



The Ecological Burdens of Globalisation and Their Effects on the Quality of Life in African Economies

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Abstract: A globalisation-induced environmental consequence can either improve or degenerate the quality of life (QoL), depending on its interference in the balance between the demand and supply of ecological resources and food security. Hence, this study examined the ecological burdens of globalisation on the QoL for 38 African countries between 1990 and 2020. Empirical inferences for the study were robustly deduced through advanced estimation methodologies. They include Driscoll-Kraay (D-K), augmented mean group (AMG), and the panel dynamic ordinary least squares (PDOLS) techniques. The study further applied the method of moments quantile regression (MMQREG) approach, since the economic progressions in each selected African country are heterogeneous despite their classification as developing nations. Notable findings from these methodologies revealed that the ecological demand burden of globalisation is diminishing the QoL.

In contrast, liberalisation's supply and food security effects are enhancing QoL. Specifically, the MMQREG procedure revealed that the adverse acceleration in the demand side of the consequence grows larger in magnitude when compared to the positive effects in the supply and food security sides as the quantile advances. The implication is that depending on the level of QoL, the ecological burden of liberalisation tends to worsen through the overexploitation and retardation of the regenerative process of natural resources, and the exacerbation of food insecurity in African countries. The study proposed applicable policy measures.

Keywords: Ecological demand; Ecological supply; Food security; Liberalisation; Life expectancy; Developing economies.

JEL Classification: D6, I31, N57.

1. Introduction

Over time, scholars have expressed diverse views about the term Quality of Life (QoL) to include happiness, well-being, a good life, and a fulfilled or valued life (McCrea et

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al., 2006; Aladejare et al., 2022). Also, the multifaceted feature of QoL has prompted researchers in related studies. The most outstanding of these measures remains the extensive use of life expectancy at birth. Its application is borne from the fact that economies with advanced living conditions potentially end up having their populace exhibiting elongated lifespans (Aladejare et al., 2022). Nevertheless, irrespective of the prevailing cultural divergences between and within nations, each country's constituted authority's central functions are wholly embedded in enhancing the QoL for its citizens. A renege on this fundamental goal often births and elevates social strife and criminality; hence, globalisation is much preached as an essential vehicle for attaining a rapid and better QoL.

Similar to the concept of QoL in the extant literature, globalisation has undergone various connotations. However, common ground about globalisation is its representation of a process in which business decisions, production processes, and markets steadily show more “external” and fewer “internal” features. Globalisation indicates a wide range of fundamental structural reforms (e.g., the public-private interface, business organisation, and varied consumption patterns). The significance of globalization in development outcomes has been dominant in some recent literature (Asongu and Minkoua, 2018; Asongu and Odhiambo, 2020; Aladejare, 2023a). One debate often allured for developing countries to liberalise their economies is that globalisation accelerates risk-sharing and adequate resource distribution, ultimately resulting in the joint prosperity of developed and developing nations (Asongu and Odhiambo, 2020). However, a liberalisation process that is not carefully guided may lack an inclusive human face, which may instead enhance or degrade the QoL for a nation (Aladejare, 2023b).

Consequently, many developing economies, especially those in Africa, are still struggling to reap the dividends triggered by openness to trade and investment as their developed counterparts. This failure suggests that the success of market openness in providing economic prosperity, and by extension improved QoL in advanced economies, has not been replicated in developing countries. This is because, in the course of globalisation, developed economies are increasingly shifting environmental burdens, particularly in the form of ecological rucksacks of exported technologies and imported raw materials to developing countries. Contemporaneously, the advanced countries diminish the pressure on their national environment by extracting fewer material resources. Also, globalisation has seen products whose production demands intensive pressure on the environment, through industrial emissions into water sources and the atmosphere, heavy metal emissions, etc., continuously grow in developing

economies. In addition, the greater coverage of raw material needs from foreign resources constitutes less of advanced countries' domestic consumption than their production of exportable goods. Accordingly, developed nations have, and continue to own substantial shares in developing countries' import demands and resource export.

By accelerating the level of economic activities in developing economies, their trade and investment liberalisation drive may exert further ecological pressures and worsen the QoL. For instance, most developing countries, such as those in Africa, are characterised by weakly enforced environmental policies; hence, further economic pressures could exacerbate poor ecological quality. The effect of such globalisation-induced environmental atrophy on life expectancy, a standard indicator of the QoL, emerges in diverse forms, including increased communicable and incommunicable diseases, inadequate social and economic amenities, and widespread poverty and inequality (Asongu and Odhiambo, 2019; Aladejare, 2023c). In contrast, when trade and investment liberalisation exist with strong regulatory frameworks to guard the environment, their beneficial effect can be enormous on the QoL. Not only will efficient ecological policies defend against adverse economic impact, but they may also further enhance the positive utilisation and management of environmental wealth, and promote wider adoption of ecologically-friendly technologies in developing countries that can advance their life expectancy (Aladejare and Musa, 2024a).

Hence, this study's objective was to assess the ecological loads of globalisation on the QoL in African countries for 38 African economies by applying a dataset between 1990 and 2020. Precisely, prevailing studies have concerned themselves more with the globalisation-environmental, ecological sustainability-life expectancy, and globalisation-life expectancy nexuses. Furthermore, extant literature evaluated the impact of globalisation through the KOF globalisation index from economic, social, and political viewpoints. While economic globalisation involves variables denoting flows of capital and services, goods, and market exchanges, political globalisation consists of variables indicating the spreading of public policies, and variables that capture the understanding of information, ideas, and people for social globalisation. Also, some studies stated globalisation using later broader KOF globalisation indexes, namely *de jure* and *de facto*. Despite these indices maintaining the three earlier disaggregated measures, globalisation *de jure* succinctly represents variables for the policies that permit the flows and activities, and globalisation *de facto* is for the actual flows and activities.

Overall, this study adds to the literature by bridging a gap in determining the environmental load of globalisation on the QoL by analysing from three ecological

perspectives: the demand, supply, and food security effects. These dimensions, when aggregated robustly, measure environmental sustainability or quality. Therefore, examining the ecological impact of globalisation on the QoL using globalisation dimensions is susceptible to producing biased outcomes that are less suitable for efficient QoL policy formulation. Instead, an evaluation of globalisation from ecological perspectives on the QoL is more useful for policymakers, providing them with an in-depth understanding of the most efficient and specific policy to adopt for a sustainable globalisation-enhanced QoL.

To the best of our knowledge, empirical research that examined the ecological burdens of globalisation from the three environmental perspectives (demand, supply, and food security) and their effects on the QoL is conspicuously scarce. Consequently, this present research bridges this literature lacuna, particularly for developing countries, by concentrating on African economies for two explicit reasons. First, among developing nations, African countries are reckoned to have the poorest QoL, mirrored by low life expectancy (Aladejare et al., 2022; Aladejare and Osagu, 2023; Shang et al., 2024). For instance, Sub-Saharan Africa (SSA) alone accounted for 58% of all under-five mortality rates (UN IGME, 2024; Shang et al., 2024), and the highest maternal mortality rate (1 in 41) in the world (WHO, UNICEF, World Bank, 2023).

Second, the continent had previously been thought to be an insignificant contributor to, and exempted from, the ills of global warming. However, recent events of rising temperatures, severe flooding and drought, famine, heatwaves, etc., indicate otherwise. Africa's emission growth rate has climbed beyond regions such as East and Central Europe (Fotio et al., 2022). Accordingly, the tendency that Africa's GHG emissions could substantially outrun other areas in no distant time due to the pervasive patronage of dirty energy across the continent is high (UN, 2021; Aladejare and Yakubu, 2024). Simultaneously, the continent is witnessing the rapid growth of the industrialisation drive, boosted by economic liberalisation policies (Aladejare and Nyiputen, 2023). When the effects of these factors are aggregated, they exacerbate the menace to food and water supply, socioeconomic development, and human health and safety; hence, weakening the QoL in Africa (WMO, 2020; Aladejare and Osagu, 2023; Aladejare and Musa, 2024b).

Empirical inferences for the study were robustly deduced through advanced estimation methodologies. They include second-generation panel unit root and cointegration tests, Driscoll-Kraay (D-K), augmented mean group (AMG) and the panel dynamic ordinary least squares (PDOLS) techniques. The study further applied the method of moments quantile regression (MMQREG) approach, since the

economic progression in each selected African country is heterogeneous despite their classification as developing nations. The MMQREG technique aligned well with the research because it integrates the distributional heterogeneity of the subject matter by incorporating fixed effects (FE). Therefore, MMQREG allows different individual relationships between the regressand and regressor series using unique conditional quantile distributions, a characteristic element often absent in traditional mean regressions (Aladejare and Bobbo, 2024; Aladejare, 2025). Empirical deductions from these techniques demonstrated that the ecological demand burden is diminishing the QoL. In contrast, the supply and food security effects of globalisation are QoL-enhancing. Notably, the MMQREG procedure revealed that the adverse acceleration in the demand side of the consequence grows larger in magnitude when compared to the positive effects in the supply and food security sides as the quantile advances.

The paper structure shows that Section 2 contains the reviewed literature, Section 3 contains the study's data and methodology, Section 4 contains the findings and discussion, and Section 5 contains the concluding remarks.

2. Literature Review

2.1. Theoretical Review

Similar to the theoretical proposition by Asongu and Odhiambo (2020), this study's premise is built on two main grounds. First, there is the neoliberal and hegemonic theoretical association between globalisation and the QoL. The neoliberal perspective sees globalisation as an unavoidable force of "creative destruction" in its approach to dictating world trade, technological creativity, investment beyond national boundaries and efficiency in production cycles (Asongu and Odhiambo, 2020). Globalisation provides an avenue for individuals with declining wages to upgrade their skill-set, and hence, increase their wages by constantly providing better alternative jobs and creating fresh employment opportunities in an economy. Nevertheless, the economy will only benefit from globalisation if it responds rapidly to the changes in the supply and demand for labour. With this reasoning, it is not out of place to assert that the globalisation drives in developing countries have been channelled to fast-track their industrialisation process and promote better QoL.

In contrast, the hegemonic perspective of globalisation has a gloomy impression of the phenomenon on the QoL. Globalisation is perceived as a means of enriching wealthy or advanced nations at the expense of poor developing economies. According to Tsai (2006), globalisation represents a "market ethos" with a hidden motive that

disregards the interests of citizens. This view holds that the dividends of globalisation are skewed to benefit the wealthy echelons of society, which only constitute a diminutive fraction of the whole population. Furthermore, the hegemonic school is compatible with the significant documented evidence on the adverse effects of globalisation on socioeconomic development and ecological sustainability (Brand and Wissen, 2013).

The second ground of this research's premise aligns with the theoretical proposition of Asongu and Odhiambo (2019). This ground holds the view that environmental degeneration is associated with the QoL from at least three primary fronts: income, education, and longevity. First, with regard to the levels of income, ecological atrophy can severely inhibit workers' potential in a household to search for jobs and their effective and efficient output when they find one (Zivin and Neidell, 2012). Second, on the aspect of education, it is logical to consider that environmental degradation can substantially determine parents'/guardians' decision to send their children/wards to school (Currie et al., 2009), particularly in the absence of, or inadequate transport facilities due to ecological atrophy and health issues arising from such degradation. To buttress further, Clark et al. (2015) noted that severe atmospheric pollution has the potential to hamper effective studying at home and school. The third front (longevity) follows from the preceding two narratives that environmental degradation naturally affects healthy living and the population's life expectancy (Aladejare, 2023c). These understandings are extensively consistent with discourses on the relationships between globalisation, the human condition and sustainable development.

Both aforesaid theoretical grounds provide a valid link between globalisation, environmental degradation, and the QoL. While the neoliberal front accepts globalisation as necessary for rapid industrialisation and development of economies, the hegemonic scepticism, particularly on the QoL, seems to be overwhelmingly suppressed in developing countries. Intuitively, the second theoretical strand connects to the first when the globalisation process in developing economies is not critically tailored towards an inclusive human development path. Consequently, instead of globalisation enriching, it will diminish the QoL for a nation.

2.2. Empirical Literature

2.2.1 The globalisation-ecological burden nexus: The study by Awan et al. (2020) applied the Hausman fixed effect (FE) and feasible generalised least squares (FGLS) approaches and submitted that globalisation significantly and adversely impacts environmental sustainability in MENA countries. Yameogo et al. (2021) adopted the generalised method of moments (GMM) technique and concluded that economic globalisation

adversely impacts ecological quality in Sub-Saharan African (SSA) economies. Likewise, Majeed et al. (2021) employed the cross-sectional autoregressive distributed lag (CS-ARDL) approach and submitted that economic globalisation reduces pollution levels in Gulf Cooperation Council (GCC) countries. Tahir et al. (2021) adopted the fully modified ordinary least squares (FMOLS), dynamic OLS (DOLS), and pool mean group (PMG) techniques and confirmed the significant reducing effect of globalisation on ecological atrophy for South Asian economies. Likewise, Leal and Marques (2021) used the ARDL and Driscoll-Kraay (D-K) and inferred that economic globalisation de facto worsens environmental degradation for 23 African countries. Also, Ali et al. (2022) applied FMOLS and DOLS techniques and submitted that globalisation exacerbates CO₂ emissions in South Asian developing nations. Farooq et al. (2022) demonstrated with the OLS method that globalisation decelerates the adverse effect of ecological degeneration in 180 economies. However, Jahanger et al. (2022) used the quantile ARDL (QARDL) method to derive the conclusion that globalisation aided CO₂ emissions in Mexico.

Furthermore, Rehman et al. (2023) showed by applying the CS-ARDL that while trade and economic globalisation directly impact ecological deterioration, financial globalisation exerts a less substantial effect. Adebayo et al. (2023) used the common correlated effects mean group (CCEMG) and CS-ARDL models to deduce the positive impact of trade globalisation on environmental sustainability in BRICS countries. With the aid of advanced econometrics estimation procedures, Cetin et al. (2023) demonstrated that globalisation reduces ecological sustainability in 14 emerging countries. Conversely, Aladejare and Nyiputen (2023) used multiple second-generation estimation approaches to conclude that globalisation has an adverse effect on environmental sustainability in African economies. Keho (2023) employed the ARDL methodology and confirmed the worsening impact of the three dimensions of globalisation (economic, political, and social) on the ecological footprint of Côte d'Ivoire. Similarly, Alam et al. (2023) used advanced structural-break estimation techniques and revealed the exacerbating effect of globalisation on environmental degradation in India. Likewise, by using the Granger causality approach, Karimli et al. (2024) showed that globalisation Granger-caused environmental atrophy in European economies. Tran et al. (2024) used the ARDL and nonlinear ARDL (NARDL) methodologies and concluded that globalisation accelerates Indonesia's ecological footprint. In contrast, Wang et al. (2024) relied on the method of moments quantile regression (MMQR). The study demonstrated that globalisation exerts a reducing effect on the environment within the low to medium quantile for the top ten emitting nations globally.

2.2.2. The globalisation-QoL relationship: Maku et al. (2018) employed the FGLS estimation approach and revealed that economies with greater intensity of globalisation exhibit accelerated human welfare compared to nations with weak globalisation indicators. Similarly, Shahbaz et al. (2019) employed a multivariate Granger causality procedure to deduce the positive effect of globalisation on life expectancy in 16 SSA countries. Akter et al. (2020) used panel quantile procedures and found that globalisation promotes life expectancy in South Asian nations. The study by Peterson (2021) showed that globalization can positively and negatively impact health at all levels of interaction. Specifically, Leal and Marques (2021) demonstrated with the ARDL and D-K models that economic globalisation directly affects life expectancy for 23 African countries. Guzel et al. (2021) expressed that with the application of continuous-updated fully modified (CUP-FM) and bias-adjusted ordinary least squares (BA-OLS) techniques, globalisation and its political, social, and economic subcomponents enhanced life expectancy in 16 low-income economies.

In a related study, Noumba et al. (2022) revealed, with the aid of a two-step GMM estimator, that globalisation enhances human well-being in 49 African nations. Rahman and Alam (2022) engaged the use of ARDL, FMOLS, Dickey-Fuller generalised least squares (DF-GLS), and the pairwise Granger causality methods. Empirically, the study showed that globalization enhanced life expectancy in Australia. Similarly, Baidoo et al. (2023) showed that economic globalisation improves welfare in 44 African nations. Likewise, Osinubi et al. (2023) applied a panel-spatial correlation consistent augmented with the least squares dummy variables (PSCC-LSDV) technique. The study found an enhancing effect of globalisation on life expectancy in 39 African economies. Also, using the CCEMG estimator, Ahmad et al. (2023) demonstrated that economic globalisation positively affects human well-being in 20 emerging countries. Conversely, Omosuyi (2023) applied the DOLS, FMOLS, and canonical cointegration regression (CCR) methods and derived the conclusion that globalisation and its political, social, and economic subcomponents have had an adverse effect on life expectancy in Nigeria.

2.2.3 The ecological burden-QoL association: Paramita et al. (2020) adopted a structural equation model (SEM) and found that there is a positive correlation between life expectancy and environmental conditions. Similarly, Chen et al. (2021) used a multiple regression model and concluded that ecological factors affect developed and developing economies differently. Conversely, Fatima et al. (2021) showed with the aid of FMOLS that environmental factors deteriorate life expectancy for 25 Asian economies. Likewise, Aladejare et al. (2022) applied the FMOLS technique and concluded that overexploitation of ecological resources deteriorates QoL in 13 West

African nations. Rahman et al. (2022) used panel corrected standard errors (PCSE) and FGLS approaches. The study found that environmental degradation threatens life expectancy in the 31 most emitting economies. Similarly, Azam et al (2023) used the ARDL methodology to demonstrate that increases in CO₂ emissions shorten life expectancy in Pakistan. Iqbal et al. (2023) emphasised that life expectancy in Asian countries is at risk due to the rising ecological footprint. Likewise, Segbefia et al. (2023) applied the CS-ARDL approach and deduced that CO₂ emissions negatively impacted life expectancy in NAFTA countries. Ebhota et al. (2023) employed the D-K estimation and confirmed the detrimental effect of air pollution on life expectancy for MINT countries.

Conversely, Somoye et al. (2023) used the linear and nonlinear ARDL methods and concluded that fossil fuel consumption enhances life expectancy in Nigeria. Warsame (2023) applied the Kernel regularised least squares (KRLS) procedure and deduced that ecological pollution has an insignificant effect on life expectancy in Somalia. Azam and Adeleye (2024) used the GMM, bootstrap OLS (BOLS), and instrumental variable (IV) techniques and revealed that solid and liquid fuel emissions impact life expectancy differently in Asian and Pacific regions. Uddin (2024) used the CS-ARDL, FMOLS, and DOLS methods and demonstrated that CO₂ emissions and ecological footprint depreciated life expectancy for some selected Asian nations. Also, Saimamatov et al. (2024) employed FMOLS, DOLS, and D-K techniques and arrived at the conclusion that CO₂ emissions adversely impact life expectancy within the Aral Sea basin. Similarly, Mimi et al. (2024) used the PCSE regression and submitted that CO₂ emissions decreased life expectancy in high-income economies. Likewise, Chen and Li (2024) demonstrated with the aid of a computable general equilibrium (CGE) model that CO₂ emissions depreciate life expectancy in China. In contrast, Aziz et al. (2024) applied the Markov chain Monte Carlo algorithm and inferred that ecological footprint insignificantly impacts life expectancy in Saudi Arabia.

2.2.4. Literature Gap: The empirical literature above shows that extant studies have established divergent relationships between ecological sustainability, globalisation, and the QoL in different countries. Notably, the reviewed studies evaluated the impact of globalisation through the KOF globalisation index from economic, social, and political perspectives. Also, while some studies indicated globalisation using later broader KOF globalisation indexes, namely de jure and de facto, others adopted the aggregated KOF globalisation index.

Generally, this research contributes to the literature by bridging a gap in the evaluation of the ecological burdens of globalisation on the QoL by analysing this

impact from three environmental dimensions, including the effects of demand, supply, and food security. These perspectives, when aggregated robustly, account for ecological sustainability. Hence, assessing the environmental impact of globalisation on the QoL, using the lens of globalisation dimensions, is susceptible to yielding biased inferences that are less suitable for an efficient QoL policy formulation. Instead, examining the ecological demand, supply and food security effects of globalisation on the QoL can equip policymakers with a deeper grasp of the subject matter and aid the adoption of the most specific policy target for a sustainable globalisation-enhanced QoL.

3. Data and Methodology

3.1. Data

This study employed a dataset between 1990 and 2020 for 38 African economies. Represented in Table 10 (Appendix 1) are the selected African economies chosen based on data availability and completeness. In this research, QoL is defined by life expectancy at birth. Its adoption is guided by the intuition that life expectancy is traditionally occasioned by human economic, social, and political interactions or activities that can either diminish or boost longevity. Three environmental perspectives (demand, supply, and food security) were considered for the ecological burdens of globalisation. Globalisation can either positively or adversely interfere with the unit of different natural areas, such as forest products, cropland, grazing and built-up lands, carbon space, and fishing grounds, required for the prosperity of an economy.

Ecological demand denotes human pressures exerted on the elements of nature, including air, water, and soil (Aladejare, 2020). It is the pace at which humans utilise natural resources for growth and development purposes. To capture this demand-side viewpoint and its interaction with globalisation, the ecological footprint deflated by globalisation was used. This approach indicates the influence of globalisation on ecological demand behaviour. Similarly, the environmental supply-side burden is measured by deflating the biocapacity by globalisation. Biocapacity is the quantity of Earth's wealth available for human consumption. It is the ability of nature to regenerate and replenish itself from human pressures (Aladejare, 2025). Food security completes the indicators for the ecological burden of globalisation. Its indicator in this study is the food production index deflated by globalization. Although the concept of food security encompasses food availability, stability, accessibility, and utilisation, food production, measured by availability, is a core component in decreasing food insecurity (Montolalu et al., 2022; Shang et al., 2024); hence, the use of the food production index in this study.

Nevertheless, the interaction between the demand and supply of nature's resources is crucial for economic growth, and food security is paramount for labour productivity and well-being. Food security is the crux of poverty and hunger in any economy. Consequently, the three perspectives become interrelated in the pursuit of environmental sustainability.

Human capital development is adopted as an interacting variable, and the human capital index represents it. Its adoption is based on the intuition that the nature of human capital development strategies and opportunities prevailing in a country can either enhance or deter the QoL. The study variables, indicators, measurements, sources, and symbols are represented in Table 1.

Table 1: Variable description

<i>Variable</i>	<i>Indicator</i>	<i>Measurement</i>	<i>Source</i>	<i>Symbol</i>
Quality of life	Life expectancy at birth	Total human years	WDI (2023)	<i>lxp</i>
Ecological burden of globalisation	Demand-side burden of globalisation	Ecological footprint per capita as a share of the KOF globalisation index	GFN (2023) and Gygli et al. (2019)	<i>efp</i>
	Supply-side burden of globalisation	Biocapacity per capita as a share of the KOF globalisation index	GFN (2023) and Gygli et al. (2019)	<i>bcg</i>
	Food security	Food production index as a share of the KOF globalisation index	WDI (2023) and Gygli et al. (2019)	<i>fpg</i>
Human capital development	Human capital index	Years of schooling and returns to education	Feenstra et al. (2015)	<i>hc</i>

Source: Author's compilation.

3.2. Methods

Specifically, the response of QoL to the ecological burden of globalisation is expressed as:

$$lxp_{it} = \alpha_0 + \alpha_1 efp_{it} + \alpha_2 bcg_{it} + \alpha_3 fpg_{it} + \alpha_4 hc_{it} + \mu_{it} \quad (1)$$

The variables have been designated as defined in Table 1. Nonetheless, prior to model estimation, preparatory testing was undertaken to protect against misleading findings. Thus, the analytical process for the analysis followed this order:

3.2.1. Cross-sectional dependency (CSD) test

While first-generation economic methodologies could yield biased outcomes by overlooking the CSD effect, second-generation procedures are better suited after affirming CSD in the model (Pesaran, 2015). Therefore, four CSD computations were made as follows:

The Lagrange multiplier (LM) CSD test equation proposed by Breusch and Pagan (1980) is as follows:

$$LM_{BP} = \sum_{i=1}^{N-1} \sum_{j=i+1}^N T_{ij} \hat{\rho}_{ij}^2 \rightarrow x^2 \frac{N(N-1)}{2} \quad (2)$$

where $\hat{\rho}_{ij}^2$ accounts for the pairwise cross-sectional correlation between residuals. Asymptotic N distribution, and T_{ij} are denoted by x^2 and tends to infinity for every cross-sectional observation. However, Pesaran (2004) advanced the scaled LM CSD test for large panels.

$$LM_{Ps} = \sqrt{\frac{1}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^N (T_{ij} \hat{\rho}_{ij}^2 - 1) \rightarrow N(0, 1) \quad (3)$$

Nevertheless, the disadvantage of size changes is typical with the scaled LM CSD test when T is small and large N , which encouraged Pesaran (2004) to launch a CSD test incorporating T and N , tending to infinity.

$$CSD_{\rho} = \sqrt{\left(\frac{2}{N(N-1)}\right)} \sum_{i=1}^{N-1} \sum_{j=i+1}^N T_{ij} \hat{\rho}_{ij} \rightarrow N(0, 1) \quad (4)$$

Furthermore, Baltagi et al. (2012) proposed a biased-scaled LM CSD test on the premise that N and $T \rightarrow$ infinity. The test is demonstrated in Equation 5 as a fixed-effect homogenous panel data model.

$$CSD_B = \sqrt{\frac{2T}{N(N-1)}} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^N \hat{\rho}_{ij} \right) \frac{(T-k) \hat{\rho}_{ij}^2 - (T-k) \hat{\rho}_{ij}^2}{\text{var}(T-k) \hat{\rho}_{ij}^2} \quad (5)$$

3.2.2. Slope heterogeneity test

In a panel data investigation, this test is essential since presuming slope homogeneity can skew the conclusions of the regression. The Pesaran and Yamagata (2008) adjusted version and the Swamy (1970) homogeneity criterion have been utilised in the present investigation. The specifications for the slope homogeneity test can be found between Equations 6 and 8.

$$E = \sum_{i=1}^N (\varphi_i - \varphi_{FEW})' \frac{W_i' H_t W_i}{\sigma_i^2} (\varphi_i - \varphi_{FEW}) \quad (6)$$

$$\tilde{\Delta} = \sqrt{N} \left(\frac{\frac{1}{N} E - k}{\sqrt{2k}} \right) \quad (7)$$

$$\tilde{\Delta}_{Adjusted\ version} = \sqrt{N} \left(\frac{\frac{1}{N} E - k}{\sqrt{\frac{2k(T-k-1)}{T+1}}} \right) \quad (8)$$

Given that E and Δ indicate test statistics. Pooled ordinary least squares (POLS) and fixed effect (FE) weighted pooled estimates are represented by φ_i and φ_{FEW} respectively. H_t and W_i are identity matrix and matrix regressors, respectively, tending away from the mean. Also, k signifies the number of independent variables, and σ_i is the estimator for σ_i^2 . To be more precise, Equations 7 and 8 comprise the Pesaran and Yamagata (2008) test and its modified version, whereas Equation 6 provides the Swamy (1970) test.

3.2.3. Test for stationarity

Second-generation unit root tests with CSD and heterogeneity factors were implemented in panel data analysis. Specifically, the cross-sectional augmented Dickey-Fuller (CADF) from Pesaran (2003) as well as the cross-sectional Im Pesaran and Shin (CIPS) from Pesaran (2007) were utilised for unit root testing. The subsequent is the CADF test statistic:

$$\Delta R_{it} = \xi_{it} + \tau_i R_{i,t-1} + \delta_i \bar{R}_{t-1} + \varphi_i \Delta \bar{R}_t + \mu_{it} \quad (9)$$

given that ξ_{it} , R_{it} , and μ_{it} indicates the intercept, study series, and error term, respectively, and integrating the first lag expression gives:

$$\Delta G_{it} = \xi_{it} + \tau_i R_{i,t-1} + \delta_i \bar{R}_{t-1} + \sum_{j=0}^p \varphi_{ij} \Delta \bar{R}_{t-j} + \sum_{j=1}^p \tau_{ij} \Delta R_{i,t-j} + \mu_{it} \quad (10)$$

where \bar{R}_{t-j} and $\Delta R_{i,t-j}$ represents the mean of lagged and first difference operators for the study cross-sections. Accordingly, the CIPS test statistic follows:

$$CIPS = \frac{1}{N} \sum_{i=1}^n \tau_i(N, T) \quad (11)$$

where the coefficient $\tau_i(N, T)$ expresses CADF test statistics stated as follows:

$$CIPS = \frac{1}{N} \sum_{i=1}^n CADF_i \quad (12)$$

3.2.4. Cointegration test

A cointegration test, notably the Westerlund (2007) error correction model (ECM)-based cointegration process, was implemented to account for CSD and heterogeneity shortcomings in panel assessment. The Westerlund cointegration test works well for long-run modelling with variables of varying orders of stationary behaviour and integrates CSD and heterogeneity effects (Aladejare and Musa, 2024a). The subsequent four statistics derived from the Westerlund cointegration test are displayed:

$$G_{\tau} = \frac{1}{N} \sum_{i=1}^n \frac{\widehat{\nabla}_i}{SE(\widehat{\nabla}_i)} \quad (13)$$

$$G_{\alpha} = \frac{1}{N} \sum_{i=1}^n \frac{T \widehat{\nabla}_i}{\widehat{\nabla}_i(1)} \quad (14)$$

$$P_{\tau} = \frac{\widehat{\nabla}_i}{SE(\widehat{\nabla}_i)} \quad (15)$$

$$P_{\alpha} = (\widehat{\nabla}_i)T \quad (16)$$

where G_t and G_a are group tests, and P_t and P_a are panel statistics, $\widehat{\mathbf{V}}_i$ represents the OLS estimator, $SE(\widehat{\mathbf{V}}_i)$ and $\widehat{\mathbf{V}}_i(1)$ signifies the standard error and semi-parametric kernel estimator of $\widehat{\mathbf{V}}_i$, respectively.

3.2.5. Panel long-run estimations

Driscoll and Kraay (D-K) Approach: The D-K approach established by Driscoll and Kraay (1998) has been demonstrated to produce stable results in panel datasets regardless of serial and spatial dependence, heteroscedasticity, and CSD. It is able to manage small and large panels, as well as balanced and unbalanced ones (Aladejare and Bobbo, 2024). Aside from being non-parametric, D-K calculates the product means of the regressor variables and residuals. Given CSD's validity, both are subsequently combined in a weighted heteroscedasticity-and-autocorrelation-consistent (HAC) estimator, resulting in robust standard errors (Aladejare and Musa, 2024a). Equation 17 illustrated the D-K technique.

$$y_{i,t} = X'_{i,t}\beta + \varepsilon_{i,t}, \quad i = 1, \dots, N, t = 1, \dots, T \quad (17)$$

Augmented mean group (AMG) method

In a similar vein, the AMG that was subsequently presented by Eberhardt and Teal (2010) corrects for heterogeneity and CSD in panel data estimation. Equations 18 and 19 illustrate how the model employs a typical dynamic process with two interdependent phases in its regression technique.

AMG: Step 1

$$\Delta y_{it} = \alpha_i + b_i \Delta x_{it} + \aleph_i \gamma_t + \sum_{w=2}^W \Gamma_i \Delta Z_t + \mu_{it} \quad (18)$$

AMG: Step 2

$$\widehat{b}_{AMG} = N^{-1} \sum_{i=1}^N \widehat{b}_i \quad (19)$$

Where Γ_i is the parameter of the time dummies, b_i is the country-specific estimate of coefficients, and γ_t is the unobserved common element. Δy_{it} and Δx_{it} represent the observed common factors, and \widehat{b}_{AMG} the AMG estimator.

Panel dynamic OLS (PDOLS) procedure

The PDOLS strategy established by Phillips and Moon (1999) and Kao and Chiang (1999) was utilised to enhance the research's long-run investigation. PDOLS predictions prove more robust than standard panel OLS estimates, given that the latter are more susceptible to second-order asymptotic bias and serial correlation difficulties, something the DOLS addresses. Additionally, the flexibility of PDOLS allows the framework to embrace series that have differing integration orders, contrasted to the Pedroni (2000) fully modified OLS (FMOLS) estimator, which mandates all variables to be integrated at first difference. The PDOLS equation is put down as follows:

$$y_{it} = \alpha_i + \alpha_t + \beta_i h_{it} + \sum_{j=-p}^p d_{ij} \Delta h_{i,t+j} + \mu_{it} \quad 20$$

where α_i and α_t are constants representing individual fixed effects and time effects, respectively. h_{it} denotes a vector of regressors, β_i is the estimated long-term impact, and d_{ij} is the parameter of a lead or lag of the first differenced regressors.

DOLS is a parametric procedure for addressing endogeneity and serial correlation estimation barriers. It capitalises on the lag and leads of differenced regressor variables. It is also productive for mitigating distortions in small samples.

Moments quantile regression approach (MMQREG) method

In 2019, Machado and Silva offered the MMQREG with FE, which effectively treats outliers in panel cross-sectional units and unobserved heterogeneity and CSD. Instead of merely modifying averages, this estimation methodology enables the individual impacts to determine the entire distribution, which allows the detection of the conditional heterogeneous covariance effects of the independent variables on QoL. Additionally, when endogenous independent series and individual effects underlie the panel data framework, the MMQREG process can be implemented. Thus, the MMQREG conditional quantiles model developed for this study is defined as:

$$Q_Y(\sigma|X_{it}) = (\alpha_i + \pi_i p(\sigma)) + X'_{it}\beta + G'_{it}\mathbf{N}p(\sigma) \quad 21$$

where X_{it} signifies a vector of explanatory variables, $Q_Y(\sigma|X_{it})$ is the quantile distribution of the dependent series Y_{it} which is a function of the location of regressors X_{it} . $\alpha_i(\sigma) \equiv \alpha_i + \pi_i p(\sigma)$ demonstrates the scalar parameter associated with the quantile $-\sigma$ FE for each cross-section. Also, $p(\sigma)$ expresses the σ -th sample quantile derived by handling the given optimisation challenge. Unlike the fundamental principle of least-squares

FE, the MMQREG distinct effect does not take into consideration constant change; rather, it expresses time-invariant coefficients whose independent effects can fluctuate through the quantiles of the regressors' conditional distribution of the regressand.

4. Estimated Results and Discussions

4.1. Descriptive statistic test outcome

The research's descriptive data are displayed in Table 2. The data in the table demonstrates that the average life expectancy of the countries under study is roughly 57.66 years. According to this data, the average lifetime for these African economies is notably lower than the average for developing nations in Asia (74 years) and Latin America and the Caribbean (75.1 years) (WDI, 2023). Additionally, the food production index, biocapacity, and mean ecological footprint for each globalisation are roughly 3.13, 6.32, and 177.35, respectively. These numbers are comparatively modest since many African economies are gradually liberalising. Furthermore, the average human capital index is roughly 1.76 points, suggesting that most African countries have underdeveloped human capital (measured by years of education and returns to school).

Table 2: Aggregate descriptive statistics

<i>Variable</i>		<i>Mean</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>	<i>Observations</i>
<i>lxp</i>	Overall	57.657	8.097	14.098	76.474	N = 1254
	Between		6.463	49.243	74.068	n = 38
	Within		4.987	17.016	69.692	T = 33
<i>efg</i>	Overall	3.125	1.457	0.021	8.929	N = 1254
	Between		1.322	0.050	6.504	n = 38
	Within		0.648	0.748	6.154	T = 33
<i>bcg</i>	Overall	6.317	11.495	0.462	94.350	N = 1254
	Between		10.814	0.565	57.009	n = 38
	Within		4.263	-17.402	43.658	T = 33
<i>fpg</i>	Overall	177.346	56.858	49.286	356.611	N = 1254
	Between		39.316	127.649	297.107	n = 38
	Within		41.551	73.913	359.865	T = 33
<i>hc</i>	Overall	1.759	0.438	1.030	2.929	N = 1254
	Between		0.395	1.142	2.577	n = 38
	Within		0.198	1.175	2.333	T = 33

Source: Author's Estimated Output.

4.2. Correlation matrix and cross-sectional dependency (CSD) results

Table 3 comprises two affiliated tests: the correlation (upper layer) and the variance inflation factor (VIF) (bottom layer) tests. Both findings have been applied to demonstrate the degree of collinearity between the independent variables investigated in the study. Empirically, the findings point to a low level of multicollinearity between the predictor variables. Furthermore, when the calculated VIF is between 1 and 5, the predictor variables show a moderate correlation (Ebi and Aladejare, 2022). As a result, the VIF mean (1.07) for the study's variables that predicted the outcome indicates the presence of a moderate association.

Table 3: Correlation and multicollinearity table

	<i>lxp</i>	<i>efg</i>	<i>bcg</i>	<i>fpg</i>	<i>hc</i>
<i>lxp</i>	1				
<i>efg</i>	-0.009	1			
<i>bcg</i>	-0.058	0.308	1		
<i>fpg</i>	-0.008	-0.053	0.003	1	
<i>hc</i>	0.481	0.183	0.082	-0.022	1
	VIF	1/VIF			
<i>efg</i>	1.14	0.877			
<i>lcp</i>	1.11	0.904			
<i>hc</i>	1.04	0.964			
<i>fpg</i>	1.00	0.996			
Mean VIF: 1.07					

Source: Author's Estimated Output.

Also, represented in Table 4 are the five CSD tests employed in the study. There is significant validation to reject the null hypothesis of cross-sectional independence. Hence, the alternative hypothesis aligning with the presence of CSD across the cross-sections is upheld.

Table 4: CSD test output

Test	Statistic	d.f	P-value
Breusch-Pagan LM	10053.96	703	0.000 ^c
Pesaran scaled LM	248.368		0.000 ^c
Pesaran CSD	22.023		0.000 ^c
Friedman Chi-square	361.413	32	0.000 ^c
Frees Normal	16.123		0.000 ^c

Note: c indicates statistical significance at 1%. H₀: Cross-sectional independence

Source: Author's Estimated Output

4.3. Slope heterogeneity and unit root outcomes

Provided in Table 5 is the slope heterogeneity test result. The output significantly validates slope heterogeneity in the study's model. Consequently, the null hypothesis of homogeneous slope coefficients was invalidated.

Table 5: Slope heterogeneity test

<i>Statistic</i>	<i>Coefficient</i>	<i>Prob.</i>
$\bar{\Delta}$	50.541 ^c	0.000 ^c
$\bar{\Delta}_{adjusted}$	55.694 ^c	0.000 ^c
H_0	Slope coefficients are homogeneous.	

Note: c indicates statistical significance at 1%; H_0 : Homogeneous slope parameters.

Source: Author's Estimated Output.

Furthermore, Table 6 presents the implementation of robust first- and second-generation unit root tests that are equipped to deal with cross-sectional and heterogeneity issues. The result shows that while liberalisation's demand and supply-side environmental burden are level stationary, life expectancy (proxy for QoL) and human capital development are first difference stationary variables.

Table 6: Unit root test output

<i>Variable</i>	<i>Second-generation unit root</i>				
	<i>Pesaran's CADF (2003)</i>		<i>Pesaran's CIPS (2007)</i>		<i>Decision</i>
	<i>Without trend</i>	<i>With trend</i>	<i>Without trend</i>	<i>With trend</i>	
<i>lcp</i>	-2.346 ^{c1}	-3.370 ^{c1}	-0.488	-1.202	I(1)
<i>efg</i>	-2.069 ^{b0}	-3.677 ^{c1}	-1.964 ^b	0.308 ^a	I(0)
<i>bcg</i>	-2.781 ^{c0}	-3.139 ^{c0}	-4.676 ^c	-5.598 ^c	I(0)
<i>fpg</i>	-3.535 ^{c1}	-3.681 ^{c1}	0.331	1.112	I(1)
<i>hc</i>	-2.304 ^{c1}	-2.653 ^{b1}	-3.503 ^c	0.491	I(1)
H_0	The series is nonstationary.		Series is I(1)		

Note: 0 and 1 represent stationarity at the level and first difference, respectively, while a, b and c indicate statistical significance at 10%, 5%, and 1%, respectively.

Source: Author's Computation.

4.4. Westerlund panel cointegration outcome

Captured in Table 7 is the cointegration test outcome for the study's model. The result aligns with the invalidation of the null hypothesis, stating the absence of a long-run

association between the covariates. Instead, the test demonstrates the validity of the alternative hypothesis that the study's independent variables co-move in the long term.

Table 7: Westerlund panel CSD cointegration Test

Statistic	Value	Statistic	Value
G_t	-1.917***	P_t	-7.994***
G_n	-5.117	P_n	-4.238***
H_0	No cointegration		

Note: *** indicates statistical significance at 1%, respectively.

Source: Author's computation.

4.5. Panel estimated outputs

Evidence in Table 8 demonstrates that the demand side of the ecological burden of globalisation has a significant adverse effect on the QoL in the D-K, AMG, and PDOLS estimates. Conversely, the supply perspective of the environmental consequence of liberalisation is significantly and positively related to the QoL in the D-K and PDOLS outputs, but substantially inverse in the AMG estimate. Also, the food security aspect of the ecological burden of globalisation is significantly beneficial for the QoL only in the D-K and PDOLS estimates. Similarly, human capital development is revealed to be significantly and positively linked with the QoL only in the D-K and PDOLS estimates. Generally, while the demand side burden of globalisation is negatively related, the supply and food security viewpoints and human capital development are substantially beneficial to the QoL.

Table 8: Estimated outputs

Variable	D-K	AMG	PDOLS	Decision
<i>efg</i>	-2.087 ^c	-0.521 ^b	-0.026 ^b	Reducing-effect
<i>bcg</i>	0.054 ^a	-1.165 ^c	0.002 ^b	Enhancing-effect
<i>fpg</i>	0.043 ^c	0.005	0.010 ^c	Enhancing-effect
<i>hc</i>	9.098 ^c	0.981	4.417 ^a	Enhancing-effect
<i>cons</i>	40.279 ^c	54.688 ^c		

Note: a, b, and c indicate statistical significance at 10%, 5%, and 1%, respectively.

Source: Author's Estimated Outputs.

Furthermore, presented in Table 9 are the MMQREG results expressing the response of the QoL to the ecological burdens of globalisation. Notably, the QoL's reaction to the three perspectives generally reflects the decisions in Table 8. Nevertheless,

the supremacy of the MMQREG model is embedded in its ability to demonstrate the quantile response of the QoL to each ecological burden indicator. Hence, the magnitude of the effects of the environmental consequences of liberalisation indicators is evident at various probable levels of the QoL. Specifically, the adverse impact of the demand-side environmental result of globalisation is significant and steadily climbs from the lower to the upper quantiles. Contrastingly similar, the positive effects of the supply perspective of the ecological burden of liberalisation is substantially enhancing and accelerating steadily, but only from the 30th to 90th quantile. Nevertheless, the pace of the negative acceleration on the demand side of the burden is faster than the positive climb on the supply side. However, the substantial advancing effect of the food security burden of globalisation on the QoL steadily and marginally declines from the lower to the upper quantiles. Also, the impact of human capital development is significant and accelerates steadily from the lower to the upper quantiles.

Table 9: MMQREG with FE output

Dependent variable: <i>lsp</i>											
Variable	Location	Scale	Lower quantile			Middle quantile			Upper quantile		
			10 th	20 th	30 th	40 th	50 th	60 th	70 th	80 th	90 th
<i>efg</i>	-2.087 ^c	0.671 ^c	-3.115 ^c	-2.839 ^c	-2.601 ^c	-2.343 ^c	-2.073 ^c	-1.814 ^c	-1.556 ^c	-1.370 ^c	-1.082 ^c
<i>beg</i>	0.054 ^b	0.015	0.031	0.037	0.043 ^a	0.048 ^b	0.055 ^b	0.060 ^b	0.066 ^b	0.070 ^b	0.077 ^b
<i>fpg</i>	0.043 ^c	-0.003 ^a	0.047 ^c	0.046 ^c	0.045 ^c	0.044 ^c	0.043 ^c	0.041 ^c	0.040 ^c	0.039 ^c	0.038 ^c
<i>hc</i>	9.098 ^c	0.336	8.584 ^c	8.722 ^c	8.841 ^c	8.969 ^c	9.105 ^c	9.234 ^c	9.363 ^c	9.455 ^c	9.600 ^c
<i>cons</i>	40.279 ^c	0.225	39.935 ^c	40.028 ^c	40.107 ^c	40.193 ^c	40.284 ^c	40.370 ^c	40.457 ^c	40.519 ^c	40.615 ^c

Note: a, b and c indicate statistical significance at 10%, 5%, and 1%, respectively.

Source: Author's Estimated Output.

Also, expressed in Figure 1 is the graphic picture depicting the behaviour of the regressor coefficients at unique quantile points. The result mirrored the behaviour in the estimated MMQREG in Table 9 for all quantiles. Particularly, the adverse rise in the demand side is steeper than the positive acceleration in the supply side of the ecological burden of liberalisation.

4.6. Discussion of Findings

The adverse ecological demand side-effect of globalisation on QoL is a plausible phenomenon. In every country, the rate of environmental demand can substantially determine the economy's domestic and foreign investment opportunities, and thus, affect the level of income and employment. African economies are amply endowed

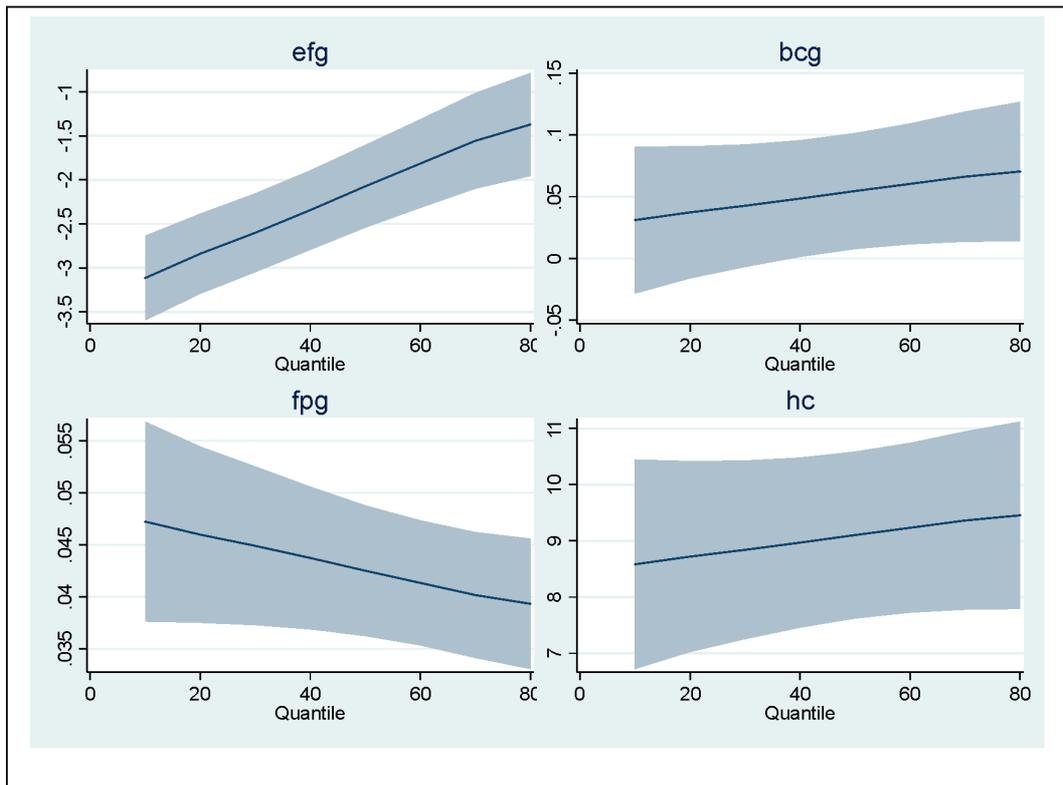


Fig. 1: Graphical representation of regressor variables' coefficients across quantiles for the study's model

Source: Author's computation.

with farmlands, forests, minerals, natural gas, oil, and coal resources, and their income significantly accounts for the funding of their national budget. Nevertheless, when these resources are overexploited in the process of industrialisation (a product of globalisation), they tend to jeopardise environmental quality.

For instance, liberalisation has been touted to expand the QoL in African economies through rapid industrialisation. Consequently, the magnitude of destructive extractive endeavours on natural wealth through land erosion, air pollution, and pollution of surface and groundwater can be exacerbated. Also, the growing demand for energy resources worldwide is exploiting weak environmental regulations in energy-rich countries like Nigeria, where gas flaring and numerous oil spillages have been an almost daily occurrence for more than 50 years. Specifically, there are over 31 million people residing at the epicentre (Niger Delta) and are daily being exposed directly and indirectly to pollution pathways (Obida et al., 2021). Likewise, an annual 780,000

premature deaths are traceable to air pollution in Africa. This high mortality rate is linked to the expansion of the oil and gas sector in South Africa and Nigeria, and fire emissions in West and Central Africa (Bauer et al., 2019); between 1990 and 2017, air pollution deaths rose by 60% across the continent (UNICEF, 2019). Hence, the implications of the degenerating ecological conditions due to excessive demand for natural wealth are dangerous for QoL improvement, particularly in African countries with relatively moderate to high QoL.

In contrast, the supply side has an enhancing effect, but only significant in countries with relatively moderate to high QoL. This result implies that ecological wealth in African countries has a significant positive transformative impact, but only in economies with relatively moderate and high QoL. Examples of countries in these categories include Mauritius, Gabon, Botswana, Ghana, Zimbabwe, South Africa, Egypt, Algeria, Morocco, etc. These economies have been leveraging globalisation to expand the supply of ecological resources for their QoL enhancement. For instance, a rich stretch of coral reef systems from Egypt to South Africa supplies coastal protection and food for millions of Africans. Also, the continent's natural forest is responsible for supplying 21% of rural household income and wild-harvested foods in 11 African countries (IPCC, 2022). This contribution aids the well-being of millions of Africans. Likewise, the two marine ecosystems in the continent's west coast and eastern parts of the Pacific Ocean have contributed immensely to the well-being of coastal African nations through the supply of nutrient-rich deep water resources.

Similarly, the third perspective—food security— is revealed to enhance the QoL in the studied countries. This result implies that globalisation has been facilitating the transportation of goods and services across borders, thus providing more choices to consumers. Also, globalisation is eliminating barriers to innovations, goods, and services, thereby leading to increased food availability, better price stability and enhanced health, promoting the QoL. In addition, industrial-scale investment in food production is gradually growing on the continent. Consequently, food production is undergoing, although slow, a revolutionary process with access to modern farming techniques, equipment, seedling research and development in African countries. These efforts are an offshoot of globalisation in ensuring food security, which is critical for accelerating the QoL on the continent.

Furthermore, many African economies have made substantial strides in improving the QoL through human capital development. It is believed that better education is a means for reducing the high level of poverty, inequality, and diseases on the continent. Also, it is essential for household income growth and enhanced human dignity. Thus,

the level of liberalisation can interact with human capital development's accelerating effect on the QoL, through the sharing of economic, social, and political ideologies between countries in and outside the continent. This interaction increases in magnitude depending on the level of QoL prevalent in African nations.

Nevertheless, as evident from the lower to upper quantiles, the rise in the magnitude of the adverse effect on the demand side exceeds the pace of the positive climb in the supply angle and positive deceleration in the food security side. These features might portend issues with the growth of globalisation in the continent. As African countries liberalise their economies, their foreign trade and investment flows are less QoL-enhancing, particularly in economies with a relatively higher QoL than those with medium and low levels on the continent. That is, the larger the QoL in a country, the more the ecological ills of globalisation become pronounced through much faster degrading environmental implications. Much knowledge and technology transferred from the developed nations to the African economies are less efficient and obsolete; consequently, they hardly promote sustainability in the extraction and use of natural resources. Hence, globalisation is making African countries a pollution haven for advanced economies. These industrialised countries capitalise on weak environmental regulations in Africa to dump their environmentally degrading technologies that are deleterious to health on the continent. Furthermore, many companies from the industrialised nations set up plants and production firms in Africa to cut production costs as they are seldom charged any significant ecological tax, thereby freely degrading the environment and worsening the QoL (Aladejare and Nyiputen, 2023).

Furthermore, deforestation is growing in the continent due to the indiscriminate felling of trees for commercial and domestic uses without replacement in most cases. For instance, shifting cultivation, which entails clearing forests to provide food for the growing population, is a critical cause of deforestation in the continent (Cerutti et al., 2023). Africa has the highest fertility rate globally (4.1 births per woman), and the challenge of feeding the rapidly growing population is encouraging the application of land for subsistence farming. This small-scale farming is a primary contributor to deforestation in these nations. For example, in Liberia, about 12% of forest cover was lost between 1990 and 2010; while since 2010, the Democratic Republic of Congo has lost at least 500,000ha of forest annually, and experienced a loss of 1.3 million ha of forest in 2013 alone (Cerutti et al., 2023). Traditional forests are felled and burned, with the land being used for farming until soil depletion takes place and cultivation is no longer feasible.

Furthermore, in their quest for foreign investment, many African economies are in the habit of leasing forest concessions and engaging in contract agreements with

private companies. For years, these agreements have continued replacing natural forests for cash crops, including coffee, rubber, cocoa, palm oil, and tea. Specifically, Côte d'Ivoire lost about 80% of its forests between 1900 and 2021 in trying to become the largest cocoa producer in the world; Ghana also followed this path (Cerutti et al., 2023). Likewise, Kenya has lost a significant amount of its sawmills to deforestation.

5. Conclusions and Recommendations

A globalisation-induced environmental consequence can either improve or degenerate the QoL, depending on its interference in the balance between the demand and supply of ecological resources and food security. Hence, this study examined the environmental consequences of globalisation on the QoL for 38 African countries between 1990 and 2020. Empirical inferences for the study were robustly deduced through advanced estimation methodologies. They include second-generation panel unit root and cointegration tests, D-K, AMG and the PDOLS techniques. The study further applied the MMQREG approach, since the economic progression in each selected African country is heterogeneous despite their classification as developing nations.

Notable findings from these methodologies revealed that globalisation's ecological demand and supply burdens are diminishing QoL. In contrast, the food security effect of globalisation is QoL-enhancing. Likewise, human capital development, which served as an interacting variable, was beneficial for the QoL. Notably, the MMQREG method demonstrated that the pace of the negative climb on the demand side of the burden is higher than on the supply side. Nevertheless, evidence from the lower to upper quantiles demonstrates that the pace of adverse impact from the ecological demand side exceeds the size of the benefits in the supply and food security angles of the consequences of globalisation in African economies. The implication is that the ecological burden of liberalisation is more advanced in countries with higher levels of QoL, through the overexploitation and retardation of the regenerative process of natural resources, and exacerbation of food insecurity in African countries.

Hence, the study recommends that drastic steps need to be taken to curtail the environmental burden of liberalisation on the QoL. First, since globalisation provides developing economies the leverage for industrial growth and poverty and inequality reduction, strategies to mitigate the demand-side ecological ills of globalisation are required. Consequently, African nations must adopt and insist on environmentally sound modus operandi for manufacturing industries to facilitate practical and significant enhancement of the QoL through less ecological degradation. African industries' continued expansion and evolution must be guided by policy measures that

insist on adopting novel technological measures for ecologically beneficial production that will aid sustainable QoL. When the production processes and business methods are revolutionised to reflect the significant adoption of modern and efficient technologies, current and composite environmental challenges of globalisation on the QoL can be diminished in these developing economies.

Also, to mitigate the supply-side environmental burden of globalisation on the QoL, governments in these developing countries should be consistently deliberate in implementing initiatives, including conservation and restoration of forests, vegetation, and biodiversity. Agencies (where not available) must be established and well-funded to control existing classified forests, reserves and national parks. They must be made to succeed within a legislatively strengthened forest governance model. Thus, there is a need to upscale human resources substantially and provide means for intervention for these entities. Since these measures will demand enormous budgets amid the weak financial capacity of these economies, alternative funding should be explored. A national environmental fund can be created to collect environmental taxes and fines on forest products and adaptable land use. This purse should be applied to financing and aiding the ecological regenerative process and other government environmental-related projects. Also, the option of public-private partnerships (PPP) for funding can be explored when executing these programs.

Globalisation can further accelerate food security and improve the QoL when farmers in African countries leverage the same modern knowledge and technology as their counterparts in the developed world. Hence, there is a need for African governments to encourage the flow of knowledge sharing by specifically targeting investments that can upgrade the agricultural sector to the same level as in the developed world. These investments can encompass the production and supply of advanced seedlings, farming tools and machinery, advanced waste management techniques, product storage, etc. Also, since the continent has the fastest population growth rate in the world, and the challenge of food security is becoming imminent for an enhanced QoL, there is a need to increase funding for human capital development consistently. This measure will ensure better farm management procedures and agricultural research and development improvements. Furthermore, bottlenecks that inhibit an efficient supply chain of agricultural produce within and between countries should be eliminated in all sectors to promote the QoL on the continent.

However, further studies can adopt a better proxy for food security that can robustly capture its four components: availability, stability, utilisation, and accessibility. The non-availability of such an indicator is a constraint in this study. Also, Most African

economies lack available and complete data on the human development index (HDI) for the studied period. Access to comprehensive HDI data for African countries could serve as a robust alternative measure of the QoL. Hence, future studies can enrich the analyses of the ecological load of globalisation by exploring this option.

Statements and Declarations

Author's contributions: The corresponding author conceived the idea, wrote the introduction, collected and analysed the data, interpreted the results, reviewed the required literature, edited the manuscript, wrote the methodology section, provided the relevant policy directions, and read and approved the final manuscript.

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Appendix 1

Table 10: 38 study countries

<i>Algeria</i>	<i>Côte d'Ivoire</i>	<i>Mali</i>	<i>Sierra Leone</i>
Angola	Egypt	Mauritania	South Africa
Benin	Eswatini	Mauritius	Tanzania
Botswana	Gabon	Morocco	Togo
Burkina Faso	Gambia, The	Mozambique	Tunisia
Burundi	Ghana	Namibia	Uganda
Cameroon	Kenya	Niger	Zambia
Central African Republic	Lesotho	Nigeria	Zimbabwe
Congo, Democratic Republic	Madagascar	Rwanda	
Congo Republic	Malawi	Senegal	

Source: Author's compilation.