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Abstract

This study employs macrodata for 23 African countries to examine whether good governance interacts with economic globalisation (EG) to foster inclusive green growth (IGG). First, the study finds that EG hampers IGG in Africa. Second, although unconditionally good governance promotes IGG, only government effectiveness interacts with EG to foster IGG. Across the social and environmental sustainability dimensions of IGG, however, the effects differ substantially. Notably, while the EG-governance pathways yield remarkable environmental sustainability net gains, a modest harmful effect was observed for socioeconomic sustainability. Evidence from our threshold analyses also suggests that while government effectiveness is critical for propelling EG to promote IGG, across the social and environmental perspectives of IGG, it is investments in building frameworks and structures for corruption control and the rule of law that are crucial. Our results shed new light on IGG and have several implications for Agenda 2030 and Agenda 2063.

Key Words: Africa, Economic Globalisation; Governance; Inclusive Growth; Inclusive Green Growth; Greenhouse Gas Emissions; Sustainable Development.

JEL Codes: *F18; F4; F6; F63; F64; H1; O55; Q01; Q56*

1. Introduction

Policymakers, in line with the Sustainable Development Goals (SDGs), have stepped up efforts aimed at achieving multidimensional sustainability (IPCC, 2022; Sarkodie, 2022; Sachs et al., 2021; GGGI, 2020; UN, 2015). In addition to their commitment to this course, African leaders have instituted a long-term development plan[1] christened, '*The Africa We Want*'. In the broader sense, Agenda 2063 seeks to foster shared prosperity, build the institutional and industrial capacity of the continent, improve environmental quality and ensure that by 2063, Africa becomes a key global player (AU, 2015). The bottom-line is that since 2015, the policy discourse in Africa has seen a paradigm shift from the focus on the economy to include equity and environmental sustainability. The preceding developments bring to the fore the concept of *Inclusive Green Growth* (hereafter: IGG), which signifies achieving a growth trajectory that is socially and environmentally sustainable such that natural capital continues to provide the resources and environmental services on which life depends (GGKP 2013). It is indeed an ambitious but crucial development agenda for settings like Africa, where the pace in fostering shared prosperity has generally been slow and even suffered a major setback following the emergence of the coronavirus pandemic (Sacks et al., 2021; World Bank, 2020; IMF, 2020; ILO, 2020).

The need to foster IGG in Africa is evident in the 2022 Climate Change Report and the 2021 Sustainable Development Goals Report, which indicates that failure to keep track of IGG could be dire, especially for developing countries. This stems from the information gleaned from the IPCC (2022), Sachs et al. (2021) and WHO (2022), which suggests that climate change is accelerating vulnerabilities to food insecurity, heat waves, floods, biodiversity loss and pollution-related mortalities. It is on the basis of the foregoing that this study examines whether *economic globalisation* (hereafter: EG) promotes IGG in Africa. According to the OECD (1995), EG is a shift from a world of different national economies to a global economy where production is internationalised, and capital flows freely and instantly. EG, thus, encompasses the gradual elimination of barriers to trade, labour mobility, foreign direct investment and financial integration (Gygli et al., 2019). Our focus on EG stems from the fact that the OECD (2017) identifies it as a vital component of the *Green Economic Opportunities* toolkit as its relevance cuts across several dimensions of IGG – from economic growth, decent work, and poverty reduction to green technological diffusion for carbon capture/abatement.

[1] This is also referred to as the African Agenda 2063.

For instance, from the socioeconomic sustainability (hereafter*:* SES) perspective of IGG, a plethora of prior contributions shows that EG can accelerate economic growth, poverty reduction and fairer income distribution through knowledge spillovers, industrialisation, macroeconomic stability, and employment (see e.g., UNCTAD, 2021; WTO, 2020; Asongu & Odhiambo, 2020a; Sachs & Warner, 1995; Aghion & Howitt, 1990). There is also empirical evidence that EG can promote SES through enhanced private-sector competition, forward and backward linkages, and global value chain participation (Obeng et al., 2022; Anetor et al., 2020; Ucal, 2014; Fauzel et al., 2015). Additionally, EG can foster social equity through infrastructural development, human capital development, and corporate social responsibility while supporting fiscal redistribution through the fulfilment of tax obligations (Opoku et al*.,* 2019). On the environmental sustainability front (hereafter: EVS), EG can prove crucial as well. For instance, green FDI can boost investments in Africa's renewable energy production and energy systems (IEA et al., 2020; FDI Intelligence, 2016; IRENA, 2013). Besides, EG can spearhead Africa's quest to improve green innovation and renewable energy investments essential for realising net-zero carbon emission by 2050.

Despite these potential IGG-gains of EG, some concerns have been raised that it can be a drawback to sustainable development. In a bird's eye view, the concern goes beyond the macroeconomic and growth-destabilisation effects in the form of capital flight and floundering of domestic firms to include environmental degradation and increased inequalities (Ndikumana & Sarr, 2019; Ravallion, 2018; Corak, 2013). For instance, on SES, red flags have been raised that EG can deepen income inequality through automation and the susceptibility of developing countries to global economic and financial shocks (see, e.g., Alvaredo et al., 2017; Pavcnik, 2017; Bourguignon, 2016; Piketty, 2013). Further, in settings like Africa, where the (i) consumption of non-renewable energy is high, (ii) energy systems are in early stages of development, (iii) contribution of the continent to global value chains is chiefly primary, and (iv) there is intense competition for FDI inflows, EG can trigger EVS setbacks by accelerating natural capital depletion and greenhouse gas emissions.

The foregoing arguments suggest that the effectiveness of EG in delivering IGG is not assured. It is in this regard that we reckon that, good governance could prove crucial in realising IGG in Africa. Put differently, we argue that effective governance could prove vital for providing the economic, political, and institutional setting required for propelling EG to promote IGG. On the EVS front, for instance, strong institutional governance is necessary for building robust legal and accountability frameworks that ensure that both domestic and foreign investors commit to environmental standards (Gu et al., 2021; Kamah, 2021; Dhrifi, 2020).

Also, prudent economic governance is imperative for supporting indigenous and foreign investors in R&D and for rolling out eco-friendly innovation schemes, which can reduce energy intensity and pollution (Abid et al., 2021; Holley & Lecavalier, 2017; Asongu et al., 2019). Moreover, against the backdrop that most firms in Africa are small and the adoption of clean fuels and technologies is low, regulatory efficiency is needed for promoting economic freedom, which according to Miller et al. (2022), promotes EVS through environmentally-sustainable production practices.

In the remit of SES, prior contributions in Asongu and Kodila-Tedika (2016) and Doumbia (2019) also stress the relevance of prudent economic governance for business freedom and support for the private sector to take advantage of incentives such as EG to contribute to shared growth. Besides, Ivanyna and Salerno (2021) and Acemoglu and Robbinson (2019) point out that robust institutional governance is essential for sharing the gains from EG and eliminating burdensome frameworks that impede firm performance. Moreover, as Asongu and Nwachukwu (2016) and Khan (2012) argue, sound political governance is also imperative for building social cohesion and a safer business climate for attracting and sustaining foreign investors to contribute to decent work and economic growth. However, these plausible EG-governance synergies could elude Africa considering the continent's weak governance quality as Nchofoung and Asongu (2022), Asongu and Odhiambo (2021a, 2021b) and Doumbia (2019) point out.

Notwithstanding these EG-governance-IGG linkages, rigorous empirical studies informing policy on whether EG and governance matter for IGG in Africa are hard to find. Although the extant scholarship on sustainable development shows that some studies have examined the (un)conditional effects of EG and governance across the SES and EVS, the poverty in these contributions is that they do not show whether these two variables foster/hamper IGG. For instance, on EVS, previous studies (see, e.g., Nchofoung & Asongu, 2022; Dauda et al., 2021; Asongu & Odhiambo, 2021b; Yameogo et al., 2021; Afrifa et al., 2020) show that EG and governance matter for environmental performance. Also, on inclusive growth, several studies find that EG and governance affect economic growth, income inequality and poverty (see, e.g., Ofori et al. 2022a; Osabohien et al., 2021; Adeleye et al., 2021; Oyinlola & Adedeji, 2019; Dougherty and Akgun, 2018). We build on these earlier contributions by interrogating how EG and governance impact IGG in Africa. This is particularly relevant considering the implementation of the African Continental Free Trade

Agreement (AfCFTA) in line with Africa's Agenda 2063.[2] Second, we go a step further to examine whether good governance interacts with EG to foster IGG. Finally, the extant scholarship on IGG is deficient as to whether there are possible IGG gains of improving Africa's institutional fabric from the short-term through to the long-term. This study seeks to contribute to the IGG scholarship by addressing these gaps.

Our contribution, which is based on macrodata for 23 African countries and instrumental variable regression, has generated some compelling findings. First, we find that EG is negatively related to IGG. Second, governance matters directly and indirectly in promoting IGG in Africa. Across the SES and EVS divide, however, the effects differ substantially. Notably, while the EG-governance pathways yield remarkable EVS net gains, a modest harmful effect was observed for SES. Finally, we provide evidence through threshold analysis to show that the short-term to long-term IGG gains of improving the various governance dynamics in Africa are striking.

The rest of the study is structured as follows: the next section provides the analytical framework linking EG and governance to IGG, while Section 3 sheds light on the methodology. Section 4 deals with the presentation of the results, with Section 5 saved for the conclusion and policy recommendations.

2. Theoretical background and literature review

2.1 Theoretical and empirical survey on the link between EG and IGG

The theoretical linkages between EG and IGG can be explained from two perspectives – the theories regarding EG and SES on the one hand, and EG and EVS on the other hand. On the former, the modernisation and endogenous growth theories recognise trade and FDI as giant channels for spurring industrialisation and durable growth through technological change, innovation and scale economies (Romer, 1986, 1990; Lucas, 1988; Grossman & Helpman, 1991; Aghion & Howitt, 1990). Further, the wisdom in the classical Ohlin (1939), the Samuelson (1948, 1939) theorem and the Balassa and Stoutjesdijk (1975) theory also position EG as vital for generating fairer income growth and distribution through specialisation, employment and poverty alleviation. Indeed, while some studies confirm that EG promotes inclusive growth (see e.g., Obeng et al., 2022; Opoku et al., 2019; Bergh & Nilsson, 2014),

[2] Goal 1.4 of Aspiration 1 of Agenda 2063 seeks to accelerate progress towards continental unity and integration for exchanges of goods and services, free movement of people and capital to spur industrialisation and growth.

harmful effects in the form of wage dispersion, capital flight, crowding out of local firms and financial shocks, have also been raised (Helpman et al., 2017; Bourgionon, 2016; Piva, 2003).

The EG-EVS linkages can also be analysed primarily through the lenses of the pollution haven hypothesis (PH), pollution halo hypothesis (PHH), and the Green Solow model. The PHH is the notion that EG harms EVS in developing countries (Copeland, 2005). This arises as EG provides grounds for pollution-intensive firms to avoid stringent environmental standards in developed countries for developing countries. Empirical evidence of this effect is seen in Tawiah (2021), Khan et al. (2020) and Balsalobre-Lorente (2022). On the contrary, the PH identifies EG as EVS-enhancer through the diffusion of eco-friendly technologies in developing countries (Doytch & Uctum, 2016; Zarsky, 1999). Studies providing empirical evidence of this effect have also been reported in the literature (see e.g., Jiang et al., 2018; Chen et al., 2013; Hakimi & Hamdi, 2016; Khan et al., 2020; Eskeland & Harrison, 2003). Additionally, in the remit of the Green Solow model, EG can be seen as a crucial driver of durable growth, which can boost the financial capacity of developing countries to address environmental degradation (Brock & Taylor, 2010).

2.2 Theoretical and empirical survey on the link between governance and IGG

The role of good governance in sustainable development stretches from mapping out demand-side policies to including economic freedom, environmental protection and pollution reduction. For instance, as the OECD (2017), World Bank (2012) and UNDP (2017, 2011) point out, quality governance is required to foster SES through appropriate fiscal and monetary policies that promote private sector performance, economic growth and poverty alleviation. The result signifies the effectiveness of policymakers in promoting economic freedom for the masses to take advantage of EG to support national development (Fay, 2012). Also, the IMF (2017, 2016), Acemoglu and Robinson (2010, 2008), and North (1990) contend that effective governance is required not only for tackling corruption but also for promoting human capital development and inclusion.

On EVS, quality governance also matters for cleaning up (reclaiming) some degraded natural capital and promoting the environmental quality of life through green innovations and the enforcement of eco-friendly production and consumption practices. This is linked with the recognition that, in unequal settings like Africa, effective redistribution can cushion poor/low-income households to adopt energy-efficient materials (Asongu & Nnanna, 2019). The Porter (1995) hypothesis also points to the relevance of governance in setting environmental standards, which can promote EVS through environmentally-benefitting innovations (Porter &

Van der Linde, 1995). For instance, recent evidence in Sarkodie et al. (2020) suggests that governments' environmental policies are critical in mitigating climate change. This point is corroborated by other scholars who argue that institutions, especially those for the rule of law and greater contract enforcement, can help flatten the EKC and lower the environmental cost of economic expansion (Tamazian et al., 2009; Bhattarai & Hammig, 2001; Panayotou, 1997).

2.3 Inclusive Green Growth (IGG) conceptual framework and hypotheses development

Drawing on the EG-governance-IGG linkages espoused in the preceding sections, we present an analytical framework that shows how IGG can be realised with EG and quality governance. Inclusive green growth, as Figure 1 indicates, takes its root from two key sustainability dimensions: (1) socioeconomic sustainability, which denotes gains in economic growth, income equality, employment, wealth accumulation, human capital development, healthcare, potable water, sanitation, and (2) environment sustainability, which signifies the protection of natural capital, improving the environmental quality of life, production and adoption of environmentally-friendly technologies, and creation of green opportunities and policy response. Figure 1 shows that socioeconomic progress, can be achieved with appropriate institutional, political and economic governance. Further, our analytical framework indicates that though EG can be leveraged to foster social and environmental progress, good governance can also play a role, especially in marginalised settings like Africa, to realise IGG. Based on this framework and our argument in the preceding sections, we incorporate our hypotheses into Figure 1. We capture the first hypothesis as unconditional effects of EG and governance on IGG, SES and EVS:

> Hypothesis (H_{1a}): Economic globalisation fosters inclusive green growth.
> Hypothesis (H_{1b}): Good governance induces inclusive green growth.

In line with our argument on the moderating role of governance in the EG-IGG relationship, we formulate our second hypothesis as follows:

> Hypothesis (H_2): Good governance interacts with economic globalisation to induce inclusive green growth.

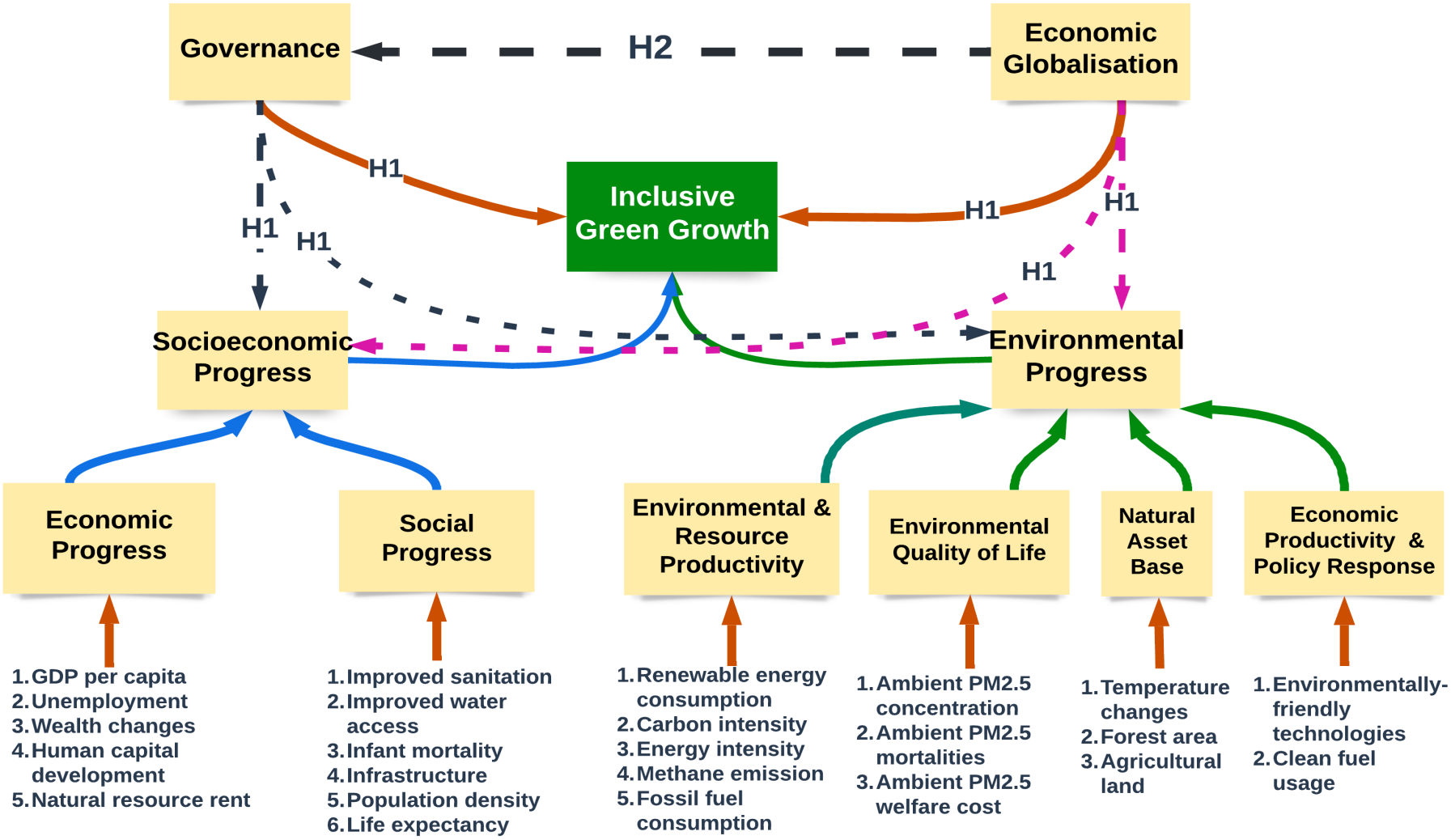

Figure 1: Conceptual Framework: Governance, Economic Globalisation and Inclusive Green Growth
Source: Authors' construct, 2022

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Finally, considering Africa's institutional fabric, as clearly depicted in Figure A.1[3], the study concludes the empirical analyses by interrogating whether, from the short-term to the long-term, improving the various facets of governance in Africa can yield remarkable IGG dividends. This is worth exploring considering the direct relationship between these governance indicators and IGG as apparent in Figure 2.

[3] All the governance indicators have average values below the global mean of 0 set by the World Bank (see Kaufmann et al., 2010)

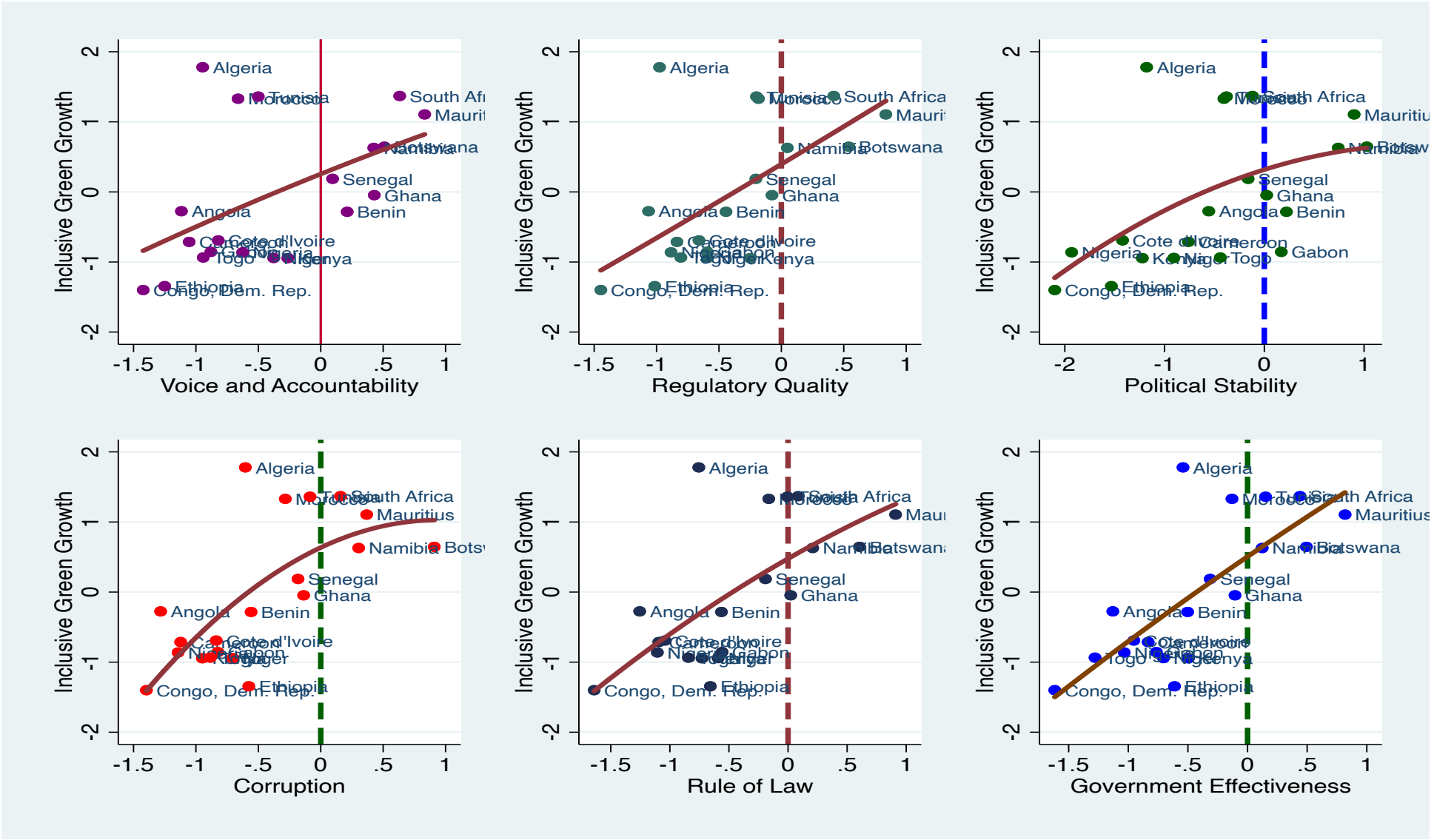

Figure 2: Graphical Relationship Between Governance and IGG in Africa, 2000 – 2020
Source: Authors' construct, 2022

3. Methodology and data

3.1 Data

The study employs macrodata spanning 2000 – 2020 for 23 African countries for the analysis.[4] The essence of the study period is to allow for sound analysis as it coincided with the period when African leaders committed to multidimensional sustainability in line with Agenda 2030. The choice of the countries is on the grounds of data availability. For instance, we could not consider countries such as Libya, Egypt, Somalia, Eritrea, Mali, and Chad as data on air pollution, pollution-related mortalities, governance quality, and wealth changes are limited. The primary outcome variable in this study is inclusive green growth (IGG) – a multidimensional sustainable development indicator generated principal component analysis (PCA). The PCA is deemed reliable for generating indices over a long period due to its power in addressing the problem of collinearity among several indicators to obtain a smaller set of indices known as principal components (Asongu & Odhiambo, 2020a, 2020b).

We further disaggregate IGG into social and environmental sustainability, where we compute the former via the Anand et al. (2013) approach. This approach is comprehensive as it integrates economic growth and income inequality in a unified manner (see Obeng et al., 2022; Ofori & Asongu, 2021). For the latter, we shy from using CO_2 emissions for greenhouse gas emissions as environmental degradation goes beyond carbon emissions to include other pollutants such as methane and nitrous oxide.

The key regressor in this study is economic globalisation (EG) and is appreciated as the KOF economic globalisation index, which is a composite index for trade and financial globalisation (Gygli et al., 2019). The moderating variable in this study is governance. To inform policy on the governance module(s) crucial for propelling EG to foster IGG, we keep tabs on the three main governance dynamics put forward by Kaufmann et al. (2010) – (i) economic governance (government effectiveness and regulatory quality), (ii) political governance (political stability, and voice and accountability), and (iii) institutional governance (the rule of law and corruption control).

Further, the study controls for some variables based on econometric prudence. The reasons informing the choice of these covariates in the conditioning information set centre on the (i) rise in the new economy in Africa, (ii) role of development assistance and (iii) resource allocation for sustainability. First, we pay attention to the new economy, measured as the

[4] The countries are: Algeria; Angola; Benin; Botswana; Cameroon; Democratic Republic of Congo; Republic of Congo; Cote d'Ivoire; Ethiopia; Gabon; Ghana; Kenya; Mauritius; Mozambique; Namibia; Niger; Nigeria; Senegal; Seychelles; South Africa; Tanzania; Togo; and Tunisia.

proportion of the population with internet access on grounds of empirical evidence that it drives both SES and EVS. For instance, some studies find that ICT diffusion promotes inclusive growth through access to information, economic growth and reduction in income inequality (Adeleye et al., 2021; Tchamyou et al., 2019; Ofori et al., 2021). Concerning EVS, while some researchers find that internet access reduces precarity and carbon footprint (see e.g., Zhao et al., 2021; Global e-Sustainability Initiative, 2020; Danish, 2019), contrary effects have also been reported (see e.g., Alatas, 2021; Higón et al., 2017; Salahuddin et al., 2016).

Second, we consider financial development per the growing evidence that resource allocation has SES and EVS implications. For instance, the extant literature shows that the effect of financial development on IGG goes beyond economic growth and reduction in the intensity and severity of poverty and income inequality (see e.g., Rewilak, 2017; Peprah et al., 2019; Demirgüç-Kunt & Singer., 2017) to include reduction in ecological footprints (see e.g., Adams & Koblodu et al., 2018; Shahbaz et al., 2018). Nonetheless, concerns have also been raised that financial development drags down social progress through the heating up of the economy (see e.g., Law & Singh, 2014; Arcand et al., 2015; Cecchetti & Kharroubi, 2012), while recent evidence in Ahmad et al. (2021), Halkos and Polemis (2017); Shahbaz et al. (2016) also show that financial development triggers environmental degradation through the materialisation effect.

Finally, we keep tabs on foreign aid considering global efforts to intensify the North-South partnership for sustainable economic growth and development (Kruckenberg, 2015; Chaurey et al., 2012). Particularly in Africa, multinational organisations such as the United Nations and WHO have stepped up support in the form of technical competence and funds for human capital development, adoption of eco-friendly technologies, enhancement of climate change resilience and mitigation of environmental degradation (OECD, 2020; ODI, 2020; DAC/OECD, 2020, WHO, 2019; UNEP, 2015; UNCTAD, 2014). Table 1 shows the descriptions and data sources for the variables.

Table 1: Description of variables and data sources

Variables	Symbol	Descriptions	Sources
Dependent variable			
Inclusive green growth	*IGG*	Sustainable development indicator generated using the PCA	Authors
Inclusive growth	*IGROWTH*	Shared prosperity generating following the approach of Anand et al. (2013)	Authors
Greenhouse gas emissions	*GHG*	Total greenhouse gas emissions (thousand metric tons of CO2 equivalent excluding Land-Use Change and Forestry)	WDI
Main independent variables			
Economic globalisation	*EG*	KOF economic globalisation index	KOF
Control variables			
Foreign aid	*FAID*	Inflow of official development assistance (% GNI)	WDI
Internet access	*INT*	Individuals using the Internet (% population)	WDI
Financial development	*FD*	Financial development index	FINDEX
Moderating variables			
Control of corruption	*CORR*	Captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests (estimate)	WGI
Rule of law	*LAW*	captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular, the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence	WGI
Government effectiveness	*GOVEFF*	Perception of the effectiveness of governments in managing and introducing policies aimed at economic growth and development (estimate)	WGI
Regulatory quality	*REGU*	Capture perceptions of the government's ability to formulate and implement sound policies and regulations that permit and promote private sector development.	WGI
Political stability	*POL*	Measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism.	WGI
Voice & accountability	*VOICE*	Captures perceptions of the extent to which a country's citizens participate in selecting their government, as well as freedom of expression, freedom of association, and free media.	WGI

Note: WDI is World Development Indicators; FINDEX is IMF's Financial Development Index; WGI is World Government Indicators; KOF is KOF. Globalisation Index

3.3. Theoretical and empirical model specifications

Taking cues from the theoretical linkages between EG and IGG as espoused in the endogenous growth theory and the institutions-IGG relationship advocated in Acemoglu and Robinson (2019) and Kaufmann et al. (2010), our theoretical models are presented. First, in line with our analytical framework in Section 2.3, this study proposes a theoretical model where IGG is driven primarily by EG, governance and the set of control variables.

$$IGG = f(EG, GOV, INT; FD; FAID), \quad (1)$$

where $\boldsymbol{IGG}$ is inclusive green growth; $\boldsymbol{EG}$ is economic globalisation; $\boldsymbol{INT}$ is internet access; $\boldsymbol{FD}$ is financial development index; $\boldsymbol{FAID}$ is foreign aid; and $\boldsymbol{GOV}$ is an indicator for the six governance modules (i.e., political stability (**POL**); corruption control (**CORR**); regulatory quality (**REGU**); government effectiveness (**GOVEFF**); the rule of law (**LAW**); and voice and accountability (**VOICE**)). That said, we follow the functional form specification of Bekun et al. (2019), Shahbaz et al. (2017), and Nathanael and Iheonu (2019) for environmental sustainability, where our dependent variable now changes to greenhouse gas emissions.

$$EVS = f(EG, GOV, INT; FD; FAID), \quad (2)$$

where $\boldsymbol{EVS}$ is environmental sustainability, while the definitions of all other symbols remain as aforementioned. Finally, in line with the theoretical specifications of Amponsah et al. (2021) and Whajah et al. (2019), the functional form for socioeconomic sustainability is also specified as:

$$SES = f(EG, GOV, INT; FD; FAID), \quad (3)$$

where $\boldsymbol{SES}$ represents socioeconomic sustainability. We proceed by transforming Equations 1 – 3 into standard empirical econometric models. In line with Objective 1, which seeks to identify the unconditional effects of EG and governance on IGG, SES and EVS, we first present three baseline models as apparent in Equations 4 – 6, where the effects of only the control variables (i.e., internet access, financial development, and foreign aid) are evaluated

$$IGG_{it} = \alpha_0 + \delta_1 IGG_{it-1} + \delta_2 INT_{it} + \delta_3 FD_{it} + \delta_4 FAID_{it} + \mu_i + \mu_t + \epsilon_{it} \quad (4)$$

$$GHG_{it} = \tau_0 + \omega_1 GHG_{it-1} + \omega_2 INT_{it} + \omega_3 FD_{it} + \omega_4 FAID_{it} + \mu_i + \mu_t + \epsilon_{it} \quad (5)$$

$$IGROWTH_{it} = \not{g}_0 + \beta_1 IGROWTH_{it-1} + \beta_2 INT_{it} + \beta_3 FD_{it} + \beta_4 FAID_{it} + \mu_i + \mu_t + \epsilon_{it}, \quad (6)$$

where $\boldsymbol{IGG_{it}}$ is inclusive green growth in country $\boldsymbol{i}$ at time $\boldsymbol{t}$ and $\boldsymbol{IGG_{it-1}}$ is the first lag of inclusive green growth, used to denote the initial sustainable development condition. In respective terms, $\boldsymbol{GHG_{it}}$ and $\boldsymbol{GHG_{it-1}}$ are used to signify greenhouse gas emissions and its first-year lag. Accordingly, we use $\boldsymbol{IGROWTH}$ and $\boldsymbol{IGROWTH_{it-1}}$ to represent inclusive growth and its first lag, while $\boldsymbol{\mu_i}$ signifies the country-specific effects, with $\boldsymbol{\epsilon_{it}}$ denoting the idiosyncratic error term.

We now focus on the specification of our full models, where the direct and indirect effects of economic globalisation ($\boldsymbol{EG}$) through governance ($\boldsymbol{GOV}$) on $\boldsymbol{IGG}$, $\boldsymbol{GHG}$ and $\boldsymbol{IGROWTH}$ are presented.

$$IGG_{it} = \alpha_0 + \delta_1 IGG_{it-1} + \delta_2 INT_{it} + \delta_3 FD_{it} + \delta_4 FAID_{it} + \delta_5 EG_{it} + \delta_6 GOV_{it} + \delta_7 (EG_{it} \times GOV_{it}) + \mu_i + \mu_t + \epsilon_{it} \quad (7)$$

$$GHG_{it} = \tau_0 + \delta_1 GHG_{it-1} + \delta_2 INT_{it} + \delta_3 FD_{it} + \delta_4 FAID_{it} + \delta_5 EG_{it} + \delta_6 GOV_{it} + \delta_7 (EG_{it} \times GOV_{it}) + \mu_i + \mu_t + \epsilon_{it} \quad (8)$$

$$IGROWTH_{it} = \not{g}_0 + \beta_1 IGROWTH_{it-1} + \beta_2 INT_{it} + \beta_3 FD_{it} + \beta_4 FAID_{it} + \beta_5 EG_{it} + \beta_6 GOV_{it} + \beta_7 (EG_{it} \times GOV_{it}) + \mu_i + \mu_t + \epsilon_{it} \quad (9)$$

In estimating Equations 7 – 9, we employ the instrumental variable technique of Blundell and Bond (1998). The reasons informing this choice are outlined in the following. First, as Tchamyou et al. (2019) and Asongu and Odhiambo (2020a) point out, applying the dynamic GMM estimator is appropriate since the study period under consideration (i.e., 21) is shorter than the sampled countries (23). Besides, we find this approach appropriate since it incorporates the lags of the outcome variables in our models. This is important as it enables us to address the issue of specification bias, which arises if one does not account for conditional convergence across the panels (Obeng et al., 2022). Additionally, the dynamic GMM estimator is suitable as it addresses potential endogeneity concerns in this study. In our study, endogeneity is apparent due to: (i) the possible bi-causal relationship between institutions and economic development (Ofori et al., 2022b; World Bank, 2012; Kaufmann et al., 2010), and financial development and inclusive growth (Ofori et al., 2022c; Ofori et al., 2022d). Further,

the introduction of $\boldsymbol{IGG_{it-1}}$, $\boldsymbol{GHG_{it-1}}$ $\boldsymbol{IGROWTH_{it-1}}$ in their respective models raises the concern of endogeneity (see Obeng et al., 2022; Ofori et al., 2020e). For instance, as Ofori and Asongu (2021) argue, the introduction of the lag of inclusive green growth ($\boldsymbol{IGG_{it-1}}$) as apparent in Equation (7) leads to endogeneity since $\boldsymbol{IGG_{it-1}}$ depends on $\boldsymbol{\epsilon_{it-1}}$, which also depends on the country-specific impact $\boldsymbol{\mu_i}$. This is because the Blundell and Bond (1998) approach uses a step-step estimation procedure whereby in the first difference estimation, the estimator sweeps away all the country-specific effects, leading to a correlation between the lag of the regressand (i.e., $\boldsymbol{IGG_{it-1}}$) and the error terms.

There are several ways of addressing these endogeneity concerns. For instance, Arellano and Bond (1991) and Wooldridge (2010) suggest that the difference lagged dependent variable and all other potentially endogenous covariates are instrumented with their past values. If we follow this procedure, Equations 7 – 9 will be estimated via the first difference GMM estimator, which has been shown to produce inefficient estimates in some instances. In particular, the first-difference GMM estimator does not consider the possible information in the level relationship and the relationships between the level and the first differences. Consequently, the first-difference GMM estimator is not robust for addressing endogeneities arising from reverse causality (Ahn & Schmidt, 1995)

It is in the remit of the aforementioned estimation concerns that Blundell and Bond (1998) propose that the two-system GMM estimator, which estimates the level and first-difference regressions as a system, should be preferred to the first-difference estimator. Accordingly, this study follows this approach by instrumenting the level equation with the lagged first-differenced covariates and that of the first-differenced estimation with the lagged level variables. Additional caveats for employing the two-step GMM estimator other than the first-difference estimator is that it is more efficient as it yields asymptotically consistent and reliable (Windmeijer, 2005; Bond et al., 2001). Additionally, we merge the instruments to address possible instrument proliferation[5] and overfitting, which according to Mehrhoff (2009), is also imperative for yielding reliable coefficients and confidence intervals.

With all these econometric requirements for sound regression taken care of, we proceed to specify the two-step system GMM model. We do so by modifying Equation (7) to capture the level and first-difference specifications of our inclusive green growth model (see Equations 10 and 11, respectively). Following similar specifications, the level specifications concerning

[5] A case where a single instrument is created for each time period and lag available, and the number of instruments exceeds the sample size.

Equation 8 (i.e., social sustainability model[6]) and Equation 9 (i.e., environmental progress model[7]) are also introduced.

$$IGG_{it} = \alpha_0 + \delta_1 IGG_{it-1} + \delta_2 INT_{it} + \delta_3 FD_{it} + \delta_4 FAID_{it} + \delta_5 EG_{it} + \delta_6 GOV_{it} + \delta_7 (EG_{it} \times GOV_{it}) + \mathcal{I}_i + \mu_t + \varepsilon_{it} \quad (10)$$

$$IGG_{it} - IGG_{it-\tau} = \delta_1 (IGG_{it-\tau} - IGG_{it-2\tau}) + \delta_2 (INT_{it} - INT_{it-\tau}) + \delta_3 (FD_{it} - FD_{it-\tau}) + + \delta_3 (FAID_{it} - FAID_{it-\tau}) + \delta_3 (EG_{it} - EG_{it-\tau}) + \delta_3 (GOV_{it} - GOV_{it-\tau}) + (\mu_t - \mu_{it-\tau}) + (\varepsilon_{it} - \varepsilon_{it-\tau}) \quad (11)$$

Next, we incorporate the joint effect of EG and GOV on IGG by introducing an interaction term for EG and GOV in model 11 to obtain Equation 14.

$$IGG_{it} - IGG_{it-\tau} = \delta_1 (IGG_{it-\tau} - IGG_{it-2\tau}) + \delta_2 (INT_{it} - INT_{it-\tau}) + \delta_3 (FD_{it} - FD_{it-\tau}) + + \delta_3 (FAID_{it} - FAID_{it-\tau}) + \delta_3 (EG_{it} - EG_{it-\tau}) + \delta_3 (GOV_{it} - GOV_{it-\tau}) + \delta_3 (EG \times GOV_{it} - EG \times GOV_{it-\tau}) + (\mu_t - \mu_{it-\tau}) + (\varepsilon_{it} - \varepsilon_{it-\tau}) \quad (14)$$

Likewise, we specify the dynamic GMM models for environmental sustainability and social progress, as seen in Equations 15 and 16.

$$GHG_{it} - GHG_{it-\tau} = \delta_1 (GHG_{it-\tau} - GHG_{it-2\tau}) + \delta_2 (INT_{it} - INT_{it-\tau}) + \delta_3 (FD_{it} - FD_{it-\tau}) + + \delta_3 (FAID_{it} - FAID_{it-\tau}) + \delta_3 (EG_{it} - EG_{it-\tau}) + \delta_3 (GOV_{it} - GOV_{it-\tau}) + (\mu_t - \mu_{it-\tau}) + (\varepsilon_{it} - \varepsilon_{it-\tau}) \quad (15)$$

$$IGROWTH_{it} - IGROWTH_{it-\tau} = \delta_1 (IGROWTH_{it-\tau} - IGROWTH_{it-2\tau}) + \delta_2 (INT_{it} - INT_{it-\tau}) + \delta_3 (FD_{it} - FD_{it-\tau}) + + \delta_3 (FAID_{it} - FAID_{it-\tau}) + \delta_3 (EG \times GOV_{it} - EG \times GOV_{it-\tau}) + \delta_3 (GOV_{it} - GOV_{it-\tau}) + (\mu_t - \mu_{it-\tau}) + (\varepsilon_{it} - \varepsilon_{it-\tau}) \quad (16)$$

We end our empirical specifications by presenting the net effects of the $\boldsymbol{EG \times GOV}$ interaction terms in models 14 – 16.

$$\frac{\partial (IGG_{it})}{\partial (EG_{it})} = \delta_2 + \delta_4 \overline{(GOV_{it})} \quad (17)$$

[6] $GHG_{it} = \tau_0 + \delta_1 GHG_{it-1} + \delta_2 INT_{it} + \delta_3 FD_{it} + \delta_4 FAID_{it} + \delta_5 EG_{it} + \delta_6 GOV_{it} + \delta_7 (EG_{it} \times GOV_{it}) + \mathcal{I}_i + \mu_t + \varepsilon_{it}$ (12)

[7] $IGROWTH_{it} = \mathcal{g}_0 + \delta_1 IGROWTH_{it-1} + \delta_2 INT_{it} + \delta_3 FD_{it} + \delta_4 FAID_{it} + \delta_5 EG_{it} + \delta_6 GOV_{it} + \delta_7 (EG_{it} \times GOV_{it}) + \mathcal{I}_i + \mu_t + \varepsilon_{it}$ (13)

$$\frac{\partial(GHG_{it})}{\partial(EG_{it})} = \omega_1 + \omega_3\overline{(GOV_{it})} \quad (18)$$

$$\frac{\partial(IGROWTH_{it})}{\partial(EG_{it})} = \delta_2 + \beta_4\overline{(GOV_{it})} \quad (19)$$

where $\overline{\boldsymbol{GOV}}$ is the mean value of each governance indicator and ($\boldsymbol{EG \times GOV}$) is six interaction terms for economic globalisation and the governance modules.

Following the standard procedure in the literature, we evaluate the efficiency of our GMM estimates on several fronts. First, though we recognise that the Sargan test can be used to assess the appropriateness of our instruments, we pay attention to Hansen's over-identification test. This is because the Sargan test can be unreliable (see Asongu & Odhiambo, 2021a). The Hansen test is evaluated based on the null hypothesis that no correlation exists between the set of identified instruments and the residuals (Hansen, 1982). Besides, post-estimation tests concerning the absence of second-order serial correlation in the residuals, the significance of the interaction terms, and the overall significance of the models are also evaluated. Finally, we check the sensitivity of the estimates on two counts. We obtain the first sub-sample by excluding the first five years from the dataset (i.e., the dataset is for 2005 – 2020) while the second sample is also obtained by excluding the last five years (i.e., the dataset is for 2000 – 2015).

4. Results and discussion

This section is divided into two parts. The first part (i.e., Section 4.1 – 4.2) focuses on the summary statistics and the computation of our IGG scores while the second part (i.e., Section 4.3 – 4.7) deals with the presentation and discussion of the main regression results.

4.1. Summary statistics and overview of in-country social and environmental progress

As apparent in Table 2, the data shows an average IGG score of 0 and a standard deviation of 1. Also, the average greenhouse gas emission over the study period is 118.85 kilotons, while that of inclusive growth is a modest US$ 898.11. The level of inclusive growth is conspicuously lower than the continent's GDP per capita of US$ 5996.051, suggesting that growth in Africa is not inclusive. For our variable of interest, economic globalisation (EG), we find an average of 41.4, which indicates that economic globalisation in Africa is in its early stages. Regarding

our governance indicators, the data clearly shows that Africa's institutional fabric is weak (see Kaufmann et al., 2010).

Table 2: Summary statistics, 2000 – 2020

Variables	Obs	Mean	Std. Dev.	Minimum	Maximum
Dependent variables					
Inclusive green growth	180	0.000	1.000	-1.424	1.783
Greenhouse gas emissions	437	118.853	184.514	-85.277	828.87
Inclusive growth	843	898.111	1475.857	48.456	13934.86
Main independent variable					
Economic globalisation	437	41.416	12.335	17.55	81.49
Moderating variables					
Rule of law	437	-0.510	0.625	-1.791	1.077
Regulatory quality	437	-0.462	0.582	-1.684	1.127
Corruption control	437	-0.529	0.593	-1.572	1.217
Voce and accountability	437	-0.407	0.686	-1.697	.941
Government effectiveness	437	-0.497	0.617	-1.746	1.057
Political stability	437	-0.488	0.870	-2.388	1.200
Control variables					
Foreign aid	460	4.666	5.750	-0.251	62.187
Internet access	458	14.061	17.495	0.006	84.12
Financial development	460	0.180	0.134	0.029	0.646

Note: Obs = Observations; Std. Dev is Standard Deviation

For instance, the average political stability and corruption control scores are -0.488 and -0.529, compared to -0.462 and -0.497 for regulatory quality and government effectiveness, respectively. For our control variables, we observe a mean foreign aid value of 4.66 (% GDP) and a financial development index of 0.18.[8]

We now turn attention to the developments concerning SES in Africa, which, as shown in Figure 3, are revealing. First, as evident in Panel B of Figure 3, the data shows that while most African countries have made remarkable strides in income growth, inclusive growth in these countries is markedly low, suggesting that growth gains have not been shared equitably. While on the whole, the sharp disparity in GDP per capita and inclusive growth is a major concern across our sampled countries, it is marked in countries such as Angola, Botswana, Gabon, Mauritius, Namibia, Nigeria and South Africa. Across the social equity perspective, information from Panel A of Figure 3 shows that although countries such as South Africa,

[8] See the correlation between the variables in Table A1

Namibia, Morocco, Tunisia, Algeria, Angola and Botswana have made enormous gains in broadening access to potable water, lags in good sanitation are glaring.

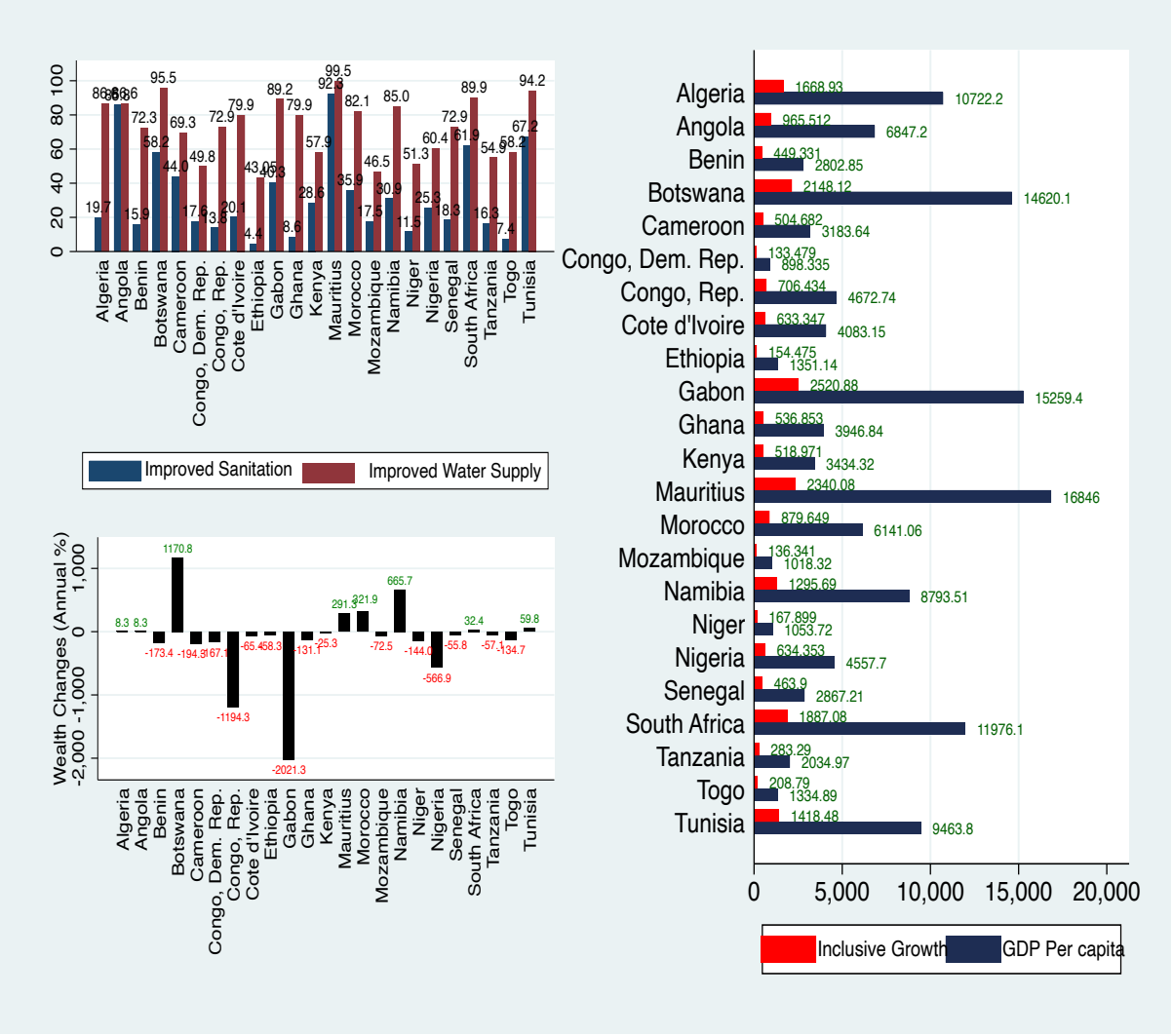

Figure 3: In-country Major Socioeconomic Progress Indicators in Africa, 2000 – 2020
Source: Authors' construct, 2022

Across the EVS dimension of IGG, Figure 4 clearly shows that Africa is a continent of high non-renewable energy consumption, with countries such as Algeria, Tunisia, Botswana, Morocco, South Africa and Mauritius ranking highest. The environmental footprint of this is evident in the high CO_2 and greenhouse gas emissions. Indeed, as we show in Panel B of Figure 4, the monetary cost (% GDP) to African governments for addressing environmental pollution is enormous, with countries such as Tunisia (6.7), Morocco (6.9), Algeria (5.3), Cameroon (4.2), Botswana (4.2), Gabon (4.5) and Ghana (4.1) and South Africa (5.2) spending highly in clean-ups.

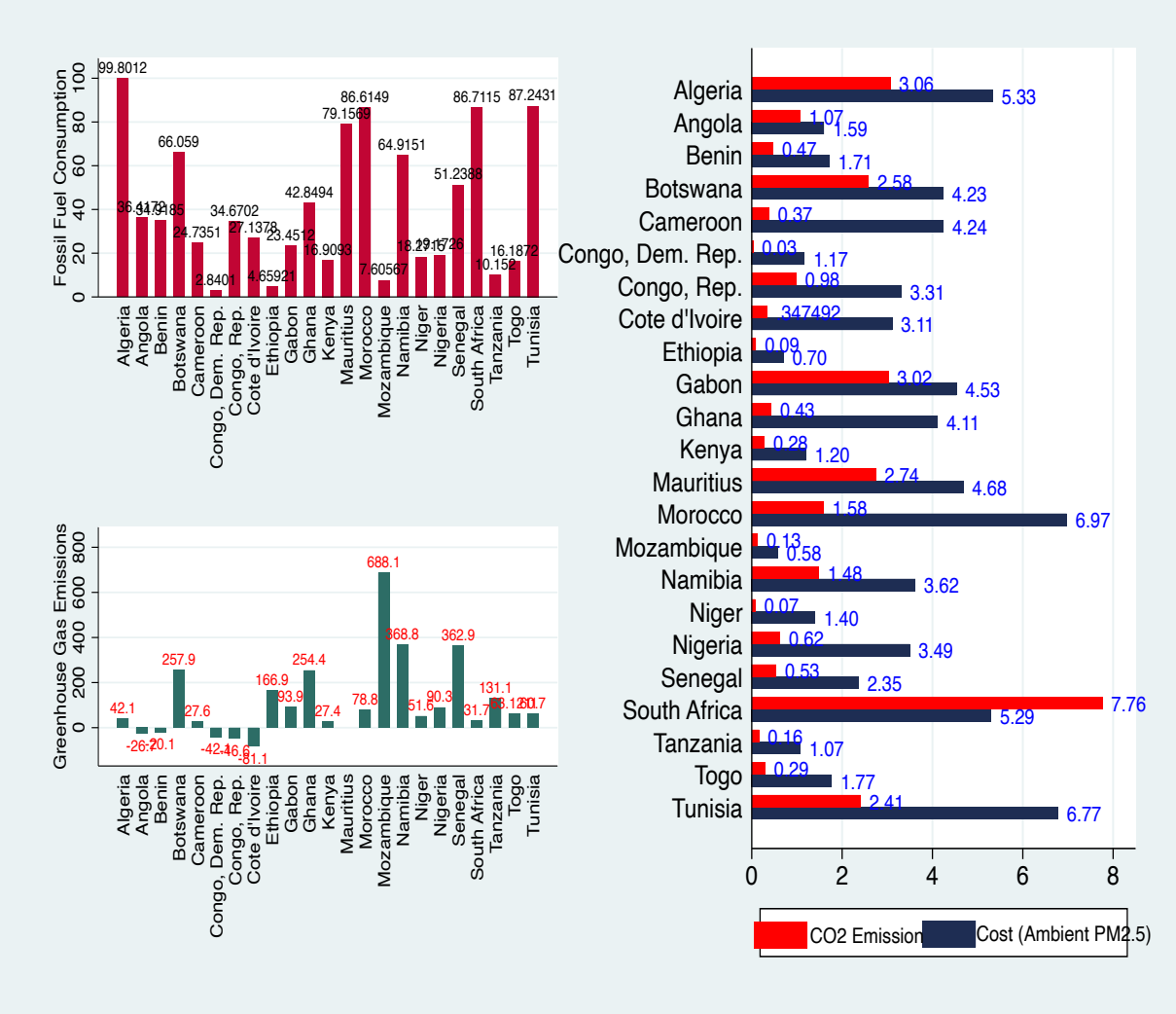

Figure 4: In-country Major Environmental Sustainability Indicators in Africa, 2000 – 2020
Source: Authors' construct, 2022

4.2 Construction of inclusive green growth (IGG) index (Main dependent variable)

In this section, we explain the procedure followed for generating our IGG scores. We begin by presenting the variables used for calculating the IGG series before delving into the PCA. First, following the extant scholarship on sustainable development as propagated chiefly by the OECD (2017), World Bank (2012), GGKP (2013), Brundtland (1987) and Meadows et al. (1972), we pay attention to 24 variables that cut across the two main dimensions of IGG (i.e., EVS and SES). It is imperative to point out that for SES, only covariates relating to social equity and economic growth are considered. For EVS, we pay attention to variables that matter for (i) the protection of natural capital, (ii) enhancing environmental quality of life, (iii) economic opportunities and policy response, and (iv) environmental and resource productivity**.** For brevity, Table 3 is presented to speak to the definitions and sources of the 24 variables.[9]

[9] See the summary statistics of these variables in Table A2

Table 3: Definition of Variables in Inclusive Green Growth (IGG) Index

Variable	Symbol	Variable description	Data source
A. Socioeconomic sustainability			
(i) Social progress			
Sanitation	*SANIT*	Population with access to improved sanitation, % total population	GGKP Database
Population density	*POP*	Population density, inhabitants per km2	OECD Statistics
Potable water	*POWAT*	Population with access to improved drinking water sources, % total population	GGKP Data
Infant mortality	*INFMORT*	Mortality rate, infant (per 1,000 live births)	WDI Data
Life expectancy	*LIFEXP*	Life expectancy at birth, total (years)	OECD Statistics
Transport infrastructure	*TRANS*	Composite index for road, air, maritime, and railway transport infrastructure	AIKP
(ii) Economic progress			
Changes in wealth	*CWEA*	Changes in wealth per capita (US$)	GGKP Data
Income growth	*INCGRO*	GDP per capita, PPP (constant 2017 international $)	GGKP Data
Income inequality	*INEQ*	Gini index (0=Lowest; 1=Highest)	GGKP Data
Human capital index	*HCI*	Human capital index, based on years of schooling and returns to education	PWT
Unemployment	*UNEMP*	Unemployment, total (% of the total labour force)	GGKP Data
B. Environmental sustainability			
(i) Natural asset base			
Agricultural land	*AGRIC*	Agricultural land (% of land area)	GGKP Data
Forest cover	*FOREST*	Forest area (% of land area)	OECD Statistics
Temperature changes	*TEMP*	Annual surface temperature, change since 1951-1980	OECD Statistics
(ii) Environmental quality of life			
Exposure to Ambient PM.2.5	*AMB*	Mean population exposure to PM2.5	OECD Statistics
Ambient PM.2.5 mortalities	*AMBMORT*	Mortality from exposure to ambient PM2.5	OECD Statistics
Ambient PM.2.5 welfare cost	*AMBCOST*	Welfare costs of premature mortalities from exposure to ambient PM2.5, GDP equivalent	OECD Statistics
(ii) Environmental & resource productivity			
Methane emission	*METHANE*	Agricultural methane emissions (thousand metric tons of CO2 equivalent)	GGKP Data
Natural resources rent	*NATRES*	Total natural resources rents (% of GDP)	GGKP Data
Renewable energy	*RENENER*	Renewable energy consumption (% of total final energy consumption)	WDI Data
Carbon intensity	*CARINT*	CO_2intensity level, primary energy	WDI Data
Fossil fuel consumption	*FOSFUL*	Fossil fuel energy consumption (% of total)	OECD Statistics
(iv) Economic opportunities & policy response			
Clean fuel usage	*CLENFUEL*	Access to clean fuels and technologies for cooking (% population)	WDI Data
Environmentally friendly technologies	*ENVTECH*	Development of environment-related technologies, % all technologies	OECD Statistics

Note: Source: Authors' construct, 2022

We now turn attention to the PCA, whose appropriateness in yielding sound indices depends on several requirements – the adequacy of our sample and the overall correlations and interrelations among the 24 variables. To determine if these covariates form a good sample, we employ the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy for the evaluation. We also employ the pairwise correlation test and the Bartlett test to examine whether the correlation between the variables is strong enough. First, information from Table A3 indicates a strong correlation between the 24 IGG variables. Second, we find evidence that the intercorrelation between the sampled IGG covariates is strong per the Bartlett Chi-square (X^2) statistic of 6891.67 and a p-value significant at 1 per cent ($p = 0.000$). Finally, per the KMO statistic of 0.74, there is sufficient evidence that the 24 covariates form an adequate sample.

With all these requirements satisfied, we proceed to generate our IGG series. It is worth noting that since these IGG variables are measured in different units, we normalised all the variables before generating the indices for each country. The results from the PCA are presented in what follows. First, we present Figure 5, which shows the total number of IGG components and the Kaiser threshold for selecting components essential for generating the scores.

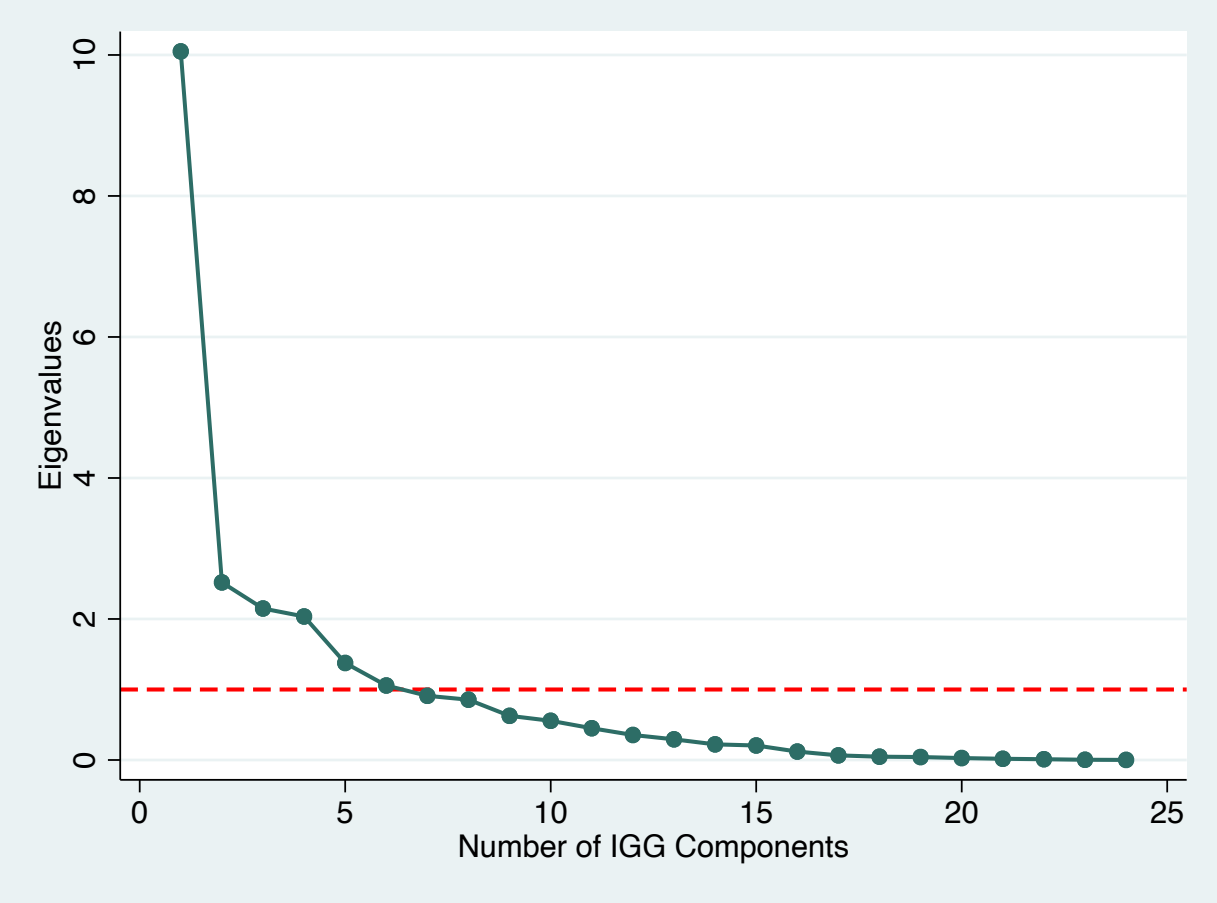

Figure 5: Screeplot of IGG Components

Figure 5 shows that out of the 24 components, only 6 are essential per the Kaiser rule of retaining components with eigenvalues of at least 1 (Ofori & Asongu, 2021; Asongu & Odhiambo, 2020a).[10] Crucially, these 6 components are statistically appropriate since they cumulatively account for 79.9 per cent variation in the sample (see Table A5).

We now focus on the presentation concerning the overview of our IGG indices for each country through graphical analysis. To allow for cross-country comparison, as Kaufmann et al. (2010) propose, we transform our IGG indices through the standard deviation approach[11] where the worse IGG score becomes -2.5 against the best score of +2.5. One should also keep tabs on the fact that a negative (positive) IGG score depends on the strength of a country's performance across the SES and EVS perspectives of IGG. This means that though a country could be making headways in SES, it could be worst off in ecological progress, culminating in an overall negative IGG. The other way round also fits the argument, with the final scenario being a case where a country is worse off (better off) across the two dimensions of sustainable development.

As clearly shown in Figure 6, we find that out of the 23 countries employed in this study, only 9 have growth trajectories that are both green and inclusive. These countries are Algeria, Botswana, Mauritius, Morocco, Namibia, Senegal, South Africa, Tanzania and Tunisia. Per the information in IPCC (2022) and Sachs et al. (2021), the successes of these countries are more of EVS rather than SES. The growth path of the rest of the countries is neither green nor inclusive, and the concern is marked in countries such as the Democratic Republic of Congo, Ethiopia, Kenya, Togo, Niger, Nigeria, Gabon and Cameroon.

[10] The attendant eigenvalues and eigenvectors are reported in Table A4

[11] This approach is a standard procedure that has been employed for cross-country comparison on the various World Governance indicators.

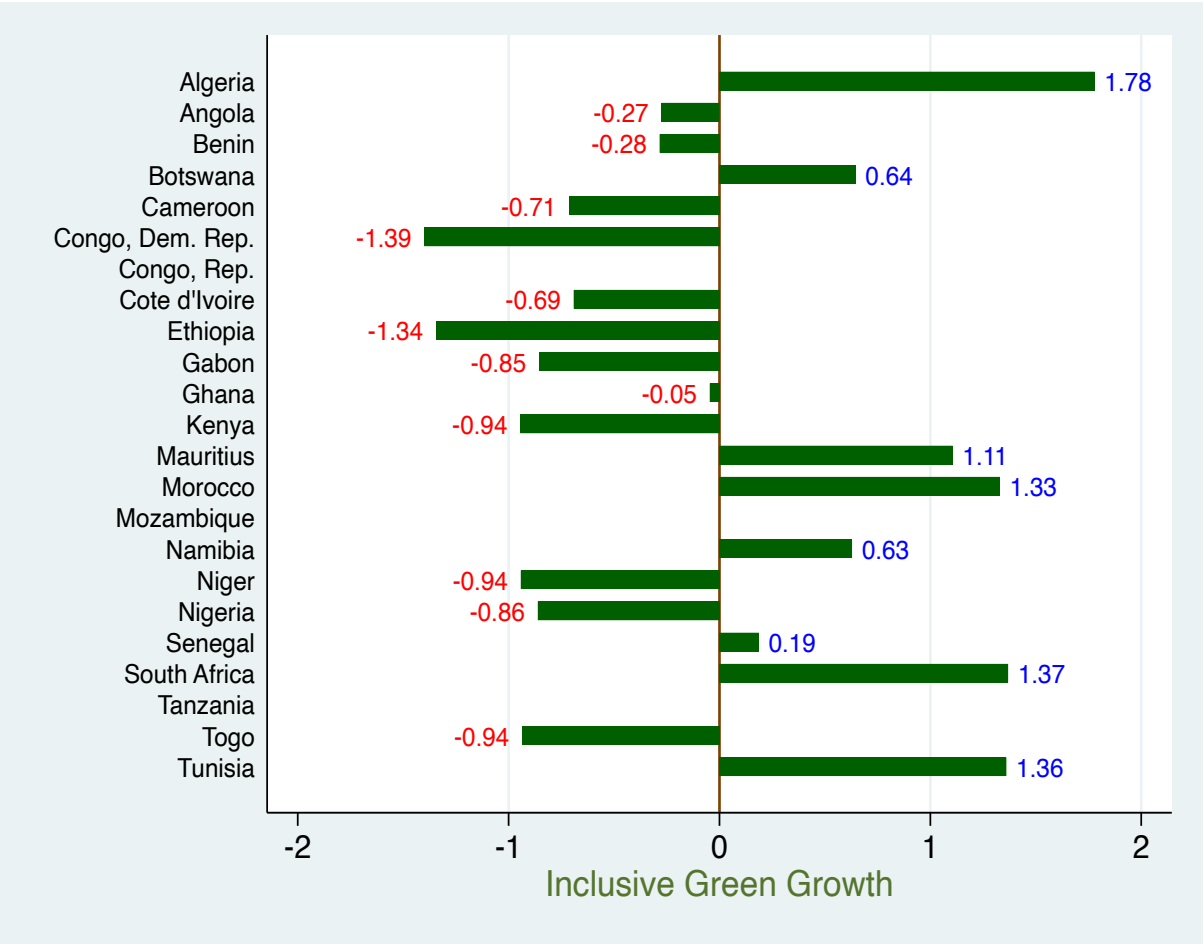

Figure 6: In-country Inclusive Green Growth in Africa, 2000 – 2020

4.3. Results for the effects of economic globalisation and governance on IGG

In this section, attention is paid to the discussion of the regression results. First, our baseline results in Column 1 of Table 4 shows that digital infrastructure proxied by internet access is IGG-inducing. The results support recent evidence in Zhao et al. (2021) and Global e-Sustainability Initiative (2020) that internet access does not only promote green economic opportunities but acts as a module for reducing carbon footprint. Though the magnitude of the effect is modest (i.e., 0.001), the result is encouraging considering information garnered from Ofori and Asongu (2021) that compared to other continents, Africa has an extensive margin for internet penetration.

Table 4: GMM results for the effects of economic globalisation and governance on sustainable development (Dependent variable: inclusive green growth)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Inclusive green growth (-1)	0.9935***	1.0176***	0.9535***	0.9910***	0.9507***	0.8838***	0.9643***	1.0024***	0.8946***	0.8819***	0.8900***	0.8600***	0.9470***	0.9433***
	(0.0095)	(0.0122)	(0.0191)	(0.0150)	(0.0428)	(0.0227)	(0.0213)	(0.0108)	(0.0435)	(0.0301)	(0.0752)	(0.0436)	(0.0284)	(0.0278)
Internet access	0.0010***	0.0014***	0.0025***	0.0008	0.0023***	0.0032***	0.0009	-0.0004	0.0026	0.0022*	0.0011	0.0023*	0.0012	0.0008
	(0.0002)	(0.0003)	(0.0005)	(0.0007)	(0.0006)	(0.0006)	(0.0006)	(0.0005)	(0.0017)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)
Financial development	-0.0126	-0.0914	-0.2248	-0.1468	-0.1159	0.0601	-0.0032	0.1044	-0.2181	-0.1162	0.1452	-0.0103	-0.0458	0.0700
	(0.0816)	(0.0529)	(0.1482)	(0.1302)	(0.1950)	(0.1324)	(0.1039)	(0.1371)	(0.3758)	(0.1790)	(0.2307)	(0.1866)	(0.2076)	(0.2631)
Foreign aid	0.0004	0.0024	0.0033	0.0043**	0.0040*	0.0036	0.0007	0.0017	0.0071***	0.0052	0.0078	0.0039	-0.0035	-0.0023
	(0.0012)	(0.0020)	(0.0030)	(0.0019)	(0.0020)	(0.0026)	(0.0015)	(0.0014)	(0.0020)	(0.0040)	(0.0051)	(0.0026)	(0.0022)	(0.0019)
Economic globalisation (EG)		**-0.0013**							0.0017	0.0028*	0.0038*	0.0015	0.0006	0.0004
		(0.0011)							(0.0021)	(0.0016)	(0.0020)	(0.0017)	(0.0018)	(0.0015)
Corruption control			**0.1246****						0.3698*					
			(0.0444)						(0.2089)					
Regulatory quality				0.0772*						0.4282**				
				(0.0412)						(0.1814)				
Government effectiveness					0.1031*						**0.3813****			
					(0.0561)						**(0.1401)**			
Rule of law						0.1536***						0.4236***		
						(0.0360)						(0.0793)		
Political stability							0.0490*						0.1031**	
							(0.0248)						(0.0447)	
Voice and accountability								0.0040						0.1616*
								(0.0141)						(0.0886)
EG × Corruption control									-0.0032					
									(0.0050)					
EG × Regulatory quality										-0.0055				
										(0.0042)				
EG × Government effectiveness											**-0.0062****			
											(0.0022)			
EG × Rule of law												-0.0057***		
												(0.0018)		
EG × Political stability													-0.0017	
													(0.0012)	
EG × Voice and accountability														-0.0026
														(0.0022)
Constant	0.0082	0.0640*	0.0848**	0.0495	0.0481	0.0399*	0.0337	-0.0054	0.0669	-0.0337	-0.1335	0.0449	0.0328	0.0294
	(0.0130)	(0.0311)	(0.0333)	(0.0295)	(0.0428)	(0.0222)	(0.0286)	(0.0223)	(0.1255)	(0.0749)	(0.1032)	(0.0725)	(0.0852)	(0.0899)
Time effect	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	160	160	160	160	160	160	160	160	160	160	160	160	160	160
Net effect	na	na	na	na	na	na	na	na	–	–	**0.0069****	–	–	–
Joint effect statistics [p-value]	na	na	na	na	na	na	na	na	–	–	**8.07[0.0104]**	–	–	–
Countries	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Instruments	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Fisher statistic	314506***	95569***	81024***	38050***	34337***	12992***	142158***	25196***	6423***	29800***	5714***	7177***	119314***	13040***
Fisher P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hansen P-Value	0.652	0.498	0.613	0.798	0.633	0.820	0.920	0.944	0.663	0.586	0.683	0.729	0.773	0.747
AR(1)	0.006	0.006	0.008	0.006	0.006	0.012	0.006	0.006	0.008	0.008	0.009	0.012	0.007	0.006
AR(2)	0.615	0.651	0.556	0.462	0.656	0.694	0.698	0.632	0.501	0.266	0.667	0.623	0.694	0.672

*Note: EG is Economic globalisation; Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.001*

Additionally, the results reveal that although foreign aid is positively related to IGG, it is not statistically significant. The result is in line with empirical evidence that though foreign aid enhances access to social amenities, it has not been complemented with the necessary income-generating opportunities to address the widespread unemployment and precarity across the continent (Asongu & Nwachukwu, 2016). Also, we find that financial development does not promote IGG in Africa. This is possible concerning the report by the World Bank (2019) that a significant number of people in Africa remain unbanked while the financially included also face financial and material challenges that impede access to finance. Besides, the negative sign raises the concern that in highly informal sector settings like Africa, financial development can heighten investments in ventures that are energy intensive (Adom et al., 2021; Ahmad et al., 2021; Shahbaz et al., 2016)[12].

We now turn attention to Hypotheses 1a and 1b, where we examine the unconditional effects of EG (Column 2) and our governance dynamics (Column 3 - 8) on IGG. First, we find that EG is not statistically significant for propelling Africa toward IGG. The EG-IGG relationship is negative (-0.001), signifying that the dark sides of cross-border trade and financial flows outweigh potential growth and social infrastructure gains (see Alvaredo et al., 2017; Opoku & Boachie, 2020). Concerning the effects of governance on IGG, we find that all our governance modules matter for promoting IGG except for voice and accountability. Notably, the evidence suggests that across the economic, political and institutional governance, the latter is rather remarkable for spurring IGG in Africa. In terms of magnitudes, while corruption control and the rule of law enhance IGG by 0.12% (Column 2) and 0.15% (Column 6), respectively, we report marginal gains of 0.07% for regulatory quality (Column 4) and 0.1% for government effectiveness (Column 5).

These results can be explained on several fronts. First, the results suggest that by addressing the loopholes in Africa's public purse and inefficiencies in resource mobilisation, policymakers can generate enough resources internally to promote IGG. This is possible considering the reports that Africa loses about US$100 billion annually through corruption (Inuwa & Ononiwu, 2020). Second, positive effect of the rule of law also means that by enhancing the efficiency of Africa's legal regime in prosecuting corrupt acts and the protection of private and natural assets, IGG can be enhanced. Also, the IGG-inducing effects of regulation quality and government effectiveness suggest that proper socioeconomic structure

[12] Adom et al. (2021) raise the concern that access to finance increases energy intensive activities such as print, metal, refinery and chemical industries

and policies that enhance economic freedom can promote IGG course. The positive impact of political stability also means that IGG can be achieved by addressing Africa's geopolitical frailties. Indeed, setbacks in Africa's quest to foster social progress have been unconstitutional political takeovers, which in 2021 alone saw 6 major occurrences[13] and the rise in terrorist groups[14] across the continent. Albeit statistically insignificant, voice and accountability is positive, meaning that deepening the voice of the public, civil society groups and community leaders can put policymakers in check to map out policies and strategies that are socially and environmentally progressive.

We now pay attention to Hypothesis 2, where we investigate whether our governance dynamics interact with EG to foster IGG (see Columns 9 – 14). Our contribution is unique and an eyeopener in several ways. Out of the 6 governance modules, we find that only government effectiveness matters for interacting with EG to foster IGG in Africa (Column 11). Consequently, we follow Brambor et al. (2006) by computing the net effect of the EG-government effectiveness pathway, which is based on Equation 17. We report a net of 0.0069, which is calculated by engaging the direct (0.0038) and indirect (-0.0062) effects of EG on IGG as well as the average government effectiveness score of -0.497 (see Table 2).

$$\frac{\partial(IGG_{it})}{\partial(EG_{it})} = 0.0038 + [(-0.0062) \times (-0.497)] = 0.0069$$

As apparent in the general regression statistics in Table 4, a joint significance test of this marginal effect is statistically significant, meaning that in the presence of government effectiveness, EG promotes IGG. This implies that for African countries to gain from EG, the effectiveness of governments in providing social overheads, for instance, in human capital development and infrastructural development are critical. Additionally, government effectiveness in the form of innovation support, research and development can cushion the continent's private to contribute to IGG. In the remit of EVS, sound economic management can also create green opportunities and the means for supporting firms and households in adopting eco-friendly technologies. For instance, government support in the form of green finance and the adoption of renewable energy or energy-efficient practices[15] in lighting,

[13] Africa recorded at least 6 Coup d'etats: 2 in Mali and 1 each in Chad, Burkina Faso, Guinea, and Sudan.
[14] Notable examples are the terrorist groups in Northern Mali, Nigeria, Cameroon, Burkina Faso, Somalia and Niger
[15] For instance, redistributive support in aiding the economic agents to transition from unclean fuels (e.g., charcoal, firewood, crop waste, dung, kerosene, etc) to renewable alternatives (biogas, plant biomass, electricity, etc).

cooking, and large-scale production can go a long way to improve the environmental quality of life.

In the next two sections, we present some major contributions of this study, which have to do with informing policy on the conditional and unconditional effects of EG on the two domains of IGG (i.e., social and environmental progress).

4.5 Effects of economic globalisation and governance on socioeconomic sustainability (SES)

Table 5 reports results for the effects of EG and governance on inclusive growth (i.e., our proxy for SES). Evidence from Column 1 indicates that financial development enhances shared prosperity in Africa. The result is empirical evidence for the finance-led growth hypothesis, which suggests that financial development can support the private sector to realise entrepreneurial and innovative ideas. This, in effect, could contribute to economic growth and durable employment opportunities. Our result is in line with Ofori et al. (2022d) and Svirvranha (2016), who argue that financial development contributes to fairer income growth and distribution. Further, we find strong evidence that foreign aid drags down inclusive growth. Although weak effect (-0.01), the negative relationship is plausibly due to the growth-impeding effect of development assistance reported in the literature (see, Babalola & Shittu, 2020; Asongu & Nwachukwu, 2016). Finally, unlike the evidence in studies such as Ofori et al. (2022d) and Adeleye et al. (2021), we find that internet access is ineffective for promoting inclusive growth.

For Hypothesis 1a, we find strong evidence that EG promotes SES in Africa (Column 2). Although weak effect (0.0113), the result is line with the argument by Ofori et al. (2022e) and Ravallion (2018) that EG promotes inclusive growth by intensifying forward and backward linkages, innovation, employment and infrastructural development. For Hypothesis 1b, the results reveal that only government effectiveness and political stability are statistically significant for boosting inclusive growth. The magnitudes of the effects show that any additional point increase in government effectiveness and political stability induces inclusive growth by 0.045% (Column 5) and 0.042% (Column 7), respectively. Collectively, the results reveal that the effectiveness of policymakers in mapping out sound economic policies, the promotion of economic freedom and the enhancement of public services are critical for promoting shared prosperity in Africa. For instance, a peaceful society enables economic agents to plan, investment and accumulate wealth while effective governance also cushions the masses to earn a living thorough decent jobs and access to social amenities.

Table 5: GMM results for the effects of economic globalisation and governance on socioeconomic sustainability (Dependent variable: Inclusive growth)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Inclusive growth (-1)	0.8676***	0.8146***	0.8667***	0.8833***	0.8827***	0.8743***	0.8650***	0.8595***	0.8125***	0.8495***	0.8529***	0.8545***	0.8594***	0.8654***
	(0.0083)	(0.0149)	(0.0072)	(0.0087)	(0.0144)	(0.0091)	(0.0155)	(0.0093)	(0.0125)	(0.0302)	(0.0138)	(0.0105)	(0.0136)	(0.0114)
Internet access	0.0006	-0.0003	0.0004	0.0007	0.0018**	0.0001	0.0006	-0.0001	-0.0007	0.0003	0.0001	-0.0000	0.0008	-0.0002
	(0.0005)	(0.0008)	(0.0005)	(0.0008)	(0.0008)	(0.0008)	(0.0010)	(0.0011)	(0.0010)	(0.0011)	(0.0006)	(0.0009)	(0.0007)	(0.0015)
Financial development	0.2624*	0.0067	0.2163	0.2820	-0.2314	0.4373	0.0040	0.5849*	-0.0581	0.3315	0.1795	0.1579	-0.1777	0.4547
	(0.1521)	(0.2928)	(0.1981)	(0.2940)	(0.2066)	(0.3249)	(0.3556)	(0.3099)	(0.7280)	(0.6683)	(0.1492)	(0.2037)	(0.3299)	(0.3593)
Foreign aid	-0.0103***	-0.0094***	-0.0086***	-0.0098***	-0.0082***	-0.0091***	-0.0112***	-0.0102***	-0.0078***	-0.0082***	-0.0097***	-0.0108***	-0.0079***	-0.0118***
	(0.0011)	(0.0018)	(0.0014)	(0.0017)	(0.0010)	(0.0015)	(0.0013)	(0.0021)	(0.0017)	(0.0023)	(0.0019)	(0.0021)	(0.0019)	(0.0022)
Economic globalisation (EG)		**0.0113*** **							0.0108**	0.0087	0.0013	0.0060	0.0069**	0.0005
		(0.0032)							(0.0049)	(0.0057)	(0.0022)	(0.0035)	(0.0031)	(0.0021)
Corruption control			0.0081						**-0.7711***					
			(0.0369)						**(0.3995)**					
Regulatory quality				-0.0306						-0.2973				
				(0.0337)						(0.3232)				
Government effectiveness					**0.0451***						-0.0098			
					(0.0262)						(0.1382)			
Rule of law						-0.0185						-0.0652		
						(0.0169)						(0.1639)		
Political stability							**0.0420*** **						0.2935	
							(0.0142)						(0.2199)	
Voice and accountability								-0.0737						-0.1614
								(0.0574)						(0.3187)
EG × Corruption control									**0.0225** **					
									(0.0087)					
EG × Regulatory quality										0.0080				
										(0.0087)				
EG × Government effectiveness											0.0010			
											(0.0036)			
EG × Rule of law												0.0012		
												(0.0046)		
EG × Political stability													-0.0056	
													(0.0049)	
EG × Voice and accountability														0.0035
														(0.0082)
Constant	0.7057***	0.6111***	0.6689***	0.5982***	0.6989***	0.6313***	0.8085***	0.6892***	0.6402***	0.4454*	0.7068***	0.5937***	0.6663***	0.7451***
	(0.0557)	(0.1456)	(0.0618)	(0.0541)	(0.0862)	(0.0608)	(0.0613)	(0.0564)	(0.1972)	(0.2477)	(0.0717)	(0.0917)	(0.1549)	(0.0803)
Observations	433	412	410	410	410	410	410	410	389	389	389	389	389	389
Time effect	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Net effect	na	na	na	na	na	na	na	na	**-0.0011****	–	–	–	–	–
Joint effect statistics [p-value]	na	na	na	na	na	na	na	na	**6.67[0.0170]**	–	–	–	–	–
Countries	23	23	23	23	23	23	23	23	23	23	23	23	23	23
Instruments	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Fisher statistic	410467***	92685***	472413***	230644***	1.588e+06***	1.966e+06***	872755***	1.425e+06***	228322***	86630***	328624***	226586***	233697***	2.012e+06***
Fisher P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hansen P-Value	0.654	0.609	0.664	0.629	0.694	0.606	0.625	0.688	0.632	0.600	0.653	0.656	0.699	0.681
AR(1)	0.005	0.005	0.010	0.009	0.008	0.010	0.009	0.011	0.009	0.013	0.009	0.010	0.009	0.009
AR(2)	0.340	0.355	0.362	0.368	0.345	0.363	0.384	0.379	0.372	0.387	0.385	0.412	0.392	0.412

*Note: EG is Economic globalisation; Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.001*

That said, we now shift focus to our second Hypothesis 2, where we find strong evidence that corruption control is the only significant governance module that interacts with EG to foster shared prosperity (Column 9). The resultant net effect, calculated by taking cues from the direct effect of EG (0.0108), the coefficient of the EG-corruption control interaction (0.0225) and the mean value of corruption control (-0.529), is, however, negative (-0.0011).

$$\frac{\partial(INGROWTH_{it})}{\partial(EG_{it})} = 0.0108 + [(0.0225) \times (-0.529)] = -0.0011$$

The study, thus, provides evidence that Africa's weak structures for corruption control, as Inuwa and Ononiwu (2020) point out, nullifies completely the positive effect of EG to yield a negative effect. The ineffectiveness of the other 5 governance indicators in interacting with EG to foster inclusive growth can also be attributed to the fact that they are noticeably underdeveloped, as shown in Figure A.2

4.6 Effects of economic globalisation and governance on environmental sustainability

Our baseline results in Column 1 of Table 6 show that financial development impedes EVS. The effect is striking (3.705), signifying that the public's carbon footprint increases by 3.7% for every 1% increase in financial development. This result is consistent with that of Ahmad et al. (2021) and Shahbaz et al. (2016), who argue that in developing countries, access to finance heightens participation in energy-intensive activities. Also, we find that foreign aid suppresses environmental performance in Africa, with the magnitude of the coefficient indicating that for every 1% increase in development assistance, EVS is hampered by 0.01%. Considering Africa's poor energy systems, the result suggests that foreign aid impedes environmental progress through the materialisation effect.

We shift focus to Hypotheses 1a and 1b by looking at the effects of EG and governance on EVS. To begin with, the results in Column 2 show that EG reduces greenhouse gas emissions by 0.048%. The implies that the spread of green infrastructure and access to eco-friendly technologies associated with EG contribute to EVS in Africa. This is plausible especially in Africa where informality and the use of unclean energy is high. Regarding our governance indicators, we provide empirical evidence for the UN (2015) claim that strong institutions, structures and frameworks will be vital in achieving the rest of the SDGs. Specifically, we find that improving the efficacy of institutions for corruption control, regulatory quality, government effectiveness and the rule of law reduces the emission of greenhouse gasses by 0.597%, 0.971%, 0.371% and 0.263%, respectively

Table 6: GMM results for the effects of economic globalisation and governance on environmental sustainability (Dependent variable: greenhouse gas emission)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Greenhouse gas emission (-1)	0.3554***	0.3240***	0.4061***	0.3997***	0.4201***	0.4553***	0.3651***	0.3733***	0.2526***	0.3521***	0.2334***	0.2816***	0.2845***	0.3181***
	(0.0183)	(0.0262)	(0.0451)	(0.0360)	(0.0244)	(0.0227)	(0.0405)	(0.0184)	(0.0434)	(0.0203)	(0.0375)	(0.0497)	(0.0482)	(0.0400)
Internet access	-0.0063	0.0070	0.0018	-0.0026	-0.0004	0.0049*	0.0031	0.0028	0.0242***	0.0479***	0.0016	0.0107**	0.0109*	0.0093*
	(0.0040)	(0.0051)	(0.0037)	(0.0039)	(0.0026)	(0.0025)	(0.0054)	(0.0035)	(0.0081)	(0.0137)	(0.0047)	(0.0051)	(0.0059)	(0.0046)
Financial development	3.7048***	4.8294**	2.9918**	4.0323***	2.9175***	0.3436	0.5055	1.1996	0.5447	-5.4494	3.2707**	2.6827**	1.7277	2.1805
	(0.7686)	(1.7979)	(1.2886)	(1.1481)	(0.6846)	(1.2309)	(1.6869)	(0.9972)	(2.0484)	(3.8007)	(1.2523)	(1.2874)	(1.6731)	(1.4437)
Foreign aid	-0.0145**	-0.0326***	-0.0255***	-0.0258***	-0.0208***	-0.0183***	-0.0074	-0.0135**	-0.0170***	-0.0050	0.0050	-0.0013	-0.0069*	-0.0054
	(0.0068)	(0.0058)	(0.0038)	(0.0041)	(0.0065)	(0.0047)	(0.0052)	(0.0062)	(0.0053)	(0.0054)	(0.0052)	(0.0080)	(0.0039)	(0.0065)
Economic globalisation (EG)		**-0.0489*** (0.0068)**							-0.1104***	-0.1506***	-0.0802***	-0.0855***	-0.0600***	-0.0680***
									(0.0219)	(0.0212)	(0.0164)	(0.0140)	(0.0112)	(0.0111)
Corruption control			**-0.5978** (0.2551)**						3.2664**					
									(1.2577)					
Regulatory quality				**-0.9711*** (0.1077)**						7.3341***				
										(1.9830)				
Government effectiveness					-0.3711**						5.4521***			
					(0.1490)						(1.2835)			
Rule of law						-0.2673***						3.8891***		
						(0.0595)						(0.6298)		
Political stability							**0.2951** (0.1203)**						2.1875***	
													(0.3483)	
Voice and accountability								**0.4303*** (0.1286)**						2.5841***
														(0.4894)
EG × Corruption control									-0.0368					
									(0.0240)					
EG × Regulatory quality										-0.1478***				
										(0.0489)				
EG × Government effectiveness											-0.1243***			
											(0.0284)			
EG × Rule of law												-0.0858***		
												(0.0214)		
EG × Political stability													-0.0436***	
													(0.0135)	
EG × Voice and accountability														-0.0474***
														(0.0123)
Constant	0.1629	2.0179***	-0.1096	-0.3727**	0.0142	0.3415**	0.7089***	0.7215***	6.2141***	8.3935***	4.0997***	4.1948***	3.1520***	3.5374***
	(0.1319)	(0.2069)	(0.1937)	(0.1651)	(0.1123)	(0.1558)	(0.2186)	(0.2034)	(1.3079)	(1.2473)	(0.8159)	(0.7025)	(0.5100)	(0.5009)
Observations	259	259	237	237	237	237	237	237	237	237	237	237	237	237
Time effect	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Net effect	na	na	na	na	na	na	na	na	–	**-0.0823***	**-0.0184***	**-0.0412***	**-0.0387***	**-0.0487***
Joint effect statistics [p-value]	na	na	na	na	na	na	na	na	–	**9.14[0.0065]**	**19.14[0.0003]**	**16.09[0.0006]**	**10.37[0.0041]**	**14.18[0.0010]**
Countries	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Instruments	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Wald Chi-statistic	1277***	378.7***	310.7***	597.4***	3310***	16199***	1064***	787.3***	793.6***	4815***	215.2***	493.4***	615.4***	665.9***
Wald P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hansen P-Value	0.737	0.598	0.643	0.667	0.695	0.605	0.617	0.611	0.647	0.517	0.653	0.614	0.637	0.678
AR(1)	0.057	0.066	0.06	0.070	0.063	0.059	0.060	0.065	0.069	0.078	0.081	0.079	0.080	0.080
AR(2)	0.101	0.123	0.113	0.123	0.106	0.103	0.111	0.112	0.133	0.135	0.145	0.131	0.137	0.138

*Note: EG is Economic globalisation; Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.001*

Additionally, we find compelling evidence that could have been hidden had we not favour governance-specific analysis of this kind. This follows the evidence that Africa's weak geopolitical setting and the 'thin voice' of civil society groups hamper EVS by 0.295% and 0.43%, respectively (see Columns 7 & 8). This is plausibly due to the acute wealth changes associated with political instability, which can wipe out gains in the public's adoption of energy-efficient materials. Additionally, political instability can be a drawback to EVS by fuelling precariousness and the destruction of eco-friendly technology installations. The greenhouse gas-increasing effect of voice and accountability can also be explained by the concern that lags in frameworks for spearheading accountability can lead to governments pursuing 'dirty growth'[16]. Additionally, in settings where the voice of the public, civil society and opinion leaders is weak, policymakers are likely not to commit to environmental progress.

Further, we find strong evidence to affirm our Hypothesis 2. Specifically, we find that, except for corruption control, all the governance indicators engender positive synergy with EG to foster environmental progress. Specifically, while we report a marginal effect of -0.082 for the EG-regulatory pathway on greenhouse gas emissions (Column 10), we find -0.018 and -0.041 for the EG-government effectiveness and EG-rule of law interaction terms (see Columns 11 & 12, respectively). These net effects are computed based on Equation (18) in respective terms as follows:

$$\frac{\partial(GHG_{it})}{\partial(EG_{it})} = (-0.1506) + [(-0.1478) \times (-0.529)] = -0.0823,$$

where -0.1506 is the direct effect of EG, -0.1478 is the indirect effect of EG and -0.529 is the mean regulatory quality score.

$$\frac{\partial(GHG_{it})}{\partial(EG_{it})} = (-0.0802) + [(-0.1243) \times (-0.497)] = -0.0184,$$

where the unconditional effect of EG is -0.0802, the conditional effect of EG is -0.1243 and -0.497 is the average government effectiveness score.

[16] A situation where policymakers focus on economic growth at the expense of the environment, with the idea of cleaning up later.

$$\frac{\partial(GHG_{it})}{\partial(EG_{it})} = (-0.0855) + [(-0.0858) \times (-0.510)] = -0.0417,$$

where the -0.0855 is the direct effect of EG, -0.0858 is the conditional effect of EG, and -0.510 is the mean of the rule of law. Following similar computations, we report net effects of -0.0387 and -0.0487 for the EG-political stability and EG-voice and accountability pathways, respectively. Overall, while these net effects reveal that sound political, institutional and economic governance are imperative for promoting environmental quality of life, the latter is notable. This suggests that proper regulatory frameworks and government effectiveness that promote economic freedom and social protection could prove momentous not only for easing the pressure on the environment but also for promoting sustainable production and consumption practices.

The empirical evidence reported in Tables 4, 5, and 6 are reliable on several fronts. First, the estimates are efficient per the Hansen p-values, which indicates the absence of instrument proliferation. Second, the AR(2) statistics confirm the absence of second-order serial correlations in the residuals and hence the appropriateness of the estimates. Third, the Fisher statistics are notably significant, suggesting that the models are appropriate for inference and policy recommendations. Fourth, the tests for the combined effects are also significant, indicating that our EG-governance pathways are statistically relevant. Finally, our results remain largely the same under sensitivity analysis with respect to time (see supplementary results: Table SM1 – SM6)

4.7 Governance thresholds and IGG net effects

In this section, we extend the analysis by way of threshold analyses to inform policy as to whether Africa can realise remarkable SES and EVS gains by channelling resources towards the development of its institutions. We do this by taking cues from Figure A1 and Table 2, which reveal that across the 6 governance indicators, Africa falls below the average threshold of zero (0). This contribution speaks directly to SDG 17, and Aspirations 3 and 4 of Agenda 2063, which generally seek to strengthen governance quality in Africa. We proceed, therefore, to calculate the net IGG, SES and EVS effects of improving the various governance indicators from the short-term (0.5) to medium-term (1.0) and the long-term (1.5). Following Brambor et al. (2006), we point out that these thresholds are computed only for the significant EG-governance interaction(s) term in Table 4 (IGG results), Table 5 (SES results), and Table 6 (EVS results).

Consequently, for the threshold effect results on IGG as reported in Table A6, we find that the short-term to long-term gains of improving government effectiveness are striking. We report short-term, medium-term and long-term effects of 0.002, 0.10 and 0.013, respectively. On SES, also, the net effects are notable as well, with the short-run, medium-term and long-term effects of improving frameworks and structure for the control of corruption being 0.022, 0.033 and 0.044, respectively (see Table A7).

Relative to the results on IGG and SES, our threshold results indicate that the EVS gains of the various governance modules are rather remarkable. The results in Table 7 show that among the 5 significant governance variables, the rule of law yields the highest EVS effects from the short term through to the long term. Notably, we find a short-run effect of -0.0855, compared to the medium-term and long-term effects of -0.9435 and -1.3725, respectively.

Table 7: Governance thresholds and environmental sustainability net effects

	Net Effects					
Thresholds	**CORR**	**REGU**	**GOVEF**	**RULE**	**POLS**	**VOICE**
0	–	-0.1506	-0.0802	-0.0855	-0.0600	-0.0680
0.5	–	-0.2245	-0.1424	-0.5145	-0.0818	-0.0917
1.0	–	-0.2984	-0.2045	-0.9435	-0.1036	-0.1154
1.5	–	-0.3723	-0.2667	-1.3725	-0.1254	-0.1391

Note: CC: Control of corruption; PS: Political stability; RG: Regulatory quality; RL: the Rule of law; VA: Voice and Accountability; GE: Government Effectiveness.

5. Conclusion and policy recommendations

In line with the quest of African leaders to make giant headways toward Agenda 2030 in the medium and Agenda 2063 in the longer term, this study investigates whether EG and governance contribute to inclusive green growth (IGG) in Africa. The study further examines whether Africa's institutional fabric is potent enough for interacting with EG to foster IGG. To this end, we mine macrodata on 23 African countries for the period 2000 – 2020 for the analysis. On the theoretical front, this study provides an analytical framework informing the academia and policy on how EG and quality governance foster IGG. The framework indicates that EG and good governance impact IGG through socioeconomic sustainability and environmental performance. In this regard, this study provides a conceptual basis for empirical

works interrogating the effects of EG and governance on multidimensional sustainability. From the empirical angle, our estimates, which are robust to endogeneity, specification bias and sample sensitivity, have generated some interesting findings. First, we find that, unconditionally, EG does not foster IGG. Second, the results reveal that, relative to economic and political dimensions of governance, institutional governance is key for promoting IGG in Africa. Third, out of the 6 governance dynamics, we find that only government effectiveness is effective for propelling EG to promote IGG in Africa. At the disaggregated level, we find that while EG promotes both social and environmental progress, the effect is remarkable in the case of the latter.

On the EG-governance interaction, the results reveal that regulatory quality and government effectiveness are the most effective modules for re-enforcing the EVS-inducing effect of EG. Nonetheless, we find that Africa's weak institutional framework for controlling corruption nullifies the SES-inducing effect of EG to yield a negative net effect. However, the optimism we provide through threshold analysis indicates that remarkable short-term to long-term IGG gains can be realised by channelling resources towards improving the quality of governance in Africa. Overall, our threshold analyses suggest that while government effectiveness is critical for propelling EG to promote IGG, across the SES and EVS dichotomy, it is investments in building frameworks and structures for corruption control and the rule of law that are crucial.

To realise the IGG potentials of EG as envisioned in Agenda 2030 and Agenda 2063, we recommend that African leaders prioritise environmentally sustainable capital flows and investments primarily in recycling and green technologies. Second, to turn around the negative effect of EG on IGG, African leaders should prioritise investments that promote economic freedom across the continent. To achieve this, we recommend that policymakers channel resources and efforts towards building frameworks for (i) promoting the public purse, (ii) supporting regulatory efficiency and (iii) ensuring government effectiveness. Doing so will enhance economic freedom in Africa, which could go a long way to cushion firms to contribute to IGG, considering the expected rebound of FDI to Africa from 2022. Third, the negative EG-corruption control net effect on inclusive growth also highlights the need for strengthening frameworks and structures crucial for protecting the public purse and ensuring that EG provides equal opportunities for all. Fourth, the pivotal role of the rule of law for EVS also suggests that African leaders should strive to secure property rights, protect natural capital, and ensure that local and foreign investors commit to sustainable production and consumption practices.

A fundamental limitation of this study is that some African countries were not considered, which was due to data unavailability. Nonetheless, considering Africa's institutional similarities, the unanimous voice of African leaders to foster IGG through trade, and the empirical rigour of this study, the findings and recommendations emanating from this study are useful for policy actions.

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References:

Abid, N., Ikram, M., Wu, J., & Ferasso, M. (2021). Towards environmental sustainability: exploring the nexus among ISO 14001, governance indicators and green economy in Pakistan. *Sustainable Production and Consumption*, 27, 653-666.

Acemoglu, D., & Robinson, J. A. (2019). *The Narrow Corridor*: How Nations Struggle for Liberty. Penguin UK.

Acemoglu, D., & Robinson, J. A. (2010). Why is Africa poor? *Economic History of Developing Regions*, *25*(1), 21-50.

Acemoglu, D., & Robinson, J.A. (2008). *The role of institutions in growth and development* (Vol. 10). Washington DC: World Bank.

Adeleye, B. N., Adedoyin, F., & Nathaniel, S. (2021). The criticality of ICT-trade nexus on economic and inclusive growth. *Information Technology for Development*, *27*(2), 293-313.

Africa Union. (2015). Agenda 2063: Framework document—The Africa We Want, available at: https://au.int/sites/default/files/documents/33126-doc-01_background_note.pdf

Afrifa, G. A., Tingbani, I., Yamoah, F., & Appiah, G. (2020). Innovation input, governance and climate change: Evidence from emerging countries. *Technological Forecasting and Social Change*, *161*, 120256.

Ahmad, M., Ahmed, Z., Yang, X., Hussain, N., & Sinha, A. (2021). Financial development and environmental degradation: do human capital and institutional quality make a difference? *Gondwana Research*.

Alataş, S. (2021). The role of information and communication technologies for environmental sustainability: evidence from a large panel data analysis. *Journal of Environmental Management*, 293, 112889.

Alvaredo, F, L Chancel, T Piketty, E Saez and G Zucman (2017), *World Inequality Report 2018*. World Inequality Lab.

Amponsah, M., Agbola, F. W., & Mahmood, A. (2021). The impact of informality on inclusive growth in Sub-Saharan Africa: Does financial inclusion matter? *Journal of Policy Modelling*, *43*(6), 1259-1286.

Anand, R., Mishra, M. S., & Peiris, M. S. J. (2013). *Inclusive growth: Measurement and Determinants*. International Monetary Fund.

Anetor, F. O., Esho, E., & Verhoef, G. (2020). The impact of foreign direct investment, foreign

aid and trade on poverty reduction: Evidence from Sub-Saharan African countries. *Cogent Economics & Finance*, *8*(1), 1737347.
Arcand, J.L., Berkes, E. & Panizza, U. (2015). Too much finance? *Journal of Economic Growth,* 20(1), 105–148.
Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, 58(2), 277-297
Asongu, S., & Nnanna, J. (2019). Foreign aid and sustainable inclusive human development in Africa. *DBN Journal of Economics and Sustainable Growth*, *1*(2), 1-29.
Asongu, S. A., & Nwachukwu, J. C. (2016). Foreign aid and governance in Africa. *International Review of Applied Economics*, *30*(1), 69-88.
Asongu, S. A., & Odhiambo, N. M. (2021a). Income levels, governance and inclusive human development in Sub-Saharan Africa. *Applied Research in Quality of Life*, 16(1), 71-103.
Asongu, S. A., & Odhiambo, N. M. (2021b). Enhancing governance for environmental sustainability in sub-Saharan Africa. *Energy Exploration & Exploitation*, *39*(1), 444-463.
Asongu, S. A., & Odhiambo, N. M. (2020a). Foreign direct investment, information technology and economic growth dynamics in Sub-Saharan Africa. *Telecommunications Policy*, *44*(1), 101838.
Asongu, S. A., & Odhiambo, N. M. (2020b). Inequality thresholds, governance and gender economic inclusion in sub-Saharan Africa. *International Review of Applied Economics*, 34(1), 94-114.
Asongu, S. A., & Odhiambo, N. M. (2018). ICT, financial access and gender inclusion in the formal economic sector: evidence from Africa. *African Finance Journal*, *20*(2), 45-65.
Asongu, S. A., & Kodila-Tedika, O. (2018). Institutions and poverty: A critical comment based on evolving currents and debates. *Social Indicators Research*, *139*(1), 99-117.
Babalola, S., & Shittu, W. (2020). Foreign aid and economic growth in West Africa: examining the roles of institutions. *International Economic Journal*, 34(3), 534-552.
Balassa, B. and A. Stoutjesdijk. (1975) Economic integration among developing countries. *Journal of Common Market Studies*, 37-55.
Balsalobre-Lorente, D., Ibáñez-Luzón, L., Usman, M., & Shahbaz, M. (2022). The environmental Kuznets curve, based on the economic complexity, and the pollution haven hypothesis in PIIGS countries. *Renewable Energy*, *185*, 1441-1455.
Bank.
Bekun, F. V., Alola, A. A., & Sarkodie, S. A. (2019). Toward a sustainable environment: Nexus between CO2 emissions, resource rent, renewable and non-renewable energy in 16-EU countries. *Science of the Total Environment*, *657*, 1023-1029.
Bhattarai, M., & Hammig, M. (2001). Institutions and the environmental Kuznets curve for deforestation: a cross-country analysis for Latin America, Africa and Asia. *World Development*, *29*(6), 995-1010.
Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, *87*(1), 115-143.
Bond, S. R., Hoeffler, A., & Temple, J. R. (2001). GMM estimation of empirical growth models. *Available at SSRN 290522*.
Bourguignon, F. (2016). Inequality and Globalization. How the rich get richer as the poor catch up, *Foreign Affair*s, 95: 11-16.
Brambor, T., Clark, W. R., & Golder, M. (2006). Understanding interaction models: Improving empirical analyses. *Political Analysis*, *14*(1), 63-82.
Brock, W. A., & Taylor, M. S. (2010). The green Solow model. *Journal of Economic Growth*,

15(2), 127-153.
Brundtland, G. H. (1987). Our common future - Call for action. *Environmental Conservation, 14*(4), 291-294.
Cecchetti, S. G., & Kharroubi, E. (2012). Reassessing the impact of finance on growth (No. 381). *Bank for International Settlements*.
Chaurey, A., Krithika, P. R., Palit, D., Rakesh, S., & Sovacool, B. K. (2012). New partnerships and business models for facilitating energy access. *Energy policy*, *47*, 48-55.
Chen, J., Wang, X., & Steemers, K. (2013). A statistical analysis of a residential energy consumption survey study in Hangzhou, China. *Energy and Buildings*, *66*, 193-202.
Copeland, B. R. (2005). Policy endogeneity and the effects of trade on the environment. *Agricultural and Resource Economics Review*, 34(1), 1-15.
Corak, M. (2013). Income inequality, equality of opportunity, and intergenerational mobility. *Journal of Economic Perspectives*, *27*(3), 79-102.
DAC/OECD (2020), *Joint Statement by the Development Assistance Committee (DAC) on the Covid-19 global pandemic*, OECD Publishing, Paris, http://www.oecd.org/dac/development-assistance-committee/DAC-Joint-Statement-COVID-19.pdf.
Dauda, L., Long, X., Mensah, C. N., Salman, M., Boamah, K. B., Ampon-Wireko, S., & Dogbe, C. S. K. (2021). Innovation, trade openness and CO2 emissions in selected countries in Africa. *Journal of Cleaner Production*, *281*, 125143.
Danish. (2019). Effects of information and communication technology and real income on CO_2 emissions: The experience of countries along Belt and Road. *Telematics and Informatics*, *45*.
Demirgüç-Kunt, A., & Singer, D. (2017). Financial inclusion and inclusive growth: A review of recent empirical evidence. *World Bank Policy Research Working Paper*, (8040).
Dougherty, S. and O. Akgun (2018), "Globalisation, decentralisation and inclusive growth", in Kim, J. and S. Dougherty (eds.), *Fiscal Decentralisation and Inclusive Growth*, OECD Publishing, Paris
Doumbia, D. (2019). The quest for pro-poor and inclusive growth: The role of governance. *Applied Economics*, *51*(16), 1762-1783.
Doytch, N., & Uctum, M. (2016). Globalization and the environmental impact of sectoral FDI. *Economic Systems*, *40*(4), 582-594.
Eskeland, G. S., & Harrison, A. E. (2003). Moving to greener pastures? Multinationals and the pollution haven hypothesis. *Journal of Development Economics*, *70*(1), 1-23.
Fauzel, S., Seetanah, B., & Sannasee, R. V. (2015). Productivity spillovers of FDI in the manufacturing sector of Mauritius. Evidence from a dynamic framework. *The Journal of Developing Areas*, 295-316.
Fay, M. (2012). *Inclusive green growth: The pathway to sustainable development*. World Bank Publications.
FDI Intelligence (2015). The Africa investment report 2015. FDI Intelligence. *Financial Times. http://forms.fdiintelligence.com/africainvestmentreport/files/The-Africa-InvestmentReport%202015 download.pdf.*
Global e-Sustainability Initiative. (2013). Smart 2020: Enabling the low carbon economy in the information age, 2008. *European Innovation Partnership on Smart Cities and Communities-Strategic Implementation Plan*, *14*, 7.
Global Green Growth Institute (GGGI) (2020). Green Growth in Action: Attaining Green Cities. Technical Report No. 14. Seoul, Republic of Korea
Green Growth Knowledge Platform (GGKP). (2013). Moving towards a Common Approach on Green Growth Indicators. *Global Green Growth Institute*, OECD, UNEP and The

World Bank
Grossman, G. M., & Helpman, E. (1991). Trade, knowledge spillovers, and growth. *European Economic Review*, *35*(2-3), 517-526.
Grossman, G. M., & Helpman, E. (1990). Trade, innovation, and growth. *The American Economic Review*, *80*(2), 86-91.
Gu, K., Dong, F., Sun, H., & Zhou, Y. (2021). How economic policy uncertainty processes impact on inclusive green growth in emerging industrialized countries: A case study of China. *Journal of Cleaner Production*, *322*, 128963.
Gygli, S., Haelg, F., Potrafke, N., & Sturm, J. E. (2019). The KOF Globalisation Index – Revisited. *Review of International Organizations, 14*(3), 543–574.
Hakimi, A., & Hamdi, H. (2016). Trade liberalization, FDI inflows, environmental quality and economic growth: a comparative analysis between Tunisia and Morocco. *Renewable and Sustainable Energy Reviews*, *58*, 1445-1456.
Halkos, G. E., & Polemis, M. L. (2017). Does financial development affect environmental degradation? Evidence from the OECD countries. *Business Strategy and the Environment*, *26*(8), 1162-1180.
Hansen, L. P. (1982). Large sample properties of generalized method of moments estimators. *Econometrica: Journal of the econometric society*, 1029-1054.
Helpman, E., Itskhoki, O., Muendler, M. A., & Redding, S. J. (2017). Trade and inequality: From theory to estimation. *The Review of Economic Studies*, *84*(1), 357-405.
Higón, D. A., Gholami, R., & Shirazi, F. (2017). ICT and environmental sustainability: A global perspective. *Telematics and Informatics*, *34*(4), 85-95.
Holley, C., & Lecavalier, E. (2017). Energy governance, energy security and environmental sustainability: A case study from Hong Kong. *Energy Policy*, *108*, 379-389.
IEA, International Energy Agency (2021). *World Energy Outlook.* IEA. Paris.
IEA, International Energy Agency (2019). *Africa Energy Outlook: World Energy Outlook Special Report.* IEA. Paris.
IEA, IRENA, UNSD, World Bank & WHO (2020). Tracking SDG 7: the energy progress report 2020. World Bank, Washington, DC.
ILO, (2020). COVID-19 Cruelly Highlights Inequalities and Threatens to Deepen Them. ILO Newsroom.
IMF (2020). World Economic Outlook: A Long and Difficult Ascent. October. *Washington, DC*, International Monetary Fund.
IMF & World Bank. (2020). Enhancing Access to Opportunities. International Monetary Fund and World Bank, *Washington, DC*: World Bank.
IRENA. (2013). Africa's renewable future: the path to sustainable growth. *International Renewable Energy Agency, Abu Dhabi*.
Inuwa, I., & Ononiwu, C. G. (2020). Traditional and Information Technology Anti-Corruption Strategies for Curbing the Public Sector Corruption in Developing Economies of Sub-Saharan Africa: A Systematic Literature Review. *The African Journal of Information Systems*, *12*(2), 5.
IPCC (2022): *Climate Change 2022: Impacts, Adaptation, and Vulnerability.* Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. In Press.
IPCC (2018). *Global Warming of 1.5°C*. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. In Press.
Ivanyna, M., & Salerno, A. (2021). Governance for Inclusive growth. *IMF Working Papers*, *2021*(098).

Jiang, L., Zhou, H. F., Bai, L., & Zhou, P. (2018). Does foreign direct investment drive environmental degradation in China? An empirical study based on air quality index from a spatial perspective. *Journal of Cleaner Production*, *176*, 864-87

Kaufman, D., Kraay, A., & Mastruzzi, M. (2010). The Worldwide Governance Indicators: Methodology and Analysis. *World Bank Policy Research Paper*, (5430).

Khan, S. A. R., Yu, Z., Belhadi, A., & Mardani, A. (2020). Investigating the effects of renewable energy on international trade and environmental quality. *Journal of Environmental Management*, *272*, 111089.

Kruckenberg, L. J. (2015). North–South partnerships for sustainable energy: Knowledge–power relations in development assistance for renewable energy. *Energy for Sustainable Development*, *29*, 91-99.

Law, S. H., & Singh, N. (2014). Does too much finance harm economic growth? *Journal of Banking & Finance*, *41*, 36-44.

Lucas Jr, R. E. (1988). On the mechanics of economic development. *Journal of Monetary Economics*, 22(1), 3- 42.

Meadows, D. H., Meadows, D. H., Randers, J., & Behrens III, W. W. (1972). The limits to growth: A Report to the Club of Rome (1972).

Nchofoung, T. N., & Asongu, S. A. (2022). Effects of infrastructures on environmental quality contingent on trade openness and governance dynamics in Africa. *Renewable Energy*, *189*, 152-163.

Ndikumana, L., & Sarr, M. (2019). Capital flight, foreign direct investment and natural resources in Africa. *Resources Policy*, *63*, 101427.

Nathaniel, S. P., & Iheonu, C. O. (2019). Carbon dioxide abatement in Africa: the role of renewable and non-renewable energy consumption. Science of the Total Environment, 679, 337-345.

North, D. C. (1990). Institutions, Institutional Change and Economic Performance. *Cambridge University Press, New York*.

Obeng, C. K., Mwinlaaru, P. Y., & Ofori, I. K. (2022). Global value chain participation and inclusive growth in Sub-Saharan Africa. In *The Palgrave Handbook of Africa's Economic Sectors* (pp. 815-840). Palgrave Macmillan, Cham.

OECD (2020), *Six decades of ODA: insights and outlook in the COVID-19 crisis*, OECD Publishing, Paris, https://doi.org/10.1787/5e331623-en.

OECD (2019). OECD Work on Green Growth 2019-20. https://issuu.com/oecd.publishing/docs/gg_brochure_2019_web

OECD (2017). Green Growth Indicators 2017. OECD Green Growth Studies, OECD Publishing, Paris, https://doi.org/10.1787/9789264268586-en.

OECD (2016). The Governance of Inclusive Growth: An Overview of Country Initiatives, OECD Publishing, Paris.

ODI (2020), *Donor Responses to The Coronavirus*, Overseas Development Institute (ODI), London, https://set.odi.org/wp-content/uploads/2020/05/Donor-responses_as-of-30April-2020.pdf.

Ohlin, B. (1935). *Interregional and international trade*. Harvard University Press, Cambridge.

Ofori, I. K., & Asongu, S. A. (2021). ICT diffusion, foreign direct investment and inclusive growth in Sub-Saharan Africa. *Telematics and Informatics*, *65*, 101718.

Ofori, I. K., Armah, M. K., Taale, F., & Ofori, P. E. (2021). Addressing the severity and intensity of poverty in Sub-Saharan Africa: How relevant is the ICT and financial development pathway? *Heliyon*, 7(10), e08156.

Ofori, I. K., Cantah, W. G., Afful Jr, B., & Hossain, S. (2022a). Towards shared prosperity in sub-Saharan Africa: How does the effect of economic integration compare to social equity policies? *African Development Review*, 34(1), 97-113.

Ofori, I. K., Dossou, T. A. M., & Akadiri, S. S. (2022b). Towards the quest to reduce income inequality in Africa: is there a synergy between tourism development and governance? *Current Issues in Tourism*, 1-21.
Ofori, I. K., Gbolonyo, E. Y., Dossou, T. A. M., & Nkrumah, R. K. (2022c). Remittances and income inequality in Africa: Financial development thresholds for economic policy. *Research in Globalization*, *4*, 100084.
Ofori, I. K., Osei, D. B., & Alagidede, I. P. (2022d). Inclusive growth in Sub-Saharan Africa: Exploring the interaction between ICT diffusion, and financial development *Telecommunications Policy*, *46*(7), 102315.
Ofori, I. K., Armah, M. K., & Asmah, E. E. (2022e). Towards the reversal of poverty and income inequality setbacks due to COVID-19: The role of globalisation and resource allocation. *International Review of Applied Economics*, 1-28.
Opoku, E. E. O., Ibrahim, M., & Sare, Y. A. (2019). Foreign direct investment, sectoral effects and economic growth in Africa. *International Economic Journal*, *33*(3), 473-492.
Osabohien, R., Iqbal, B. A., Osabuohien, E. S., Khan, M. K., & Nguyen, D. P. (2021). Agricultural trade, foreign direct investment and inclusive growth in developing countries: evidence from West Africa. *Transnational Corporations Review*, 1-12.
Oyinlola, M. A., & Adedeji, A. (2019). Human capital, financial sector development and inclusive growth in sub-Saharan Africa. *Economic Change and Restructuring*, *52*(1), 43-66.
Panayotou, T. (1997). Demystifying the environmental Kuznets curve: turning a black box into a policy tool. *Environment and development economics*, *2*(4), 465-484.
Pavcnik, N. (2017). *The impact of trade on inequality in developing countries* (No. w23878). National Bureau of Economic Research.
Peprah, J. A., Ofori, I. K., & Asomani, A. N. (2019). Financial development, remittances and economic growth: A threshold analysis. *Cogent Economics & Finance*, *7*(1), 1625107.
Piketty, T (2013), Capital in the Twenty-First Century, Belknap Press.
Porter, M. E., & Van der Linde, C. (1995). Green and competitive: ending the stalemate. *Harvard business review*, *73*(5), 120-134.
Ravallion, M. (2018). Inequality and globalization: A review essay. *Journal of Economic Literature*, *56*(2), 620-642.
Rewilak, J. (2017). The role of financial development in poverty reduction. *Review of Development Finance*, *7*(2), 169-176.
Romer, P. M. (1990). Endogenous technological change. *Journal of Political Economy*, *98*(5, Part 2), 71-102.
Romer, P.M. (1986), Increasing returns and long-run growth, Journal of Political Economy 94, 100221037.
Roodman, D. (2009). How to do xtabond2: An introduction to difference and system GMM in Stata. *The Stata Journal*, *9*(1), 86-136.
Sachs, J., Kroll, C., Lafortune, G., Fuller, G., Woelm, F. (2021). *The Decade of Action for the Sustainable Development Goals: Sustainable Development Report 2021.* Cambridge: Cambridge University Press.
Sachs, J. & Warner, A. (1995). Natural Resource Abundance and Economic Growth, *NBER Working Paper*, No. w5398.
Salahuddin, M., Alam, K., & Ozturk, I. (2016). The effects of Internet usage and economic growth on CO2 emissions in OECD countries: A panel investigation. *Renewable and Sustainable Energy Reviews*, *62*, 1226-1235.
Samuelson, P. (1948). International trade and the equalisation of factor prices. *The Economic Journal*, 58(230), 163-184.
Samuelson, P. (1939). The Gains from International Trade." *Canadian Journal of Economics,*

5(2), 195–205
Sarkodie, S. A. (2022). Winners and losers of energy sustainability—Global assessment of the Sustainable Development Goals. *Science of the Total Environment*, 154945
Sarkodie, S. A., Adams, S., & Leirvik, T. (2020). Foreign direct investment and renewable energy in climate change mitigation: does governance matter? *Journal of Cleaner Production*, *263*, 12126
Sarkodie, S. A., & Strezov, V. (2019). Effect of foreign direct investments, economic development and energy consumption on greenhouse gas emissions in developing countries. *Science of the Total Environment*, *646*, 862-871.
Shahbaz, M., Gozgor, G., Adom, P. K., & Hammoudeh, S. (2019). The technical decomposition of carbon emissions and the concerns about FDI and trade openness effects in the United States. *International Economics*, *159*, 56-73.
Shahbaz, M., Nasir, M. A., & Roubaud, D. (2018). Environmental degradation in France: the effects of FDI, financial development, and energy innovations. *Energy Economics*, *74*, 843-857.
Shahbaz, M., Shahzad, S. J. H., Ahmad, N., & Alam, S. (2016). Financial development and environmental quality: the way forward. *Energy Policy*, 98, 353-364.
Shahbaz, M., Hye, Q. M. A., Tiwari, A. K., & Leitão, N. C. (2013). Economic growth, energy consumption, financial development, international trade and CO2 emissions in Indonesia. *Renewable and Sustainable Energy Reviews*, *25*, 109-121.
Shahbaz, M., Khan, S., Ali, A., & Bhattacharya, M. (2017). The impact of globalization on CO2 emissions in China. *The Singapore Economic Review*, *62*(04), 929-957.
Svirydzenka, K. (2016). *Introducing a new broad-based index of financial development*. International Monetary Fund.
Tamazian, A., Chousa, J. P., & Vadlamannati, K. C. (2009). Does higher economic and financial development lead to environmental degradation: evidence from BRIC countries. *Energy policy*, *37*(1), 246-253.
Tawiah, V., Zakari, A., & Adedoyin, F. F. (2021). Determinants of green growth in developed and developing countries. *Environmental Science and Pollution Research*, *28*(29), 39227-39242.
Tchamyou, V. S., Asongu, S. A., & Odhiambo, N. M. (2019). The role of ICT in modulating the effect of education and lifelong learning on income inequality and economic growth in Africa. *African Development Review*, *31*(3), 261-274.
Ucal, M. Ş. (2014). Panel data analysis of foreign direct investment and poverty from the perspective of developing countries. *Procedia-Social and Behavioural Sciences*, *109*, 1101-1105
UNCTAD. (2021). *Global foreign direct investment fell by 42% in 2020, outlook remains weak*. United Nations Conference on Trade and Development
UNCTAD (2014), *World Investment Report 2014: Investing in the SDGs: An Action Plan*, United Nations Publications, Geneva,
UNDP (2017). UNDP's Strategy for Inclusive and Sustainable Growth, New York, USA.
UNDP (2011). Governance Principles, Institutional Capacity and Quality. *Bureau for Development Policy*, New York, 270-291.
United Nations Environment Programme (UNEP) (2019). Assessment of Complementarities between GGGI's Green Growth Index and UNEP's Green Economy Progress Index - GGGI Technical Report No. 10. http://hdl.handle.net/20.500.11822/32224.
UNFCCC (2015). Press Release: Rising Number of Initiatives by Cities and Better Land Management Show Pathways Towards Carbon Neutral Future. Bonn. http://www.newsroom.unfccc.int/media/1605/pr20141506_sb40_close.pdf.
United Nations (UN) (2015) Resolution adopted by the General Assembly on 25 September

2015, Transforming Our World: the 2030 Agenda for Sustainable Development. https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E IEA, IRENA, UNSD, World Bank, WHO. 2022. Tracking SDG 7: The Energy Progress Report. World Bank, Washington DC. © World Bank. License: Creative Commons Attribution—NonCommercial 3.0 IGO (CC BY-NC 3.0 IGO). Available from: https://trackingsdg7.esmap.org/downloads

World Health Organisation (WHO) (2022). The Global Health Observatory. Air pollution data portal. https://www.who.int/data/gho/data/themes/air-pollution

WHO (2019), *Global Spending on Health: A World in Transition*, World Health Organization, Geneva, https://www.who.int/health_financing/documents/health-expenditure-report-2019/en/.

World Health Organisation (WHO) (2022). The Global Health Observatory. Air pollution data portal. https://www.who.int/data/gho/data/themes/air-pollution

Windmeijer, F. (2005). A finite sample correction for the variance of linear efficient two-step GMM estimators. *Journal of Econometrics*, *126*(1), 25-51.

Woolridge (2010). Econometric Analysis of Cross Section and Panel Data. 2nd ed. Cambridge, MA: MIT Press.

World Bank (2022). World Development Indicators. February 2022 Washington, DC: World Bank.

World Bank (2021). World Development Indicators. April 2021. *Washington, DC*: World Bank.

World Bank. (2019). Bank Regulation and Supervision a Decade after the Global Financial Crisis. *Global Financial Development Report*.

World Bank. (2012). *Inclusive Green Growth: The Pathway to Sustainable Development*. Washington, DC. World Bank.

World Economic Forum (2021). Net Zero Carbon Cities: An Integrated Approach. Insight Report.

World Trade Organization (WTO) (2020). World Trade Organization Annual Report 2020. Geneva, Switzerland. https://www.wto.org/english/res_e/booksp_e/anrep_e/anrep20_e.pdf

Yameogo, C. E., Omojolaibi, J. A., & Dauda, R. O. (2021). Economic globalisation, institutions and environmental quality in Sub-Saharan Africa. *Research in Globalization*, 3, 100035.

Zarsky, L. (1999). Havens, halos and spaghetti: untangling the evidence about foreign direct investment and the environment. *Foreign Direct Investment and the Environment*, *13*(8), 47-74.

Zhao, S., Hafeez, M., & Faisal, C. M. N. (2021). Does ICT diffusion lead to energy efficiency? and environmental sustainability in emerging Asian economies? *Environmental Science and Pollution Research*, 1-10.

APPENDICES

Table A1: Pairwise correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Inclusive green growth	1												
(2) Inclusive growth	0.145	1											
(3) Greenhouse gas emission	0.225**	0.0270	1										
(4) Internet access	0.569***	0.0606	0.117	1									
(5) Financial development	0.570***	0.134	0.341***	0.382***	1								
(6) Foreign aid	-0.570***	-0.323***	0.006	-0.363***	-0.454***	1							
(7) KOF economic globalisation	0.670***	0.235**	0.233**	0.515***	0.710***	-0.608***	1						
(8) Political stability	0.443***	0.235**	0.473***	0.154*	0.415***	-0.278***	0.316***	1					
(9) Regulatory quality	0.586***	0.190*	0.470***	0.318***	0.675***	-0.404***	0.635***	0.716***	1				
(10) Government effectiveness	0.702***	0.167*	0.492***	0.361***	0.648***	-0.356***	0.609***	0.680***	0.900***	1			
(11) Rule of law	0.630***	0.188*	0.618***	0.331***	0.604***	-0.254***	0.540***	0.782***	0.900***	0.923***	1		
(12) Corruption control	0.633***	0.146	0.579***	0.245**	0.687***	-0.263***	0.577***	0.710***	0.879***	0.907***	0.948***	1	
(13) Voice and Accountability	0.322***	0.0458	0.508***	-0.00811	0.510***	-0.154*	0.358***	0.666***	0.791***	0.673***	0.732***	0.748***	1

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

Table A2: Summary statistics of IGG variables

Variables	N	Mean	Std. Dev.	Minimum	Maximum
Clean fuel usage	391	33.708	34.727	0.340	99.100
Agricultural land	437	44.888	19.502	8.022	80.888
Life expectancy	460	60.322	7.848	46.267	76.880
Forest cover	483	30.889	23.621	0.663	91.978
Fossil fuel consumption	345	40.944	30.13	1.640	99.978
Economic growth	483	5996.051	4955.111	630.702	22870.29
Renewable energy	437	56.944	30.394	0.059	98.343
Exposure to Ambient PM.2.5	299	6.661	2.365	1.130	15.200
Unemployment	483	8.772	7.392	0.320	33.29
Sanitation	423	30.846	24.102	2.000	93.200
Potable water	368	73.000	17.158	28.900	99.900
Wealth changes	287	-94.743	620.182	-3281.8	1867.6
Temperature changes	483	1.007	0.420	-0.562	2.291
Population density	483	78.127	121.545	2.180	626.486
Carbon intensity	444	0.150	0.126	0.024	0.738
Ambient PM.2.5 mortalities	460	283.848	162.144	47.066	742.247
Ambient PM.2.5 welfare cost	460	3.187	1.909	0.474	8.621
Transport infrastructure	414	8.746	8.774	1.255	37.649
Income inequality	327	46.213	8.622	32.900	66.900
Human capital index	460	1.869	0.455	1.118	2.939
Methane emission	437	11414.7	13434.02	20.000	68350
Natural resources rent	460	11.726	12.439	0.001	58.65
Environmentally friendly technologies	393	10.806	16.667	0.000	100.00
Infant mortality	460	52.18	24.283	12.500	121.200

Note: N = Observations; Std. Dev denotes Standard Deviation.

Table A3: Pairwise correlation matrix for IGG index variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Cleanfuel (1)	1																							
agric (2)	0.127	1																						
enerint (3)	-0.504***	-0.236**	1																					
forest (4)	-0.151*	-0.439***	0.125	1																				
fosful 51)	0.866***	0.317***	-0.597***	-0.396***	1																			
gpc (6)	0.795***	0.0410	-0.499***	0.0456	0.667***	1																		
renener (7)	-0.840***	-0.325***	0.576***	0.398***	-0.991***	-0.657***	1																	
amb (8)	-0.290***	-0.0262	0.309***	0.205**	-0.213**	-0.458***	0.235**	1																
unemp (9)	0.631***	0.195**	-0.322***	-0.0673	0.647***	0.732***	-0.624***	-0.242**	1															
sanit (10)	0.630***	0.119	-0.437***	0.130	0.474***	0.717***	-0.482***	-0.376***	0.389***	1														
powat (11)	0.797***	0.227**	-0.726***	0.0297	0.782***	0.842***	-0.781***	-0.300***	0.656***	0.701***	1													
cwea (12)	0.164*	0.263***	-0.188*	-0.475***	0.412***	0.0983	-0.452***	-0.164*	0.230**	0.189*	0.227**	1												
temp (13)	0.143	0.0688	-0.0247	-0.249***	0.155*	-0.197**	-0.126	0.162*	-0.156*	-0.211**	-0.103	-0.0746	1											
pop (14)	0.223**	0.178*	-0.122	-0.115	0.175*	0.285***	-0.200**	-0.467***	-0.165*	0.384***	0.218**	-0.0003	-0.0054	1										
carint (15)	0.512***	0.468***	-0.104	-0.289***	0.647***	0.452***	-0.651***	-0.120	0.678***	0.308***	0.430***	0.177*	0.0286	0.0189	1									
ambmort (16)	0.862***	0.320***	-0.556***	-0.211**	0.820***	0.692***	-0.761***	-0.116	0.644***	0.436***	0.750***	0.102	0.178*	0.157*	0.540***	1								
ambcost (17)	0.852***	0.323***	-0.559***	-0.209**	0.811***	0.662***	-0.749***	-0.0986	0.629***	0.437***	0.741***	0.122	0.183*	0.136	0.523***	0.992***	1							
trans (18)	0.563***	0.141	-0.430***	-0.325***	0.646***	0.732***	-0.669***	-0.523***	0.513***	0.511***	0.648***	0.470***	-0.198**	0.558***	0.325***	0.500***	0.475***	1						
ineq (19)	-0.0129	0.340***	-0.210**	-0.0248	0.166*	0.267***	-0.187*	-0.0500	0.560***	0.253***	0.351***	0.398***	-0.421***	-0.290***	0.382***	0.0683	0.0780	0.303***	1					
hc (20)	0.525***	0.167*	-0.390***	-0.0021	0.515***	0.780***	-0.507***	-0.330***	0.648***	0.461***	0.674***	0.170*	-0.257***	0.233**	0.409***	0.625***	0.598***	0.665***	0.347***	1				
methane (21)	-0.403***	0.0402	0.538***	-0.105	-0.428***	-0.342***	0.442***	0.122	-0.277***	-0.206**	-0.595***	-0.0883	-0.0008	-0.0914	-0.117	-0.439***	-0.428***	-0.365***	-0.180*	-0.378***	1			
natres (22)	-0.0285	-0.453***	0.265***	0.527***	-0.277***	0.0348	0.290***	0.322***	-0.112	0.0344	-0.110	-0.459***	-0.0849	-0.272***	-0.240**	-0.210**	-0.209**	-0.378***	-0.253***	-0.209**	0.252***	1		
envtech (23)	0.118	-0.0487	0.0912	-0.0168	0.0656	0.0656	-0.0561	-0.0429	-0.00239	0.0057	-0.0305	-0.009	0.0245	0.142	-0.003	0.0824	0.0809	0.0780	-0.189*	0.0642	0.107	0.00995	1	
infmort (24)	-0.760***	-0.164*	0.441***	0.372***	-0.766***	-0.674***	0.767***	0.507***	-0.578***	-0.353***	-0.628***	-0.337***	-0.0765	-0.283***	-0.425***	-0.695***	-0.680***	-0.675***	0.009	-0.699***	0.366***	0.367***	-0.126	1

*$p < 0.1$, **$p < 0.05$, ***$p < 0.001$

Table A4: Eigenvectors of IGG components

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Comp8	Comp9	Comp10	Comp11	Comp12	Comp13	Comp14	Comp15	Comp16	Comp17	Comp18
cleanfuel	0.276	0.117	-0.227	0.033	0.080	-0.030	0.179	0.005	-0.014	0.040	-0.067	-0.180	0.109	0.220	0.045	-0.218	0.063	-0.059
agric	0.105	-0.358	0.090	0.136	0.058	0.579	-0.147	0.177	-0.130	-0.141	-0.021	-0.035	-0.407	0.342	0.113	-0.119	-0.080	0.110
enerint	-0.205	-0.034	0.016	0.022	0.471	-0.080	-0.037	-0.177	0.497	0.144	0.113	-0.199	0.052	0.399	-0.035	-0.212	0.267	-0.026
forest	-0.087	0.518	0.069	0.053	-0.085	0.104	-0.145	0.111	0.113	0.237	0.240	-0.312	-0.254	-0.210	0.488	0.064	0.038	-0.139
fosful	0.288	-0.094	-0.135	0.101	0.000	-0.081	0.168	0.077	0.076	0.055	-0.198	0.052	-0.075	-0.212	0.099	-0.026	0.001	-0.186
incgro	0.268	0.260	0.062	-0.076	0.140	0.004	0.054	-0.093	-0.058	-0.059	0.102	0.205	0.020	0.008	-0.024	-0.045	0.273	0.542
renener	-0.285	0.106	0.101	-0.075	0.004	0.088	-0.196	-0.086	-0.124	-0.113	0.229	-0.055	0.197	0.211	-0.060	0.120	-0.054	0.111
amb	-0.130	0.020	-0.139	0.457	-0.046	0.028	-0.039	0.364	0.512	-0.278	0.071	0.124	0.056	-0.241	-0.079	-0.278	-0.162	0.165
unemp	0.237	0.085	0.175	0.260	0.210	-0.146	-0.083	-0.206	-0.119	0.115	0.099	0.090	0.095	0.104	0.368	-0.110	-0.569	0.249
sanit	0.199	0.227	0.114	-0.146	0.056	0.298	0.372	0.233	-0.047	0.139	0.208	-0.297	0.232	-0.036	-0.440	-0.161	-0.302	-0.004
powat	0.282	0.175	0.042	0.036	-0.168	0.084	0.062	0.136	-0.032	0.033	0.010	0.067	-0.161	0.041	0.058	-0.178	0.510	0.178
cwea	0.115	-0.337	0.248	-0.032	-0.054	-0.350	0.362	0.296	0.161	-0.075	0.264	-0.299	-0.151	0.136	0.141	0.400	0.002	0.159
temp	-0.006	-0.203	-0.498	0.103	-0.112	0.028	0.104	-0.124	-0.077	0.339	0.664	0.279	-0.119	0.018	-0.064	0.013	0.003	-0.034
pop	0.091	-0.036	-0.093	-0.551	0.048	0.390	-0.052	0.059	0.361	0.063	-0.005	0.148	0.009	-0.015	0.201	0.084	-0.154	-0.102
carint	0.195	-0.132	0.055	0.269	0.341	0.198	-0.031	-0.185	0.153	0.433	-0.230	-0.043	-0.054	-0.271	-0.180	0.372	0.049	0.066
ambmort	0.271	0.031	-0.225	0.150	0.001	0.083	-0.166	-0.001	0.007	-0.215	0.044	-0.106	0.298	0.123	0.088	0.226	0.079	-0.013
ambcost	0.267	0.025	-0.225	0.162	-0.011	0.082	-0.148	0.028	-0.011	-0.225	0.065	-0.155	0.333	0.141	0.104	0.248	0.086	-0.277
trans	0.246	-0.043	0.155	-0.291	0.029	-0.125	0.034	0.011	0.275	-0.075	0.063	0.442	0.153	0.024	0.177	-0.029	-0.052	-0.080
ineq	0.097	-0.048	0.556	0.259	-0.038	0.030	-0.053	0.105	-0.077	0.157	0.184	0.261	0.141	0.092	-0.060	-0.147	0.167	-0.503
hc	0.236	0.138	0.155	-0.055	0.092	-0.051	-0.359	-0.133	0.129	-0.322	0.306	0.008	-0.298	-0.182	-0.405	0.213	-0.033	-0.048
methane	-0.158	-0.114	0.014	-0.021	0.551	0.156	0.293	-0.033	-0.266	-0.363	0.207	0.009	0.069	-0.413	0.252	-0.066	0.174	-0.108
natres	-0.104	0.442	-0.124	0.148	0.205	-0.013	0.363	0.049	-0.007	-0.163	-0.144	0.321	-0.347	0.358	-0.087	0.285	-0.141	-0.224
envtech	0.016	0.010	-0.172	-0.157	0.411	-0.274	-0.386	0.654	-0.250	0.218	-0.024	0.085	-0.011	0.025	-0.069	0.004	-0.003	0.009
infmort	-0.261	0.070	0.115	0.138	-0.073	0.259	0.089	0.232	0.037	0.148	-0.014	0.255	0.348	0.028	0.062	0.392	0.124	0.248

Variable	Comp19	Comp20	Comp21	Comp22	Comp23	Comp24
cleanfuel	-0.320	0.007	0.652	0.353	-0.103	0.005
agric	-0.199	-0.104	-0.122	0.066	-0.053	0.059
enerint	0.107	-0.240	-0.139	-0.076	-0.003	0.032
forest	-0.233	-0.028	-0.109	0.050	0.012	0.021
fosful	0.026	-0.384	-0.006	-0.256	0.054	0.690
incgro	-0.378	0.100	-0.030	-0.480	-0.069	0.019
renener	0.034	0.352	0.117	0.128	0.074	0.691
amb	-0.022	0.229	0.075	-0.017	-0.004	0.012
unemp	0.329	-0.082	0.077	-0.012	-0.041	-0.045
sanit	0.051	-0.075	-0.247	0.019	0.026	0.016
powat	0.617	0.127	-0.034	0.256	0.016	0.056
cwea	0.009	0.128	0.096	-0.057	0.023	-0.005
temp	-0.011	-0.004	-0.019	0.006	0.002	-0.002
pop	0.231	0.163	0.333	-0.284	0.065	-0.068
carint	-0.050	0.349	-0.022	0.180	0.006	0.039
ambmort	-0.035	-0.082	-0.103	0.011	0.745	-0.124
ambcost	0.095	0.135	-0.200	-0.167	-0.600	-0.030
trans	-0.264	0.028	-0.373	0.496	-0.053	0.086
ineq	-0.076	0.121	0.192	-0.231	0.123	-0.055
hc	0.066	-0.329	0.236	0.128	-0.088	-0.011
methane	0.071	0.005	0.048	0.085	0.019	-0.033
natres	0.053	0.105	-0.045	-0.030	0.062	-0.014
envtech	0.018	0.021	-0.012	0.001	0.006	-0.000
infmort	0.023	-0.494	0.182	0.127	-0.144	-0.032

Note: Comp is principal component;

Table A5: Principal components and eigenvalues for Inclusive green growth

Component	Eigenvalue	Difference	Proportion	Cumulative	KMO Statistic
Comp 1	**10.051**	**7.532**	**0.419**	**0.419**	**0.826**
Comp 2	**2.519**	**0.370**	**0.105**	**0.524**	**0.363**
Comp 3	**2.149**	**0.113**	**0.089**	**0.613**	**0.744**
Comp 4	**2.036**	**0.659**	**0.085**	**0.698**	**0.579**
Comp 5	**1.376**	**0.320**	**0.057**	**0.755**	**0.800**
Comp 6	**1.057**	**0.146**	**0.044**	**0.799**	**0.831**
Comp 7	0.911	0.055	0.038	0.837	0.776
Comp 8	0.855	0.228	0.036	0.873	0.684
Comp 9	0.627	0.071	0.026	0.899	0.844
Comp 10	0.556	0.105	0.023	0.922	0.742
Comp 11	0.451	0.096	0.019	0.941	0.876
Comp 12	0.355	0.062	0.015	0.956	0.610
Comp 13	0.293	0.071	0.012	0.968	0.850
Comp 14	0.222	0.016	0.009	0.977	0.296
Comp 15	0.206	0.086	0.009	0.986	0.708
Comp 16	0.120	0.054	0.005	0.991	0.758
Comp 17	0.066	0.019	0.003	0.994	0.821
Comp 18	0.047	0.005	0.002	0.996	0.655
Comp 19	0.042	0.015	0.002	0.997	0.391
Comp 20	0.028	0.010	0.001	0.999	0.746
Comp 21	0.017	0.006	0.001	0.999	0.669
Comp 22	0.011	0.008	0.001	1.000	0.558
Comp 23	0.004	0.002	0.000	1.000	0.569
Comp 24	0.002	0.000	0.000	1.000	0.749
Overall	–	–	–	–	**0.720**

Note: KMO is Kaiser-Meyer-Olkin; Comp is Principal Component
Source: Authors' construct, 2022

Table A6: Governance thresholds and inclusive green growth net effects

			Net	Effects		
Thresholds	**CORR**	**REGU**	**GOVEF**	**RULE**	**POLS**	**VOICE**
0	na	na	0.0038	na	na	na
0.5	na	na	0.0025	na	na	na
1.0	na	na	0.0100	na	na	na
1.5	na	na	0.0131	na	na	na

Note: CC: Control of corruption; PS: Political stability; RG: Regulatory quality; RL: the Rule of law; VA: Voice and Accountability; GE: Government Effectiveness and na is Not Applicable

Table A7: Governance thresholds and socioeconomic sustainability net effects

			Net	Effects		
Thresholds	**CORR**	**REGU**	**GOVEF**	**RULE**	**POLS**	**VOICE**
0	0.0108	na	na	na	na	na
0.5	0.0221	na	na	na	na	na
1.0	0.0333	na	na	na	na	na
1.5	0.0446	na	na	na	na	na

Note: CC: Control of corruption; PS: Political stability; RG: Regulatory quality; RL: Rule of law; VA: Voice and Accountability; GE: Government Effectiveness and na is Not Applicable

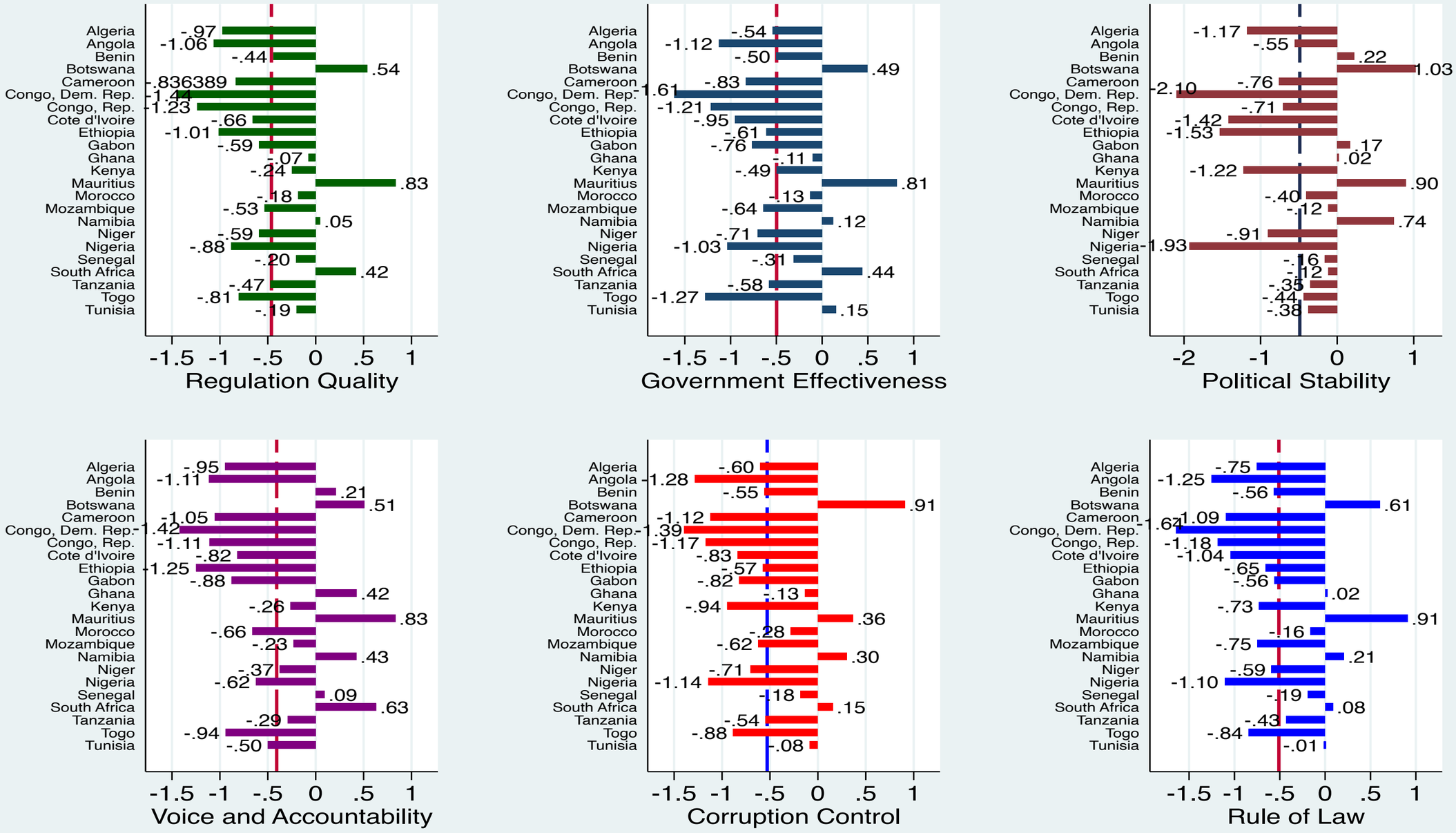

Figure A.1: In-country Governance Performance In Africa, 2000 – 2020

Table SM1: GMM results for the effects of economic globalisation and governance on sustainable development, 2005 – 2020 (Dependent variable:Inclusive green growth)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Inclusive green growth (-1)	1.0201***	1.0228***	1.0054***	1.0265***	0.9817***	0.9207***	1.0052***	1.0248***	0.9685***	0.9612***	1.0207***	0.9398***	1.0012***	0.9921***
	(0.0107)	(0.0115)	(0.0189)	(0.0215)	(0.0166)	(0.0253)	(0.0213)	(0.0154)	(0.0479)	(0.0398)	(0.0619)	(0.0358)	(0.0337)	(0.0246)
Internet access	0.0005**	0.0005	0.0006	0.0003	0.0017***	0.0026***	0.0002	-0.0003	0.0025	0.0005	-0.0000	0.0015	0.0002	0.0008
	(0.0002)	(0.0003)	(0.0005)	(0.0008)	(0.0004)	(0.0009)	(0.0009)	(0.0003)	(0.0015)	(0.0013)	(0.0013)	(0.0013)	(0.0008)	(0.0007)
Financial development	-0.1370***	-0.0787	-0.1470	-0.2951***	-0.2251**	-0.1376	-0.0459	-0.0561	-0.5094**	-0.0316	-0.1446	-0.1699	-0.1096	-0.2244*
	(0.0379)	(0.0796)	(0.1050)	(0.0978)	(0.0921)	(0.1615)	(0.0926)	(0.1137)	(0.1886)	(0.1332)	(0.1418)	(0.1766)	(0.1506)	(0.1112)
Foreign aid	0.0010	0.0012	-0.0005	0.0099**	0.0042	0.0047	0.0003	0.0025	0.0087*	0.0053	0.0066	0.0046	-0.0024	-0.0011
	(0.0015)	(0.0011)	(0.0038)	(0.0041)	(0.0029)	(0.0036)	(0.0011)	(0.0017)	(0.0042)	(0.0037)	(0.0065)	(0.0041)	(0.0031)	(0.0030)
Economic globalisation (EG)		-0.0008							0.0022	0.0010	0.0014	0.0007	-0.0002	-0.0000
		(0.0008)							(0.0017)	(0.0019)	(0.0017)	(0.0018)	(0.0014)	(0.0012)
Corruption control			0.0106						0.2243					
			(0.0506)						(0.1940)					
Regulatory quality				0.1164***						0.3747**				
				(0.0323)						(0.1623)				
Government effectiveness					0.0911**						0.2091			
					(0.0400)						(0.1658)			
Rule of law						0.1453***						0.3048***		
						(0.0460)						(0.0884)		
Political stability							0.0052						0.0513	
							(0.0219)						(0.0438)	
Voice and accountability								0.0103						0.1167
								(0.0116)						(0.0814)
EG × Corruption control									-0.0010					
									(0.0038)					
EG × Regulatory quality										-0.0069**				
										(0.0032)				
EG × Government effectiveness											-0.0043			
											(0.0026)			
EG × Rule of law												-0.0046**		
												(0.0022)		
EG × Political stability													-0.0012	
													(0.0009)	
EG × Voice and accountability														-0.0022
														(0.0019)
Constant	0.0362***	0.0603*	0.0489**	0.0732***	0.0687**	0.0768*	0.0332	0.0274	0.0519	0.0122	-0.0092	0.0680	0.0699	0.0849*
	(0.0082)	(0.0289)	(0.0225)	(0.0248)	(0.0310)	(0.0419)	(0.0206)	(0.0204)	(0.1083)	(0.0842)	(0.0759)	(0.0988)	(0.0564)	(0.0409)
Time effect	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	143	143	143	143	143	143	143	143	143	143	143	143	143	143
Countries	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Instruments	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Wald Statistic	111707***	142474***	7.263e+06***	111338***	6756***	15658***	40538***	168872***	32617***	10145***	5842***	12103***	166833***	17115***
Wald P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hansen P-Value	0.577	0.581	0.607	0.797	0.615	0648	0.765	0.620	0.491	0.564	0.692	0.537	0.633	0.699
AR(1)	0.006	0.006	0.007	0.007	0.007	0.010	0.005	0.006	0.00	0.008	0.008	0.008	0.006	0.006
AR(2)	0.578	0.622	0.549	0.448	0.613	0.642	0.594	0.598	0.444	0.425	0.591	0.556	0.625	0.585

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table SM2: GMM results for the effects of economic globalisation and governance on sustainable development 2005 – 2020 (Dependent variable: Inclusive Growth)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Inclusive growth (-1)	0.9156***	0.8467***	0.9349***	0.9325***	0.9373***	0.9140***	0.9055***	0.8870***	0.8679***	0.8863***	0.9270***	0.9099***	0.8869***	0.9102***
	(0.0139)	(0.0317)	(0.0192)	(0.0287)	(0.0248)	(0.0227)	(0.0229)	(0.0171)	(0.0475)	(0.0392)	(0.0310)	(0.0309)	(0.0315)	(0.0358)
Internet access	0.0008	0.0006	0.0011	-0.0003	0.0009	0.0003	0.0001	0.0002	0.0004	-0.0005	0.0028**	0.0024*	0.0017	0.0015
	(0.0009)	(0.0013)	(0.0007)	(0.0012)	(0.0012)	(0.0011)	(0.0011)	(0.0005)	(0.0018)	(0.0014)	(0.0013)	(0.0012)	(0.0011)	(0.0012)
Financial development	-0.2700	-0.6226*	0.0069	0.3781	-0.3330	0.0927	-0.1519	0.4474	-0.9783	-0.5376	-1.3521**	-0.4567	-1.1561*	-0.2037
	(0.3325)	(0.3503)	(0.3601)	(0.6186)	(0.4993)	(0.5406)	(0.5532)	(0.3932)	(0.5949)	(0.6471)	(0.6372)	(0.6223)	(0.6134)	(0.6861)
Foreign aid	-0.0189***	-0.0184***	-0.0201***	-0.0231***	-0.0213***	-0.0175***	-0.0201***	-0.0179***	-0.0187***	-0.0187***	-0.0182***	-0.0205***	-0.0200***	-0.0191***
	(0.0013)	(0.0005)	(0.0023)	(0.0023)	(0.0010)	(0.0017)	(0.0021)	(0.0024)	(0.0030)	(0.0024)	(0.0013)	(0.0026)	(0.0023)	(0.0025)
Economic globalisation (EG)		0.0119***							0.0165*	0.0143**	0.0057	0.0044	0.0041*	0.0015
		(0.0024)							(0.0093)	(0.0063)	(0.0045)	(0.0041)	(0.0024)	(0.0046)
Corruption control			0.1825***						1.1106**					
			(0.0393)						(0.4210)					
Regulatory quality				0.1852***						-0.7297				
				(0.0301)						(0.4353)				
Government effectiveness					0.0624						0.2945			
					(0.0367)						(0.3534)			
Rule of law						-0.0580						-0.1090		
						(0.0391)						(0.1335)		
Political stability							0.0081						0.2711**	
							(0.0294)						(0.1293)	
Voice and accountability								0.1561***						-0.2400
								(0.0450)						(0.1859)
EG × Corruption control									0.0275***					
									(0.0086)					
EG × Regulatory quality										0.0168**				
										(0.0078)				
EG × Government effectiveness											-0.0059			
											(0.0069)			
EG × Rule of law												-0.0016		
												(0.0029)		
EG × Political stability													-0.0033	
													(0.0025)	
EG × Voice and accountability														0.0018
														(0.0045)
Constant	0.5599***	0.5234***	0.2968**	0.3005***	0.4234***	0.4762***	0.6182***	0.5421***	0.1999	0.1191	0.4559*	0.3357**	0.7857***	0.4266**
	(0.0454)	(0.1076)	(0.1171)	(0.0942)	(0.0986)	(0.0806)	(0.0843)	(0.0998)	(0.3926)	(0.3505)	(0.2639)	(0.1479)	(0.2109)	(0.1617)
Time effect	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	341	320	341	341	341	341	341	341	320	320	320	320	320	320
Countries	23	23	23	23	23	23	23	23	23	23	23	23	23	23
Instruments	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Wald Statistic	701396***	27976***	203321***	205872***	217303***	223865***	177991***	93371***	38043***	409927***	33879***	19807***	370623***	77991***
Wald P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hansen P-Value	0.641	0.718	0.634	0.635	0.654	0.622	0.602	0.611	0.690	0.642	0.689	0.670	0.653	0.641
AR(1)	0.005	0.005	0.007	0.009	0.008	0.011	0.011	0.010	0.006	0.008	0.007	0.008	0.006	0.007
AR(2)	0.412	0.432	0.465	0.481	0.506	0.436	0.484	0.454	0.459	0.474	0.481	0.457	0.497	0.475

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table SM3: GMM results for the effects of economic globalisation and governance on sustainable development, 2005– 2020 (Dependent variable: Greenhouse gas emissions)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Greenhouse gasses emission (-1)	0.2446***	0.1511***	0.2817***	0.3156***	0.2992***	0.2824***	0.2676***	0.2259***	0.0915**	0.0476	0.2370***	0.2571***	0.2305***	0.1557**
	(0.0063)	(0.0378)	(0.0238)	(0.0167)	(0.0250)	(0.0203)	(0.0291)	(0.0123)	(0.0361)	(0.0555)	(0.0410)	(0.0385)	(0.0663)	(0.0587)
Internet access	-0.0006	0.0210**	0.0043	0.0002	0.0007	0.0024	-0.0038	-0.0035	0.0224**	0.0430***	0.0129	0.0120	0.0150	0.0083*
	(0.0018)	(0.0083)	(0.0038)	(0.0029)	(0.0017)	(0.0023)	(0.0035)	(0.0035)	(0.0081)	(0.0125)	(0.0082)	(0.0077)	(0.0097)	(0.0048)
Financial development	2.1266***	3.7403***	2.4711***	1.7068*	1.6094*	1.9689**	3.2074***	2.4917***	2.5106**	-1.1861	2.3965*	2.5127	1.2369	3.8026***
	(0.2378)	(0.6373)	(0.6801)	(0.9317)	(0.7810)	(0.9164)	(1.1005)	(0.6845)	(1.0135)	(1.3306)	(1.3610)	(1.6069)	(1.8677)	(1.1980)
Foreign aid	-0.0010	-0.0186**	-0.0078	0.0151***	0.0149***	0.0005	-0.0040***	-0.0052	-0.0016	0.0132	0.0044	-0.0026	0.0157*	0.0000
	(0.0018)	(0.0081)	(0.0049)	(0.0042)	(0.0052)	(0.0023)	(0.0009)	(0.0032)	(0.0091)	(0.0132)	(0.0057)	(0.0095)	(0.0084)	(0.0054)
Economic globalisation (EG)		-0.0689***							-0.1492***	-0.0740**	-0.0512***	-0.0863***	-0.0059	-0.0397**
		(0.0135)							(0.0229)	(0.0280)	(0.0129)	(0.0208)	(0.0105)	(0.0158)
Corruption control			-0.4744***						5.1301***					
			(0.1330)						(1.4232)					
Regulatory quality				-0.2865						0.8161				
				(0.2448)						(0.8673)				
Government effectiveness					-0.1450						2.6754			
					(0.1433)						(1.7024)			
Rule of law						-0.0450						4.3883**		
						(0.1719)						(1.6249)		
Political stability							0.2733***						0.2621	
							(0.0868)						(0.9502)	
Voice and accountability								0.3772**						0.7075
								(0.1707)						(1.4091)
EG × Corruption control									-0.0914***					
									(0.0254)					
EG × Regulatory quality										-0.0384				
										(0.0245)				
EG × Government effectiveness											-0.0674*			
											(0.0388)			
EG × Rule of law												-0.1067***		
												(0.0306)		
EG × Political stability													-0.0014	
													(0.0173)	
EG × Voice and accountability														-0.0094
														(0.0223)
Constant	0.5930***	3.2189***	0.0147	0.6113**	0.6591***	0.4978*	0.2813*	0.6797***	7.7124***	4.7444***	2.5684***	4.1267***	0.4299	2.1036*
	(0.1002)	(0.5505)	(0.1285)	(0.2492)	(0.2050)	(0.2709)	(0.1474)	(0.1773)	(1.4335)	(1.2562)	(0.6650)	(1.1481)	(0.4334)	(1.0547)
Time effect	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	171	171	171	171	171	171	171	171	171	171	171	171	171	171
Countries	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Instruments	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Wald Statistic	36062***	195.7***	226.8***	834.8***	11905***	1819***	700.3***	2626***	16116***	237***	96.66***	247.9***	192.6***	745.1***
Wald P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hansen P-Value	0.419	0.347	0.650	0.640	0.619	0.642	0.598	0.752	0.341	0.663	0.602	0.646	0.681	0.679
AR(1)	0.053	0.055	0.066	0.054	0.058	0.056	0.063	0.066	0.074	0.036	0.069	0.074	0.053	0.085
AR(2)	0.100	0.108	0.112	0.196	0.103	0.199	0.107	0.117	0.149	0.175	0.121	0.130	0.100	0.145

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table SM4: GMM results for the effects of economic globalisation and governance on sustainable development, 2000 – 2015 (Dependent variable: Inclusive green growth)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Inclusive green growth (-1)	0.9935***	1.0176***	0.9535***	0.9910***	0.9507***	0.8838***	0.9643***	1.0024***	0.8946***	0.8819***	0.8900***	0.8721***	0.9470***	0.9433***
	(0.0095)	(0.0122)	(0.0191)	(0.0150)	(0.0428)	(0.0227)	(0.0213)	(0.0108)	(0.0435)	(0.0301)	(0.0752)	(0.0568)	(0.0284)	(0.0278)
Internet access	0.0010***	0.0014***	0.0025***	0.0008	0.0023***	0.0032***	0.0009	-0.0004	0.0026	0.0022*	0.0011	0.0016	0.0012	0.0008
	(0.0002)	(0.0003)	(0.0005)	(0.0007)	(0.0006)	(0.0006)	(0.0006)	(0.0005)	(0.0017)	(0.0011)	(0.0011)	(0.0012)	(0.0011)	(0.0011)
Financial development	-0.0126	-0.0914	-0.2248	-0.1468	-0.1159	0.0601	-0.0032	0.1044	-0.2181	-0.1162	0.1452	0.0887	-0.0458	0.0700
	(0.0816)	(0.0529)	(0.1482)	(0.1302)	(0.1950)	(0.1324)	(0.1039)	(0.1371)	(0.3758)	(0.1790)	(0.2307)	(0.1872)	(0.2076)	(0.2631)
Foreign aid	0.0004	0.0024	0.0033	0.0043**	0.0040*	0.0036	0.0007	0.0017	0.0071***	0.0052	0.0078	0.0042	-0.0035	-0.0023
	(0.0012)	(0.0020)	(0.0030)	(0.0019)	(0.0020)	(0.0026)	(0.0015)	(0.0014)	(0.0020)	(0.0040)	(0.0051)	(0.0028)	(0.0022)	(0.0019)
Economic globalisation (EG)		-0.0013							0.0017	0.0028*	0.0038*	0.0012	0.0006	0.0004
		(0.0011)							(0.0021)	(0.0016)	(0.0020)	(0.0021)	(0.0018)	(0.0015)
Corruption control			0.1246**						0.3698*					
			(0.0444)						(0.2089)					
Regulatory quality				0.0772*						0.4282**				
				(0.0412)						(0.1814)				
Government effectiveness					0.1031*						0.3813**			
					(0.0561)						(0.1401)			
Rule of law						0.1536***						0.4268***		
						(0.0360)						(0.1002)		
Political stability							0.0490*						0.1031**	
							(0.0248)						(0.0447)	
Voice and accountability								0.0040						0.1616*
								(0.0141)						(0.0886)
EG × Corruption control									-0.0032					
									(0.0050)					
EG × Regulatory quality										-0.0055				
										(0.0042)				
EG × Government effectiveness											-0.0062**			
											(0.0022)			
EG × Rule of law												-0.0062***		
												(0.0018)		
EG × Political stability													-0.0017	
													(0.0012)	
EG × Voice and accountability														-0.0026
														(0.0022)
Constant	0.0082	0.0640*	0.0848**	0.0495	0.0481	0.0399*	0.0337	-0.0054	0.0669	-0.0337	-0.1335	0.0339	0.0328	0.0294
	(0.0130)	(0.0311)	(0.0333)	(0.0295)	(0.0428)	(0.0222)	(0.0286)	(0.0223)	(0.1255)	(0.0749)	(0.1032)	(0.0926)	(0.0852)	(0.0899)
Time effect	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	160	160	160	160	160	160	160	160	160	160	160	160	160	160
Countries	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Instruments	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Wald Statistic	314506***	95569***	81024***	38050***	34337***	12992***	142158***	25196***	6423***	29800***	5714***	16577***	119314***	13040***
Wald P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hansen P-Value	0.652	0.498	0.613	0.698	0.633	0.620	0.620	0.644	0.663	0.586	0.683	0.753	0.673	0.647
AR(1)	0.006	0.006	0.008	0.006	0.006	0.012	0.006	0.006	0.008	0.008	0.009	0.010	0.007	0.006
AR(2)	0.615	0.651	0.556	0.462	0.656	0.694	0.698	0.632	0.501	0.266	0.667	0.628	0.694	0.672

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table SM5: GMM results for the effects of economic globalisation and governance on sustainable development, 2000 – 2015 (Dependent variable: Inclusive growth)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Inclusive growth (-1)	0.8535***	0.8171***	0.8737***	0.8874***	0.8709***	0.8707***	0.8679***	0.8598***	0.8240***	0.8316***	0.8731***	0.8761***	0.8473***	0.8755***
	(0.0068)	(0.0093)	(0.0068)	(0.0106)	(0.0089)	(0.0089)	(0.0085)	(0.0114)	(0.0134)	(0.0227)	(0.0080)	(0.0118)	(0.0094)	(0.0098)
Internet access	-0.0006	-0.0018*	-0.0003	0.0002	0.0002	0.0001	0.0007	0.0003	-0.0003	0.0001	0.0007	0.0010*	0.0001	0.0006
	(0.0008)	(0.0009)	(0.0006)	(0.0006)	(0.0004)	(0.0006)	(0.0005)	(0.0011)	(0.0008)	(0.0013)	(0.0007)	(0.0005)	(0.0007)	(0.0011)
Financial development	0.6250***	0.2017	0.6288**	0.4415*	0.2606	0.4685*	0.1184	0.4275	0.0954	-0.0296	0.1831	0.1697	0.1664	0.5319
	(0.2213)	(0.3036)	(0.2484)	(0.2187)	(0.1578)	(0.2294)	(0.1318)	(0.3268)	(0.6086)	(0.6154)	(0.2330)	(0.2275)	(0.2068)	(0.3408)
Foreign aid	-0.0120***	-0.0118***	-0.0121***	-0.0123***	-0.0105***	-0.0117***	-0.0123***	-0.0132***	-0.0094***	-0.0095***	-0.0118***	-0.0120***	-0.0117***	-0.0126***
	(0.0019)	(0.0024)	(0.0014)	(0.0020)	(0.0011)	(0.0024)	(0.0009)	(0.0025)	(0.0022)	(0.0024)	(0.0019)	(0.0017)	(0.0016)	(0.0023)
Economic globalisation (EG)		0.0104***							0.0086**	0.0098***	-0.0012	-0.0004	0.0019	-0.0035
		(0.0020)							(0.0035)	(0.0026)	(0.0019)	(0.0029)	(0.0023)	(0.0022)
Corruption control			0.0855						-0.5447					
			(0.0499)						(0.3386)					
Regulatory quality				-0.0662						-0.4680**				
				(0.0666)						(0.2196)				
Government effectiveness					0.0505*						-0.0217			
					(0.0258)						(0.1272)			
Rule of law						-0.0213						0.0726		
						(0.0291)						(0.1705)		
Political stability							0.0432***						0.2569	
							(0.0109)						(0.1557)	
Voice and accountability								-0.0757						-0.1101
								(0.0555)						(0.1758)
EG × Corruption control									0.0170**					
									(0.0070)					
EG × Regulatory quality										0.0143***				
										(0.0047)				
EG × Government effectiveness											0.0014			
											(0.0033)			
EG × Rule of law												-0.0021		
												(0.0047)		
EG × Political stability													-0.0046	
													(0.0037)	
EG × Voice and accountability														0.0016
														(0.0040)
Constant	0.7524***	0.6168***	0.5784***	0.5413***	0.7194***	0.6622***	0.7643***	0.7168***	0.6622***	0.5727**	0.7508***	0.6823***	0.8183***	0.7388***
	(0.0426)	(0.0983)	(0.0728)	(0.1092)	(0.0805)	(0.0557)	(0.0504)	(0.0588)	(0.1623)	(0.2701)	(0.0436)	(0.0955)	(0.1164)	(0.0754)
Observations	345	345	322	322	322	322	322	322	322	322	322	322	322	322
Number of id	23	23	23	23	23	23	23	23	23	23	23	23	23	23
Instruments	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Wald Statistic	629932***	43066**	454325**	825286**	492713**	426645**	448070**	303698**	473975**	72368**	791882**	75269**	177831**	247729**
Wald P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hansen P-Value	0.613	0.651	0.603	0.624	0.684	0.614	0.789	0.634	0.659	0.640	0.609	0.620	0.606	0.677
AR(1)	0.006	0.005	0.010	0.010	0.009	0.010	0.010	0.010	0.009	0.009	0.010	0.011	0.010	0.010
AR(2)	0.361	0.380	0.395	0.390	0.374	0.391	0.396	0.411	0.394	0.407	0.399	0.415	0.425	0.407

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table SM6: GMM results for the effects of economic globalisation and governance on sustainable development, 2000 – 2015 (Dependent variable: Greenhouse gas emissions)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Greenhouse gasses emission (-1)	0.3554***	0.3240***	0.4061***	0.3997***	0.4201***	0.4553***	0.3651***	0.3733***	0.2526***	0.3521***	0.2334***	0.2816***	0.2845***	0.3181***
	(0.0183)	(0.0262)	(0.0451)	(0.0360)	(0.0244)	(0.0227)	(0.0405)	(0.0184)	(0.0434)	(0.0203)	(0.0375)	(0.0497)	(0.0482)	(0.0400)
Internet access	-0.0063	0.0070	0.0018	-0.0026	-0.0004	0.0049*	0.0031	0.0028	0.0242***	0.0479***	0.0016	0.0107**	0.0109*	0.0093*
	(0.0040)	(0.0051)	(0.0037)	(0.0039)	(0.0026)	(0.0025)	(0.0054)	(0.0035)	(0.0081)	(0.0137)	(0.0047)	(0.0051)	(0.0059)	(0.0046)
Financial development	3.7048***	4.8294**	2.9918**	4.0323***	2.9175***	0.3436	0.5055	1.1996	0.5447	-5.4494	3.2707**	2.6827**	1.7277	2.1805
	(0.7686)	(1.7979)	(1.2886)	(1.1481)	(0.6846)	(1.2309)	(1.6869)	(0.9972)	(2.0484)	(3.8007)	(1.2523)	(1.2874)	(1.6731)	(1.4437)
Foreign aid	-0.0145**	-0.0326***	-0.0255***	-0.0258***	-0.0208***	-0.0183***	-0.0074	-0.0135**	-0.0170***	-0.0050	0.0050	-0.0013	-0.0069*	-0.0054
	(0.0068)	(0.0058)	(0.0038)	(0.0041)	(0.0065)	(0.0047)	(0.0052)	(0.0062)	(0.0053)	(0.0054)	(0.0052)	(0.0080)	(0.0039)	(0.0065)
Economic globalisation (EG)		-0.0489***							-0.1104***	-0.1506***	-0.0802***	-0.0855***	-0.0600***	-0.0680***
		(0.0068)							(0.0219)	(0.0212)	(0.0164)	(0.0140)	(0.0112)	(0.0111)
Corruption control			-0.5978**						3.2664**					
			(0.2551)						(1.2577)					
Regulatory quality				-0.9711***						7.3341***				
				(0.1077)						(1.9830)				
Government effectiveness					-0.3711**						5.4521***			
					(0.1490)						(1.2835)			
Rule of law						-0.2673***						3.8891***		
						(0.0595)						(0.6298)		
Political stability							0.2951**						2.1875***	
							(0.1203)						(0.3483)	
Voice and accountability								0.4303***						2.5841***
								(0.1286)						(0.4894)
EG × Corruption control									-0.0368					
									(0.0240)					
EG × Regulatory quality										-0.1478***				
										(0.0489)				
EG × Government effectiveness											-0.1243***			
											(0.0284)			
EG × Rule of law												-0.0858***		
												(0.0214)		
EG × Political stability													-0.0436***	
													(0.0135)	
EG × Voice and accountability														-0.0474***
														(0.0123)
Constant	0.1629	2.0179***	-0.1096	-0.3727**	0.0142	0.3415**	0.7089***	0.7215***	6.2141***	8.3935***	4.0997***	4.1948***	3.1520***	3.5374***
	(0.1319)	(0.2069)	(0.1937)	(0.1651)	(0.1123)	(0.1558)	(0.2186)	(0.2034)	(1.3079)	(1.2473)	(0.8159)	(0.7025)	(0.5100)	(0.5009)
Observations	259	259	237	237	237	237	237	237	237	237	237	237	237	237
Countries	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Instruments	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Wald Statistic	1277***	378.7***	310.7***	597.4***	3310***	16199***	1064***	787.3***	793.6***	4815***	215.2***	493.4***	615.4***	665.9***
Wald P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hansen P-Value	0.737	0.598	0.643	0.667	0.695	0.605	0.617	0.611	0.647	0.517	0.653	0.614	0.637	0.678
AR(1)	0.057	0.066	0.067	0.070	0.063	0.059	0.063	0.065	0.069	0.078	0.081	0.079	0.080	0.081
AR(2)	0.101	0.123	0.113	0.123	0.106	0.103	0.111	0.112	0.133	0.135	0.145	0.131	0.137	0.138

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1