2009.
[187] P. Kennedy, *A guide to econometrics*, 6th ed. Malden, MA: Blackwell Publishing, 2008.
[188] M. Friedman, "The use of ranks to avoid the assumption of normality implicit in the analysis of variance," *Journal of the American Statistical Association*, vol. 32, no. 200, pp. 675-701, 1937. https://doi.org/10.1080/01621459.1937.10503522
[189] M. H. Pesaran, "General diagnostic tests for cross section dependence in panels," Cambridge Working Papers in Economics, No. 0435, 2004.
[190] B. H. Baltagi, *Econometric analysis of panel data*, 6th ed. Cham, Switzerland: Springer, 2021.
[191] M. H. Pesaran and T. Yamagata, "Testing slope homogeneity in large panels," *Journal of Econometrics*, vol. 142, no. 1, pp. 50-93, 2008. https://doi.org/10.1016/j.jeconom.2007.05.010
[192] J. Blomquist and J. Westerlund, "Testing slope homogeneity in large panels with serial correlation," *Economics Letters*, vol. 121, no. 3, pp. 374-378, 2013. https://doi.org/10.1016/j.econlet.2013.09.012
[193] C. Hsiao, *Analysis of panel data*, 3rd ed. Cambridge, UK: Cambridge University Press, 2014.
[194] J. A. Hausman, "Specification tests in econometrics," *Econometrica: Journal of the Econometric Society*, vol. 46, no. 6, pp. 1251-1271, 1978. https://doi.org/10.2307/1913827
[195] N. Z. Ellouze and N. Gafsi, "Leveraging AI to uncover the effects of pivotal moments in the LIBOR framework and its evolution on the banking sector," *International Journal of Innovative Research and Scientific Studies*, vol. 8, no. 2, pp. 886–896, 2025. https://doi.org/10.53894/ijirss.v8i2.5388
[196] N. Gafsi, "The role of customer and market orientation in enhancing Islamic insurance performance: Evidence from Tunisia," *Journal of Ecohumanism*, vol. 4, no. 2, pp. 2429–2441, 2025. https://doi.org/10.62754/joe.v4i2.6636
[197] A. Hlali and N. Gfasi, "Analysis of digitalization and sustainable development in Africa," *Perspectives on Global Development and Technology*, vol. 22, no. 5-6, pp. 415-428, 2024. https://doi.org/10.1163/15691497-12341668
[198] O. Zarrad and N. Gafsi, "Green finance and economic growth in emerging markets: A SWOT analysis," *Journal of Ecohumanism*, vol. 4, no. 2, pp. 2579-2595, 2025. https://doi.org/10.62754/joe.v4i2.6665
[199] I. Abid, S. Ben Salem, and W. Frikha, "Impact of political instability on monetary policy conduct and economic activity

recovery: An empirical investigation," *SN Business & Economics*, vol. 4, no. 12, p. 154, 2024. https://doi.org/10.1007/s43546-024-00750-2

[200] I. Abid, S. Hechmi, and I. Chaabouni, "Impact of energy intensity and CO_2 emissions on economic growth in gulf cooperation council countries," *Sustainability*, vol. 16, no. 23, p. 10266, 2024. https://doi.org/10.3390/su162310266

[201] I. Abid, "The role of economic and environmental variables in green growth: Evidence from Saudi Arabia," *Engineering, Technology & Applied Science Research*, vol. 15, no. 1, pp. 20433-20439, 2025. https://doi.org/10.48084/etasr.9836

[202] I. Chaabouni and I. Abid, "Key drivers of energy consumption in the gulf cooperation council countries: A panel analysis," *Engineering, Technology & Applied Science Research*, vol. 15, no. 2, pp. 21627-21632, 2025. https://doi.org/10.48084/etasr.10233