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Economic globalisation and Africa's quest for greener and more inclusive growth: The missing link

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Abstract

This study examines the contingency and threshold effects of economic freedom in the economic globalisation (EG) and inclusive green growth (IGG) relationship in Africa. Based on macro data for 22 African countries and the Driscoll-Kraay standard errors with fixed effects instrumental variable regression, the following findings are established. First, Africa's mostly unfree economic setting, conditions EG to reduce IGG. Second, when we disaggregate EG into its financial and trade globalisation components, we find that the IGG-impeding net effect of the latter is rather striking. Third evidence from our threshold analysis suggests that by improving Africa's mostly unfree economic architecture to 60% (moderately free) or 80% (free), the IGG-deteriorating net effects of EG are mitigated (but not nullified). We conclude that unless effort is made to improve Africa's economic architecture level, the envisaged IGG gains of economic globalisation might prove elusive.

Keywords: Africa; Economic freedom; Economic globalisation; Inclusive green growth

JEL Classification : F14; F4; O56; Q01

1. Introduction

Since the ground-breaking report of the Brundtland Commission in 1987, policymakers worldwide are stepping-up efforts with the aim of fostering multidimensional sustainability (Sachs et al., 2021; United Nations [UN], 2020; Fay, 2012). Notably, since the unanimous adoption of the Millennium Development Goals and the ensuing Sustainable Development Goals (SDGs), global attention has shifted considerably towards achieving growth that is both green and inclusive (Ofori et al., 2022; Acosta et al., 2020; Organization for Economic Cooperation and Development [OECD], 2017; Green Growth Knowledge Program [GGKP], 2013). Inclusive green growth (IGG), as aptly delineated in Ofori et al. (2022) is a growth trajectory that simultaneously yields environmental progress, and fairer income growth and distribution.

As peculiar of the developing world, African countries face several constraints in their bid to foster IGG. Salient of these challenges include the soaring public debts, rising pockets of territorial instability, and climate change cast doubt on the possibility of IGG in Africa. For instance, the United Nations Conference on Trade and Development [UNCTAD] (2022a) reports that most African countries are in or at debt distress or the risk of it, which could limit their capacity to fund IGG projects. Similarly, the Intergovernmental Panel on Climate Change [IPCC] (2022) and the United Nations Department of Economic and Social Affairs [UNDESA] (2022) document that climate change and its multifaceted concerns of water stress, heat wave, and food insecurity is inhibiting Africa's progress towards IGG.

It is in this sense that this study argues that EG deserves attention. Focusing on economic globalisation (EG) is particularly important considering the implementation of the African Continental Free Trade Agreement (AfCFTA) as a pathway for generating and sharing prosperity across the continent (African Union [AU], 2020). According to Nye and Keohane (2000, p.4), "*EG refers to the long-distance flows of goods, capital and services as well as information and perceptions that accompany market exchanges.*". Thus, EG expedites the integration of economies, technologies and productive knowledge, which are major drivers of both socioeconomic and environmental sustainability (see, Clark, p.86; Norris, 2000, p.155). For instance, from the socioeconomic perspective of IGG, new growth theories suggest that EG generates innovation spillover and production efficiency that developing countries can leverage upon to promote resilient growth, employment, and poverty alleviation (see, Potrafke, 2015, p. 518; Chen & Ravallion, 2013). Further, it is widely argued that foreign direct investment [FDI]), which is a key component of EG, promotes human capital development, private sector competition, and fairer income distribution in developing countries (Beck et al., 2007; Rodrik, 2006). Indeed, in Africa, several empirical studies confirm that EG promotes economic growth (see, Opoku et al., 2019; Sakyi & Egyir, 2017), income equality (Xu et al., 2021; Ajide et al., 2021), employment and poverty alleviation (Asongu et al., 2020; Awad, 2019), as well as human development (Shahbaz et al., 2019; Asongu & Nwachukwu, 2017; Asongu, 2013).

On the environmental sustainability front, proponents of EG contend that trade can facilitate the spread of eco-friendly technologies, which can enable developing countries to reduce ecological footprint (World Trade Organization [WTO], 2022; Ahmed et al., 2021; Wurlod & Noailly, 2018). Moreover, trade can trigger economic complexity, resource efficiency, and the diffusion of sustainable production and management practices to enhance environmental performance in developing countries (Gozgor et al., 2020; WTO & UNEP, 2018; Verdolini & Galeotti, 2011). Besides, through FDI, multinational companies (MNCs) can promote energy efficiency, climate-friendly innovations and investments in clean and resilient infrastructure in

developing countries (OECD, 2017, Melane-Lavado et al., 2018). For instance, foreign investment in sustainable mining, energy production, and transportation could promote IGG in Africa. Studies confirming positive effects of EG on the environment in Africa abound (see e.g., Ibrahim, & Ajide, 2022; Yameogo et al., 2021; Acheampong et al., 2019; Amuakwa-Mensah & Adom, 2017).

Despite these potential shared growth and environmentally sustainable effects of EG, some dark sides have also been reported in the literature. First, on the environment, several studies stress that EG can accelerate the depletion of natural assets (Whitfield & Zalk, 2020; Asiedu, 2013). This is more so considering the fact that African countries rely heavily on natural resource exploitation for growth (UNCTAD, 2022b). Further, EG can intensify greenhouse gas emissions and air pollution, especially in Africa where institutional quality is weak, environmental standards are flexible, and various governments are putting in place incentives to attract FDI (Opoku & Boachie, 2020; Doytch, 2020; Bokpin, 2017). Also, Rodrik (2018) argues that EG can compromise social progress in developing countries by increasing unemployment and income inequality. Concerns in the form of capital flight, floundering of domestic firms, and increased susceptibility of developing countries to global shocks have also been reported in the literature (see e.g., Ndikumana & Sarr, 2019; Krugman, 2017).

These perspectives suggest that EG might fall short in promoting IGG in Africa. It is in this regard that this study pays attention to the moderating role of economic freedom in the EG-IGG relationship. The core of our argument is that EG is likely to benefit societies characterised by procedural fairness, protection of private properties, friendly tax codes, and productive incentives for the private sector. Economic freedom, thus, denotes a set of productive incentives that can cushion the private sector to flourish and contribute to greener and equitable growth. For example, De Haan and Sturm (2000) argue that economic freedom promotes property rights and low tax codes, which are critical for stimulating private sector innovation and productivity. Besides, Miller et al. (2022) stress that in freer economies; the private sector invests in clean infrastructure and technologies, which can boost green growth. Additionally, by reducing transaction costs and investment uncertainties, economic freedom enables investors to specialise and allocate resources efficiently for resilient growth (Adesina & Mwamba, 2019). This, could, in turn, support Africa's quest to diversify, sustain growth, create decent jobs, and improve the quality of life. However, in Africa where the economic architecture is mostly unfree as Miller et al. (2023) point out, it can instead condition EG to hamper IGG. Structured differently, Africa's mostly unfree economic architecture can nullify or dampen potential IGG-enhancing effect of EG.

The contribution of this study to the IGG discourse, and for that matter, policymaking in Africa is clear and manifold. First, we estimate the extent to which economic freedom moderates the effect of EG (including the major typologies of trade globalisation and financial globalisation) on IGG. We argue that this neglect could be costly for African nations. This is more so as though both intra- and inter-African trade are expected to intensify following the implementation of the AfCFTA (World Bank, 2022), the UNCTAD (2021) predicts increased capital flows to Africa. Accordingly, while empirical evidence on trade globalisation is imperative for advising policymakers on the IGG effects of merchandised and non-mechandised trade between Africa and its trading partners, financial globalisation informs policy on the extent to which capital flows impact IGG.

Second, we disaggregate economic freedom into government integrity, business freedom, government spending, and investment freedom. This disaggregation is imperative for policy-

specific recommendations. This is because while African countries report high levels of government spending, they rank low on government integrity, investment freedom and business freedom (Miller et al., 2023). Ignoring these perspectives could be problematic for policy formulations as African governments and their development partners might find it difficult rolling out policy-specific interventions. Third, we point out the IGG gains of improving Africa's 'mostly unfree' economic architecture to the 'moderately free', 'mostly free', and 'free' brackets. Considering the fact that our sampled countries are financially constrained, this threshold analysis is imperative for informing policymakers on the multidimensional sustainability gains of improving regulatory efficiency, market openness, and the rule of law in Africa.

We structure the remainder of this study as follows. Review of theories and empirical evidence linking EG and economic freedom to IGG is provided in Section 2. We present our research methods in Section 3, and the attendant findings, and conclusion and policy recommendations in Sections 4 and 5, respectively.

2. Literature review

2.1 Theoretical linkages between EG and economic development

The theoretical linkages between the contemporary notion of EG and economic development are anchored in the neoclassical, endogenous and dependency growth theories. First, the neoclassical growth theory of Solow (1956) and Swan (1956) recognises EG as a fundamental driver of resilient growth. These theorists contend that through EG, countries can increase their capital stock and the acquisition of new inputs and foreign technologies. The theory assumes technological progress to be exogenous whereas the marginal returns to capital diminish in the long-run. The long-run expectation is that growth will plunge into a steady state. Nonetheless, in the long-run, if EG triggers remarkable technological progress, output per worker and the efficiency of investments could increase exponentially (Barro et al., 1992). This could enable developing countries to generate high growth rates even in the long-run (De Jager, 2004; Herzer et al., 2008).

Closely related to the neoclassical theory is the endogenous growth theory, which suggests that EG promotes the stock of physical and human capital as well as technological progress among trade openers (Krueger, 1998; Grossman & Helpman, 1991). The endogenous growth theory considers technological progress to be endogenous. Accordingly, through EG, countries can realise increasing returns to scale to technological progress or knowledge diffusion to achieve growth rate (Rivera-Batiz & Romer, 1991; Borensztein et al., 1998). This can enable developing countries to build stronger forward and backward linkages, boost growth and generate socioeconomic opportunities that can reverberate throughout the economy. However, in the context of the dependency theory, EG can hurt social progress in developing countries by heightening unemployment and income inequality (Girling, 1973). This arises at least in the short run as the adoption of new production techniques and innovation fuel skill set mismatch and job losses. Stiglitz (2002) and Ndikumana and Sarr (2019) also argue that the increase in the ownership of assets/resources by multinational companies in host countries can lead to the floundering of domestic firms, capital flight, and macroeconomic instability.

2.2 Theoretical relationship between EG and the environment

Several theories/hypotheses have been put forward to link EG to environmental performance. First, the trade-environment hypothesis of Shahbaz et al. (2019b) suggests that trade openness affects the environment through two main channels: the scale and composition effects. The former suggests that EG stimulates economic growth and hastens ecological footprint in the

process. That is, EG comes with high raw materials exploitation, consumption and energy intensity that degrades the environment. The composition effect, on the other hand, relates trade to environmental quality based on the type of goods that countries produce. Poorer countries with weaker environmental regulations tend to produce more polluting goods, while richer countries with stronger environmental policies specialize in producing cleaner goods. As a result, polluting industries can shift from developed to developing countries.

The pollution haven hypothesis also indicates that EG provides grounds for polluting firms in advanced countries to relocate to countries with less environmental regulation and enforcement costs (Mani & Wheeler, 1998; Keller & Levinson, 2002). This can enhance carbon intensity in developing countries and trigger substantial environmental setbacks (McGuire, 1982). In contrast, the pollution halo hypothesis suggests that EG can promote environmental sustainability. The import of this hypothesis is that EG triggers eco-friendly technological shocks and the diffusion of sustainable production and management practices that developing countries can leverage to foster environmental progress (see, Zarsky, 1999). Taking into account the theoretical linkages between EG and inclusive growth, and the environment, we capture the first hypothesis as:

Hypothesis (1a): economic globalisation promotes inclusive green growth in Africa.

2.3 Empirical literature on EG, economic growth and the environment

In a global study involving 178 countries and macro data spanning over the period 1980-2018, Dorfell et al. (2021) explore the main determinants of inclusive growth. Among other factors such as low inflation and a burgeoning financial market, the authors stress that trade openness is a major long-run growth enhancer. We find a corroborative study in Berg et al. (2012) who investigate the relationship between trade openness and institutional efficiency on inclusive growth in a comprehensive work involving 140 countries. The authors find evidence that trade contributes to inclusive growth by promoting efficiency and innovation. However, it can also exacerbate inequality if the gains from trade are not equitably distributed. The authors note that the relationship between trade and inequality is complex and depends on a range of factors, including the structure of the economy and the nature of trade policies.

Wang et al. (2023) also employ macro data spanning 2000-2021 to examine the effect of trade openness and FDI on inclusive growth in Africa. Based on this, the study advised that to open up more opportunities for inclusive growth, the government of African countries should open up to trade in a manner that will attract the inflow of FDIs. In a parallel development, Lim and McNelis (2016) also find that the inclusive growth potentials of trade depend on the nature of the production structures of a country and the stage of economic development. Accordingly, the authors assert that trade widens the income disparity gap between developed and developing countries.

A plethora of empirical works also interrogate the effect of EG on the environment. For instance, in focusing on 25 African countries, Opoku-Mensah et al. (2021) use the Stochastic impacts by regression on population, affluence, and technology model to examine the effect of EG on carbon emissions. Their evidence based on 25 African countries suggests that EG will increase CO₂ emissions in Africa by 17%. Similarly, Kim et al. (2019) employ a panel data instrumental-variable quantile approach to examine the relationship between trade and carbon emissions in the context of developed and developing countries. on the one hand, the authors

find that advanced countries reduce their carbon emissions by trading with developing countries. On the other hand, they find that trading with the Global South mitigates CO₂ emissions for developing countries while trading with the Global North intensifies CO₂ emissions. Also, by applying the panel pooled mean group-autoregressive distributive lag models, Essandoh et al. (2020) explore the short-run and long-run linkages between 52 countries for the period 1991 to 2014 in both developed and developing countries. The study reveals that in the long-run, whereas trade intensifies CO₂ emissions in developing countries, it reduces carbon emissions in advanced countries.

Yameogo et al. (2021) use macro data for the period 2002-2017 to investigate the effect of EG on environmental quality in sub-Saharan Africa (SSA). The authors find strong evidence that EG reduces carbon emissions in SSA. Additionally, the authors find that environmental quality-enhancing effect of EG increases in the presence of institutional quality. Subramaniam and Masron (2021) also contribute to the EG-environment discourse examining whether cross-border trade and capital flows induce biofuel consumption in 50 developing countries for the period 2012-2016. Evidence from the study indicates that EG promotes the demand for renewable energy. The authors contend that the adoption of new technologies favours the consumption of renewable energy and enables developing to reduce carbon intensity and by extension, improve environmental quality. This finding aligns with that of Tamazian and Rao (2010) who find evidence in the case of 24 transitional economies that financial globalisation boosts environmental performance. The authors attribute this result to the role of research and development and institutional quality in promoting energy-related efficiency and low greenhouse gas emissions.

Asongu and Odhiambo (2020) analyse the impacts of both trade openness and FDI on environmental sustainability in SSA. The study provides evidence based on the dynamic system generalised method of moments (GMM) and macro data stretching from 2000-2018 to show that FDI mitigates CO₂ while trade openness exacerbates CO₂ emissions. It is evidence that contradicts that of Opoku and Boachie (2020) that FDI degrades the environment of 36 African countries by fuelling CO₂ and overall greenhouse gas emissions.

2.4 Theories on economic freedom, economic growth and the environment

The theory of economic liberalism highlights the essence of the free movement of goods, services, capital and economic agents in promoting sustainable economic growth (Esposito & Zaleski, 1999; Gwartney et al., 1999). The theory stresses that, by eliminating economic repression, individuals and businesses can make their own economic decisions and allocate resources more efficiently to enhance economic growth. Proponents of economic freedom contend that regulatory efficiency, friendly tax codes, investment support and property rights support innovation and entrepreneurship that can cushion developing countries to build resilient growth trajectories (De Haan & Sturm, 2000; Sturm & De Haan, 2001). Thus, directly or indirectly, economic freedom can create the conducive economic setting for economic agents to take advantage of prospects such as EG to participate meaningfully in the economy.

The theoretical link between economic freedom and the environment is anchored in the theory of pollution policy or the positive theory of environmental regulation. The theory points to feasible ways of achieving the socially optimal level of pollution or reducing the social costs associated with unsustainable production and consumption practices (Coase, 1960; Helfand et al., 2003). The theory, thus, indicates the internalisation of external costs of production by (i) setting pollution taxes equal to marginal social damage or (ii) introducing a tradable emission permit that restricts aggregate pollution to the efficient level. In the line with the above theories

pointing to the direct effect on IGG, and its possible contingency effect in the EG-IGG relations, we present the following hypotheses:

Hypothesis (1b): economic freedom enhances inclusive green growth in Africa.

Hypothesis (2): economic freedom moderates economic globalisation to promote inclusive green growth in Africa.

2.5 Empirical literature on economic freedom, economic growth and the environment

The literature on economic freedom and social progress in Africa is now emerging. A study by Sharma (2020), for instance, examines the effect of economic freedom on several areas of socioeconomic sustainability, namely the infant mortality rate, life expectancy, neonatal mortality rate and under-five mortality rate. Compelling evidence based on a sample of 34 SSA countries and data for the period 2005-2016 indicates that economic freedom (including the sub-components of sound money, legal system, free trade, and regulation) is significant in promoting health outcomes in SSA. A similar contribution is that of Korle et al. (2021) who scrutinize the interactive effect of FDI and economic freedom on human development in a panel of 36 African countries. In the study, the authors apply the dynamic ordinary least squares to a dataset covering the period 1996-2017. The study finds that while economic freedom dynamics such as financial freedom, investment freedom, and business freedom moderate FDI to improve the score of the human development index (HDI), contrary findings arise when property rights, trade freedom, government integrity and tax burden are considered.

In a related study, Okunlola and Akinlo (2021) extend the socioeconomic sustainability discourse by investigating whether economic freedom enhances the quality of life in Africa. The study employs data for the period 1985-2016 and the system GMM estimator for the analysis. Robust evidence from the study shows that economic freedom is significant for promoting the quality of life. The results remain consistent when the authors disaggregate the quality of life into life expectancy, per capita income, literacy rate, and household final consumption expenditure per capita. Batuo and Asongu (2015) also investigate the role of economic freedom on income inequality in 26 African countries considering the period 1996-2010. The authors provide strong evidence that economic freedom worsens income inequality in Africa. The authors argue that the negative income-redistributive effect of economic freedom is possibly due to its high legal component.

Focusing on capital flows, Bengoa and Sanchez-Robles (2003) assess the moderating role of economic freedom in the relation between FDI and economic freedom in 18 Latin American countries for the period 1970-1999. The authors find that economic freedom incentivizes greater FDI inflows on the one hand, and also conditions FDI to promote economic growth, on the other. Heckelman and Powell (2010) also contribute to the economic freedom-social progress discourse by examining whether in the presence low economic freedom, corruption promotes economic growth in 71 countries. Evidence from the study indicates that, in an economically repressed environment, corruption stimulates private sector growth and economic development by enabling economic agents to circumvent burdensome regulations. A strand of the literature also explores the effect of economic freedom on the environment. For instance, Joshi and Beck (2018) employ macro data ranging from 1995-2010 on 22 OECD and 87 non-OECD countries to estimate the effect of economic freedom on CO₂ emissions. The findings from the system GMM estimators reveal that economic freedom generally has a positive and statistically significant effect on carbon emissions. Adesina and Mwamba (2019) also analyse the effect of economic freedom on environmental performance in 24 African

countries paying attention to the period 1995-2013. The study establishes that economic freedom components such as trade freedom, business freedom, freedom from corruption, and fiscal freedom reduce CO₂ emissions. Further, the study reveals that while business freedom and freedom from corruption mitigate carbon emissions in upper-middle income countries, trade freedom matters for promoting environmental quality in lower-middle income countries.

Mamkhezri et al. (2022) also investigate the effect of economic freedom on ecological footprint (composed of cropland, forest products and grazing land) in 17 Asia-Pacific countries. Results based on the spatial Durbin panel estimator reveal that investment freedom reduces cropland and forest-product footprints, property rights, business freedom, while tax burden compromise environmental quality by intensifying pressures on all the three ecological footprint indicators.

Thus far, the empirical literature review shows that both EG and economic freedom affect inclusive growth or environmental performance. Conspicuously missing in the literature, however, is a rigorous empirical work quantifying the extent to which economic freedom conditions EG to impact IGG. Second, actionable thresholds informing policy on investments required for economic freedom to cause complementary policies to foster IGG in Africa are missing in the extant scholarship on sustainable development. This study bridges these gaps by employing the empirical strategy clearly articulated in the next section.

3. Methods

3.1 Data and justification for the inclusion of variables

The study assesses a panel of 22 African countries with data stretching over the period 2008-2020. Table A.1 provides a list of the sampled countries. The choice of the sampled countries and periodicity is due to data availability. For instance, data on the welfare cost of exposure to ambient pollution, and wealth changes markedly for countries such as Somalia, Eritrea, Chad, Eswatini, Niger, Libya, and Zambia.

The main outcome variable in this study is inclusive green growth (IGG). In this study, we operationalise IGG following Ofori et al. (2022) who computed IGG based on data that provides perspectives to the socioeconomic and environmental sustainability of countries or territories. Accordingly, we employ 23 variables that according to the OECD (2017), GGKP (2013), and Fay (2012) drive multidimensional sustainability. The IGG series for the sampled countries are then generated following the principal component analysis (PCA). In SM1, which is provided as a Supplementary Material to this study, the description of the data and econometric procedure for calculating the IGG scores are elaborated.

The main independent variable in this study is economic globalisation (EG). Consistent with the focus of this study, we employ the EG index (de facto) of Gygli et al. (2019). Compared to other EG measures such as trade openness and the Dreher (2006)EG index, the EG index (de facto) of Gygli et al. (2019) is more comprehensiveness. This is because it disaggregates EG into trade globalisation (TG) and financial globalisation (FG). The EG index of Gygli et al. (2019) is thus a composite index of TG (denoting exchange of goods and services over long distances), and FG (signifying capital flows and stock of foreign assets and liabilities). More importantly, the index provides perspectives for researchers to focus on either trade/capital flows (i.e., de facto) as against trade/investment policies (i.e., de jure). All the globalisation indexes in this study range from 0 (lowest) to 100 (highest).

The moderating variable in this study is economic freedom. It is an index for regulatory efficiency, rule of law, government size, and market openness. To allow for policy-specific

recommendations, the study further disaggregates economic freedom into: (1) government integrity, (2) business freedom, (3) government spending (3) and (4) investment freedom. This disaggregation is also justified in that whereas business freedom and government integrity are major components of regulatory efficiency and the rule of law toolkit, respectively, government spending and investment freedom are under the umbrella of government size and market openness, respectively. All the economic freedom indicators range from 0 (0%) to 1 (100%). The data for economic freedom are taken from Milleret al. (2022).

Also, in accordance with sound econometric procedure for obtaining robust regression estimates, several variables are also controlled for. Precisely, the study controls for foreign aid, ICT diffusion, financial access and energy consumption. First, the essence of foreign aid in the conditioning information set is based on empirical evidence that it can promote fairer access to social overheads, and inclusive growth (Wamboye et al., 2013). Also, on environmental sustainability, the International Monetary Fund [IMF] (2022) documents that aid can support developing countries to reduce the carbon footprint and/or build resilience to climate change. In this study, foreign aid is appreciated as net official development assistance as a share of national income. The foreign aid data are taken from the World Development Indicators [WDI] (World Bank, 2023).

Moreover, we pay attention to internet access in line with empirical evidence that internet usage enhances growth, inclusive governance, and fairer access to information, markets, healthcare and socioeconomic opportunities (Adeleye et al., 2020). In the remit of environmental sustainability, while Asongu et al. (2017) show that ICT diffusion mitigates the harmful effect carbon emissions of human development, Salahuddin and Alam (2016) argue that it can trigger environmental setbacks through high energy consumption and greenhouse gas emissions. The study captures internet access as Individuals using the Internet (as percentage of the population). The data for internet access are taken from the WDI (World Bank, 2023).

Further, our attention on financial access is grounded in theory and empirical evidence. First, consistent with the extensive margin's theory and the finance-led hypothesis, access to financial products and services can support the private sector to innovate, grow and contribute to poverty alleviation (Corrado & Corrado, 2017). Similarly, anecdotal evidence indicates that access to finance is instrumental for promoting eco-friendly innovations and access to green technologies, which can mitigate production-based pollution and climate change vulnerability (Salahuddin et al., 2015). Nevertheless, Zhang (2011) argues that financial access can accelerate ecological footprint through the materialisation effect. Financial access in this study is taken from the IMF's financial development index (Svirydzhenka, 2016).

Finally, in line with the SDG 7, we control for energy consumption. Indeed, previous studies show that renewable energy consumption induces shared growth by reducing production costs, income inequality and poverty (see e.g., Apergis & Payne, 2010). In addition, the International Energy Agency [IEA] (2021) stress that renewable energy consumption supports green growth and climate change mitigation by decreasing greenhouse gas emission and air pollution. However, there is also the concern that non-renewable energy consumption can be a drawback to environmental quality and fairer income growth and distribution (IEA & World Bank, 2017). Energy consumption in this study is access to hydroelectricity, and is sourced from the WDI (World Bank, 2023). Table 1 presents a summary of the definition of all the variables used in this study. The pairwise correlations between the variables are also reported in Table A.2.

Table 1: Variable description and data sources

Variables	Symbols	Descriptions	Sources
<i>Dependent variable</i>			
Inclusive green growth	<i>igg</i>	Sustainable development indicator generated using the PCA	Authors
<i>Main independent variables</i>			
Economic globalisation	<i>eg</i>	Index for the exchange of goods and services over long distances, and the capital flows and stock of foreign assets and liabilities (de facto)	Gygli et al. (2019)
Trade globalisation	<i>tg</i>	Index for the exchange of goods and services over long distances (de facto)	Gygli et al. (2019)
Financial globalisation	<i>fg</i>	Index for the capital flows and stock of foreign assets and liabilities (de facto)	Gygli et al. (2019)
<i>Moderating variables</i>			
Economic freedom	<i>efs</i>	An index obtained by averaging four factors: government size, rule of law, regulatory quality and open markets (Highest = 1; Lowest = 0)	Heritage Foundation (2023)
Government integrity	<i>govint</i>	An index obtained by averaging equally the score for three factors: risk of bribery, control of corruption, and perception of corruption (Highest = 1; Lowest = 0).	Heritage Foundation (2023)
Business freedom	<i>busf</i>	An index calculated by averaging equally the score for four factors: access to electricity, business environment risk, regulatory quality, and women's economic inclusion (Highest = 1; Lowest = 0).	Heritage Foundation (2023)
Investment freedom	<i>invtf</i>	An index computed by averaging equally the score for seven factors: foreign investment code, restrictions on land ownership, national treatment of foreign investment, sectoral investment restrictions, capital controls, foreign exchange controls, and expropriation of investments without fair compensation (Highest = 1; Lowest = 0).	Miller et al. (2023)
Government spending	<i>govsize</i>	An index computed as 100 minus a constant variation of the square of all government expenditure in a fiscal year (Highest = 1; Lowest = 0).	Heritage Foundation (2023)
<i>Control variables</i>			
Financial access	<i>trade</i>	Index for the access to financial products and services (Highest = 1; Lowest = 0).	Svirydzenka (2016)
Foreign aid	<i>faid</i>	Inflow of official development assistance (% GNI)	World Bank, 2023
Internet access	<i>int</i>	Individuals using the Internet (% of population)	World Bank, 2023
Energy consumption	<i>enerpc</i>	Electricity production from hydroelectric sources (% of total)	World Bank, 2023

3.2 Model specification and empirical strategy

This section presents the empirical foundation for affirming or invalidating the hypotheses underpinning this study. As articulated in Section 2, the theoretical foundations of our hypotheses are deeply rooted in the pollution halo, endogenous growth theory, and the economic liberalism argument of economic development. These theories/hypotheses identify trade and financial globalisation as key drivers of socioeconomic and environmental sustainability. Drawing on these perspectives of multidimensional sustainability, the study follows the empirical contributions of Ofori et al. (2023, 2022) and Cantore et al. (2016) where we model IGG as:

$$igg_{it} = \alpha_0 + \beta_1 finance_{it} + \beta_2 internet_{it} + \beta_3 electric_{it} + \beta_4 foraid_{it} + \beta_5 ecofree_{it} + \beta_6 eg_{it} + \beta_7 (eg_{it} \times ecofree_{it}) + \varepsilon_{it} \quad (1)$$

where igg_{it} is inclusive green growth in country i at time t , $finance_{it}$ is financial access, $internet_{it}$ is internet access, $electric_{it}$ is hydroelectricity consumption, $foraid_{it}$ is foreign aid, and eg_{it} is economic globalisation, which is composed of trade globalisation (tg_{it}). Also, $ecofree_{it}$ is economic freedom, which comprises business freedom ($busf_{it}$), government integrity ($govint_{it}$), investment freedom ($invtf_{it}$), and government expenditure (gov_{it}). Finally, $eg_{it} \times ecofree_{it}$ is an interaction term for economic globalisation and economic freedom.

The parameters of interest in Equation (1) are β_6 and β_7 , which in respective terms capture the direct and indirect effects of economic globalisation on inclusive green growth. To respond to the Hypothesis2 of the study, we engage the estimates for β_6 and β_7 and the mean of economic freedom as expressed in Equation (2).

$$\frac{\partial(igg_{it})}{\partial(eg_{it})} = \beta_6 + \beta_7(\overline{ecofree_{it}}), \quad (2)$$

where $ecofree$ is the mean value of economic freedom and all symbols remain as earlier mentioned.

3.3 Preliminary tests

In cross-country analysis involving trade and economic development, it is imperative to subject the dataset to some rigorous preliminary tests. Precisely, we test for the presence or otherwise of (i) unit root, (ii) correlation, and (iii) cross-sectional dependence in the data. On the latter, the study employs the Pesaran's (2021) cross-sectional dependence test, which is premised on the null hypothesis that there is no cross-sectional dependence in the data. Failure to reject the null hypothesis for any of the variables means that there is no cross-sectional dependence in the dataset, and vice-versa. Additionally, the study employs pairwise correlation test to ascertain the intercorrelations among the variables. Finally, taking cues from the cross-sectional dependence test results, the study employs either the first-generation or second-generation unit root tests to examine the stationarity properties of the variables.

Table 2 presents the results from the cross-sectional dependence test. Information gleaned from Table 2 indicates the presence of cross-sectional dependence in the data. Notably, we find that cross-sectional dependence is strong in covariates such as financial access, internet access, investment freedom and trade globalisation.

Table 2: Cross-sectional dependence test

Variable	CD-Test	P-value
Inclusive green growth	1.47	0.142
Financial access	44.26***	0.000
Internet access	60.11***	0.000
Electricity consumption	3.04***	0.002
Foreign aid	4.33***	0.000
Economic globalisation	-0.77	0.439
Trade globalisation	4.35***	0.000
Financial globalisation	0.50	0.616
Economic freedom	0.40	0.691
Business freedom	-0.42	0.671
Government integrity	5.02***	0.000
Government spending	4.44***	0.000
Investment freedom	5.02***	0.000

*NB: Under the null hypothesis of cross-sectional independence; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$*

In view of this, we shy away from the first-generation unit root tests in favour of the second-generation unit root tests. Precisely, the study applies the cross-sectionally augmented panel unit root test (CIPS) and the Pesaran's cross-sectionally augmented Dickey-Fuller (PESCADF) test (Pesaran, 2007). Table 3 reports that the stationary results from the CIPS and PESCADF. For variables such as investment freedom, government expenditure and government integrity, both the CIPS and PESCADF show evidence of no unit root. Also, whereas the CIPS suggests that economic freedom and foreign aid have no unit root, the PESCADF shows evidence of no unit root for electricity consumption.

Finally, we explore the intercorrelation between the variables. The attendant results in Table A.2 show that while all the globalisation variables have positive correlation with IGG, electricity consumption and business freedom show otherwise. While this preliminary/first-hand information concerning the dataset is relevant, it is limited in the sense that it ignores several factors or conditions that influence multidimensional sustainability. Accordingly, we subject these perspectives into empirical analysis in the next section.

Table 3: Unit root tests

Variable	PESCADF Statistic	CIPS Statistic
Inclusive green growth	-0.878	-2.426
Financial access	-2.172	-1.478
Internet access	-2.26	-1.810
Electricity consumption	-2.976***	-2.310
Foreign aid	-2.160	-2.612*
Economic globalisation	-1.553	-1.616
Trade globalisation	-1.568	-1.638
Financial globalisation	-1.767	-1.712
Economic freedom	-2.222	-3.103***
Business freedom	-1.659	-2.147
Government integrity	-2.764**	-3.051***
Government spending	-2.691**	-2.853***
Investment freedom	-2.913***	-2.779**

**** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$*

3.4 Estimation strategy

This study employs techniques that produce consistent estimates in the presence of some aspect of endogeneity (e.g., simultaneity or reverse causality and the unobserved heterogeneity), heteroskedasticity, autocorrelation and cross-sectional dependence. The choice of the estimation technique must, thus, address these preliminary concerns and potential endogeneity inherent in Equation (1). Specifically, the simultaneity dimension of endogeneity is apparent in this study considering the potential bi-causal relation between IGG and financial access as documented in the finance-led growth and growth-led growth hypotheses (see, Schumpeter, 1911, McKinnon, 1973). Accordingly, we follow Opoku et al. (2022) where we integrate the fixed effects instrumental variable (IV) regression in the Driscoll-Kraay (1998) standard errors approach. In what follows, we deepen the understanding on the relevance of fixed effects IV-GMM-DCK standard errors estimator.

First, Driscoll and Kraay's (1998) estimator is robust to general forms of cross-sectional and temporal dependence. In this study, cross-sectional dependence is apparent, as confirmed by Pesaran's (2021) test of cross-sectional independence. Second, vis-à-vis the random effects or fixed effects estimator, the Driscoll-Kraay estimator is heteroskedastic and autocorrelation consistent (Driscoll-Kraay, 1998). Third, it is widely acknowledged that, compared to competing estimation techniques such as the Beck and Katz's (1995) panel-corrected standard errors, the Driscoll and Kraay (1998) estimator is more appropriate when the number of cross-sections exceed the time period (Zhang & Lin, 2012). Our data fulfils this requirement as well considering the fact that the number of countries in this study is 22 and the time period is 13 (i.e., $N=22 > T=13$). Fourth, the Driscoll and Kraay estimator accounts for constant differences across countries and thus reduces the likelihood of heterogeneity bias. Following Opoku et al. (2022), the study uses the first lags of the explanatory variables as instruments for the estimation. Finally, we employ the Blundell and Bond (1998) IV estimator for robustness checks.

4. Results

4.1 Summary statistics

Table 4 reports the summary statistics of the variables. The data reveal an average economic globalisation index of 52.7%, which indicates a moderately high cross-border trade and capital flows within and between Africa and the rest of the world. Across the trade and financial spheres of economic globalisation, mean levels of 52.1% and 53.3%, are apparent respectively.

Table 4: Descriptive Statistics, 2008 – 2020

Variable	Obs	Mean	Std. Dev.	Minimum	Maximum
Inclusive green growth	286	0.017	0.999	-1.091	2.736
Financial access	286	0.146	0.131	0.000	0.474
Internet access	286	22.735	19.527	0.015	84.12
Energy consumption	286	44.654	38.419	0.000	99.95
Foreign aid	286	3.779	4.082	0.000	22.517
Economic globalisation	286	52.744	14.413	0.000	89.022
Trade globalisation	286	52.145	15.564	0.000	89.921
Financial globalisation	286	53.343	16.322	0.000	99.186
Economic freedom	286	56.338	7.488	38.900	77.000
Business freedom	286	57.823	12.849	30.000	83.300

Table 4 continued

Government integrity	286	32.568	10.645	12.200	64.000
Government size	286	75.531	12.357	33.400	96.500
Investment freedom	286	48.252	17.242	15.000	90.000

Source: Authors' computations, 2023.

Also, the data show that the flow of soft loans, grants and technical assistance to the sampled countries averages 3.77% as a share of the continent's GDP. Additionally, the data reveal that financial access in Africa is low (14.6%). Similarly, the data suggest that digital infrastructure is in its nascent development in Africa. For the economic freedom indicators, the data reveal some interesting developments about Africa. Specifically, we observe a mean economic freedom score of 0.563 (56.3%) over the study period. As per the economic freedom categorization of Miller et al. (2023), this means that Africa's economic architecture is mostly unfree. Across the various sub-components of economic freedom, the data show that government spending is high in Africa (75.5%) whereas both investment freedom 0.482 (48.2%) and business freedom 0.578 (57.8%) are repressed. Perusing the data further, we present Figure 1 to show that the most economically unfree countries in Africa are Angola, Congo Republic and the Democratic Republic of Congo. Notwithstanding, countries such as Mauritius, Botswana, South Africa, Namibia, and Morocco have made remarkable strides in building freer economies.

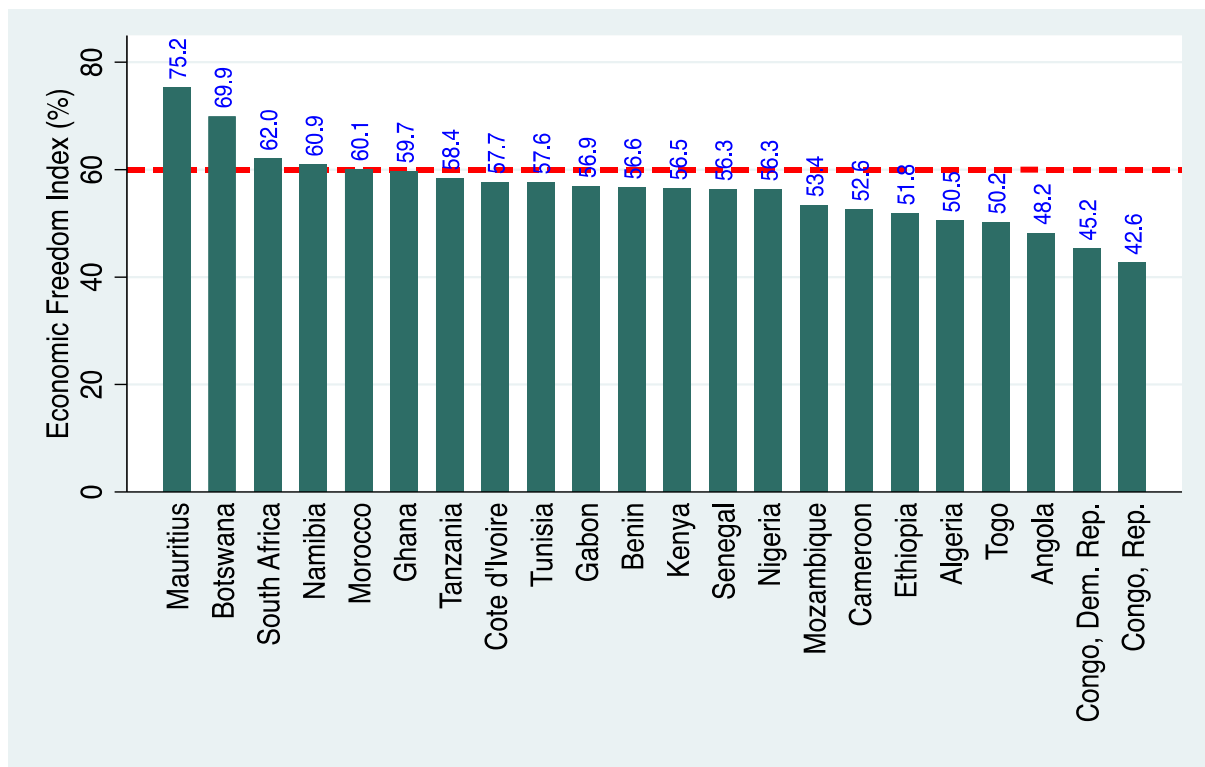


Figure 1: Economic freedom performance in African countries, 2008-2020.

Note: Data are taken from the Heritage Foundation Data Centre.

Authors' construct, 2023.

For the outcome variable, inclusive green growth (IGG), the data show that over the study period, Africa reports an average score of 0.017, which is regarded as green and inclusive. The in-country IGG performance of the countries we present in Figure 2 suggests that not all the countries are growing green and inclusive. Precisely, we find that, of the 22 countries considered in this study, only 9 countries have a growth trajectory that is both green and inclusive (see Figure 2). These countries are Togo, Mauritius, Nigeria, Benin, Ghana, Morocco,

Senegal, Tunisia, and Tanzania. The progress of these countries can – at least partly – be attributed to their strong commitment to reducing poverty and income inequality, broadening access to social overhead capital and cleaner energies.

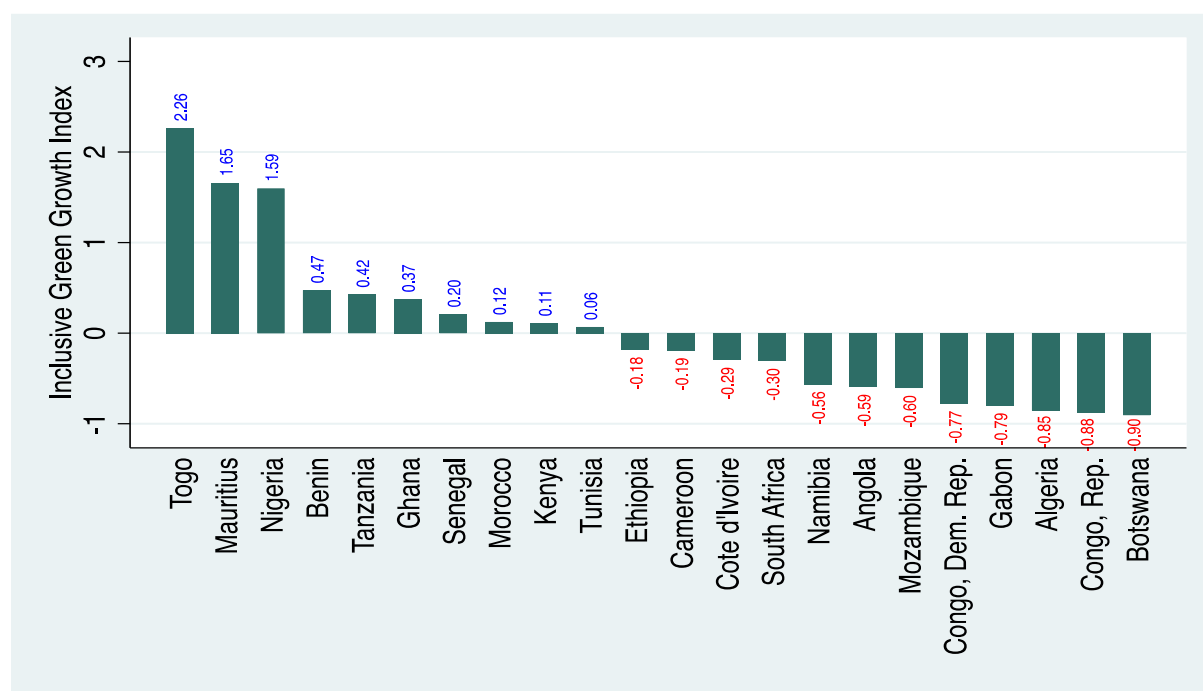


Figure 2: Inclusive green growth in African countries, 2008-2020. Authors' calculations, 2023.

4.2 Effects of economic globalisation and economic freedom on IGG

Table 5 presents the findings for the effects of economic globalisation (EG) and economic freedom on IGG in Africa. First, the evidence in Column 1 shows that, unconditionally, EG promotes IGG in Africa, albeit statistically insignificant. Thus, we do not find empirical evidence for Hypothesis 1a. From Columns 2-6, we pay attention to Hypothesis 1b, where we investigate the direct effects of economic freedom (including the subcomponents of government integrity, business freedom, investment freedom, and government spending) on IGG. The evidence shows that improvement in economic freedom is associated with greener and more inclusive growth although empirical support proves elusive (Column 2). At the disaggregated level, the findings are revealing. Notably, we find that among all the various subcomponents of economic freedom, only government integrity is statistically significant for promoting IGG (Column 4). Precisely, the evidence shows that a 1% improvement in government integrity promotes IGG by 0.013 points. These findings support our argument that ignoring the various perspectives of economic freedom could hamper policymaking.

Table 5: Effects of Economic Globalisation and Economic Freedom on Inclusive Green Growth

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Financial access	-0.3857 (0.3378)	-0.1313 (0.0844)	-0.1700** (0.0769)	-0.1260 (0.1062)	-0.1836** (0.0720)	-0.1317 (0.0845)	-1.2946*** (0.3645)	-1.0629*** (0.3761)	-1.0753 (0.7618)	-0.4071 (0.2943)	-1.0349*** (0.3435)
Internet access	-0.0002 (0.0005)	-0.0006 (0.0005)	-0.0007 (0.0005)	-0.0011* (0.0007)	-0.0005 (0.0005)	-0.0006 (0.0005)	0.0004 (0.0004)	-0.0002 (0.0003)	-0.0001 (0.0005)	-0.0001 (0.0005)	-0.0002 (0.0006)
Electricity consumption	-0.0002 (0.0002)	-0.0002 (0.0002)	-0.0002 (0.0002)	-0.0005** (0.0002)	-0.0002 (0.0002)	-0.0002 (0.0002)	-0.0000 (0.0002)	0.0002 (0.0002)	-0.0003 (0.0002)	-0.0003 (0.0003)	0.0002 (0.0003)
Foreign aid	-0.0082* (0.0047)	-0.0052 (0.0057)	-0.0061 (0.0044)	0.0013 (0.0047)	-0.0065 (0.0056)	-0.0060 (0.0054)	-0.0082** (0.0033)	-0.0083*** (0.0027)	-0.0045 (0.0061)	-0.0091* (0.0050)	-0.0072* (0.0039)
Economic globalisation (EG)	0.0038 (0.0035)						-0.0569*** (0.0097)	-0.0244*** (0.0056)	-0.0154*** (0.0040)	-0.0019 (0.0062)	-0.0081*** (0.0027)
Economic freedom		0.0049 (0.0039)					-0.0555*** (0.0116)				
Business freedom			-0.0011 (0.0029)					-0.0271*** (0.0068)			
Government integrity				0.0130** (0.0052)					-0.0221* (0.0119)		
Government spending					-0.0015 (0.0010)					-0.0055 (0.0055)	
Investment freedom						-0.0002 (0.0011)					-0.0175*** (0.0042)
EG × Economic freedom							0.0012*** (0.0002)				
EG × Business freedom								0.0005*** (0.0001)			
EG × Government integrity									0.0007*** (0.0002)		
EG × Government spending										0.0001 (0.0001)	
EG × Investment freedom											0.0003*** (0.0001)
Net effects	na	na	na	na	na	na	-0.0562***	-0.0240***	-0.0152***	-0.0018	-0.0079***
	na	na	na	na	na	na	0.0096	0.0056	0.0039	0.0061	0.0027
Joint Sig, Test Statistic	na	na	na	na	na	na	-5.85	-4.29	-3.82	-0.31	-2.94
Joint Sig, Test P-value	na	na	na	na	na	na	0.000	0.000	0.000	0.758	0.003
Observations	286	286	286	286	286	286	286	286	286	286	286
Countries	22	22	22	22	22	22	22	22	22	22	22
Wald Statistic	49.42***	33.80***	54.78***	18.58***	21.43***	31.51***	206.8***	347.6***	3334***	670***	50.25***
Wald P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5.98e-08
Hansen J statistic	2.637	2.474	2.748	2.836	2.390	2.678	3.072	3.217	3.943	2.620	2.316
Hansen p-value	0.620	0.649	0.601	0.586	0.664	0.613	0.546	0.522	0.414	0.623	0.678

*na is not applicable; Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1*

That said, we now shift focus to Hypothesis 2, where we consider the contingency effects of economic freedom in the EG-IGG relationship. Compelling evidences in Columns 7-11 show that all our economic freedom dynamics interact with EG to reduce IGG in Africa. First, for the economic freedom-IGG interactive term in Column 7, we report a net effect of -0.056 on IGG. This is computed by engaging the direct effect of EG on IGG (-0.0569), the coefficient of the EG-economic freedom interaction term (0.0012), and the average economic freedom score of 0.563, as apparent in Table 4. This net effect is statistically significant at 1%, and is obtained by invoking the *'lincom'* command in Stata. Following similar computations, we obtain marginal effects of -0.024 and -0.015 for the business freedom-EG, and government integrity-EG interaction terms in Columns 8 and 9, respectively. In the same vein, we find evidence at 1% level of significance that government spending and investment freedom interact with EG to reduce IGG by 0.001 and 0.007, respectively. The study, thus, establishes that, although unfree investment environment and high government consumption impede IGG, the dampening effects of repressed business freedom and government integrity are rather remarkable. These findings are revealing and provide strong empirical evidence that unfree/repressed economic environments can hurt multidimensional sustainability (Miller et al., 2023).

This is possible in that weak government integrity stifles private sector competition, open innovation and growth, which can reduce the positive impact of EG on IGG (IMF, 2019). Further, in unfree investment settings, there is lack of transparency, entrepreneurial opportunities and incentives for the private sector to grow and create descent economic opportunities. Besides, in unfree investment jurisdictions, governments' restrictions (directives) on capital flows (allocation), and undue political takeovers, which can dampen the IGG-enhancing effect of EG on IGG. Particularly, these developments can (i) signal established firms not to investment in green technologies, or (ii) be a disincentive to 'clean' foreign investors who are wary of undue political takeovers. Examples are the officially reported cases of host country-foreign investor disputes in countries such as Tanzania, Mozambique, Benin, and Congo (Adarkwah, 2021; p.201). Moreover, although government consumption in defence, healthcare delivery and resilient infrastructure can cushion EG to promote inclusive growth, excessive expenditure can also obstruct IGG. For instance, excessive government spending can crowd-out private investment and/or increase taxes and public debt. This can create a business environment that is unconducive to entrepreneurship and inimical to long-term planning and performance of firms. In this sense, high government expenditure, as evident in this study (75.5% of GDP as apparent in Table 4) can create perpetual economic stagnation, hampering IGG in the process.

For our ancillary results, the study finds that financial access, ICT diffusion and energy consumption reduce IGG in Africa. Precisely, while a 1% increase in financial access reduce IGG by 0.17 points (Column 3), internet access and energy consumption impede IGG by 0.001 and 0.0005 points, respectively (Column 4).The evidence concerning the IGG-deteriorating effect of internet access on IGG is at variance with that of Adeleye et al. (2021).However, it aligns with evidence that internet access can hinder IGG by intensifying income inequality and carbon emissions (see Njangang et al., 2022; Salahuddin & Alam, 2016). This is possible considering the fact that disparities in internet access across the rural-urban divide in Africa is high. Besides, many African countries still import 'second-hand' ICT gadgets from advanced countries, which have been shown to impede environmental progress through high energy intensity and CO₂ emission (Salahuddin & Alam, 2016). Also, the IGG-impeding effect of financial access is in line with the concern that access to financial products and services in Africa is largely concentrated in urban centres, and also attracts high lending cost. In this sense, financial accessing is more likely to support the entrepreneurial and innovative of affluent households relative to poor houses, dragging-down inclusive growth in the process. Moreover,

in Africa where informality is high, an increase in financial access can degrade the environment through the materialisation effect, and the participation in activities that are energy-intensive.¹ Finally, the deleterious effect of energy consumption on IGG can be attributed to the widespread energy poverty and informality in Africa² (IEA, 2021; IEA & World Bank, 2017).

4.2.1 Effects of trade globalisation and economic freedom on IGG

In this section, we examine whether the contingency effect of economic freedom in the EG-IGG relationship differ when disaggregate EG into trade globalisation (TG) and financial globalisation (FG). We first scrutinize the contingency effects of economic freedom in the trade globalisation-IGG relationship (see Table 6).

Table 6: Effects of Trade Globalisation and Economic Freedom on Inclusive Green Growth

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Financial access	-0.2047 (0.3382)	-0.8863 (0.5974)	-0.8482** (0.4000)	-0.5279 (0.8107)	-0.2736 (0.2687)	-0.8797* (0.4595)
Internet access	-0.0000 (0.0005)	0.0009 (0.0007)	0.0002 (0.0004)	-0.0000 (0.0005)	-0.0000 (0.0005)	0.0003 (0.0004)
Electricity consumption	-0.0003 (0.0002)	0.0001 (0.0002)	0.0003 (0.0002)	-0.0001 (0.0002)	-0.0003 (0.0003)	0.0002 (0.0003)
Foreign aid	-0.0089** (0.0042)	-0.0065* (0.0034)	-0.0087*** (0.0026)	-0.0005 (0.0070)	-0.0106** (0.0044)	-0.0058 (0.0039)
Trade globalisation (TG)	0.0016 (0.0035)	-0.0451** (0.0188)	-0.0248*** (0.0059)	-0.0131*** (0.0047)	-0.0033 (0.0070)	-0.0090** (0.0035)
Economic freedom		-0.0408** (0.0193)				
Business freedom			-0.0265*** (0.0084)			
Government integrity				-0.0137 (0.0107)		
Government spending					-0.0052 (0.0064)	
Investment freedom						-0.0163** (0.0064)
TG × Economic freedom		0.0009** (0.0004)				
TG × Business freedom			0.0005*** (0.0001)			
TG × Government integrity				0.0005* (0.0003)		
TG × Government spending					0.0001 (0.0001)	
TG × Investment freedom						0.0003** (0.0001)
Net effects	na na	-0.0446** (0.0186)	-0.0245*** (0.0058)	-0.0129*** (0.0046)	-0.0032 (0.0068)	-0.0088*** (0.0034)

¹ Examples of these activities include the restaurants, print and chemical businesses.

² According to the IEA (2021), about 600 million people in Africa do not have access to electricity.

Joint Sig, Test Statistic	na	-2.40	-4.19	-2.78	-0.48	-2.57
Joint Sig, Test P-value	na	0.016	0.000	0.005	0.634	0.010
Observations	286	286	286	286	286	286
Countries	22	22	22	22	22	22
Wald Statistic	128.2***	46.42***	54.87***	26.60***	354.4***	205.7***
Wald P-value	0.000	0.000	0.000	0.000	0.000	0.000
Hansen J statistic	2.322	3.277	2.903	3.171	2.302	2.427
Hansen p-value	0.677	0.513	0.574	0.530	0.680	0.658

*na is not applicable; Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$*

The evidence in Columns 2-6 of Table 6 shows that all our economic freedom indicators condition TG to reduce IGG in Africa. This finding is revealing per the evidence in Column 1 that TG boosts IGG by 0.001 points, although statistical support proves elusive. First, we report a net effect of -0.044 for the economic freedom-TG interaction term (Column 2). This total effect is calculated by taking into consideration the direct effect of trade globalisation on IGG (-0.0451), the mean value of economic freedom (0.563), and the coefficient of the trade globalisation and economic freedom interaction term (0.0009) on IGG. This harmful contingency effect remains notable when we consider the various perspectives of economic freedom. We find that business freedom and government integrity moderate trade globalisation to reduce IGG by 0.024 and 0.012, respectively. Similarly, we compute total effects of -0.003 and -0.008 for the government spending-trade globalisation (Column 5), and investment freedom-trade globalisation (Column 6), respectively.

The analysis, therefore, shows that regulatory inefficiency and unfree business environments are the major impediments to the effectiveness of TG in promoting IGG in Africa. Indeed, in Africa where enterprises are general small/medium, burdensome regulations can interfere with long-term business planning or price-setting process, which can inhibit firm performance and growth. Additionally, corruption can distort the composition of resource allocation away from clean energy, education and technical training, infrastructure, and investment support for the private sector (World Bank, 2018). This can impede shared prosperity by: (i) limiting market access for new entrants/smaller firms, (2) undermining private sector competition, and (3) incentivising private firms to favour rent-seeking activities. Also, unfree business environments can hurt environmental sustainability by undermining the adoption of green technologies, and the incentive of the private sector to invest in sustainable production and management practices, and research and development (OECD, 2017).

4.2.2 Effects of financial globalisation and economic freedom on IGG

Table 7 reports the findings for the conditional and unconditional effects of financial globalisation (FG) and economic freedom on IGG. We find that unconditionally, financial globalisation is positively related to IGG, albeit statistically insignificant. The conditional effects of FG on IGG are unique and revealing as well. First, we find that economic freedom moderates FG to reduce IGG by 0.036 (Column 2).

Table 7: Effects of Financial Globalisation and Economic Freedom on Inclusive Green Growth

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Financial access	-0.3305 (0.2146)	-0.7762*** (0.2260)	-0.6756** (0.3080)	-0.6510 (0.4290)	-0.3536* (0.1968)	-0.5516*** (0.2114)
Internet access	-0.0006 (0.0005)	-0.0006 (0.0006)	-0.0007 (0.0005)	-0.0007 (0.0007)	-0.0006 (0.0006)	-0.0008 (0.0007)
Electricity consumption	-0.0002 (0.0002)	-0.0002 (0.0002)	0.0000 (0.0002)	-0.0005** (0.0002)	-0.0002 (0.0003)	-0.0000 (0.0002)
Foreign aid	-0.0059 (0.0050)	-0.0066** (0.0027)	-0.0061*** (0.0023)	-0.0020 (0.0043)	-0.0063 (0.0053)	-0.0059 (0.0038)
Financial globalisation (FG)	0.0028 (0.0019)	-0.0365*** (0.0083)	-0.0159*** (0.0060)	-0.0103*** (0.0037)	0.0029 (0.0051)	-0.0039* (0.0023)
Economic freedom		-0.0341*** (0.0099)				
Business freedom			-0.0169** (0.0071)			
Government integrity				-0.0098 (0.0091)		
Government spending					-0.0011 (0.0036)	
Investment freedom						-0.0086*** (0.0026)
FG × Economic freedom		0.0007*** (0.0001)				
FG × Business freedom			0.0003*** (0.0001)			
FG × Government integrity				0.0004*** (0.0002)		
FG × Government spending					-0.0001 (0.0001)	
FG × Investment freedom						0.0002*** (0.0000)
Net effects	na	-0.0361*** (0.0082)	-0.0156*** (0.0059)	-0.0101*** (0.0036)	0.0029 (0.0050)	-0.0038* (0.0022)
Joint Sig, Test Statistic	na	-4.37	-2.63	-2.74	0.58	-1.69
Joint Sig, Test P-value	na	0.000	0.000	0.006	0.561	0.091
Observations	286	286	286	286	286	286
Countries	22	22	22	22	22	22
Wald Statistic	76.48***	305.3***	133.3***	211.1***	2565***	55.93***
Wald P-value	0.000	0.000	0.000	0.000	0.000	0.000
Hansen J statistic	2.704	2.714	2.997	3.091	2.571	2.387
Hansen p-value	0.608	0.607	0.558	0.543	0.632	0.665

*na is not applicable; Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$*

Similarly, the business freedom-FG, government integrity-FG, and investment freedom-FG interaction terms yield combined effects of -0.015, -0.010, and -0.003, respectively (Columns 3, 4 and 6). We show that compared to all other economic freedom indicators, unfree business environments and weak government integrity dampen Africa's IGG efforts. This is intuitive in

that both burdensome/redundant regulatory procedures are disincentive to foreign investors. For instance, while an unfree business environment is associated with high cost of starting, operating or closing down a business, unchecked government spending can also crowd-out businesses. This could cause foreign investors to shy away from committing enormous resources to eco-friendly investment (e.g., for carbon capture and water treatment), which could hurt environmental progress. Further, unfree business environments could also be attractive to ‘polluting’ rather ‘clean’ foreign firms. This is possible in Africa where environmental standards are weak, meaning that ‘polluting’ foreign firms could operate without accounting for the full cost of degradation to natural capital. Additionally, in unfree business environments, multinational companies (MNCs) could favour outsourcing or opt for strong ties with other foreign companies. This can hurt forward and backward linkages in the host countries, which can impede private sector performance (e.g., job creation) and inclusive growth.

The dampening effect of weak government integrity in the FG-IGG relationship is also not far-fetched. For example, informal payments by foreign investors to secure electricity/water connection or accepting bribes to enable foreign investors to skip environmental obligations can be a drawback to IGG in several respects. First, it can impair the capacity of African governments to tackle social problems or build climate change resilience (UN, 2018). Second, it can fuel illegal exploitation and/or trade in natural resources (e.g., wildlife, timber, etc), which can trigger setbacks to biodiversity and environmental progress (OECD, 2018). Third, it can provide grounds for polluting firms to operate without reclaiming or accounting damages to agricultural land, fresh water and air quality. For example, foreign firms may fail to adopt open innovation to mitigate leaching to water bodies and destruction to biodiversity associated with mining, cement or chemical production can be a drawback to IGG. This can intensify Africa’s challenge regarding water stress and premature mortalities arising from exposure to lead and air pollution (Global Green Growth Institute, 2019).

4.3 Computation of economic freedom thresholds

Thus far, the study has established that although EG appears to be IGG-enhancing, Africa’s mostly unfree economic architecture is likely to nullify the gains. Additionally, the analysis shows that across the trade and financial globalisation perspectives of EG, the potential nullifying-effect of poor economic freedom on the former is rather remarkable. Accordingly, in this section, we present a major contribution of this study, which has to do with informing policy on the short-term to long-term IGG gains of improving economic freedom in Africa.

These short-term to long-term threshold effects of economic freedom in the EG-IGG relationship is based on the argument by Miller et al. (2023) that countries perform better across the socioeconomic and environmental sustainability spheres of IGG when their economic environment is at least moderately free. In view of this, we provide evidence as to whether by improving the current level of economic freedom in Africa (0.563 (56.3%)) to 0.60 (60%), 0.70 (70%) or 0.80 (80%), the negative effects of EG identified in Tables 5,6, and 7 can be nullified or mitigated. The choice of these threshold values is deliberate in that Miller et al. (2023) consider 60% as the minimum value of the ‘*moderately free*’ bracket (i.e., 60–69.9%). Similarly, 70% and 80% are the minimum values for the ‘*mostly free*’ (70 – 79.9%), and ‘*free*’ (80-100%) categorisation.

With all that said, we present Table 8 to show the IGG gains of improving all the economic freedom indicators from the short-term (0.6) to the medium term (0.7) and long-term (0.8). Notably, we find that, at higher levels of economic freedom, all the IGG-deteriorating effects of EG are mitigated (but not nullified). For instance, by improving government integrity from

the short-term (0.6) to the long-term (0.8), the negative net effect is reduced from -0.015 to -0.014. Similarly, promoting investment freedom from 0.6 to 0.8, mitigates the marginal negative effect from -0.0079 to -0.0078.

Table 8: EG-IGG net effects at various economic freedom thresholds

Variables	0.6	0.7	0.8
Economic freedom (overall)	-0.0561** (0.0096)	-0.0560*** (0.0095)	-0.0559*** (0.0095)
Business freedom	-0.0240*** (0.0056)	-0.0240*** (0.0056)	-0.0239*** (0.0055)
Government integrity	-0.0150*** (0.0039)	-0.0149*** (0.0039)	-0.0148*** (0.0038)
Government spending	-0.0018 (0.0061)	-0.0018 (0.0061)	-0.0018 (0.0061)
Investment freedom	-0.0079*** (0.0027)	-0.0078*** (0.0026)	-0.0078*** (0.0026)

*NB: Results when globalisation is captured as economic globalisation in Equation 1; Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$*

Conspicuously, the study finds that increasing government expenditure beyond 0.6 (60%) appears to have no statistically significant effect in conditioning EG to promote IGG. When we disaggregate EG into trade globalisation and financial globalisation, the study reveals some important pieces of evidence. Precisely, we find that if EG is captured as financial globalisation, the mitigating effect of economic freedom is rather remarkable (Table A.3) when compared to the trade globalisation net effects in Table A.4. This is possible considering the plausible eco-friendly and sustainable management and production spillovers associated with financial globalisation. In this sense, improvements in economic freedom can provide a conducive environment for financial globalisation to promote IGG. Crucially, the results in Table 8, Table A.3 and Table A.4 show that irrespective of the type of globalisation, the mitigating effects of government integrity and investment freedom are striking.

5. Conclusion and policy implications

This study contributes to policy discourse aimed at promoting greener and more inclusive growth in Africa. Particularly, we examine whether economic freedom conditions economic globalisation (disaggregated into trade and financial globalisation) to foster inclusive green growth in Africa. We then compute thresholds necessary and sufficient for economic freedom (including the sub-indices of business freedom, government integrity, investment freedom, and government spending) to form relevant synergies with complementary policies to promote greener and more inclusive growth in Africa. To this end, we apply the Discroll-Kraay standard errors estimator with fixed effects two-step IV-GMM to macro data covering the period 2008-2020 for the analysis.

The following findings are established. First, compelling evidence from empirical analysis indicates that Africa's mostly unfree economic environment is likely to nullify the marginal positive effect of economic globalisation on inclusive green growth. Second, across the financial globalisation and trade globalisation dichotomy of economic globalisation, the study finds that the diminishing effect of economic freedom on the latter is rather striking. Third, compelling evidence from our threshold analysis suggests that, by improving Africa's mostly unfree economic architecture to 0.6 (moderately free) or 0.8 (free), the IGG-deteriorating net effects of EG are mitigated (but not nullified). It follows that beyond the relevance of economic freedom in influencing EG for favourable effects on IGG, complementary policies are still

worthwhile in order to boost the favourable moderating incidences of corresponding economic freedom dynamics.

This leads to the following policy options. First, African governments should endeavour to enhance economic freedom in Africa. Particularly, reforms aimed at addressing burdensome and redundant regulations should be pursued. Particularly, considering the highly informal setting of Africa, the reforms should aim at reducing the time and cost of accessing business needs such as the cost of accessing energy, water, and the cost of registering and closing down businesses. Second, investments in robust legal frameworks, and property rights should be pursued to improve the continent's economic architecture to at least the moderately free level. Third, in line with the remarkable role of financial globalisation on inclusive green growth African should governments encourage FDIs that come with sustainable technologies for production and distribution as well as innovations for reducing greenhouse gas emissions.

Future studies can explore how the economic freedom and economic globalisation interaction affect inclusive green growth in regions such as South America and South Asia. Additionally, future contributions should examine whether the contingency effect of economic freedom matters across the environmental and socioeconomic sustainability perspectives of inclusive green growth.

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Table A.1: List of sampled countries

Algeria	Kenya
Angola	Mauritius
Benin	Morocco
Botswana	Mozambique
Cameroon	Namibia
Democratic Republic of Congo	Nigeria
Congo Republic	Senegal
Cote d'Ivoire	South Africa
Ethiopia	Tanzania
Gabon	Togo
Ghana	Tunisia

Table A.2: Pairwise correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Inclusive green growth	1												
(2) Financial access	0.0752	1											
(3) Internet access	0.0138	0.564***	1										
(4) Energy consumption	-0.297***	-0.261***	-0.155**	1									
(5) Foreign aid	0.00746	-0.469***	-0.418***	0.397***	1								
(6) Economic globalisation	0.158**	0.484***	0.118*	-0.0758	-0.0395	1							
(7) Trade globalisation	0.0968	0.319***	0.0247	-0.0166	0.0354	0.899***	1						
(8) Financial globalisation	0.187**	0.550***	0.185**	-0.118*	-0.104	0.909***	0.634***	1					
(9) Economic freedom	0.226***	0.602***	0.448***	-0.284***	-0.286***	0.189**	0.0339	0.302***	1				
(10) Business freedom	-0.0046	0.690***	0.561***	-0.301***	-0.304***	0.216***	0.118*	0.270***	0.694***	1			
(11) Government integrity	0.0466	0.645***	0.488***	-0.210***	-0.293***	0.272***	0.126*	0.360***	0.792***	0.675***	1		
(12) Government spending	0.270***	-0.291***	-0.150*	0.0616	0.233***	-0.211***	-0.191**	-0.191**	0.0877	-0.212***	-0.223***	1	
(13) Investment freedom	0.234***	0.420***	0.369***	-0.311***	-0.207***	0.210***	0.112	0.264***	0.768***	0.416***	0.609***	-0.0355	1

* $p < 0.01$, ** $p < 0.05$, *** $p < 0.001$

Table A.3: FG-IGG net effects at various economic freedom thresholds

Variables	0.6	0.7	0.8
Economic freedom (overall)	-0.0360*** (0.0082)	-0.0360*** (0.0082)	-0.0359*** (0.0082)
Business freedom	-0.0156*** (0.0059)	-0.0156*** (0.0059)	-0.0155*** (0.0059)
Government integrity	-0.0100*** (0.0036)	-0.0099*** (0.0036)	-0.0099*** (0.0036)
Government spending	0.0029 (0.0050)	0.0029 (0.0050)	0.0029 (0.0050)
Investment freedom	-0.0037* (0.0022)	-0.0037* (0.0022)	-0.0037* (0.0022)

*NB: Results when globalisation is captured as financial globalisation in Equation 1; Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$*

Table A.4: TG-IGG net effects at various economic freedom thresholds

Variables	0.6	0.7	0.8
Economic freedom (overall)	-0.0445** (0.0185)	-0.0445** (0.0185)	-0.0444** (.0185)
Business freedom	-0.0245*** (0.0058)	-0.0244*** (0.0058)	-0.0244*** (0.0058)
Government integrity	-0.0128*** (0.0045)	-0.0127*** (0.0045)	-0.0127*** (0.0045)
Government spending	-0.0032 (0.0069)	-0.0032 (0.0068)	-0.0032 (0.0068)
Investment freedom	-0.0087** (0.0034)	-0.0087** (0.0033)	-0.0087** (0.0033)

*NB: Results when globalisation is captured as trade globalisation in Equation 1; Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$*