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Financial Development and Economic Growth Nexus in Emerging Economies: The Role of National Security, Environmental Sustainability and Green Bonds

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Abstract

This study investigates financial development and economic growth and moderated for the role of national security, environmental sustainability and green bonds in the emerging economies using annual time series data which covered the period of 2000 to 2022, panel differenced and system generalized method of moment (GMM) as the baseline model as well as fully modified ordinary least squares (FMOLS) and dynamic ordinary least squares (DOLS) as the models for robustness checks. Financial development was stratified into financial development – financial institution access index and financial institution depths index and financial markets – measured with financial markets access index and financial markets depths index. Also, national security were measured with military expenditure, global peace index and global terrorism index, environmental sustainability was measured with indicators such as ecological footprint, biodiversity index and renewable energy share, while the green bonds were measured with environmental protection expenditure and carbon footprint of bank loans as we controlled for climate change and foreign remittances. Findings from the GMM results revealed that while financial development and green bonds shows positive and significant effects on the economic growth in the emerging economies, the national security had negative effects, while the environmental sustainability had significant negative and positive effects on the economic growth of the emerging economies and similar findings were made from the results of the robustness checks (FMOLS) and (DOLS). Also, from the results of the interactive effects financial development with national security, environmental sustainability green bonds, we found that the variables had significant effects on the economic growth. In addition, findings from the marginal effects (ME) and threshold effects (TH) results revealed that while financial

development improves economic growth, additional effects of national security, environmental sustainability and green bonds may have adverse effects on the economic growth in the emerging economies at a certain threshold. Based on these findings, this study recommends that financial development, national security and environmental sustainability should be improved by the authorities to forestall economic growth in the emerging economies.
Keywords: Economic Growth, Financial Development, National Security, Environmental Sustainability, Green Bonds

1. Introduction

Every nation prioritizes achieving economic growth, which is why governments pursue it through a variety of policies and goals (Schumpeter, 1911). Greater economic growth boosts business profitability, which permits increased investment in R&D, lowers poverty, improves infrastructure, and enhances people's quality of life (Biplob and Halder 2018). Economic growth can result in technological advancement, better lives and property, and willingness among businesses to take chances and innovate. It is critically important to the emerging economies in terms of poverty reduction, infrastructural development, investment and innovation, improvement of the standard of living and government revenue, increased global competitiveness, reduction of over-dependence on Aids, and increasing social stability by contributing to the drastic reduction of unemployment, inequality, and social unrest, thereby creating a more cohesive and prosperous society (Barro 2001). However, this cannot be properly achieved without taking into consideration some factors such as financial development, national security, environmental sustainability and green bonds. To this end, scholars are very curious to ascertain whether financial development promotes economic growth and development, with the majority of research suggesting that the development of an economy's financial sector is a prerequisite for economic expansion (Mckinnon 1973, Calderon & Liu 2002, Shaw 1973, Robinson 1952, Khalid & Marasco 2019). Nonetheless, economic growth may also occur as a result of the financial sector's expansion due to funding, the creation of new institutions, tools, and markets, and the maintenance of large investments (Guru and Yadav 2019). Besides, while exploring economic growth, authorities should not limit their considerations to financial development, rather, highlighting national security, environmental sustainability, and green bonds can also boost economic growth and development of emerging economies if properly harnessed.

Left for itself, economic growth cannot be fully achieved without the effects of financial development, because financial development plays crucial roles in improving economic growth in terms of capital formation, efficient resource allocations, risk diversifications, improvement of trade and commerce, entrepreneurship and innovation, and financial inclusion (Schumpeter 1911, Hurlin & Venet 2008). According to Bijlsma et al. (2018), financial development facilitates the best possible deployment of money and provides improved knowledge about potentially successful projects. This implies that strong, efficient and stable financial systems are required for achieving economic growth in the emerging economies. Thus, the reinforcement of financial systems like financial institutions and financial markets should be placed on a closer look for the achievement of economic growth in emerging economies. Many

researchers have numerously argued that financial development has a significant on economic growth (Alenoghena et al. 2020, Manasseh et al. 2021, Okunlola et al. 2020, Albert et al. 2022, Song & Appiah-Otoo 2022, Umar et al. 2021 and Akinlola et al. 2020), nevertheless, the discussion on the linkages between financial institution access and financial institution depths as well as financial market access and financial market depths and economic growth has not been fully addressed in the literature. In this light, prior studies may benefit from a deeper understanding of the influence of financial development, classified as financial institutions and financial markets (with emphasis on their access and depths) on economic growth.

For effective securitization of lives and properties, national security plays a crucial role in creating a conducive environment for economic activities by ensuring that a country's borders and sovereignty are protected against external threats, including aggression or invasion by other nations or non-state actors (Bezi et al. 2016). According to (Saba 2020), national security is capable of promoting economic growth by providing defence capabilities to prevent and defend against military aggression, terrorism, cyberattacks, insurgency, suicide bombing, war and other forms of asymmetric warfare essential for safeguarding national interests to ensure the safety of citizens. In this light, Aminu et al. (2023) argued that a secured nation is less vulnerable to internal and external conflicts, and violence since national security upholds law and order, prevents unrest and preserves the functioning of democratic institutions. National security therefore boosts economic growth by encouraging investment, promoting peace and order, and enhancing the security of lives and properties which raises investors' confidence, business confidence and global competitiveness as it attracts investment in the country, preserves the cultural heritage of the country, values and norms from external influences or threats that could undermine them, combat transnational threats like organized crimes, human trafficking, drug trafficking and terrorism (Yusuf & Mohd, 2023). However, prior studies like (Chuk et al. 2017, Saba 2020, Bezi et al. 2016, Zakaria et al. 2019, Saba & Ngepah 2021, Yusuf & Mohd 2023, Ngepah & Djemo 2019, Saba 2021, Saba 2019, Kabiru et al. 2021, and Aminu et al. 2023) argued that national security has significant impacts on the economic growth. As such, none of the above-mentioned studies viewed national security from military spending, global peace index and global terrorism index perspectives. This is therefore very important because it gives a holistic measure of the effects of national security of every nation on economic growth.

A multi-layered strategy that encompasses several linked factors like financing businesses with loans, extending financial services to the nuke and crannies, improving the quality of financial services by making it seamlessly safe, fast, convenient and secured, securitization of lives and properties, and improving the quality of the human living environment by safeguarding them against natural and human-induced disasters, can aid economic growth (Manasseh et al. 2024). However, the complex ramifications of these parameters, notably the human living environment, are influenced are influence by a variety of other factors such as environmental degradation, greenhouse gas emissions, carbon dioxide emissions and waste disposable management (Natufe & Osagie 2023). Environmental sustainability, for instance, has played a crucial role in fostering long-term economic growth. It aims at reducing pollution, improving are and water quality, regulating indiscriminate waste disposal minimizing exposure to harmful

substances which may hamper public health outcomes, lowering healthcare costs and improving the living conditions of the citizens (Abubabakar & Abdullahi, 2023). Some researchers (Lee, 2019) contended that the adoption of a sustainable environment can reduce resource consumption and waste generation, and encourage innovation in clean technologies, renewable energy, and efficient production processes which opens up new market opportunities and expands customer bases, stimulating economic activity and employment, contributing to better public health and wellbeing of people, promotes equitable access to resources and environmental benefits for all segments of society, including marginalized communities, aids in mitigating the impacts of environmental risks such as climate change, extreme weather events, and resource scarcity. However, the critical areas of environmental sustainability have not been exploited by the prior studies, hence there is a great need to evaluate the effects of environmental sustainability in the direction of carbon footprint, biodiversity and renewable energy on economic growth in the emerging economies.

Additionally, even with improved financial systems, national security and environmental sustainability, achieving this economic growth may be difficult without considering the green bond – financing environmental projects or one related to climate change through the green bond which allows for promoting sustainable economic growth by financing environmentally beneficial projects, stimulating innovation, attracting investment, improving access to cleaner energy sources and meeting regulatory requirements and demand for sustainability (Flammer 2021). Financial development is widely recognized as critical for financing green bond projects like the expansion of renewable energy sources such as biomass, solar, wind and hydroelectric power (Sangiopgi &Schopohh 2021). Investments in renewable energy and energy efficiency projects supported by green bonds contribute to reducing dependence on fossil fuels and enhancing energy security (Mitchel et al. 2024). This can lead to cost savings in energy expenditures, improved resilience to energy price fluctuations, and reduced environmental externalities associated with traditional energy sources. It can also encourage innovation and technological advancement in green technologies and practices. Companies and projects funded by green bonds often need to develop or adopt new technologies to meet green criteria and standards (Argandofia et al. 2022). Green bonds fund projects that can lead to improved public health outcomes, such as cleaner air and water, reduced pollution, and enhanced resilience to climate change impacts and better health and quality of life outcomes contribute to productivity gains, reduced healthcare costs, and overall societal well-being, which are all advantageous to economic growth initiatives (Lebelle et al. 2020).

In the light of the previous discussion, it could be deduced that a robust improvement in the financial system development, national security, environmental sustainability and green bonds must be encouraged to mitigate inadequate financial system development, high rate of insecurity, environmental unsustainability and poor green bod funding and their severe consequences on the economic growth. As a result, economic growth might be aided by fortifying financial institutions, financial markets, financial inclusion, financial innovation, improving robust national security architecture, improving environmental sustainability by making environmental protection laws to regulate the human living environment, and ensuring steady green funding (Manasseh et al. 2024). Moreover, improving financial development, and

national security, ensuring a sustainable environment and increasing the green bond to revitalize the health of financial systems, facilitating robust funding of military expenditure and securitization, activating laws and principles that guide the environmental utilization, and funding environmental and climate-related projects like solar system, clean energy, biomass, wind and hydroelectric power, may contribute to economic growth (Manasseh et al. 2024). So, while adopting renewable energy technologies, funding environmental and climate projects and improving national security could be very beneficial in improving economic growth on the one hand, developed financial institutions and financial markets can induce economic growth on the other hand (Manasseh et al. 2021). Considering the aforementioned, it becomes clear that there is a great need for a greater understanding of the role of financial development (financial institutions and financial markets), national security, environmental sustainability and green bonds on economic growth in emerging economies. Therefore financial institutions are measured with the financial institutions' access index and financial institution depth index, and financial markets are measured with the financial market access index, and financial markets depths index as well as national security – a measure of military spending, global peace index and global terrorism index; environmental sustainability – measured with carbon footprint, biodiversity index and renewable energy share and green bond which was measured with environmental protection expenditures and carbon footprint of bank loans were all investigated about economic growth in this study. Thus, this study is guided by the following research questions: a). What are the effects of financial development – financial institutions and financial markets that significantly influence economic growth in emerging economies? b). Does national security influence economic growth significantly in emerging economies? c). What is the role of environmental sustainability on economic growth in emerging economies? d). How does green bond financing influence economic growth in emerging economies?

To empirically investigate these questions, we used a dynamic generalized method of moment (GMM) that was robustly checked using the fully modified ordinary least squares (FMOLS) and dynamic ordinary least squares (DOLS), measured financial development with financial institutions – measured with financial institutions access index and financial institution depth index; and financial markets – measured with financial market access index, and financial markets depths index; as well national security – a measure of military spending, global peace index and global terrorism index; environmental sustainability – measured with carbon footprint, biodiversity index and renewable energy share and green bond which was measured with environmental protection expenditures and Carbon footprint of bank loans were all investigated about economic growth in the emerging economies. The existing empirical literature on financial development and economic growth has made limited efforts to deepen our understanding of the synergy between these indicators (Alenoghena et al. 2020, Akinlola et al. 2020, Manasseh et al. 2021, Albert, et al. 2022, Okunlola et al. 2020). Empirical studies have numerously made contributions toward assessing financial development and economic growth. However, these studies have failed to consider both financial institutions and financial markets such as the financial institution access index, financial institution depth index, financial market access index, and financial market depth index (Alenoghena et al. 2020, Akinlola et al. 2020, Manasseh et al. 2021, Albert, et al.2022, Okunlola et al. 2020). Moreover,

prior research concentrated on credit to the private sector to assess the relevance of financial development influence on economic growth (Otto 2016, Akpansung and Babalola 2016, Abdullahi and Adamu 2018), with a limited or no emphasis on indicators such as national security, environmental sustainability, and green bond. Thus, as at the time of writing this study, there is no empirical study on the synergies between financial institutions measured with financial institutions access index and financial institution depth index; and financial markets measured with financial market access index, and financial markets depths index as well as national security – a measure of military spending, global peace index and global terrorism index; environmental sustainability – measured with carbon footprint, biodiversity index and renewable energy share and green bond which was measured with environmental protection expenditures and Carbon footprint of bank loans were all investigated about economic growth in the emerging economies. This has led to discrepancies and misconceived findings in past empirical research, resulting in inconclusive policy outcomes. For instance, (Albert et al. 2022 and Umar et al. 2021) show that financial development improves economic growth, while (Song & Appiah-Otoo 2022, and Akinlola et al. 2020) found that it reduces economic growth respectively. Despite various government reforms and policies like Structural Adjustment Programme (SAP) as well as evidence provided by previous studies on economic growth (Alenoghena et al. 2020, Okunlola et al. 2020, Albert et al. 2022, Song & Appiah-Otoo 2022, Umar et al. 2021, Manasseh et al. 2021, Akinlola et al. 2020), economic growth in the emerging economies remained low compared to other regions. Amidst, it is appropriate to reevaluate economic growth in the light of the synergy between financial development which focuses on both financial institutions and financial markets, national security, environmental sustainability and green bonds, particularly in emerging economies, to gain a deeper understanding of their relationships.

This study lends to the body of existing literature in the following ways. Firstly, to the best of our understanding, this is the first empirical research to examine the synergy between financial development which focused on both financial institutions and financial markets, national security measured with – military expenditure, global peace index and global terrorism index, environmental sustainability measured with – carbon footprint, biodiversity and renewable energy share, green bond measured with environmental protection expenditures and Carbon footprint of bank loans in the emerging economies. Focusing on both financial institutions and financial markets to measure the nexus between financial development and economic growth, provides us the avenue to make substantial policy insights into the need to improve financial development for effective economic growth in emerging markets. Secondly, we investigate how national security affects economic growth. The purpose is to stress the importance of national security of lives and properties to economic growth in emerging economies since a secured nation provides the necessary conditions for businesses to thrive, investments to flourish, and economies to prosper over the long term (Chuk et al. 2017). The results of the research may offer an important indication of how effectively an emerging economy would secure lives and properties to forestall economic growth in the region. Thirdly, further steps were taken by examining the linkages between environmental sustainability and economic growth. In this context, we robustly investigated environmental sustainability using the carbon

footprint, biodiversity and renewable energy shares to ascertain their effects on economic growth in emerging economies. This gives an extra layer of insight and enables a more precise assessment of environmental sustainability, which might help to diversify economic growth in emerging economies.

Fourthly, this study investigated the effects of green bonds on economic growth. Green bonds play a crucial role in promoting sustainable economic growth by financing environmentally beneficial projects, stimulating innovation, attracting investment, improving energy security, and meeting regulatory and market demands for sustainability (Bhutta et al. 2022). This was also done by utilizing environmental protection expenditures and the Carbon footprint of bank loans to effectively measure green bonds in emerging markets. The results will facilitate policies toward the improvement of the understanding of the essence of funding environmental and climate-related projects. Fifth, most of the researchers were confident in the applicability of various techniques they employed to estimate their respective studies. For instance, despite the flaws of each of these techniques (Farjallah & Abdelhamid 2017, Kumar & Paramanik 2020, and Odugbesan et al. 2021) conducted their research using the autoregressive distributed lag model (ARDL) approach, (Alam et al. 2022) utilized the bootstrapped ARDL approach, while (Alenoghena et al. 2020) utilized the asymmetric cointegration and threshold analytical technique, respectively, without a robust check. However, we utilized the dynamic differenced and system generalized method of moment (GMM) as the baseline model and robustly checked the findings using the panel fully modified ordinary least squares (FMOLS) and panel dynamic ordinary least squares (DOLS). While the dynamic GMM is consistent in taking care of endogeneity, specification bias, serial correlation and overidentification of instruments, the FMOLS and DOLS models are also consistent in solving cross-sectional dependency problems that exist due to unobserved shocks and spatial effects. Furthermore, we conducted the interactive analysis by examining the interactive effects of national security, environmental sustainability, and green bonds on financial development to determine if there will be improvement in the economic growth of emerging or not. After this, we calculated the marginal effects (ME) and the threshold effects (TH) of national security, environmental sustainability, and green bonds on financial development to ascertain whether their additional effects can improve economic growth or not in emerging economies. The remainder of the study was organized as follows. Section 2 reviews the literature; Section 3 deals with materials and methods; Section 4 deals with empirical results and analysis; and Section 5 offers conclusion, policy implications, and recommendations.

2. Review of Related Theories and Empirical Studies

2.1 Theoretical Review

Since Schumpeter's (1911) initial study, there has been debate on the relationship between finance and economic growth in both industrialized and developing nations. He argues that a healthy financial sector is required to support the expansion of the real sector, which in turn spurs economic growth. Implying that the degree of development or deepening of the financial sector determines the rate of economic growth. Therefore, financial services are more readily available as the financial sector develops. In this view, the supply-leading hypothesis explains

how financial deepening helps to spur economic growth. The supply-leading theory is based on the main contention that financial development is the primary driver of economic growth. It asserts that the expansion of the financial sector leads to the best possible distribution of resources (Hurlin and Venet, 2008). According to the supply-leading theory, there is no feedback from economic growth in the causal relationship between finance and growth. The development of the financial sector is a prerequisite for economic expansion. To buttress this point, Mckinnon (1973) and Shaw (1973) argued that a well-developed financial sector improves financial intermediation by minimizing transaction and monitoring costs as well as asymmetric information and when the financial sector is well-developed, it facilitates the development of financial services and makes them more easily accessible when the actual sector of the economy needs them. Robinson (1952) introduced a counterargument to the supply-leading hypothesis when he claimed that economic expansion is a prerequisite for financial deepening. This position is ingrained in the growth-led or demand-following finance theory. It implies that financial development follows economic expansion as the causal relationship. As the economy grows, there is a greater need for financial services, which broadens the financial sector (Calderón and Liu, 2002). According to Singh (1999), an expanding economy leads to an increase in macroeconomic activity, which in turn fosters the growth of the financial sector.

In sum, this study draws on key theories linking finance, growth, and environmental sustainability. The supply-leading hypothesis suggests that financial development drives economic growth by improving resource allocation and reducing costs. Conversely, the growth-led theory posits that economic expansion creates demand for financial services, leading to financial sector growth. These perspectives are interconnected, with finance both influencing and being influenced by growth. Additionally, financial development can impact environmental sustainability through green investments and sustainable technologies. The framework expects financial deepening to promote growth (supply-leading), which may either harm or benefit the environment depending on investment focus. Variable selection is guided by these theories, with financial, economic, and environmental indicators reflecting hypothesized causal pathways. Explicitly linking these theories enhances the study's coherence and theoretical rigor.

2.2 Empirical Review

2.2.1 Financial Development and Economic Growth

According to empirical research, domestic credit and private domestic credit to GDP ratios have a favourable impact on output per capita, according to Botev et al. (2019). According to Kumar and Paramanik's (2020) research, sustained financial development contributes to economic growth. Additionally, Asteriou and Spanos (2019) show that financial development boosts economic growth in the absence of financial crises but hinders it when one occurs. Biplob and Halder (2018) show that there is a causal link between Bangladesh's economic growth and financial development. Taofeek & Olumuyiwa (2016) also discovered that capital investment and trade openness are essential for inclusive growth in Nigeria. According to Muhsin and Şerife (2016), per capita income and financial development have a major, beneficial influence on economic growth. Furthermore, Manasseh et al. (2021) found that financial development via financial intermediaries has an insignificant on economic growth. In

a similar vein, Ngong et al. (2021) found a long-term correlation between financial deepening and productivity in the manufacturing sector. Alenoghena et al. (2020) studied the impact of financial development on economic growth from 1980 to 2018. They determined that the financial development variables and economic growth are cointegrated in the long run. Okunlola et al. (2020) investigated the causal relationship between financial development indicators and economic growth using the Toda and Yamamoto approach for the period 1985 to 2015 and found a bi-directional causality between financial markets indicators and economic growth while unilateral causality running from stock market indicators to GDP was established. Albert et al. (2022) studied the impact of financial development on economic growth in Nigeria (1980-2019) and found that private sector credit had a significant positive impact on Nigeria's growth. Song & Appiah-Otoo (2022) employed a dataset that comprises 31 provinces in China to study the impact of financial technology (fintech) on economic growth from 2011 to 2017 and found that fintech has a positive impact on the economic growth of China. Umar et al. (2021) explored the impact of financial development on economic growth in Nigeria from 1980 to 2019 and discovered financial development shocks negatively impacted both short and long-term growth, with negative shocks having a similar effect. Akintola et al. (2020) studied the impact of financial sector development on economic growth in Nigeria using quarterly data between 2000Q1 and 2019Q4 and found that financial deepening, banking system liquidity and all share indexes had a positive and significant impact on the growth of real output in the long run.

2.2.2 National Security and Economic Growth

A different body of scholarship suggested that there could be a positive or negative correlation between national security and economic growth. According to one of the studies, by Isola et al. (2019), price, output, employment, security and defence spending, the sociopolitical environment, and several other factors are all significantly impacted by insecurity and anti-national activities. Chuku et al. (2019) discovered that terrorism causes economic activity to shift from private investment expenditure to government counterterrorism spending. Shabir et al. (2015) proposed that Pakistan's economic growth has been adversely impacted by terrorism. Similarly, Fatima et al. (2014) concluded that terrorist activity has an impact on India's economic growth. According to Tahar et al. (2018), terrorism has a beneficial impact on economic growth in both developed and developing nations. In a related vein, Dauda (2014) investigated how the Boko Haram situation affects Yobe State's economy and discovered that the state's socioeconomic activities were badly impacted by insecurity. According to Nkwatoh and Nathaniel (2018), contrary to what many economic theories suggest, insecurity just poses a threat to economic activity and has no detrimental effects on the overall economy. According to Ebipre and Wilson (2020), there has been a sharp fall in economic activity throughout Nigeria's geopolitical zones, and national instability has made it more difficult to achieve sustainable economic growth.

Research by Saba (2020), Chuk et al. (2017), Bezi et al. (2016), Zakaria et al. (2019), and Saba and Ngepah (2021) shows that terrorist activity makes businesses more vulnerable and hinders their potential to thrive. Consequently, military spending and industrialization have a long-term association. Similarly, Yusuf and Mohd (2023), Ngepah and Djemo (2019), Saba (2021), Saba

(2020), Saba (2019), Kabiru et al. (2023), and Aminu et al. (2023) investigate the following subjects: The degree of alignment between military spending and security implications for 34 African nations between 1990 and 2015; and the link between military expenditure and security results for 51 African countries between 2000 and 2018. These studies' findings demonstrated that: a) different security approaches, methods, or actions produce the same or similar results throughout Africa; b) military spending has a significant negative impact on growth in the continent; c) there is no evidence or support for the hypothesis that higher military spending causes economic growth or aligns economic outcomes in Africa; d) military expenditures and their ensuing security effects differ from nation to nation with different effects on economic growth in Africa; e) the increasing level of insecurity in Nigeria hurts the economy; and f) terrorism hinders economic growth, respectively.

2.2.3 Environmental Sustainability and Economic Growth

In the context of environmental sustainability, Alam et al. (2022) discovered a Granger causation relationship between the growth in CO2 emissions and the US economy. Additionally, Adams et al. (2020) discovered that environmental sustainability is lower in nations with high geopolitical risk reported. According to Khan et al. (2021), economic growth has a positive effect on CO2 emissions, suggesting that economic expansion reduces environmental sustainability. According to Zhang et al. (2021), real GDP has a positive effect on CO2 emissions, suggesting that an increase in GDP will result in less environmental sustainability in Malaysia. In a similar vein, Tafti and Mottaghitalab (2017) found that the consumption of renewable energy and economic growth are correlated. Both renewable and non-renewable energy consumption have a positive and considerable impact on economic growth, as shown by Atems and Hotaling's (2018) research; however, the former seems to have a bigger positive impact. According to Lee (2019), industrialization and economic expansion have come at the expense of environmental damage. According to Marinaş et al. (2018), there is no direct correlation between economic growth and the consumption of renewable energy, but over time, there is a directional association between the two.

Abubakar and Abdullahi (2023) analysed the impact of carbon dioxide emissions on economic growth in Nigeria from 1980 to 2020, exploring whether this relationship hinges on the level of financial development and the empirical evidence suggested limited long-term influence of CO2 emissions on economic growth independently. Natufe and Osagie (2023) focused on the interplay between carbon emissions and Nigeria's economic growth spanning from 1985 to 2021. The ARDL approach was used to analyse the data. Findings revealed a short-term positive impact of carbon emissions on economic growth. Relatedly, Borgi et al., (2023) conducted an empirical study examining the impact of environmental change on inclusive finance in African countries from 1996 to 2020. The study revealed a significant adverse effect of environmental change on inclusive finance while highlighting that government quality, particularly across political, institutional, and economic dimensions, plays a crucial role in moderating this relationship, indicating a positive influence on financial inclusion when economic governance is considered.

2.2.4 Green Bonds and Economic Growth

Flammer (2021) addressed green bonds as an efficient instrument to promote climate-friendly investments in countries. In another study, Tang and Zhang (2020) argued that green bonds could provide significant advantages for shareholders leading to a better green capital market. Bhutta et al. (2022) studied the impacts of green bonds and concluded that promoting green bonds helps combat environmental degradation. In another study, Wang et al. (2022) analyzed monthly data from 2011 to 2021 of different economies and found that issued green bonds significantly contribute to sustainable development. Tolliver et al. (2020) expressed that in line with the Paris Agreement, all countries try differently to promote green financing tools, and green bonds are among the most appropriate instruments. Voica et al. (2015) declared that promoting green investments is essential for countries to increase the share of consumption of green energy in the total energy consumption basket. While Hu et al. (2023) assert that investing in green projects fosters technological innovation, contributing to lower CO2 emissions, ElBannan and Löffler (2024) found that a significant portion of green bond financing fails to yield measurable environmental benefits.

Li et al. (2023) stress the role played by green finance in enhancing environmental quality. At the same time, Mitchell et al. (2024) and Velte (2023) introduce another perspective, providing evidence that investment in green bonds enhances the sustainability of business models by overcoming internal obstacles and fortifying corporate strategies, asset selection, and governance. Baltas and Mann (2024) demonstrate that green bond indices do not consistently outperform the market. Meanwhile, based on research by Argandoña et al. (2022), green bonds can positively and significantly influence economic growth in Latin American and Caribbean countries as measured by the percentage of the country's GDP. However, on the contrary, Lebelle et al. (2020) stated that the issuance of green bonds in developed countries has a more negative impact on the green bond market. Sangiorgi & Schopohl (2021) found that the majority of investors actively invest in the green bond market through various investment channels. Investors usually tend to choose green bonds issued by a company or country, however, investor demand for green bonds has not been fully met, especially from non-financial companies. According to the research results of Taghizadeh et al. (2021), green bonds in Asia tend to provide higher returns even though they have high risks. This is supported by research by Wang et al. (2020) who stated that the issuance of green bonds could provide many benefits for the green bond market in China.

2.3 Knowledge Gap

This study investigated financial development and economic growth in emerging economies and moderated the role of national security, environmental sustainability and green bonds from 2000 to 2022 and a critical overview of previous empirical studies revealed that the synergy between the phenomena has not been investigated especially in the emerging markets. Studies like (Albert et al. 2022, Manasseh et al. 2021, Akinlola et al. 2020, Alenoghena et al. 2020, Okunlola et al. 2020, Song & Appeah-Otoo 2022) highlight the importance of financial development on economic growth with the majority of the studies focused on the effects of financial development and economic growth (Albert et al. 2022, Manasseh et al. 2021), credit to the private sector and economic growth (Betove et al. 2019), and per capita income and

economic growth. However, none of the reviewed studies centred on investigating financial development in terms of financial institutions and financial markets. Therefore, given the importance of understanding the connections between financial development and economic growth, this study filled the gap in the existing literature by investigating the relationship between financial institutions access index, financial institutions depths index, financial markets access index, financial markets depths index on economic growth in the emerging economies.

Previous studies on national security and economic growth have focused on insecurity (Nkwatoh and Nathaniel 2018, Isola et al. 2019), terrorism (Shabir et al. 2015, Chuk et al. 2019, Tahar et al. 2018), and Boko Haram (Dauda 2014), respectively. However, the studies as mentioned above did not establish the link between the global peace index, global terrorism index and military expenditure holistically, despite their significance in driving economic growth, impacting the quality of security or lives and properties, international perception of a country and determining the quality of investors and investments attracted in the country. To address this gap, we investigated the link between military expenditure and economic growth, the global peace index and economic growth and the global terrorism index and economic growth in emerging economies, unlike the prior studies. These proxies are very crucial since many emerging economies have numerous significant security challenges that affect the economic progress of the nations. Consequently, information obtained from this investigation would aid the stakeholders and policymakers in making policies that would boost national security in emerging economies to forestall economic growth.

More so, lessons drawn from the literature reviewed show that in terms of synergy between environmental sustainability and economic growth, while some studies focus on CO2 emissions (Alam et al. 2019, Zhang et al. 2021, and Abubakar and Abdullahi 2023), renewable energy (Marinars et al. 2018, Tafti and Mottaghitalab 2017), environmental sustainability (Khan et al, 2021), energy consumption (Atems and Hotaling's 2018), and industrialization (Lee 2019). However, the prior studies failed to capture the effects of ecological footprint, biodiversity and renewable energy share which are very important in studying the synergy between environmental sustainability and economic growth. Haven observed this literature gap, this study therefore utilized the ecological footprint – a broader measure of environmental sustainability since it consists of six components namely: Carbon Footprint, Land Use, Water Use, Materials, Waste, and Pollution, which account for the various ways in which human activities impact the environment. In addition, we utilized biodiversity and renewable energy share which precious studies failed to capture. The essence of utilizing these proxies stems from the fact that the majority of emerging economies nations are faced with environmental issues and therefore need to be addressed effectively. Hence, the findings from this study would serve as a policy repository in the area of environmental sustainability in emerging economies.

Furthermore, some of the reviewed studies examined the connections between green bonds and economic growth (see: Velte 2023, Baltas & Mann, 2024, Tagghizadeh et al. 2021, Sangioogi & Schopohl 2021, Lebelle et al. 2020). It was observed that none of the previous studies utilized indicators like Environmental protection expenditures and carbon footprint of bank loans to measure the green bond like this present study. However, our core reasons for utilizing these

stems from the fact that emerging economies nations are mostly faced with climate-related issues which truncate economic activities in sectors like the agricultural and manufacturing sectors among others. This makes it difficult for the functionalities and operationalization of economic activities if not properly handled. Particularly, the outcome of this study will be very beneficial in climate change policies to solve related issues in emerging economies.

3. Data Source, Description and Econometric Model

3.1. Data Sources and Description

38 emerging economies were researched in the study, which ran from 2000 to 2022. Based on the availability of data, the study's countries were selected. The study examined the relationship between financial development and economic growth and moderated the role of national security, environmental sustainability and green bonds. Table 1 below lists the study's data along with the sources from which they were sourced.

Table 1: Definition of Variables and Data Source

Variable	Definition	Link to the Data	Source
RGDP	Real gross domestic product (Current US$)	https://data.worldbank.org/indicator/NY.GDP.MKTP.CD	World Bank's World Development Indicators (WDI)
FINAI	Financial Institution Access Index	https://data.imf.org/?sk=f8032e80-b36c-43b1-ac26-493c5b1cd33b	International Monetary Fund (IMF)
FINDI	Financial Institution Depths Index	https://data.imf.org/?sk=f8032e80-b36c-43b1-ac26-493c5b1cd33b	International Monetary Fund (IMF)
FIMAI	Financial Markets Access Index	https://data.imf.org/?sk=f8032e80-b36c-43b1-ac26-493c5b1cd33b	International Monetary Fund (IMF)
FIMDI	Financial Markets Depths Index	https://data.imf.org/?sk=f8032e80-b36c-43b1-ac26-493c5b1cd33b	International Monetary Fund (IMF)
EFP	Ecological Foot Print	https://www.footprintnetwork.org/licenses/public-data-package-free/?	Global Footprint Network
BDI	Biodiversity Index	https://databank.worldbank.org/metadataglossary/africa-development-indicators/series/ER.B	UNDP Geo Hub
RES	Renewable Energy Share	https://data.worldbank.org/indicator/EG.FEC.RNEW.ZS	World Bank's World Development Indicators (WDI)
MEXP	Military Expenditure	https://data.worldbank.org/indicator/MS.MIL.XPND.GD.ZS	World Bank's World Development Indicators (WDI)
GPI	Global Peace Index	https://www.visionofhumanity.org/wp-content/uploads/2022/06/GPI-2022-overall-scores-and-domains-2008-2022.xlsx	Institute of Economics and Peace

GTI	Global Terrorism Index	https://www.visionofhumanity.org/maps/global-terrorism-index/#/	Vision for Humanity
EPE	Environmental protection expenditures	https://data-explorer.oecd.org/vis?tenant=archive&df[ds]=DisseminateArchiveDMZ&df[id]=DF_EPER&df[ag]=OECD&dq=.....&lom=LASTNPERIODS&lo=5&to[TIME_PERIOD]=false	OECD Database
CFB	The carbon footprint of bank loans	https://climatedata.imf.org/datasets/596f11fea29d429ba6c5507e3756a751/explore	Climate Change Indicators Dashboard
CLI	Climate change – a measure of climate risk index	https://climateknowledgeportal.worldbank.org/	Climate change knowledge portal (historical data)
REM	Personal remittance received (% of GDP)	https://data.worldbank.org/indicator/BX.TRF.PWKR.DT.GD.ZS	World Bank's World Development Indicator (WDI)

Source: Conceived by the Author. Argentina, Bangladesh, Brazil, Bulgaria, Chile, China, Czech Republic, Egypt, Greece, Hungary, India, Indonesia, Iran, Israel, South Korea, Kuwait, Malaysia, Mauritius, Mexico, Morocco, Nigeria, Oman, Pakistan, Peru, Philippines, Poland, Qatar, Romania, Russia, Saudi Arabia, South Africa, Taiwan, Thailand, Turkey, Ukraine, United Arab Emirate, Venezuela, and Vietnam.

3.2. Model Specifications

3.2.1 Baseline Model – Differenced and System Generalized Method of Moment (GMM)

This study utilized a well-known estimation approach panel dynamic generalized method of moment (GMM) model. The model is considered the best estimator for this study due to its ability to measure the long-run relationship and solve the endogeneity, identification, and simultaneity restrictions. The panel model for the study is specified as follows.

$$Y_{i,t} = \alpha + \beta Y_{i,t-1} + \gamma X_{i,t-1} + \varepsilon_{i,t} \quad ---------- (1)$$

Where Y is the dependent variable, X stands for a vector of explanatory variables, φ_i is the time-invariant country-specific fixed effect, ε is the disturbance term which follows N (0, δ_2) and the subscripts "i" and "t" represent country and time, respectively.

Given that our panel has a big cross-section, N, and a short number of periods, T (i.e., number of cross-sections or countries, N = 38, and number of years, T = 21), the dynamic differenced and system GMM panel specification is the best suitable for this study. Based on the key characteristics listed below, which Blundell and Bond (1998) regarded as significant, this estimating technique turns out to be exceedingly perceptive, reliable, and highly appropriate. First, using the instrumentation process of the corresponding lags of independent variables, the GMM technique is particularly appropriate in addressing the endogeneity problem caused by the inclusion of the initial value of RGDP and other endogenous variables in the model. Secondly, it accounts for the heterogeneity that is visible or may be an inherent characteristic shared by emerging market economies and RGDP trends across time. Thirdly, it tackles the

issue of misspecification that typically arises with static models. The inclusion of a lagged dependent variable in GMM usually omitted in static models is important because of its robust influence in predicting the contemporaneous response of the dependent variable. Furthermore, given that the instruments weaken after estimating the first differenced GMM, Blundell and Bond (1998) have shown why the system GMM estimator is more effective than the differenced GMM estimator. Finally, even in the presence of persistent series and heteroscedasticity, the system GMM estimator robustly maintains consistency in the standard error (Blundell and Bond 1998; Bond et al. 2001). We utilized indicators such as carbon dioxide emissions (metric tons per capita), national security index, political stability index, climate change risk index, and personal remittances received (% of GDP), to measure the effects of national security, environmental sustainability, political stability, climate change, and remittances on financial development as well as the magnitude of their interaction on economic growth. We interacted the above indicators with financial development to understand the role the inflows of foreign remittances, a stable political environment, a safe and secure environment, and the mitigation of climate risk play in promoting economic growth in emerging economies. Thus, we modify the model as follows:

$$Y_{i,t} = \alpha + \beta Y_{i,t-1} + \gamma X_{i,t-1} + \rho Interact_{it} + \varphi_i + \varepsilon_{i,t} \quad ----------(2)$$

In equation (2) Y represents the gross domestic product (RGDP) which is the dependent variable, and X represent the vector of the explanatory variables (financial institutions access index, financial institution depths index, financial markets access index, financial markets depths index, climate change and foreign remittances), I indicates the cross-sectional index and ρ is the coefficients of the interactive variables military expenditure, global peace index, global terrorism index, ecological footprint, biodiversity index, renewable energy share, environmental protection expenditure, carbon footprint of bank loans.

Therefore, to estimate equation (2), it would be necessary to lag the dependent variable to overcome the endogeneity issues and country-specific effects (Hao 2006). Additionally, Levine and Zervos (1998) employed the explanatory variables' initial values as tools to eliminate the simultaneity issue in the econometric model; however, the outcomes led to information loss and possible consistency loss, making the estimation ineffective (Beck and Levine, 2004). However, the initial values of the explanatory variables should be replaced with the appropriate instruments for the model to be effective and consistent. In light of this, Blundell and Bond (1998) suggested an alternative estimator, the system GMM, after discovering that instruments lose their strength after the initial estimation.

$$Y_{i,t} - Y_{i,t-1} = \beta\left(Y_{i,t-1} - Y_{i,t-2}\right) + \gamma\left(X_{i,t} - X_{i,t-1}\right) + \left(\varepsilon_{i,t} - \varepsilon_{i,t-1}\right) ---------- (3)$$

In equation (3), first-differencing eliminates the intercept and the country-specific effects (η). However, the estimation of equation (3) will be biased and inconsistent, as the lagged dependent variable $\left(Y_{i,t-1} - Y_{i,t-2}\right)$ and the error term $\left(\varepsilon_{i,t} - \varepsilon_{i,t-1}\right)$ will be correlated and would render the explanatory variables to be endogenous (Hao, 2006). Therefore, Arellano and Bond (1991) posit that the model must pass the following moment conditions.

$$E\left[Y_{i,t-n}\left(\varepsilon_{i,t} - \varepsilon_{i,t-1}\right)\right] = 0 \text{ for } n \geq 2,\ t = 3, \ldots\ldots\ldots\ T$$

$E\left[X_{i,t-n}\left(\varepsilon_{i,t}-\varepsilon_{i,t-1}\right)\right]=0$ for $n\geq 2, t=3,\ldots\ldots\ldots\ldots T$

Certain conceptual concerns in a GMM novel, such as identification, simultaneity, and exclusion of restrictions, need to be clarified for easier comprehension and seamless presentation. Exclusion restriction is the process by which strictly exogenous variables influence the dependent variable only through the suspected endogenous explanatory variables. Identification is related to the choice of the dependent, endogenous, and strictly exogenous explanatory variables. The issue of simultaneity is addressed with past values of contemporaneous explaining variables as instruments (Asongu and Acha-anyi 2019). It is important to remember that all of the explanatory variables—aside from time-invariant indicators, which are thought to be strictly exogenous—should be predetermined or suspected endogenous variables (Boateng et al., 2018). This identification of time-invariant indicators as strictly exogenous is consistent with Roodman (2009b), who elucidated the reason why time-invariant indicators cannot become endogenous in the first difference. The Hansen J test of identifications is used as the statistical test to validate the variables that were chosen, and according to Beck et al. (2003), the null hypothesis of the underlying Sargan Overidentifying Restrictions Test should not be rejected for the strictly exogenous variables to explain the dependent variable solely through the channel of known or suspected endogenous variables. In addition, we estimated the Arellona-Bond serial correlations, which contain both AR1 and AR2, to make sure that the estimated findings do not contain AR2 (Arellano & Bond 1991).

3.2.2. Marginal and Threshold Effect

Furthermore, we calculated the marginal effect (ME) and threshold effect (TH) of national security (NSC), environmental sustainability (EVS) and green bonds (GBOND) on financial development (FD) in this study because of the role they play on the economic growth of emerging market countries, which previous research did not take into account. The marginal effect of national security (NSC), environmental sustainability (EVS) and green bonds (GBOND) on economic growth (RGDP) is determined by calculating the partial derivative of equation (3) concerning financial development (FD) as follows:

$$\frac{\partial RGDP_{i,t}}{\partial FD_{i,t}}=\aleph+\gamma NSC_{i,t} \quad \text{----------} \quad (4)$$

$$\frac{\partial RGDP_{i,t}}{\partial FD_{i,t}}=\beta+\omega EVS_{i,t} \quad \text{----------} \quad (5)$$

$$\frac{\partial RGDP_{i,t}}{\partial FD_{i,t}}=\varphi+\Omega GBOND_{i,t} \quad \text{----------} \quad (6)$$

Therefore, the coefficients ($\aleph$, β, and φ) in the partial derivative equations (4), (5), and (6) are the main focus of this study. If ($\aleph$, β, and φ) are negative (i.e., ($\aleph$, β, and $\varphi<0$) and ($\gamma, \omega, and\ \Omega$) are positive (i.e., $\gamma, \omega, and\ \Omega>0$), it implies that while national security, environment sustainability and green bonds have positive effects on economic growth; their interactive effects on the financial development may exert adverse effects on economic growth in the emerging economies. This suggests that as financial development increases economic growth, the additional effects of national security, environmental sustainability and green bonds

diminish economic growth of emerging economies. However, previous studies like Okere et al. (2022), and Ofori et al. (2023) argued that if the above conditions hold, the researcher should pertinently calculate the threshold levels of national security, environmental sustainability and green bonds since their coefficients have different signs and magnitudes. Thus, we present below their threshold level equations as follows.

$$NSC = \frac{\aleph}{\gamma}, EVS = \frac{\beta}{\omega}, GBOND = \frac{\varphi}{\omega}, \qquad (7)$$

The possibility of estimating equations (7) means that the marginal effects (ME) must be greater than zero, thus, this is shown in equations (8), (9) and (10) as in below.

$$ME < 0 \Rightarrow \begin{bmatrix} NSC < TH_{NSC}, forTH_{NSC} = \left(\frac{\aleph}{\gamma}\right) and\ \partial > 0 \\ NSC > TH_{NSC}, for\ TH_{NSC} = \left(\frac{\aleph}{\gamma}\right) and\ \partial < 0 \end{bmatrix} - - - - - - - - (8)$$

$$ME < 0 \Rightarrow \begin{bmatrix} EVS < TH_{EVS}, forTH_{EVS} = \left(\frac{\beta}{\omega}\right) and\ \theta > 0 \\ EVS > TH_{EVS}, for\ TH_{EVS} = \left(\frac{\beta}{\omega}\right) and\ \theta < 0 \end{bmatrix} - - - - - - - - - (9)$$

$$ME < 0 \Rightarrow \begin{bmatrix} GBOND < TH_{GBOND}, forTH_{GBOND} = \left(\frac{\varphi}{\omega}\right) and\ \emptyset > 0 \\ GBOND > TH_{GBOND}, for\ TH_{GBOND} = \left(\frac{\varphi}{\omega}\right) and\ \emptyset < 0 \end{bmatrix} - - - (10)$$

3.2.3. Model for Robustness Check – FMOLS and DOLS

Importantly, this study used two additional cointegration techniques—fully modified ordinary least squares (FMOLS) and dynamic ordinary least squares (DOLS)—to further robustly check the GMM model's results. The primary goal was to eliminate the influence of the cross-sectional dependence problem and the possibility that the error terms were contemporaneously associated, which the GMM model was unable to address. McCoskey and Kao (1998), Chiang (2000), Phillips & Moon (1999), and Pedroni (2000) have all made extensive use of the FMOLS and DOLS. Saikkonen (1992) and Stock and Watson (1993) advanced an asymptotically efficient estimator that eliminates feedback in the cointegrating system by augmenting the cointegrating regression with lags and leads of independent variables, which the DOLS estimator on the other hand finds problematic. Phillips and Hansen (1990) proposed a semi-parametric model for the correction of the problem of long-run correlation among cointegrating equations and stochastic regressors innovations, resulting in FMOLS estimators. As a result, the study provides a dynamic model where;

$$RGDP_{it} = \alpha_0 + \alpha_1 RGDP_{t-1} + \alpha_2 FD_{it} + \alpha_3 NSC_{it} + \alpha_4 EVS_{it} + \alpha_5 GBOND_{it} + \alpha_6 CLI_{it} + \alpha_7 REM_{it} + \alpha_8 Y_{it} + \sigma_t + \vartheta_t + \varepsilon_{it} - - - - - - - (11)$$

Where RGDP denotes the real gross domestic product – a measure of economic growth, $RGDP_{t-1}$ is the first difference of the economic growth, FD is the financial development which encompass indicators such as – financial institution access index, financial institution depth index, financial markets access index, and financial markets depths index, NSC is the national security – measured with military expenditure, , NSC is the national security, PINS is the

political instability, CLI is the climate change, REM is the remittances, Y is the set of control variables which include inflation rate (INFL) and exchange rate (EXCR).

The fundamental notion underlying both the DOLS and FMOLS estimators is for standard normal inference by correcting for serial correlation and endogeneity bias. If the variables are incorporated into I(0) or I(1) and do not have a unit root, FMOLS and DOLS can be estimated most effectively. The models address the issue of cross-sectional dependency, bias, and non-stationary explanatory factors. However, we used the FMOLS and DOLS models to estimate the long-run co-integrating vector between financial development and economic growth in emerging markets. Furthermore, to further explore the idea that financial development is not the only factor that determines economic growth, we also took into account the influence of national security, political unpredictability, environmental sustainability, climate change, and remittances by analyzing their relationship with financial development and determining whether there would be any changes. As a result, we outline the interacting effects model below. As a result, the following model describes the model for the interaction effects.

$$RGDP_{it} = \alpha_0 + \alpha_1 RGDP_{t-1} + \alpha_2 FD_{it} + \alpha_3 NSC_{it} + \alpha_4 EVS_{it} + \alpha_5 GBOND_{it} + \alpha_6 CLI_{it} + \alpha_7 REM_{it} + \alpha_8 Y_{it} + \rho Interact_{it} + \sigma_t + \vartheta_t + \varepsilon_{it} \quad ------(12)$$

Where α_0 is the constant, and $\rho Interact_{it}$ is the interactive term.

We selected GMM, FMOLS, and DOLS because each addresses specific econometric issues to ensure robust results. GMM effectively handles endogeneity, serial correlation, and cross-sectional dependence in short panels by using lagged instruments and system estimation, making it ideal for dynamic models with endogenous variables. FMOLS and DOLS complement this by providing long-run cointegration estimates that correct for serial correlation and endogeneity bias, especially addressing cross-sectional dependence. While GMM focuses on short-term dynamics and endogeneity, FMOLS and DOLS ensure the stability of long-run relationships, together enhancing the overall methodological rigor. Limitations, such as potential weak instruments in GMM and assumptions about stationarity in FMOLS and DOLS, are acknowledged, but their combined use strengthens the validity of the findings.

4. Results Presentation and Discussions

To estimate financial development and economic growth in emerging economies as well as to moderate the role of national security, environmental sustainability and green bonds, we ensured that the model variables passed through pre-estimation tests – unit root tests, Spearman's Correlation matrix test, and descriptive statistics to give further information about the variables before the GMM estimation. In addition, we employed various unit root tests including the Fisher-ADF, Fisher-PP (1999), Im, Pesaran & Shin - IPS (2003), and Levine Lin & Chu - LLC (2002). The results demonstrate that every variable has an integration order of 1~I(0) or 1~I(1). No variables were integrated to order 1~I(2). Thus, variables appear to have no unit roots, implying that all variables are stationary. Given the findings, the null hypothesis (H0), which assumes the existence of a unit root, is rejected. Before presenting the GMM results, we presented descriptive statistics which were used to enhance our data displays and Spearman Rank correlation results as below (see Tables 2 & 3).

4.1 Descriptive Statistics and Correlation Analysis

Table 2 shows the results of the descriptive statistics which calculates a basic summary of the variables used in a model. The mean, median, standard deviation, skewness, and kurtosis values did not deviate significantly from one another, according to our descriptive statistics data. This suggested that the variables are normally distributed since each of the variable's probability values for the Jarque-Bera statistics are less than 0.05, indicating that the variables are normally distributed and appropriate for the analysis of the given model. Also, the values of the mean, median, standard deviation, Kurtosis and Skewness for each of the model variables did not drift so much from each other and the mean variations in the series move from -9.210 to 21.85 which are the minimum and maximum variables in the series.

Table 2: Summary of Descriptive Statistics

	RGDP	FINAI	FINDI	FIMAI	FIMDI	EFP	BDI	MEXP	RES	GPI	GTI	EPE	CFB	CLI	REM
Mean	16.56	3.373	0.781	4.103	-0.281	-1.430	0.232	0.971	13.96	9.891	9.353	47.23	17.02	-0.512	35.17
Median	16.67	3.553	1.244	4.578	-0.237	-0.359	0.344	1.014	13.66	9.702	8.218	0.896	16.90	-0.723	43.91
Maximum	21.85	5.304	3.352	6.080	4.600	5.993	3.091	4.565	17.90	13.29	19.60	1.700	3.165	0.743	5.950
Minimum	10.05	0.698	-3.897	-4.605	-5.640	-9.210	-4.313	-3.925	7.857	9.242	4.948	0.564	8.150	-1.292	0.254
Std. Dev.	3.233	0.912	1.677	1.782	1.458	2.792	1.301	0.952	2.291	0.798	3.446	66.64	5.084	0.477	21.97
Skewness	-0.215	-0.401	-0.851	-2.482	1.020	-1.224	-0.222	-0.714	-0.174	3.044	1.047	0.757	0.230	0.031	-0.811
Kurtosis	1.984	2.911	3.097	9.226	7.531	3.905	2.582	5.264	2.775	11.84	3.874	1.733	3.328	1.283	2.012
Jarque-Bera	42.40	22.70	101.3	2095.	586.5	204.0	12.97	318.3	7.308	206.7	9.131	8.985	6.575	9.285	6.463
Probability	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.026	0.00	0.010	0.004	0.037	0.001	0.039
Obs.	836	836	836	793	570	718	836	836	836	836	836	836	793	570	718

Source: Computed by the Author.

Table 3 results present the nature and magnitude of the association between two ranking variables was also investigated using Spearman's rank correlation test. It shows how monotonous the connection it is when two variables or more are involved. This suggests that as one variable increases, the other tends to increase (or decrease). It does not necessarily require a linear relationship. The majority of the variables are slightly negatively correlated, according to the Spearman rho rule of thumb (0 to ±0.20 is inconsequential, ±0.21 to ±0.40 is weak, ±0.41 to ±0.60 is moderate, ±0.61 to 0.80 is strong, and ±0.81 to ±1.00 is regarded extremely strong). From the results, we discovered that financial development measures – FINAI, FINDI, FIMAI and FIMDI strongly and positively correlate with the economic growth of the emerging economies, which is similar to findings made from environmental sustainability measures – EFP, BODI and RES. It was further discovered that military expenditure has strong positive correlations with the economic growth of emerging economies, while the global peace index and global terrorism index showed strong negative correlations with emerging economies' growth. Other variables of the green bonds and control variables portrayed negative correlations with the economic growth in the emerging economies. Furthermore, there's a significant likelihood that changes in one variable will create a drift in

another since the variables are associated, which will keep the variable from returning to a steady long-term trend or average. Using the Levine Lin & Chu - LLC (2002), Im, Pesaran & Shin - IPS (2003), Fisher-ADF, and Fisher-PP (1999) unit root tests, we examined the variables throughout the panel lens to make sure there was no unit root (See Table 3).

Table 3: Summary of Spearman's Correlation Matrix

	RGDP	FINAI	FINDI	FIMAI	FIMDI	EFP	BODI	MEXP	RES	GPI	GTI	EPE	CFBL	CLI	REM
RGDP	1														
FINAI	0.574	1													
FINDI	0.516	-0.024	1												
FIMAI	0.464	0.045	0.034	1											
FIMDI	0.819	0.072	-0.174	-0.091	1										
EFP	0.913	0.845	0.097	-0.038	-0.241	1									
BDI	0.794	-0.057	0.121	0.024	-0.448	0.142	1								
RES	0.830	0.081	-0.155	-0.160	0.839	-0.221	-0.461	1							
MEXP	0.644	0.017	-0.116	-0.151	0.632	-0.142	-0.307	0.661	1						
GPI	-0.792	-0.024	-0.045	-0.071	0.293	-0.065	-0.185	0.309	0.254	1					
GTI	-0.843	-0.034	-0.156	-0.101	0.544	-0.187	-0.226	0.565	0.454	-0.063	1				
EPE	-0.970	-0.026	0.067	0.035	-0.201	0.031	0.068	-0.195	-0.148	-0.111	-0.179	1			
CFB	-0.873	0.039	-0.867	0.154	-0.188	-0.129	0.534	0.099	-0.151	-0.025	0.523	0.471	1		
CLI	-0.628	0.226	-0.639	-0.252	0.546	0.266	-0.296	0.043	-0.083	-0.010	0.025	0.985	0.528	1	
REM	-0.484	-0.128	-0.560	0.197	-0.034	-0.053	0.012	-0.038	-0.122	-0.045	-0.032	-0.028	0.889	0.366	1

Source: Computed by the Author

4.2. Testing for Unit Root

We employed various panel unit root tests such as Levine, Lin and Chu (LLC), as suggested by Levine et al. (2002), Im, Pesaran and Shin proposed by Im et al. (2003) and Fisher unit root tests – Fisher-ADF and Fisher-PP test as proposed by Madala and Wu (1999) for this purpose to test for stationarity and identify the order of integration of the variables for effective econometric decision making. These tests were developed with the null hypothesis "has a unit root" as the foundation, and the decision rule "if the probability value is less than 0.05, we will reject the null hypothesis and accept the alternative" as the decision rule. The unit root test results are shown in Table 4 below. However, based on Table 4's results, it can be concluded that the model variables do not have a unit root, making them appropriate for estimating the relationships under investigation. The results also indicate that no variable was found to be integrated of order I(2) – second difference and above, however, some variables are integrated of order I(0) – level and others are integrated of order I(1) – first difference. These results provide validation for the model's variables used in the estimation of the relationships examined in this investigation.

Table 4: Unit Root Test Results

Variable	LLC	IPS	Fisher-ADF	Fisher-PP	Level	First Diff.
RGDP	-16.67 (0.000)	-15.33 (0.000)	354.9 (0.000)	384.6 (0.000)	_	I(1)
FINAI	-17.22 (0.000)	-15.14 (0.000)	393.111 (0.000)	354.5 (0.000)	_	I(1)
FINDI	-24.50 (0.0000)	-22.26 (0.000)	523.6 (0.000)	1364. (0.000)	_	I(1)
FIMAI	-7.724 (0.000)	-9.016 (0.000)	228.7 (0.000)	236.7 (0.000)	I(0)	_
FIMDI	-27.06 (0.000)	-20.71 (0.000)	485.9 (0.000)	486.2 (0.000)	I(0)	_
EFP	-21.50 (0.000)	-20.81 (0.000)	496.1 (0.000)	501.8 (0.000)	I(0)	_
BDI	-18.50 (0.000)	-17.29 (0.000)	402.2 (0.000)	421.5 (0.000)	_	I(1)
RES	-33.42 (0.000)	-18.32 (0.000)	575.3 (0.000)	582.4 (0.000)	I(0)	_
MEXP	-12.60*** (0.000)	-39.64*** (0.000)	-2.837*** (0.002)	-41.27*** (0.000)	I(0)	_
GPI	-5.657*** (0.000)	-20.73*** (0.000)	-1.788** (0.036)	-20.74*** (0.000)	_	I(1)
GTI	-15.83*** (0.000)	-24.68*** (0.000)	-17.86*** (0.000)	-21.85*** (0.000)	_	I(1)
EPE	-25.31*** (0.000)	-5.050*** (0.000)	-16.52*** (0.000)	-8.267*** (0.000)	_	I(1)
CFB	-7.732*** (0.000)	-20.49*** (0.000)	-3.430*** (0.000)	-17.79*** (0.000)	_	I(1)
CLI	5.914*** (0.000)	343.2*** (0.000)	-2.859*** (0.001)	1227.*** (0.000)	I(0)	_
REM	-13.01*** (0.000)	328.9*** (0.000)	-14.45*** (0.000)	717.5*** (0.000)	I(0)	_

Source: Compiled by the Author; NB: ***, ** and * represent the 1%, 5% and 10 levels of significance, (.) represents the probability value, and I(0) and I(1) denote the integration order level and first difference

4.3 Testing for Cointegration

The results of the Kao and Pedroni cointegration tests, which serve as a robustness check, are shown in Table 5. Since the stationarity and integration order of the variables had been established, we used the aforementioned tests to investigate whether or not financial development, environmental sustainability, national security, green bonds and economic growth in emerging economies cointegrate. These tests were designed using "no cointegration" as the null hypothesis and "cointegration" as the alternative hypothesis. Nevertheless, given that the probability values of the majority of the seven Pedroni tests are less than 0.05, we can conclude financial development, environmental sustainability, national security, green bonds and economic growth in emerging economies are cointegrated. Also, Since the ADF-Statistic

coefficients were less than 0.05 for the models, the Kao cointegration test results also supported these conclusions.

Table 5: Results for Cointegration tests.

PEDRONI COINTEGRATION TEST				
Within Dimension				
TESTS	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Panel v-Statistic	-0.834 (0.797)	-2.915** (0.018)	8.038*** (0.000)	-0.774 (0.780)
Panel rho-Statistic	-4.340*** (0.000)	3.684*** (0.003)	6.975*** (0.000)	7.333*** (0.000)
Panel PP-Statistic	-10.05*** (0.000)	-1.836** (0.033)	-11.04*** (0.000)	-10.72*** (0.000)
Panel ADF-Statistic	-2.305** (0.010)	7.941*** (0.000)	-5.667*** (0.000)	-10.12*** (0.000)
Between Dimension				
Group rho-Statistic	-4.524*** (0.000)	8.770*** (0.000)	3.220*** (0.009)	8.934*** (0.000)
Group PP-Statistic	-14.18*** (0.000)	4.366*** (0.000)	-7.538*** (0.000)	-2.585*** (0.004)
Group ADF-Statistic	-3.266*** (0.000)	8.452*** (0.000)	6.846*** (0.000)	-6.087*** (0.000)
KAO (1999) COINTEGRATION TEST (ROBUSTNESS CHECK)				
ADF- Statistic	-6.889*** (0.000)	2.515*** (0.005)	-4.849*** (0.000)	-7.178*** (0.000)

Source: Compiled by the Author; NB: ***, ** and * represents the 1%, 5% and 10 level of significance, (.) represents the probability value

4.4 Analysis of the Baseline Differenced and System GMM Results

The long-run relationship between financial development, national security, environmental sustainability, green bonds and economic growth in emerging economies are shown in Table 6 and the different system panel generalized method of moment (GMM) were utilized for this analysis. The GMM model best estimates equations when they are integrated of level (I(0)) or first differenced (I(1)) other than the second difference (I(2)) and above. Furthermore, the GMM model is efficient in estimating the long-run relationships between the model variables and also consistent in solving some estimation problems like the endogeneity, heterogeneity, serial correlations, specification bias and instrumentation problems in the model. For clarity's sake, this analysis was stratified as follows – the general (which is the analysis of the panel generalized method of the moment) which was accompanied by an analysis of each of the interactive effects results of national security, environmental sustainability, and green bonds with the financial development as presented in the subsequent sections.

4.4.1 Analysis of the Panel Generalized method of moment (GMM)

The GMM results in Table 6 show that across differenced and system GMM, the past values of economic growth have negative and significant effects on the current economic growth values in the emerging economies except for model 1 in difference GMM. Following the GMM basic assumptions, for all the specified models, the system GMM was suggested as the most suitable

model since the results of the coefficients of the fixed effects models were greater than the coefficient of the lag of the dependent variables of the PMG. The results of the system GMM revealed that the financial development measures – financial institution access index (FINAI) have significant negative effects on the economic growth in emerging economies. Contrary to this, it was discovered that the Financial Institution Depth Index (FINDI), Financial Market Access Index (FIMAI) and Financial Markets Depths Index (FIMDI) portrayed significant positive effects on the economic growth of the emerging economies. Furthermore, the results also revealed that environmental sustainability (EVS) and its measures show mixed effects on economic growth in emerging economies. In model 1, the results of the ecological footprint showed significant negative effects on economic growth in emerging economies, the biodiversity index (BDI) depicted positive effects on economic growth in emerging as found in models 2 & 4, the renewable energy share (RES) showed significant negative long-run effects on economic growth in model 3 and also showed a significant positive long-run effects on economic growth in the emerging economies in model 4.

In the like manner, from our results, we found that national security (NSC) generally portrayed significant negative long-run effects on economic growth in emerging economies. Specifically, across models 1 – 4, the military expenditure (MEXP), the global peace index (GPI) and the global terrorism index (GTI) showed significant negative long-run effects on the economic growth in the emerging economies. But the green bonds measures – environmental protection expenditure (EPE) and carbon footprint of bank loans (CFB) positively depicted long-run significant effects on the economic growth in emerging economies. Also, the results of the control variables – climate change and remittances have significant effects on the economic growth in emerging economies. Findings further show that the instruments were not overidentified for the specified models and there was no trace of second-order serial correlations found in the models. These findings are in line with the findings that were previously made by (Alenoghena et al. 2020, Akinlola et al. 2020, Chuk et al. 2017, Alam et al. 2022) among others.

Table 6: Estimation of Panel Dynamic GMM

Variable	Diff GMM				System GMM			
	1	2	3	4	1	2	3	4
RGDP (-1)	0.890*** (0.000)	-0.752** (0.035)	-0.902*** (0.000)	-0.063*** (0.000)	0.646*** (0.000)	-0.441*** (0.000)	-0.903*** (0.000)	-0.164*** (0.000)
FINAI	0.110*** (0.000)				0.470*** (0.000)			
FINDI		-0.894*** (0.000)				0.347*** (0.000)		
FIMAI			-0.416*** (0.000)				0.026*** (0.000)	
FIMDI				-0.616*** (0.000)				0.229*** (0.000)
EFP	0.027*** (0.000)			0.081** (0.014)	-1.369*** (0.000)			0.008*** (0.000)
BDI		-0.536***		0.032***		0.912***		0.463***

		(0.000)		(0.000)		(0.000)		(0.001)
RES			0.878*** (0.000)	0.439 (0.310)			-0.877*** (0.000)	0.344*** (0.000)
MEXP	0.875*** (0.000)	-1.448* (0.052)	-0.387*** (0.000)	-0.524*** (0.000)	-0.242*** (0.000)	-0.090*** (0.000)	-0.125*** (0.000)	-0.025*** (0.000)
GPI	-0.896 (0.153)	0.725*** (0.000)	0.038*** (0.000)	1.448 (0.052)	-0.407*** (0.000)	-0.360*** (0.000)	-0.583*** (0.006)	-0.914*** (0.000)
GTI	0.951** (0.0154)	-0.292** (0.037)	0.823*** (0.000)	0.037*** (0.000)	0.442*** (0.000)	-0.786*** (0.000)	0.931*** (0.000)	-0.216*** (0.000)
EPE	-0.104** (0.0242)		0.823*** (0.000)		0.523*** (0.000)		0.900*** (0.000)	
CFB		1.859*** (0.000)		0.011** (0.013)		0.179*** (0.000)		0.180*** (0.004)
CLI	-0.479*** (0.000)	-0.288*** (0.000)	-0.061** (0.010)	-0.798*** (0.000)	0.525*** (0.000)	0.799*** (0.000)	0.804*** (0.000)	-0.494*** {0.005)
REM	-0.974*** (0.000)	9.602** (0.009)	-0.601*** (0.000)	2.058** (0.015)	0.927*** (0.000)	-0.112*** (0.000)	-0.987*** (0.000)	0.304*** (0.000)
No. of Obs.	836	831	835	836	836	836	814	824
PMG	-0.875	0.658	1.158	1.365	-0.175	0.658	1.158	1.365
Fixed Effects	0.987	5.021	2.265	6.365	0.987	5.021	2.265	6.365
AR1	1.996 (0.562)	6.365 (0.012)	2.584 (0.574)	0.444 (0.505)	1.996 (0.562)	6.365 (0.012)	2.584 (0.574)	0.444 (0.505)
AR2	2.584 (0.574)	0.458 (0.505)	1.02241 (0.857)	20.96 (0.573)	2.584 (0.574)	0.458 (0.505)	1.02241 (0.857)	20.96 (0.573)
Hansen	19.18 (0.967)	1.996 (0.562)	2.132 (0.573)	12.18 (0.667)	19.18 (0.967)	1.996 (0.562)	2.132 (0.573)	12.18 (0.667)

Source: Authors' Concept. ***p < 0.01, **p < 0.05, *p < 0.10. (.) represent the probability value. All the variables are in the natural log form except for those in rates

4.4.2 Analysis of the Interactive Effects of Environmental Sustainability with Fin Dev.

To deepen our understanding of the results, we conducted an interactive effect of environmental sustainability with financial development to sift their effects on the economic growth of the emerging economies which is the sole aim of the analysis in this section. We found that the past values of economic growth portrayed significant effects on the current economic growth values in emerging economies. The results findings evidenced that the interaction between the financial institution access index and ecological footprint (FINAI*EFP) have significant positive effects on the economic growth in emerging economies and similar results were found from FINDI*EFP which portrayed significant positive effects on the economic growth in the emerging economies. In addition, we found that the FIMAI*EFP has significant negative effects on economic growth, while the FIMDI*EFP has significant positive effects on the

economic growth of emerging economies. When we carried out the interaction between financial development and biodiversity it was found that negative but significant long-run relationships were found from FINAI*BDI, FINDI*BDI, FIMAI*BDI and FIMDI*BDI and economic growth in the emerging economies. Further explorations by interacting the renewable energy share (RES) and financial development, it was discovered that while FINAI*RES and FINDI*RES showed significant negative effects on the economic growth in emerging economies, FIMAI*RES and FIMDI*RES showed positive and significant effects on economic growth in emerging economies. These findings are in line with the earlier findings by scholars such as (Okunlola et al. 2020, Manasseh et al. 2021, Saba 2020, Abubakar & Abdullahi 2023) among others. Moreover, we did not find any trace of second-order serial correlations and the instruments of the models are not overidentified.

Table 7: Interacting Environmental Sustainability with Financial Development

Variable	Diff GMM					System GMM				
	1	2	3	4	5	1	2	3	4	5
RGDP (-1)	-0.668*** (0.000)	0.311*** (0.000)	0.121*** (0.000)	0.056*** (0.0051)	0.162*** (0.000)	-0.411*** (0.000)	-0.158*** (0.000)	-0.818 (0.228)	0.686 (0.000)	-0.982*** (0.000)
FINAI	-0.026*** (0.004)		-0.297*** (0.000)		-0.386*** (0.000)	10.27*** (0.000)		0.711 (0.171)		0.193** (0.000)
FINDI		0.488*** {0.000)					0.144*** (0.000)			
FIMAI			-0.884*** (0.000)					0.122 (0.256)		
FIMDI				0.323*** (0.0000)					0.011 (0.728)	
EFP	-0.349*** (0.000)					-93.08*** (0.0000)				
BDI	0.438*** (0.000)					0.180*** (0.000)				
RES	0.309*** (0.000)					-12.79*** (0.000)				
MEXP	0.276*** (0.000)	0.505** (0.017)	-0.371*** (0.000)	-0.445***	0.024*** (0.000)	-0.323***	0.092** (0.020)	-0.771 (0.946)	1.651 (0.615)	-0.128***

				(0.000)		(0.000)				(0.002)
GPI	0.051*** (0.000)	0.210*** (0.000)	-0.822*** (0.000)	0.878*** (0.000)	-0.416*** (0.000)	0.616*** (0.000)	-0.393*** (0.000)	-0.844 (0.000)	-0.566 (0.636)	-0.133*** (0.000)
GTI	-0.078*** (0.000)	0.113*** (0.000)	0.247*** (0.000)	0.784*** (0.000)	-0.013** (0.025)	-0.032*** 0.000)	-0.110*** (0.000)	-0.114** (0.020)	0.110 (0.864)	-0.741 (0.704)
EPE	-0.364** (0.000)	-0.016*** (0.000)	0.715*** (0.000)	-0.739*** (0.000)	-0.058*** (0.000)	0.419*** (0.000)	-4.089 (0.914)	-0.060*** (0.000)	-0.004 (0.840)	-0.128*** (0.002)
CFB	0.426*** (0.000)	-0.329*** (0.000)	-0.474*** (0.000)	-0.258** (0.002)	-0.874*** (0.000)	0.027*** (0.000)	-0.016 (0.527)	-0.070*** (0.001)	-0.192*** (0.000)	value
FINAI*EFP		-0.264*** (0.000)					0.542*** (0.000)			
FINDI*EFP			-0.956*** (0.000)					0.929*** (0.000)		
FIMAI*EFP				-0.112*** (0.000)					-0.193*** (0.000)	
FIMDI*EFP					0.130*** (0.000)					1.253*** (0.004)
FINAI*BDI		0.168*** (0.000)					-0.771*** (0.000)			
FINDI*BDI			-0.077*** (0.000)					-0.193*** (0.000)		
FIMAI*BDI				-0.875** (0.000)					-0.904** (0.013)	
FIMDI*BDI					-0.102*** (0.000)					-0.411*** (0.005)

FINAI*RES		-0.379*** (0.000)					-1.970*** (0.003)			
FINDI*RES			-0.241*** (0.000)					0.609*** (0.000)		
FIMAI*RES				-0.635** (0.000)					0.071*** (0.000)	
FIMDI*RES					0.292** (0.037)					0.313*** (0.000)
CLI	-0.358*** (0.000)	0.638*** (0.000)	-0.288*** (0.000)	-0.079*** (0.000)	0.734*** (0.000)	-0.151*** (0.000)	0.027*** (0.000)	-0.915*** (0.000)	-0.010 (0.594)	0.186*** (0.001)
REM	-0.384*** (0.000)	0.418*** (0.000)	-0.235*** (0.000)	0.978*** (0.000)	-0.965*** (0.000)	-0.208*** (0.000)	0.862*** (0.000)	0.075 (0.225)	0.034*** (0.000)	0.094*** (0.000)
No of Obs.	788	658	712	465	789	836	836	815	806	836
PMG	1.367	2.368	0.587	0.025	0.887	1.367	2.368	0.587	0.025	0.887
Fixed Effects	1.574	2.588	0.014	5.021	4.652	1.574	2.588	0.014	5.021	4.652
AR1	1.057 (0.388)	1.235 (0.187)	9.577 (0.342)	0.027 (0.880)	1.391 (0.563)	1.057 (0.388)	1.235 (0.187)	9.577 (0.342)	0.027 (0.880)	1.391 (0.563)
AR2	2.677 (0.889)	0.190 (0.663)	0.190 (0.663)	0.725 (0.485)	0.977 (0.378)	2.677 (0.889)	0.190 (0.663)	0.190 (0.663)	0.725 (0.485)	0.977 (0.378)
Hansen	7.099 (0.607)	1.933 (0.145)	6.738 (0.338)	14.11 (0.674)	1.295 (0.167)	7.099 (0.607)	1.933 (0.145)	6.738 (0.338)	14.11 (0.674)	1.295 (0.167)

Source: Authors' Concept. ***p < 0.01, **p < 0.05, *p < 0.10. (.) represent the probability value. All the variables are in the natural log form except for those in rates

4.4.3 Interactive Effects of National Security with Financial Development

Solely, our aim in this section is to investigate the interactive effects of national security with financial development to see if their effects will improve or hamper the economic growth of emerging economies. Findings from the estimated GMM results show that the past values of economic growth contributed significantly to the current values of economic growth in emerging economies. Further findings from the main models revealed that financial development, national security, environmental sustainability and green bonds portrayed significant effects respectively on the economic growth in emerging economies at various degrees. Finding from the interactive effects of financial institutions' access index and military expenditure shows that FINAI*MEXP FINDI*MEXP and FIMAI*MEXP have negative and insignificant effects on the economic growth of the emerging economies, while the FIMDI*MEXP showed a significant positive effect on the economic growth in the emerging economies. Similarly, we discovered that the FINAI*GPI, FINDI*GPI and FIMDI*GPI

portrayed significant negative effects on the economic growth of the emerging economies, while the FIMAI*GPI has significant positive effects on the economic growth of the emerging markets economies. Sequentially, findings from the results show that the interactive effects of national security and financial development revealed that FINAI*GTI, FINDI*GTI, FIMAI*GTI and FIMDI*GTI have significant negative effects on the economic growth of emerging economies. These findings are tallied with the previous findings made by scholars like (Saba 2020, Bezi et al. 2016, Zakaria et al. 2019, Albert et al. 2022) among others. However, we found that there is no existence of second-order serial correlations (AR2) which could make the results inconsistent and the results of the Hansen test for the models show that the instruments of the models were not overidentified.

Table 8: Interacting National Security with Financial Development

Variable	Diff GMM					System GMM				
	1	2	3	4	5	1	2	3	4	5
RGDP (-1)	-0.599*** (0.000)	0.066*** (0.000)	4.861*** (0.000)	-0.844*** (0.000)	-0.265*** (0.000)	-0.180*** (0.000)	0.277*** (0.000)	0.016*** (0.000)	0.013*** (0.010)	30.52*** (0.000)
FINAI	22.91*** (0.000)		-0.022** (0.038)		-0.246*** (0.000)	0.267*** (0.001)		0.018*** (0.0000)		0.825 (0.828)
FINDI		0.129 (0.086)					0.121*** (0.000)			
FIMAI			-1.235* (0.043)					7.083*** (0.000)		
FIMDI				-0.341** (0.025)					0.941*** (0.000)	
EFP	-0.024*** (0.000)	108.1*** (0.000)	-1.143** (0.018)	-1.151*** (0.000)	-1.112*** (0.000)	0.384*** (0.000)	-0.905*** (0.000)	-0.115*** (0.000)	1.991** (0.021)	0.450*** (0.000)
BDI	0.982*** (0.000)	0.136*** (0.000)	0.023*** (0.000)	0.205** (0.016)	0.713*** (0.000)	0.316*** (0.000)	0.255 (0.457)	-0.817 (0.526)	-0.210*** (0.000)	0.125*** (0.000)
RES	-0.376*** (0.000)	-0.510*** (0.000)	-0.545***	-0.016***	0.638*** (0.000)	0.609 (0.162)	1.146** (0.023)	1.385** (0.040)	-0.341 (0.561)	1.506 (0.540)

			(0.006)	(0.000)						
MSP	0.132 (0.574)					0.056 (0.454)				
GPI	-1.004 (0.648)					0.118 (0.133)				
GTI	2.007 (0.254)					0.515*** (0.000)				
EPE	1.132*** (0.000)	0.071*** (0.000)	0.873*** (0.000)	1.098*** (0.000)	0.005 (0.485)	0.834 (0.719)	-1.570 (0.162)	-0.834 (0.108)	0.793*** (0.000)	-0.079 (0.645)
CFB	0.085*** (0.000)	1.168*** (0.000)	0.251 (0.903)	0.067*** (0.000)	0.007 (0.965)	0.298 (0.820)	1.386*** (0.003)	0.032 (0.590)	-0.039 (0.690)	0.075 (0.552)
FINAI*MEXP		-0.589 (0.715)					-0.046 (0.248)			
FINDI*MEXP			0.025*** (0.003)					-1.073 (0.204)		
FIMAI*MEXP				0.725*** (0.003)					-0.021 (0.451)	
FIMDI*MEXP					0.286*** (0.000)					0.148*** (0.000)
FINAI*GPI		1.313 (0.103)					-0.361* (0.000)			
FINDI*GPI			-0.961*** (0.001)					-0.753** (0.012)		
FIMAI*GPI				-1.233*** (0.012)					0.676*** (0.000)	
FIMDI*GPI					2.251*** (0.000)					-11.42*** (0.000)
FINAI*GTI		-0.154*** (0.004)					-1.517** (0.014)			

FINDI*GTI			-1.181*** (0.000)					-0.271*** (0.000)		
FIMAI*GTI				-1.121*** (0.000)					-0.065** (0.019)	
FIMDI*GTI					-19.98** (0.027)					-1.073*** (0.004)
CLI	0.366*** (0.000)	-0.193*** (0.000)	-1.116** (0.033)	0.851*** (0.002)	0.365* (0.048)	0.156** (0.024)	-1.232 (0.435)	-0.093 (0.546)	0.675 (0.481)	0.718 (0.506)
REM	0.750*** (0.000)	0.153*** (0.000)	0.112** (0.000)	0.273*** (0.000)	1.570*** (0.002)	2.020*** (0.000)	0.657*** (0.000)	0.957*** (0.000)	0.462*** (0.000)	0.323*** (0.000)
No of Obs.	836	835	801	827	795	776	836	821	805	689
PMG	-0.693	1.015	0.025	1.058	-0.582	-0.693	1.015	0.025	1.058	-0.582
Fixed Effects	2.365	8.01	1.105	3.574	2.584	2.365	8.01	1.105	3.574	2.584
AR1	5.085 (0.124)	5.102 (0.824)	8.887 (0.117)	2.317 (0.128)	2.872 (0.573)	5.085 (0.124)	5.102 (0.824)	8.887 (0.117)	2.317 (0.128)	2.872 (0.573)
AR2	1.216 (0.296)	1.214 (0.270)	0.012 (0.909)	-0.566 (0.636)	6.119 (0.557)	1.216 (0.296)	1.214 (0.270)	0.012 (0.909)	-0.566 (0.636)	6.119 (0.557)
Hansen	0.254 (0.907)	0.525 (0.957)	0.370 (0.869)	0.741 (0.704)	8.006 (0.587)	0.254 (0.907)	0.525 (0.957)	0.370 (0.869)	0.741 (0.704)	8.006 (0.587)

Source: Authors' Concept. ***p < 0.01, **p < 0.05, *p < 0.10. (.) represent the probability value. All the variables are in the natural log form except for those in rates

4.4.4 Analysis of the Interactive Effects of Green Bonds on Financial Development

We carried out the analysis of the interactive effects of green bonds on financial development in this section to ascertain their effects on economic growth in emerging economies. From the main models of the differenced and system GMM, we found that financial development, national security, environmental sustainability and green bonds have respectively significant effects on the economic growth of emerging economies in various degrees. However, when we interacted with the environmental protection expenditure (EPE) with the financial development, we made the following discoveries. The FINAI*EPE and FINDI*EPE have significant positive effects on the emerging market economies growth, and further findings revealed that while the FIMAI*EPE showed a positive and significant effect on the economic growth of the emerging economies, the FIMDI*EPE portrayed a negative and significant effect on the economic growth in the emerging economies. The result findings also revealed that the instruments were not overidentified, while results of the AR2 show that there is no trace of

second-order serial correlations in the models. These findings are however similar to previous empirical findings by scholars such as (Sagiopgi & Schopol, 2021, Lebelle et al. 2020, Bhutta et al. 2022, Tang & Zhang 2022) among others.

Table 9: Interacting Green Bond with Financial Development

Variable	Diff GMM					System GMM				
	1	2	3	4	5	1	2	3	4	5
RGDP (-1)	0.366*** (0.010)	0.054*** (0.000)	-0.133*** (0.000)	0.041*** (0.000)	0.018*** (0.000)	-0.162 (0.854)	0.017*** (0.000)	-0.415*** (0.000)	-0.831*** {0.001)	-0.909*** (0.000)
FINAI	0.025*** (0.007)		0.018 (0.598)		0.015*** (0.000)	0.008*** (0.006)		-0.213*** (0.000)		0.934*** (0.000)
FINDI		0.033*** (0.002)					0.012*** (0.000)			
FIMAI			0.009 (0.149)					-0.192*** (0.000)		
FIMDI				0.316*** (0.000)					-0.261** (0.032)	
EFP	0.945*** (0.000)	0.905*** (0.000)	0.687*** (0.000)	0.984*** (0.000)	-0.019 (0.218)	0.314*** (0.000)	-1.031** (0.030)	-0.421*** (0.000)	-0.213 (0.360)	0.169 (0.443)
BDI	-0.078*** (0.000)	1.862 (0.094)	-0.717*** (0.000)	0.017 (0.511)	-0.0523 (0.702)	0.232*** (0.000)	0.017 (0.309)	-0.013** (0.017)	1.0316** (0.030)	0.421 (0.264)
RES	-0.010 (0.176)	0.479 (0.441)	0.768*** (0.000)	-0.213 (0.360)	-0.666*** (0.000)	-1.068*** (0.000)	0.129** (0.000)	-0.468* (0.000)	-0.452 (0.1759)	-0.137*** (0.000)
MSP	0.717** (0.000)	-0.013** (0.017)	0.669** (0.000)	0.040*** (0.000)	-0.474*** (0.000)	0.338*** (0.000)	0.512*** (0.000)	0.330*** (0.000)	0.378*** (0.000)	0.036*** (0.000)

GPI	-6.117 (0.515)	-11.433*** (0.000)	0.333 (0.050)	-1.155*** (0.000)	-0.128*** (0.000)	-0.102*** (0.000)	-0.082*** (0.000)	-0.084*** (0.000)	0.018*** (0.000)	0.041*** (0.001)
GTI	-1.164*** (0.005)	-1.126*** (0.000)	-0.189*** (0.000)	-0.330** (0.029)	-0.325*** (0.000)	-0.331*** (0.000)	-0.433*** (0.000)	-0.296*** (0.000)	-0.202** (0.023)	-0.158 (0.200)
EPE	-0.938*** (0.000)					-0.834*** (0.000)				
CFB	-0.555*** (0.000)					-0.089* (0.044)				
FINAI*EPE		0.640*** (0.000)					0.530** (0.022)			
FINDI*EPE			0.012*** (0.639)					0.386*** (0.000)		
FIMAI*EPE				0.132*** (0.002)					0.253*** (0.010)	
FIMDI*EPE					-0.159** (0.018)					-0.370*** (0.000)
FINAI*CFB		0.091*** (0.000)					-0.094*** (0.000)			
FINDI*CFB			-0.074*** (0.000)					0.056*** (0.000)		
FIMAI*CFB				-0.007 (0.439)					0.081*** (0.000)	
FIMDI*CFB					0.096***					0.238*** (0.000)

					(0.000)					
CLI	0.017*** (0.000)	-0.266 (0.766)	0.712*** (0.000)	0.526*** (0.000)	5.059*** (0.004)	-0.629*** (0.000)	-0.696*** (0.000)	0.371*** (0.000)	-0.022** (0.022)	0.131** (0.010)
REM	21.97 (0.052)	1.560*** (0.003)	0.047 (0.058)	30.60*** (0.006)	23.11*** (0.009)	0.081*** (0.000)	0.116*** (0.000)	0.767*** (0.000)	0.732*** (0.000)	0.119*** (0.009)
No of Obs.	658	736	812	687	748	819	548	824	775	697
PMG	0.254	0.672	1.578	2.056	1.258	0.254	0.672	1.578	2.056	1.258
Fixed Effects	0.671	-1.585	0.998	4.651	2.541	0.671	-1.585	0.998	4.651	2.541
AR1	2.967 (0.765)	2.532 (0.895)	2.546 (0.145)	1.014 (0.587)	1.147 (0.593)	2.967 (0.765)	2.532 (0.895)	2.546 (0.145)	1.014 (0.587)	1.147 (0.593)
AR2	0.944 (0.847)	0.263 (0.575)	0.504 (0.776)	2.718 (0.225)	0.982 (0.776)	0.944 (0.847)	0.263 (0.575)	0.504 (0.776)	2.718 (0.225)	0.982 (0.776)
Hansen	4.558 (0.573)	0.352 (0.881)	0.322 (0.998)	1.563 (0.258)	0.322 (0.998)	4.558 (0.573)	0.352 (0.881)	0.322 (0.998)	1.563 (0.258)	0.322 (0.998)

Source: Authors' Concept. ***p < 0.01, **p < 0.05, *p < 0.10. (.) represent the probability value. All the variables are in the natural log form except for those in rates

4.4.5 Analysis of the Interactive Effects of Environmental Sustainability & Green Bonds

We further interacted with the environmental sustainability with the green bonds to see their effects on the economic growth of the emerging economies and also to see whether the green bonds influence environmental sustainability or not in the emerging economies. From the main results, we discovered that respectively financial development, national security, sustainable development and green bonds have significant effects on the economic growth of emerging economies. The results of the interactive effects show that EFP*EPE has significant effects on economic growth and this implies that the influence of environmental protection expenditure on the ecological footprint has a positive effect on the economic growth in emerging economies. Contrary, the interaction between the biodiversity index and environmental protection expenditure (BDI*EPE) portrayed a negative and significant effect on the economic growth in emerging economies, while the reserve was the case when we interacted with the renewable energy share and environmental protection expenditure (RES*EPE) since it showed a positive and significant effect on the economic growth in the emerging economies. Also, from the interactive effects of the environmental sustainability and carbon footprint of bank loans (CFB), we found that EFP*CFB has significant negative effects on economic growth, while the BDI*CFB and RES*CFB portrayed significant positive effects on economic growth in emerging economies. The results of the control variables – climate change and remittances have negative and significant effects on the economic growth in emerging economies. The authors also found no trace of second-order serial correlations and the instruments were not

overidentified in each of the models. These findings corroborate with earlier findings made by (Flammer 2021, ElBannam & Loffler 2024, Li et al. 2023, Khan et al. 2021) among others.

Table 10: Interacting Environmental Sustainability with Green Bond

Variable	Diff GMM				System GMM			
	1	2	3	4	1	2	3	4
RGDP (-1)	0.844*** (0.000)	-0.171*** (0.000)	0.129*** (0.000)	0.137*** (0.000)	-0.118 (0.446)	0.601 (0.570)	-0.628 (0.240)	-1.809 (0.442)
FINAI	-0.197** (0.039)		-0.807*** (0.000)		-0.118 (0.446)		-0.628 (0.240)	
FINDI		-0.652*** (0.024)				-0.072** (0.011)		
FIMAI			0.601*** (0.000)				3.828*** (0.000)	
FIMDI				-7.067*** (0.000)				-0.032 (0.287)
EFP	0.291*** (0.000)		4.097** (0.021)	-0.835*** (0.000)	-0.055 {0.174)		0.020 (0.345)	-0.208*** (0.009)
BDI	-0.220** (0.021)	-0.185*** (0.000)		-0.475*** (0.000)	0.828*** (0.000)	-0.179*** (0.000)		0.129*** (0.000)
RES	0.664 (0.212)	-0.279 (0.151)	0.497 (0.177)		0.535*** (0.000)	0.287*** (0.000)	0.211** (0.022)	
MSP	-0.814*** (0.000)	-0.366*** (0.000)	0.639*** (0.000)	-1.217*** (0.001)	-0.346 (0.202)	-0.377 (0.256)	-0.150 (0.443)	-0.227 (0.397)
GPI	0.418*** (0.000)	0.512*** (0.000)	0.592*** (0.011)	0.336*** (0.000)	0.614*** (0.000)	0.517*** (0.000)	0.488*** (0.000)	0.665*** (0.000)
GTI	-0.513 (0.311)	0.374*** (0.005)	-0.218** (0.021)	0.680 (0.224)	0.447*** (0.000)	0.303*** (0.000)	0.470*** (0.001)	-0.801 (0.221)
EPE	0.134*** (0.000)				0.186*** (0.000)			
CFB	0.080*** (0.000)				0.076*** (0.000)			
EFP*EPE		0.076*** (0.000)				0.082*** (0.008)		
BDI*EPE			-0.965*** (0.000)				-0.549*** (0.000)	

RES*EPE				-0.017*** (0.000)				0.898*** (0.000)
EFP*CFB		-0.344*** (0.000)				-0.540*** (0.000)		
BDI*CFB			0.082*** (0.000)				0.747*** (0.000)	
RES*CFB				-0.824*** (0.000)				0.018*** (0.000)
CLI	-0.987*** (0.000)	-0.462*** (0.000)	0.359*** (0.000)	-0.183*** (0.000)	3.788*** (0.000)	3.848*** (0.000)	-8.315*** (0.000)	-9.254*** (0.000)
REM	0.870*** (0.000)	0.984*** (0.000)	-0.146*** (0.000)	-0.081*** (0.000)	0.363** (0.000)	0.716*** (0.000)	-0.081*** (0.000)	-0.459*** (0.000)
No of Obs.	658	736	812	687	748	819	548	824
PMG	-0.875	0.658	1.158	9.365	-0.875	0.658	1.158	9.365
Fixed Effects	0.987	5.021	2.265	6.365	0.987	5.021	2.265	6.365
AR1	2.967 (0.765)	2.532 (0.895)	2.546 (0.145)	1.014 (0.587)	2.967 (0.765)	2.532 (0.895)	2.546 (0.145)	1.014 (0.587)
AR2	1.803 (0.132)	0.727 (0.765)	1.697 (0.587)	2.587 (0.548)	1.803 (0.132)	0.727 (0.765)	1.697 (0.587)	2.587 (0.548)
Hansen	5.030 (0.587))	2.689 (0.637)	1.147 (0.593)	0.015 (0.615)	5.030 (0.587))	2.689 (0.637)	1.147 (0.593)	0.015 (0.615)

Source: Authors' Concept. ***p < 0.01, **p < 0.05, *p < 0.10. (.) represent the probability value. All the variables are in the natural log form except for those in rates

4.5 Measurement of Marginal and Threshold Effects

Having found the existence of long-run relationships between financial development, national security, environmental sustainability, green bonds and economic growth in emerging economies, we deepened investigations by calculating the marginal and threshold effects of national security, environmental sustainability and green bonds concerning financial development on the economic growth in the emerging economies following extensive studies by Ofori et al. (2023) and Okere et al. (2022). This analysis aimed to determine the effects of additional changes in national security, environmental sustainability and green bonds on economic growth. The results were calculated using equations (4), (5), (6), (7), (8), (9) and (10) which the results obtained were presented in Table 11. For clarity's sake, the results of each measure of national security, environmental sustainability and green bonds were presented in the table for quick understanding of the readers. However, if ($\aleph$, β, and φ) are negative (i.e., ($\aleph$, β, and $\varphi < 0$) and ($\gamma, \omega, and\ \Omega$) are positive (i.e., $\gamma, \omega, and\ \Omega > 0$), it implies that while

national security, environment sustainability and green bonds have positive effects on economic growth; their interactive effects on the financial development may exert adverse effects on economic growth in the emerging economies. The threshold (TH) effects results reveal that these adverse effects on economic growth can only occur when a certain threshold (see Table 11) in the national security, environmental sustainability and green bonds are met. This demonstrates that as financial development increases economic growth, the marginal effects (ME) of national security, environmental sustainability and green bonds may have adverse effects on economic growth when a particular threshold is met.

Table 11: Results for Marginal and Threshold Effects

	Differenced GMM Dep. variable: Economic Growth (RGDP)				**System GMM Dep. variable: Economic Growth (RGDP)**			
Variable	**UCE**	**COE**	**ME**	**TH**	**UCE**	**COE**	**ME**	**TH**
Environmental Sustainability with Fin Development								
FINAI*EFP	-2.110	-0.589	-2.699	3.582	0.384	-0.046	0.338	-8.347
FINDI*EFP	0.129	0.025	0.154	5.160	-0.905	-1.073	-0.926	0.843
FIMAI*EFP	-1.235	0.725	-1.960	-1.703	-0.115	-0.021	-0.136	5.476
FIMDI*EFP	-0.341	0.286	0.055	-1.192	1.091	0.148	1.239	7.371
FINAI*BDI	0.982	1.313	2.295	3.137	0.316	-0.361	-0.045	-0.875
FINDI*BDI	0.136	-0.961	-0.825	-0.141	0.255	-0.753	-0.498	-0.338
FIMAI*BDI	0.023	-1.233	-1.210	-0.019	-0.817	0.676	-0.141	-1.208
FIMDI*BDI	0.205	2.251	2.456	0.091	-0.210	-11.42	-11.63	0.018
FINAI*RES	-0.376	-0.154	-0.530	2.441	0.609	-1.517	-0.908	-0.401
FINDI*RES	-0.510	-1.181	-1.691	0.431	1.146	-0.271	0.875	4.228
FIMAI*RES	-0.545	1.121	0.576	-0.486	1.385	-0.065	1.320	-21.30
FIMDI*RES	-0.016	-1.998	-2.014	0.008	-0.341	-1.073	-1.414	0.317
National Security with Financial Development								
FINAI*MEXP	-0.026	-0.264	-0.290	0.098	-0.386	0.542	0.156	0.712
FINDI*MEXP	0.488	-0.956	-0.468	-0.510	0.144	0.929	1.073	0.155
FIMAI*MEXP	-0.804	-0.112	-0.916	7.178	0.122	-0.193	-0.371	-0.632
FIMDI*MEXP	0.323	0.130	0.453	2.484	0.011	1.253	1.264	0.008
FINAI*GPI	0.051	0.168	0.219	0.303	0.616	-0.771	-0.155	-0.798
FINDI*GPI	0.210	-0.077	0.133	-2.727	-0.393	-0.193	-0.586	2.036
FIMAI*GPI	-0.822	-0.875	-1.697	0.939	-0.844	-0.904	-1.748	0.933
FIMDI*GPI	0.878	-0.102	0.776	-8.607	-0.566	-0.411	-0.977	1.377
FINAI*GTI	-0.078	-0.379	-0.457	0.205	-0.032	-1.970	-2.002	0.016
FINDI*GTI	0.113	-0.241	-0.128	-0.468	-0.110	0.609	0.499	-0.180
FIMAI*GTI	0.217	-0.635	-0.418	-0.341	-0.114	0.071	-0.040	-1.605
FIMDI*GTI	0.784	0.290	1.074	2.703	-0.741	0.318	-0.423	-2.330
Green Bonds with Financial Development								
FINAI*EPE	0.945	0.640	1.585	1.476	0.008	0.530	0.538	0.015
FINDI*EPE	-0.078	0.012	-0.066	-6.500	0.012	0.386	0.398	0.031
FIMAI*EPE	0.010	0.132	0.142	0.075	-0.192	0.253	0.061	-0.758
FIMDI*EPE	0.717	-0.159	0.558	-4.509	-0.261	0.370	0.109	-0.705
FINAI*CFB	0.025	0.091	0.116	0.274	-1.031	-0.094	-1.125	10.96
FINDI*CFB	0.033	-0.071	-0.038	-0.464	0.017	0.056	0.073	0.303
FIMAI*CFB	0.009	-0.007	0.002	-1.285	0.129	0.081	0.210	1.592

FIMDI*CFB	0.316	0.096	0.412	4.579	0.512	0.238	0.750	2.151
Environmental Sustainability & Green Bonds								
EFP*EPE	0.291	0.076	0.367	3.828	-0.055	0.082	0.027	-0.670
BDI*EPE	-0.220	-0.965	-1.185	0.227	0.828	-0.549	0.279	-1.508
RES*EPE	0.664	-0.017	0.647	-39.05	0.535	0.898	1.433	0.595
EFP*CFB	4.097	-0.344	3.753	-11.90	0.020	-0.540	-0.520	-0.037
BDI*CFB	-0.185	0.082	-0.103	-2.256	-0.179	0.747	0.568	-0.239
RES*CFB	-0.279	-0.824	-1.103	0.338	0.287	0.018	0.305	15.94

Source: Computed. Note: UCE=unconditional effects, COE=conditional effects, ME=marginal effects, TH=threshold effects and all other variables are as defined earlier.

4.6 Robustness Check – FMOLS and DOLS

To improve the understanding of the linkages between financial development and economic growth in emerging economies while moderating the role of national security, environmental sustainability and green bonds, we re-estimated the specified models using the panel fully modified ordinary least squares (FMOLS) and panel dynamic ordinary least squares (DOLS) to investigate if there could be further changes of the variables on economic growth in the emerging economies. Another rationale for conducting this robust analysis is because the FMOLS and DOLS take care of cross-sectional dependency problems using the leads and lags which the GMM could not properly account for. However, for the sake of clarity, we stratified the analysis into panel dynamic analysis as well as interactive effects in the subsequent sections below.

4.6.1 Analysis of the Panel Dynamic FMOLS and DOLS Results

From Table 12, the estimated results of the FMOLS show that the past values of economic growth significantly contributed to the current values of economic growth in emerging economies. The Financial Institutions Access Index (FINAI) showed a significant positive effect on economic growth in emerging economies. Contrary to this, the Financial Institution Depths Index (FINDI) has negative and significant effects on the economic growth in emerging economies and this is similar to the outcome of the results of financial markets access index (FIMAI) and Financial Markets Depths Index (FIMDI) that showed significant negative effects on the economic growth of the emerging economies. Furthermore, the environmental sustainability measures – ecological footprint, biodiversity and renewable energy share have significant positive effects on economic growth. Findings further show that national security measures – military expenditure and global peace index have significant positive effects on the economic growth in emerging economies, while the global terrorism index portrayed significant negative effects on the economic growth in emerging economies. Furthermore, we discovered that the green bond indicators – environmental protection expenditure and carbon footprint of bank loans respectively showed negative and positive significant effects on the economic growth in emerging economies and the results of the control variables –climate change and remittances showed negative and significant effects on the economic growth in the emerging economies. The results of the R-squared – measure of goodness of fit show that the explanatory variables greatly explained the total variations in economic growth.

In the DOLS perspective, it was discovered that the past values of economic growth significantly contributed to the current values of economic growth in emerging economies. Findings further show that financial development indicators have significant effects on economic growth in the emerging economies in this manner, while FINAI and FIMDI portrayed positive effects, the FINDI and FIMAI showed negative effects on economic growth in the emerging economies. This is synonymous with findings made from the results of environmental sustainability indicators which show that ecological footprint and biodiversity have significant negative effects on economic growth, while renewable energy share has positive effects on the economic growth of emerging economies. In the like manner, the national security measures were found to show significant effects on economic growth, while the green bond measures showed significant effects in this manner – EPE portrayed positive effects on economic growth, while the CFB showed significant negative effects on economic growth in emerging economies. The control variables – climate change and remittances have significant effects on economic growth in emerging economies. Furthermore, the results of the R-squared show that the model variables explained the economic growth of the emerging economies greatly. These findings corroborate previous findings made by scholars such as (Alenoghena et al. 2020, Akinlola et al. 2020, Chuk et al. 2017, Alam et al. 2022) among others.

Table 12: Estimation of Panel Dynamic FMOLS and DOLS Results

Variable	FMOLS				DOLS			
	1	2	3	4	1	2	3	4
RGDP (-1)	0.598*** (0.000)	-0.091*** (0.000)	2.528*** (0.002)	-0.918*** (0.000)	1.164*** (0.000)	3.234*** (0.001)	-0.972*** (0.000)	-0.549** (0.000)
FINAI	1.924*** (0.0000)				1.024*** (0.000)			
FINDI		-0.046*** (0.000)				-0.540*** (0.000)		
FIMAI			-6.868*** (0.000)				-6.868*** (0.000)	
FIMDI				-5.106 (0.582)				1.456*** (0.000)
EFP	0.568*** (0.000)			-0.229*** (0.000)	-0.818*** (0.000)			0.458*** (0.000)
BDI		0.177*** (0.000)		0.310** (0.022)		-0.066*** (0.000)		0.176*** (0.000)
RES			0.234*** (0.000)	0.371*** (0.000)			0.163*** (0.000)	0.066*** (0.000)
MEXP	0.089 (0.000)	0.021*** (0.000)	0.205 (0.0791)	0.871*** (0.563)	0.179*** (0.000)	-0.985*** (0.000)	7.157*** (0.000)	-0.786*** (0.000)
GPI	0.784*** (0.000)	0.538*** (0.002)	0.870*** (0.000)	0.045** (0.029)	-1.311** (0.016)	-0.098*** (0.000)	-0.139*** (0.000)	-0.122*** (0.000)
GTI	0.920*** (0.000)	-0.845*** (0.000)	-0.889*** (0.000)	-0.054*** (0.000)	0.783*** (0.000)	-0.060*** (0.000)	-0.224*** (0.000)	0.820*** (0.000)
EPE	-0.714*** (0.000)		-1.311** (0.016)		0.877*** (0.000)		0.459** (0.000)	
CFB		0.734*** (0.000)		-0.350*** (0.006)		-0.844*** (0.000)		-0.122 (0.083)

CLI	-0.524*** (0.000)	0.420*** (0.000)	-0.883*** (0.000)	-0.516*** (0.000)	-0.215** (0.014)	-0.461*** (0.007)	-0.129** (0.038)	0.299 (0.766)
REM	-0.024** (0.0205)	-0.144*** (0.000)	-0.897*** (0.000)	-0.415*** (0.000)	-0.595*** (0.000)	-0.715*** (0.000)	0.095*** (0.000)	0.015 (0.531)
No. of Obs.	836	831	835	836	836	836	814	824
R-Squared	0.944	0.715	0.827	0.606	0.944	0.515	0.527	0.786

Source: Authors' Concept. ***p < 0.01, **p < 0.05, *p < 0.10. (.) represent the probability value. All the variables are in the natural log form except for those in rates

4.6.2 Analysis of Interaction of Environmental Sustainability with Financial Development

From Table 13, we propose to estimate the interactive effects of environmental sustainability and financial development in emerging economies to ascertain their effects on economic growth in emerging economies using the FMOLS and DOLS estimation techniques. Findings from the interaction between ecological footprint and financial development show that FINAI*EFP and FINDI*EFP have significant negative effects on economic growth, while FIMAI*EFP and FIMDI*EFP showed significant effects on economic growth in emerging economies. Furthermore, when we interacted with biodiversity and financial development we discovered that FINAI*BDI, FIMAI*BDI and FIMDI*BDI showed negative effects on economic growth, while FINDI*BDI portrayed significant positive effects on economic growth in the emerging economies. In addition, the results of renewable energy share and financial development show that FINAI*RES and FIMDI*RES have significant positive effects on economic growth, FINDI*RES showed negative and significant effects on economic growth, while FIMAI*RES has an insignificant negative effect on the economic growth in the emerging economies. From the DOLS results, we found that the FINAI*EFP has negative and insignificant effects on economic growth, while FIMDI*EFP has significant negative and significant effects on economic growth, while the FINDI*EFP and FIMAI*EFP showed positive and significant effects on economic growth. Furthermore, we found that FINAI*BDI had insignificant negative effects, while FIMAI*BDI has significant negative effects on economic growth in emerging economies. On the contrary, FINDI*BDI and FIMDI*BDI showed significant positive effects on the economic growth of emerging economies. More so we found that while FINAI*RES and FINDI*RES showed significant negative effects on economic growth, the FIMAI*RES had positive but insignificant effects on economic growth, while FIMDI*RES showed significant positive effects on economic growth in emerging economies. These findings are in line with the earlier findings made by scholars such as (Okunlola et al. 2020, Manasseh et al. 2021, Saba 2020, Abubakar & Abdullahi 2023) among others.

Table 13: Interacting Environmental Sustainability with Financial Development

Variable	**FMOLS**					**DOLS**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
RGDP (-1)	0.035*** (0.000)	0.257*** (0.000)	0.276*** (0.003)	0.144*** (0.000)	0.853*** (0.004)	-0.824 (0.089)	-0.372**	0.137*** (0.000)	0.591*** (0.000)	-2.034***

							(0.020)			(0.000)
FINAI	0.671*** (0.000)		0.635*** (0.000)		-2.831 (0.568)	-2.022** (0.012)		0.350*** (0.000)		0.237*** (0.000)
FINDI		0.563*** (0.000)					0.873 (0.141)			
FIMAI			0.773*** (0.000)					0.026*** (0.000)		
FIMDI				0.449*** (0.000)					-0.302*** (0.000)	
EFP	0.492*** (0.000)					-0.559 (0.849)				
BDI	0.337*** (0.005)					0.511*** (0.000)				
RES	0.255*** (0.000)					-1.315 (0.876)				
MEXP	0.818*** (0.000)	0.366*** (0.028)	-0.269*** (0.000)	0.876*** (0.000)	0.770*** (0.000)	0.250*** (0.000)	0.392*** (0.000)	2.949*** (0.000)	0.027*** (0.000)	-9.735*** (0.000)
GPI	0.267*** (0.000)	0.838*** (0.000)	0.015 (0.587)	-0.399*** (0.000)	0.319*** (0.000)	-0.035 (0.058)	0.227*** (0.000)	-5.460*** (0.000)	0.712 (0.523)	-1.535*** (0.000)
GTI	0.160*** (0.000)	-0.133*** (0.000)	-0.445*** (0.000)	0.014*** (0.000)	0.166*** (0.000)	-0.215 (0.091)	3.161*** (0.000)	0.526*** (0.000)	-2.726 (0.514)	0.102** (0.027)
EPE	0.559*** (0.000)	-0.170*** (0.000)	0.319*** (0.000)	-4.615 (0.141)	0.205*** (0.000)	0.224 (0.524)	0.559*** (0.000)	-0.516***	-1.705 (0.981)	0.235*** (0.000)

								(0.000)		
CFB	0.726 (0.980)	0.065 (0.914)	0.313*** (0.000)	0.091 (0.475)	-0.450*** (0.000)	-0.613** (0.010)	-0.419 (0.058)	-6.182*** (0.000)	0.371*** (0.000)	1.984*** (0.000)
FINAI*EFP		-0.599*** (0.000)					-0.017 (0.625)			
FINDI*EFP			-0.042*** (0.000)					0.214*** (0.003)		
FIMAI*EFP				0.385*** (0.003)					0.265*** (0.000)	
FIMDI*EFP					0.232*** (0.000)					-8.129*** (0.000)
FINAI*BDI		-0.373*** (0.000)					-0.345 (0.632)			
FINDI*BDI			5.608*** (0.000)					1.184*** (0.000)		
FIMAI*BDI				-9.874*** (0.000)					-0.233*** (0.000)	
FIMDI*BDI					-0.906 (0.693)					0.3767*** (0.000)
FINAI*RES		4.039*** (0.000)					-0.383 (0.856)			
FINDI*RES			-4.998*** (0.000)					-0.467***		

								(0.000)		
FIMAI*RES				-2.283 (0.886)					5.878 (0.125)	
FIMDI*RES					4.782 (0.358)					0.585*** (0.000)
CLI	1.118 (0.878)	0.021*** (0.000)	-1.400 (0.343)	-2.948*** (0.000)	1.444*** (0.001)	2.922*** (0.000)	-1.811*** (0.000)	0.026 (0.876)	0.697*** (0.000)	-0.305*** (0.000)
REM	1.368 (0.358)	-3.133*** (0.000)	-0.496*** (0.000)	-5.885*** (0.000)	-7.856*** (0.000)	2.171*** (0.000)	-1.171*** (0.000)	-9.564*** (0.000)	-0.439 (0.140)	-6.795*** (0.000)
No of Obs.	788	658	712	465	789	836	836	815	806	836
R-squared	0.864	0.995	0.531	0.868	0.684	0.760	0.695	0.731	0.668	0.684

Source: Authors' Concept. ***p < 0.01, **p < 0.05, *p < 0.10. (.) represent the probability value. All the variables are in the natural log form except for those in rates

4.6.3 Analysis of the Interaction of National Security with Fin. Dev.

From the results of the FMOLS, while interacting the military expenditure with the financial development indicators, we observed that FINAI*MEXP, FINDI*MEXP, FIMAI*MEXP and FIMDI*MEXP have significant positive effects on the economic growth of the emerging economies and we also detect a similar results from the interaction of global peace index and financial development which shows that FINAI*GPI, FINDI*GPI and FIMAI*GPI have significant positive effects on the economic growth, while the FIMDI*GPI have an insignificant effect on the economic growth. We also found that the interaction of the global terrorism index with the financial development shows that FINAI*GTI and FIMAI*GTI have negative and insignificant effects on economic growth, while FINDI*GTI and FIMDI*GTI have significant negative effects on the economic growth in emerging economies. Furthermore, from DOLS results, the interactive effects of the military expenditure with financial development, we found that FINAI*MEXP and FINDI*MEXP have significant effects on the economic growth, while the FIMAI*MEXP and FIMDI*MEXP showed insignificant effects on the economic growth. In addition, we found that while FINAI*GPI and FINDI*GPI showed an insignificant and negative effect on economic growth in the emerging economies, FIMAI*GPI and FIMDI*GPI shows significant positive effects on the economic growth in the emerging economies. The results of the interactive effects of global terrorism index and financial development shows that FINAI*GTI, FINDI*GTI and FIMAI*GTI have significant negative effects on growth of emerging economies, while FIMDI*GTI showed negative and

insignificant effect on economic growth of the emerging economies. These findings aligned with previous findings by (Saba 2020, Bezi et al. 2016, Zakaria et al. 2019, Albert et al. 2022) among others.

Table 14: Interacting National Security with Financial Development

Variable	FMOLS					DOLS				
	1	2	3	4	5	1	2	3	4	5
RGDP (-1)	0.719*** (0.000)	-0.431*** (0.000)	0.739*** (0.000)	-0.128*** (0.000)	-0.151*** (0.000)	1.102*** (0.000)	1.944*** (0.000)	0.588*** (0.000)	1.005 (0.891)	0.282 (0.914)
FINAI	0.847 (0.562)		1.438 (0.156)		4.928 (0.854)	-2.219 (0.982)		-0.143*** (0.000)		0.265 (0.587)
FINDI		0.829 (0.587)					0.048*** (0.000)			
FIMAI			0.196*** (0.000)					-0.807 (0.268)		
FIMDI				0.019*** (0.000)					0.981*** (0.000)	
EFP	-0.022 (0.981)	-0.013 (0.911)	-0.174 (0.814)	0.745*** (0.000)	0.740*** (0.000)	-0.033 (0.959)	0.582*** (0.000)	-0.019 (0.849)	-0.006*** (0.035)	0.075*** (0.005)
BDI	-1.005*** (0.000)	0.017*** (0.008)	-0.203 (0.626)	-0.009*** (0.000)	-0.022*** (0.000)	-0.021*** (0.000)	-0.093 (0.687)	-0.002 (0.358)	-0.051*** (0.000)	-0.046*** (0.001)
RES	-0.003*** (0.020)	-0.003** (0.023)	-0.055*** (0.000)	-0.051** (0.025)	-0.076*** (0.000)	-0.065*** (0.000)	-0.028*** (0.021)	0.059*** (0.002)	0.038*** (0.000)	0.039*** (0.000)
MEXP	-0.618*** (0.000)					0.046*** (0.000)				
GPI	-0.031*** (0.000)					0.042 (0.455)				

GTI	-0.019*** (0.001)					0.055*** (0.000)				
EPE	0.021*** (0.000)	0.055 (0.050)	0.008*** (0.000)	0.026*** (0.000)	0.006** (0.026)	-0.054*** (0.000)	0.063** (0.023)	0.022*** (0.000)	-0.025*** (0.003)	0.113*** (0.000)
CFB	0.106*** (0.013)	-0.037*** (0.001)	0.029*** (0.000)	-0.044 (0.568)	-0.054*** (0.001)	0.037 (0.285)	-0.014*** (0.000)	-0.015*** (0.000)	0.043*** (0.000)	0.008*** (0.000)
FINAI*MEXP		0.079*** (0.000)					0.032*** (0.000)			
FINDI*MEXP			0.009*** (0.000)					0.007*** (0.000)		
FIMAI*MEXP				0.074*** (0.000)					0.167 (0.395)	
FIMDI*MEXP					0.573*** (0.000)					0.007 (0.083)
FINAI*GPI		0.368*** (0.000)					-0.025 (0.877)			
FINDI*GPI			0.014*** [(0.001)					-0.017 (0.971)		
FIMAI*GPI				0.007*** (0.013)					0.012*** (0.000)	
FIMDI*GPI					-0.031 (0.598)					0.014*** (0.000)
FINAI*GTI		-0.039 (0.192)					-0.011*** (0.000)			
FINDI*GTI			-0.014*** (0.000)					-0.122** (0.035)		

FIMAI*GTI				-0.015 (0.705)					-0.085*** (0.000)	
FIMDI*GTI					-0.011*** (0.000)					-0.077 (0.871)
CLI	0.088*** (0.000)	0.009*** (0.000)	0.093*** (0.000)	-0.063** (0.012)	-0.801*** (0.000)	-0.586** (0.012)	0.833*** (0.000)	5.885*** (0.008)	0.0594*** (0.000)	0.039 (0.414)
REM	2.851*** (0.000)	0.038*** (0.000)	-0.099 (0.759)	-0.014 (0.821)	0.096*** (0.000)	0.022*** (0.000)	0.090*** (0.001)	2.156*** (0.000)	0.017 (0.461)	0.009*** (0.026)
No. of Obs.	836	835	801	827	795	776	836	821	805	689
R-squared	0.560	0.783	0.888	0.860	0.605	0.876	0.453	0.810	0.660	0.936

Source: Authors' Concept. ***p < 0.01, **p < 0.05, *p < 0.10. (.) represent the probability value. All the variables are in the natural log form except for those in rates

4.6.4 Analysis of the Interactions of Green Bonds with Financial Development

We carried out the interactive effects of green bonds with financial development to ascertain their effects on the economic growth in the emerging economies in this section and findings from the results revealed that financial development, national security, environmental sustainability, and green bonds have significant effects on the economic growth in the emerging economies. The results of FMOLS show that FINAI*EPE, FINDI*EPE and FIMAI*EPE have significant positive effects on the economic growth in emerging economies, while the FIMDI*EPE showed a significant negative effect on economic growth in emerging economies. Relatedly, we found that while FINAI*CFB has a negative and insignificant effect on economic growth, FINDI*CFB, FIMAI*CFB and FIMDI*CFB have significant negative effects respectively on economic growth in emerging economies. However, in the DOLS paradigm, we make the following discoveries. We found that FINAI*EPE and FINDI*EPE have significant positive effects on economic growth, FIMAI*EPE showed negative insignificant effects on economic growth in emerging economies, while FIMDI*EPE had positive and insignificant effects on the economic growth in emerging economies. The results of R-squared show that economic growth was greatly explained by the explanatory variables and these findings correspond with the earlier findings by scholars such as (Sagiopgi & Schopol, 2021, Lebelle et al. 2020, Bhutta et al. 2022, Tang & Zhang 2022) among others.

Table 15: Interacting Green Bond with Financial Development

Variable	FMOLS					DOLS				
	1	2	3	4	5	1	2	3	4	5

RGDP (-1)	0.042*** (0.000)	0.829*** (0.000)	0.504*** (0.000)	0.101*** (0.000)	-0.012*** (0.000)	0.464*** (0.000)	43.59*** (0.000)	82.77*** (0.000)	38.69*** (0.000)	0.313*** (0.000)
FINAI	0.037*** (0.000)		0.351*** (0.003)		0.217*** (0.000)	0.911*** (0.000)		0.566*** (0.000)		value
FINDI		-0.030*** (0.002)					0.064 (0.016)			
FIMAI			0.157*** (0.000)					0.914*** (0.000)		
FIMDI				-19.10*** (0.000)					value	
EFP	0.025*** (0.000)	0.091** (0.018)	-0.173*** (0.000)	0.069*** (0.000)	0.074*** (0.000)	0.008*** (0.000)	0.556*** (0.000)	0.258*** (0.000)	1.920*** (0.000)	0.755*** (0.000)
BDI	0.026*** (0.000)	0.311*** (0.000)	9.014*** (0.000)	6.027*** (0.000)	0.078*** (0.000)	0.007*** (0.000)	0.216*** (0.000)	0.438*** (0.000)	0.425*** (0.000)	0.210*** (0.000)
RES	0.008*** (0.000)	1.724*** (0.000)	4.174*** (0.000)	0.084*** (0.000)	0.092*** (0.000)	0.463*** {0.000)	11.39*** (0.000)	130.9*** (0.000)	95.31*** (0.000)	-1.828*** (0.000)
MSP	0.007*** (0.000)	-0.209*** (0.000)	0.431*** (0.000)	0.363*** (0.000)	0.019** (0.018)	0.007*** (0.000)	-0.209*** (0.000)	0.431*** (0.000)	0.363*** (0.000)	0.019** (0.018)
GPI	0.947*** (0.000)	-0.649 (0.000)	0.329*** (0.000)	-0.787*** (0.000)	0.563*** (0.000)	0.947 (0.000)	-0.649 (0.000)	0.329*** (0.000)	-0.787*** (0.000)	0.563*** (0.000)
GTI	-0.010** (0.039)	-0.432*** (0.000)	4.284*** (0.000)	1.674*** (0.000)	0.039*** (0.001)	-0.010** (0.039)	-0.432*** (0.000)	4.284*** (0.000)	1.674*** (0.000)	0.039*** (0.001)
EPE	0.044*** (0.000)					0.228*** (0.000)				

CFB	0.044*** (0.000)					0.255*** (0.000)				
FINAI*EPE		0.029*** (0.000)					0.105*** (0.000)			
FINDI*EPE			0.347*** (0.000)					0.068*** (0.000)		
FIMAI*EPE				0.013*** (0.000)					-0.006 (0.355)	
FIMDI*EPE					-0.016*** (0.000)					0.019 (0.128)
FINAI*CFB		-0.784 (0.974)					0.004 (0.654)			
FINDI*CFB			-0.174*** (0.000)					0.056** (0.040)		
FIMAI*CFB				-0.279*** (0.000)					0.060 (0.192)	
FIMDI*CFB					-0.241*** (0.000)					0.064** (0.016)
CLI	0.003*** (0.000)	0.395*** (0.000)	0.105*** (0.000)	0.013*** (0.000)	0.011*** (0.000)	0.018*** (0.000)	0.012*** (0.000)	-0.027*** (0.002)	-0.026*** (0.000)	-0.826*** (0.000)
REM	0.021*** (0.000)	0.357 (0.975)	-0.009** (0.040)	0.368 (0.979)	-0.013*** (0.008)	-0.014*** (0.007)	-0.013** (0.011)	-18.05 (0.957)	0.017*** (0.000)	-0.716*** (0.000)
No of Obs.	658	736	812	687	748	819	548	824	775	697
R-squared	0.933	0.560	0.623	0.581	0.751	0.675	0.688	0.969	0.858	0.551

Source: Authors' Concept. ***p < 0.01, **p < 0.05, *p < 0.10. (.) represent the probability value. All the variables are in the natural log form except for those in rates

4.6.5 Analysis of Interactive Effects of Environmental Sustainability with Green Bonds

The estimation of the interactive effects of environmental sustainability and green bonds was conducted in this section to sift if the influence of green bonds on environmental sustainability can influence economic growth or not in emerging economies. From the main results, we

discovered that financial development and its variables, national security measures, environmental sustainability indicators and green bonds indicators have significant effects on economic growth respectively at various degrees. From the interactive effects results of the FMOLS, it was revealed that while EFP*EPE portrayed a negative effect on the economic growth in emerging economies, BDI*EPE and RES*EPE showed significant effects on the emerging economies' growth. Furthermore, EFP*CFB and BDI*CFB have significant negative effects on economic growth, while RES*CFB portrayed an insignificant positive effect on economic growth in emerging economies. From the DOLS results, we discovered that EFP*EPE, BDI*EPE and RES*EPE have significant positive effects on economic growth in emerging economies. Contrary to this, while EFP*CFB shows insignificant negative effects, and RES*CFB shows significant negative effects on economic growth, the BDI*CFB portrayed a significant positive effect on economic growth in emerging economies. The results of the R-squared for the models in both FMOLS and DOLS revealed that economic growth was greatly explained by the explanatory variables. These findings align with previous studies such as (Flammer 2021, ElBannam & Loffler 2024, Li et al. 2023, Khan et al. 2021) among others.

Table 16: Interacting Environmental Sustainability with Green Bond

Variable	FMOLS				DOLS			
	1	2	3	4	1	2	3	4
RGDP (-1)	-4.982** (0.026)	0.002*** (0.005)	-5.807 (0.105)	-4.925** (0.031)	0.906*** (0.000)	-4.982*** (0.004)	-3.670 (0.091)	-5.091*** (0.005)
FINAI	0.437*** (0.000)		0.438*** (0.001)		-0.035*** (0.000)		0.378*** (0.000)	
FINDI		0.002*** (0.001)				-10.49*** (0.000)		
FIMAI			0.456*** (0.000)				0.426*** (0.000)	
FIMDI				0.860*** (0.000)				8.222*** (0.001)
EFP	-0.231*** (0.000)		0.741** (0.014)	0.010*** (0.001)	-0.040*** (0.000)		1.069*** (0.000)	-2.306*** (0.000)
BDI	1.284*** (0.000)	1.423*** (0.000)		2.143*** (0.000)	2.542*** (0.000)	-0.174*** (0.000)		-0.279*** (0.000)
RES	-1.424*** (0.000)	-0.902*** (0.001)	-0.755 (0.097)	-1.527*** (0.000)	-1.195** (0.016)	0.226*** (0.000)	-0.582*** (0.000)	-0.784 (0.974)
MEXP	2.176*** (0.000)	3.130*** (0.000)	2.497*** (0.000)	2.917*** (0.000)	2.895*** (0.000)	-0.197 (0.367)	-0.051*** (0.002)	0.086 (0.630)
GPI	-0.086 (0.399)	-0.719***	-0.686** (0.015)	-0.269 (0.293)	-0.571** (0.020)	-0.340***	-3.030*** (0.000)	-0.241***

		(0.000)				(0.000)		(0.000)
GTI	-0.340*** (0.000)	-3.030*** (0.000)	-3.901*** (0.000)	-3.635*** (0.000)	-3.713*** (0.000)	-3.901*** (0.000)	-3.635*** (0.000)	-3.713*** (0.000)
EPE	7.457*** (0.005)				2.901**** (0.000)			
CFB	6.645*** (0.000)				6.653*** (0.000)			
EFP*EPE		-1.520 (0.064)				6.679*** (0.000)		
BDI*EPE			6.009*** (0.000)				5.312*** (0.000)	
RES*EPE				6.081*** (0.000)				7.226*** (0.000)
EFP*CFB		-36.93*** (0.000)				-0.803 (0.210)		
BDI*CFB			-4.347*** (0.000)				17.18*** (0.000)	
RES*CFB				0.053 (0.5215)				-4.612*** (0.000)
CLI	-1.424*** (0.000)	-0.902*** (0.001)	-0.755*** (0.097)	-1.527*** (0.000)	-1.195*** (0.016)	1.284*** (0.000)	1.423*** (0.000)	2.901*** (0.000)
REM	-0.231*** (0.000)	-0.582*** (0.000)	0.226*** (0.000)	0.086 (0.630)	-0.051*** (0.002)	-0.197 (0.367)	2.143*** (0.000)	2.542*** (0.000)
No of Obs.	658	736	812	687	748	819	548	824
R-squared	0.914	0.718	0.599	0.852	0.875	0.669	0.741	0.889

Source: Authors' Concept. ***p < 0.01, **p < 0.05, *p < 0.10. (.) represent the probability value. All the variables are in the natural log form except for those in rates.

4.6. Discussion of Findings

This study centred on examining financial development and economic growth in emerging economies and moderating the role of national security, environmental degradation, and green bonds from 2000 to 2022 owing to data availability and estimating the relationship with the panel differenced and system generalized method of moment (GMM) as the baseline model and fully modified ordinary least squares (FMOLS) and dynamic ordinary least squares (DOLS) as the model for robustness check. We choose the models based on their peculiarity in solving some econometric estimation issues like endogeneity, cross-sectional dependence, heterogeneity, country-specific effects and serial correlation estimation problems. From the

analyzed results, the descriptive statistics revealed that the values of the mean, median, standard deviation, skewness and kurtosis did not drift so much from each other, and the probability values of the Jarque-Bera statistic for all the variables are less than 0.05 showing that the variables are normally distributed. We also found the existence of correlations between financial development, national security, environmental sustainability, green bonds and economic growth in emerging economies from the results of Spearman's correlation test. Relatedly, we discovered no trace of unit root and the variables were integrated of I(0) and I(1) and not I(2). The results of Pedroni (2004) and Kao (1999) suggested that cointegration exists between financial development, national security, environmental sustainability, green bonds and economic growth in emerging economies across all the models tested.

Findings from the differenced and system GMM results show that financial development has a significant positive effect on economic growth in the emerging economies, also environmental sustainability indicators have both negative and positive effects on economic growth. In addition, national security and its measures have significant negative effects on the economic growth in emerging economies, while green bonds have significant positive effects on the economic growth in emerging economies. Furthermore, we conducted the interactive effects of national security, environmental sustainability and green bonds with financial development to deepen the analysis of the study and we found that the interactive terms showed significant effects on the economic growth of the emerging economies in various degrees. Furthermore, we calculated the marginal effects (ME) and threshold effects (TH) of national security, environmental sustainability and green bonds concerning financial development since their additional effects can improve or adversely affect the economic growth of emerging economies. However, we found that while financial development improves economic growth, the marginal effects (ME) of national security, environmental sustainability and green bonds may adversely affect economic growth on a certain threshold (TH). Moreover, evidence from the results of the robustness checks – FMOLS and DOLS shows that financial development and its indicators have both negative and positive effects on the economic growth in emerging economies, environmental sustainability has positive effects on economic growth in the FMOLS, and both negative and positive effects on economic growth in the DOLS results. Findings also revealed that national security has significant negative effects on economic growth except for the military expenditure and global peace index in the FMOLS results, while green bonds have both negative and positive effects on economic growth in emerging economies. Also, the interactive effects of national security, environmental sustainability and green bonds with financial development were carried out and the results show that they have significant effects on economic growth respectively at various degrees. These findings are in line with some of the reviewed studies (Saba 2020, Bezi et al. 2016, Zakaria et al. 2019, Albert et al. 2022. Alenoghena et al. 2020, Manasseh et al. 2021, Abubakar & Abdullahi 2023, Borgi et al. 2023, Khan et al. 2021, Telliver et al. 2020, Wang et al. 2022, Baltas & Mann 2024) among others.

Referring to the research questions that guide this study which was stated as follows. a). What are the effects of financial development – financial institutions and financial markets that significantly influence economic growth in emerging economies? b). Does national security influence economic growth significantly in emerging economies? c). What is the role of

environmental sustainability on economic growth in emerging economies? d). How does green bond financing influence economic growth in emerging economies? Our research findings provided answers to the research questions in the following ways. Firstly, the financial development measured with financial institution indicator – financial institution access index and financial institution depths index as well as financial markets index – financial markets access index and financial markets depths index have significant positive effects on economic growth. The implication is that an increase in financial development through the financial institutions and financial markets would lead to an increase in economic growth in the emerging economies. Therefore, research question one was fulfilled since financial development portrayed positive and significant effects on economic growth in emerging economies. Secondly, the national security which was measured with indicators such as military expenditure, global peace index and global terrorism index portrayed significant negative effects on economic growth in the emerging economies. This implies that an increase in military expenditure, global peace index and global terrorism index exert significant negative effects on the economic growth of the emerging economies and based on this, the second research question was fulfilled. Thirdly, our study also fulfilled the third research question given that environmental sustainability showed significant negative and positive effects on economic growth in emerging economies. This implies that changes in environmental sustainability would lead to a decrease or increase in economic growth in emerging economies, thus, the research question was fulfilled. Lastly, our study fulfilled the fourth research question since the green bonds which were measured with the environmental protection expenditure and carbon footprint of bank loans showed positive and significant effects on economic growth and this implies that change in the green bonds would lead to increasing economic growth in the emerging economies.

The peculiarity of this study from the existing studies is enumerated as follows. Firstly, none of the prior studies examined the synergy between financial development and economic growth and also moderated the role of national security, environmental sustainability, green bonds and economic growth in emerging economies holistically like this study at the time of writing. Secondly, we robustly measured the financial development with indicators which were categorized into financial institutions measured with – financial institutions access index and financial institutions depths index as well as financial markets measured with – financial markets access index and financial markets depths index which prior studies neglected and we fund that financial development has significant positive effects on economic growth which implies that the financial development indicators positively contribute to increase in economic growth in the emerging economies. Thirdly, we also carried out a robust analysis of the effects of national security on economic growth by measuring national security with indicators such as military expenditure, global peace index and global terrorism index haven discovered that most of the prior studies failed to use these indicators as well as seeing their importance in measuring national security and therefore we found that national security has significant negative effects on the economic growth of the emerging economies. Fourth, using indicators such as ecological footprint, biodiversity and renewable energy share to measure environmental sustainability made our study peculiar. As such, we discovered that

environmental sustainability has both negative and positive effects on the economic growth in the emerging economies. Fifth, unlike prior studies (Telliver et al. 2020, Wang et al. 2022, Baltas & Mann 2024, Voica et al. 2015, Lebelle et al. 2020), we thoroughly evaluate the green bonds with indicators such as environmental protection expenditure and carbon footprint of bank loans and found a positive and significant relationship between these indicators and economic growth in emerging economies. Sixth, we estimated the relationships with the aid of panel differenced and system generalized method of moment (GMM) model as the baseline model which is consistent in estimating efficiently the long-run effects in the model as well as taking care of endogeneity, overidentification of the instruments, sampling bias, and serial correlations. Seventh, we robustly checked the results of the GMM model by employing the fully modified ordinary least squares (FMOLS) and dynamic ordinary least squares (DOLS) as the robustness check model which takes care of cross-sectional dependency and country-specific effects which the above-stated studies ignored. Eight, we calculated the marginal effects (ME) and threshold effects (TH) of national security, environmental sustainability and green bonds concerning financial development on economic growth and found that as financial development increases economic growth, the additional increase of national security, environmental sustainability and green bonds would exert negative effects on the economic growth in the emerging economies at a certain threshold.

5. Conclusion, Policy Implications and Policy Recommendations

Robust financial development is critically required for every nation's economic achievement. Financial development is integral to economic growth because it improves resource allocation, facilitates investment, manages risks, mobilises savings, enhances market efficiency, supports entrepreneurship, contributes to economic stability, and integrates economies into the global financial system. Certainly, some economic conditions not limited to robust financial institutions and financial markets considering their access and depths, national security, environmental sustainability and green bonds are to be considered while exploring economic growth. Findings from the differenced and system GMM results show that financial development has a significant positive effect on economic growth in the emerging economies, also environmental sustainability indicators have both negative and positive effects on economic growth. In addition, national security and its measures have significant negative effects on the economic growth in emerging economies, while green bonds have significant positive effects on the economic growth in emerging economies. Also, the results of interactive effects of national security, environmental sustainability and green bonds with financial development showed significant effects on the economic growth of emerging economies in various degrees. Furthermore, we calculated the marginal effects (ME) and threshold effects (TH) of national security, environmental sustainability and green bonds concerning financial development since their additional effects can improve or adversely affect the economic growth of emerging economies. However, we found that while financial development improves economic growth, the marginal effects (ME) of national security, environmental sustainability and green bonds may adversely affect economic growth on a certain threshold (TH). Moreover, evidence from the results of the robustness checks – FMOLS and DOLS shows similar findings

from the GMM results. Based on these findings, this study concludes that financial development and green bonds have significant positive effects on economic growth in emerging economies, national security has negative and significant effects on economic growth, and environmental sustainability has both negative and positive effects on economic growth in emerging economies.

Given the above conclusions, we made the following recommendations to improve economic growth through financial development, national security, environmental sustainability and green bonds in emerging economies. However, it is recommended that authorities should endeavour to improve the financial system development by paying much interest to financial institutions (access and depths) as well as financial markets (access and depths). This would be done by ensuring effective inclusive finance, implementing policies that increase access to financial services for underserved populations, such as rural communities and low-income groups such as mobile banking and digital financial services, supporting fintech innovations that provide new ways for people to access financial services, such as blockchain technology and digital wallets, improvement in financial literacy programs that educate individuals and businesses about financial management, investment, and the use of financial products, and massively investing in financial market infrastructures such as broadband network connectivity. Thus, by focusing on these areas, policymakers can help to create a robust financial system that supports sustainable economic growth in emerging economies. Furthermore, boosting economic growth through national security involves implementing policies that create a stable, safe environment conducive to economic activities and investments, by modernizing and expanding the capabilities of law enforcement agencies such as the military, policing and other security services to reduce crime rates and ensure public safety, developing robust cybersecurity measures to protect national infrastructure, businesses, and individuals from cyber threats, promoting stability and prevention of conflicts, increasing military expenditure and security costs, and investing in education and training programs for security personnel to ensure they are well-equipped to handle emerging threats and challenges to secure lives and properties and maintain a peaceful society. It would be recommended that environmental sustainability can boost the economic growth of emerging economies when the authorities invest in R&D for green technologies, such as renewable energy, energy-efficient systems, and sustainable agriculture practices, and facilitate the adoption of clean technologies by offering incentives like tax breaks or subsidies for businesses that implement energy-efficient or environmentally friendly technologies, develop infrastructure projects that incorporate sustainability principles, such as energy-efficient buildings, sustainable transportation systems, and green urban planning to mitigate greenhouse gas emissions, carbon dioxide emissions and other hazardous emissions which are harmful to human health and dwellings. This can be done by funding these environmental-friendly projects through robust green bonds such as environmental protection funding and the carbon footprint of bank loans to increase emerging economies' growth. In sum, low-income emerging markets, prioritized financial inclusion initiatives could include expanding mobile banking infrastructure, subsidizing microfinance programs, and strengthening financial literacy campaigns, each with clear steps and resource considerations. Security reforms might involve enhancing border

controls, investing in intelligence, or civil service training, aligned with specific security challenges faced by each country. For green investment programs, incentives for renewable energy projects, establishing green funds, or regulatory reforms, along with potential hurdles like funding gaps or institutional capacity.

The research explicitly acknowledges imitations, including data constraints, potential measurement errors, and the inherent challenges of accurately capturing complex interactions among variables. Additionally, outlining avenues for future research such as conducting sector-specific analyses to understand nuanced effects, implementing micro-level case studies for detailed insights, or exploring additional environmental and security indicators, will provide a balanced perspective. These suggestions can guide subsequent scholars in building on this work and will enhance the study's contribution to ongoing debates in the field.

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