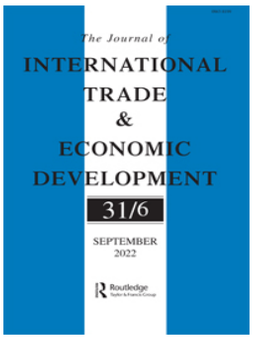

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The dynamic relationship between economic globalisation, institutional quality, and ecological footprint: Evidence from Ghana

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ABSTRACT

Research on the relationship between globalisation and the environment tends to focus on the direct effect of globalisation, rarely considering the role of institutions. This paper introduces insights from political economy, which suggests that environmental sustainability models would be greatly improved if institutions are considered. We test this hypothesis by estimating the relationship between economic globalisation, bureaucratic quality, and ecological footprint in Ghana for the period 1984–2016. The long-run analysis is based on the autoregressive distributive lag (ARDL) bound testing approach to cointegration. The result supports the hypothesis that expansion in economic globalisation has a reducing effect on environmental quality. Bureaucratic quality appears to exert a significant positive effect on ecological footprint. Furthermore, the estimation shows that the quality of institutions is critical for environmental quality. Based on the results the paper presents some policy recommendations.

KEYWORDS Economic globalisation; institutional quality; environmental degradation; ecological footprint; Ghana

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1. Introduction

Environmental degradation has evolved into one of the greatest challenges facing the world. Human demands for water, infrastructure, energy, food among others, trigger ecological pressure which encourages emissions, resource depletion, and ecological distortion (Al-Mulali et al. 2015; Jorgenson 2003). The resulting ecological impacts include, but are not limited to land degradation, pollution, loss of biodiversity, and climate change. This has been amplified by the growth in globalisation and the subsequent adoption of the 2030 Agenda for Sustainable Development. Globalisation facilitates economic

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growth and development and contributes to poverty reduction but also heightens the demand for natural resources. This creates a trade-off dilemma between environmental sustainability and economic development. The quality of institutions is fundamental to the environmental sustainability agenda, hence the globalisation-environmental degradation nexus. Institutions provide the structures for economic transactions and ensure the regulation of economic and social engagements in a form that constraints or provides incentives for organisational actions (Rothstein and Teorell 2008; North 1990). It is, therefore, crucial to investigate the effect of economic globalisation and institutional quality on ecological footprint if environmental degradation is to be reduced.

The last few decades have witnessed substantial integration of economies due to globalisation into the global market. Globalisation is hereby defined as the proliferation of cross-border engagements that facilitate the establishment of transnational structures and international integration of economic, political, social, and ecological processes on global, supra-national, national, regional, and local levels (Rennen and Martens 2003). The integration of economies and their impact on the environment is currently an unresolved issue in the environmental economics literature. Opponents of globalisation argue that heterogeneity of ecological characteristics between countries implies that environmental destruction could increase locally as a result of trade liberalisation. That is, since contextual environmental factors vary spatially if the production of goods and services relocate geographically then the impact on environmental quality will be subject partly to the relative strength of the systems and structures to protect the environment of the new location (Damania, Fredriksson, and List 2003; Antweiler, Copeland, and Taylor 2001). Implicit in this argument is the view that the dynamics and complexities in local trade laws and regulations signify that it is by no means certain that curbing market disparities will necessarily cause production patterns that are environmentally friendly in locations currently undergoing rapid environmental destruction (Assa 2018; Saunders and Cagatay 2004; Abler and Shortle 1992). Thus, globalisation facilitates economic growth, but it has also expedited natural resource depletion in many developing countries (Cole 2006; Tisdell 2001).

In contrast, advocates of globalisation contend that it facilitates economic growth and development, and hence welfare gains. Given that much environmental degradation may be attributed to economic activities emanating from globalisation, the higher levels of economic growth will eventually lead to environmental improvement known as the Environmental Kuznets Curve (EKC) (Stern 2004; Grossman and Krueger 1991). That is, through economic growth, an economy can adopt environmentally benign production technologies, which can mitigate environmental degradation. These contending views pose a crucial policy dilemma for developing countries, whether urgent policies are required now to control environmental destruction, or that should be a secondary goal, while policy priority should primarily continue to focus on trade liberation and economic growth and address environmental degradation issues later (Barbier 1997). Besides the theoretical ambiguity, the empirical evidence on the impact of globalisation on the environment presents conflicting outcomes- from negative impact (eg. Shahbaz et al. 2019; Cole 2006), to positive impact (Koengkan, Fuinhas, and Santiago 2020; Antweiler, Copeland, and Taylor 2001; Bommer and Schulze 1999), and no impact (Akadiri, Alola, and Akadiri 2019; Ahmed et al. 2019; Saunders and Cagatay 2004).

Furthermore, there has been much debate in scholarly and policy circles about the role of institutional quality in ensuring that globalisation does not compromise environmental quality. According to North (1990) institutions are the laws, rules, and

regulations that govern the actions of individuals, and organisations and form social interactions. Institutions determine the degree of trade into a country, which in turn can expedite economic growth (Antweiler, Copeland, and Taylor 2001; Tisdell 2001) and the dynamics of environmental degradation. Besides enhancing economic growth, institutions may also facilitate environmental degradation in countries where institutions suffer from a range of issues including rent-seeking, bribery, and clientelism (Rothstein and Teorell 2008; Damania, Fredriksson, and List 2003). Therefore, countries with strong institutions and those with weak institutions are likely to assume different environmental outcomes from globalisation (Copeland 2005; Bhattarai and Hammig 2004). Therefore, institutions are significant in the environmental sustainability agenda.

While a significant number of studies that employed CO_2 emissions in the environmental literature exist (see. Balsalobre-Lorente et al. 2020; Shahbaz et al. 2019; Akadiri, Alola, and Akadiri 2019; Dogan and Turkekul 2016; Kohler 2013; Antweiler, Copeland, and Taylor 2001), studies that employ ecological footprint (EF) as a measure of environmental degradation are limited but emerging (Gokmenoglu, Taspinar, and Rahman 2021; Langnel and Amegavi 2020; Dogan, Taspinar, and Gokmenoglu 2019; Ahmed et al. 2019; Al-Mulali et al. 2015). Even though CO_2 emissions measure environmental degradation, it only measures a small proportion of the destruction to the environment. In this context, the ecological footprint which is a more comprehensive measure of environmental sustainability captures the direct and indirect impact of anthropogenic activities on regenerative biological capacity (Gokemenogluet al. 2021; Dogan, Taspinar, and Gokmenoglu 2019). It is arguably the only metric that compares the resource demand of government, business, and individuals against what the earth can renew. The ecological footprint measures human demands on the environment regarding its biocapacity components which include built-up land, grazing land, fishing grounds, cropland, and forest land (Jorgenson 2003; Wackernagel and Rees 1998). Human consumption has exceeded the production capacity of natural resources, causing a significant threat to the environment. This demand-supply deficit is depleting the earth's resource production capacity, consequently destroying the ecosystem.

Ghana is a developing country in Africa, characterised by environmental and socio-economic challenges. The cost of environmental degradation in Ghana is estimated at US$6.3 billion which is equivalent to 10.7 percent of Ghana's 2017 gross domestic product. The last few years have witnessed substantial growthin carbon emissions, emissions have doubled from 0.26 in 1990–0.59 metric tons per capita in 2016 (World Bank 2020). Furthermore, the drive to expedite economic growth and development in Ghana has necessitated the government of Ghana over the years to introduce several policies. Ghana introduced a liberal development policy in the 1990s and opened its economy to the world. This has led to the implementation of different trade reforms in the last two decades. Notable examples include the establishment of the Ghana Investment Promotion Centre (GIPC) in 1994, implementation of the common external customs tariffs to harmonise custom tariffs with the Economic Community of West African States (ECOWAS), and the ratification of the Economic Partnership Agreement with Europe to promote trade between Ghana and Europe in 2016. These trade reforms have resulted in a significant increase in international trade volume with foreign direct investment increasing from 0.25% of GDP in 1990–6.34% of GDP in 2016. (World Bank 2020). Ghana has been characterised by plummeting levels of institutional quality due to growth in corruption (Amegavi 2021; Transparency International 2018). Corruption erodes the capacity of institutions to effectively enforce trade and environmental regulations.

According to the United Nations (2017), the growing corruption that has engulfed regulatory and governance structures is affecting Ghana's capacity to achieve the Sustainable Development Goals (SDGs). These issues make Ghana an interesting case study for investigating the impacts of globalisation and institutional quality on the environment.

The paper makes three contributions to the literature. First, investigating the relationship between globalisation, institutional quality, and environmental degradation by adopting ecological footprint as an indicator of environmental degradation to the best of our knowledge is new. Thus, employing multidimensional metrics of human demands offers the opportunity to capture this complex relationship without risking the problem of omitted variable bias usually observed in empirical studies (Langnel and Amegavi 2020). Second, accounting for the dynamics of institutional quality is a moderate novelty that has witnessed limited empirical attention in the globalisation-environment literature. Last, the paper illuminates the specific policy domains through which appropriate policies can be formulated to address the issues emanating from the globalisation-environment relationship. The rest of the paper is organised as follows. Section 2 presents the related literature and section 3 describes the methodology. The results and discussions are presented in section 4 and section 5 presents the conclusion and policy implications.

2. Theoretical and empirical review

2.1. Globalisation and environmental degradation

The literature identifies three channels through which the effects of globalisation on the environment can be explained: the scale, composition, and technical effects (Antweiler, Copeland, and Taylor 2001; Panayotou 2000). The scale effect is the degree to which globalisation influences trade and economic activities in a country. Through the scale effect, increased globalisation stimulates economic activities causing an increase in production and environmental degradation due to growth in natural resource use (Tisdell 2001; Cole 2006). The negative scale effects of globalisation are more pronounced in countries characterised by weak institutions (Copeland 2013; Panayotou 2000). Second, the composition effect is the impact of globalisation on the production output of countries. Compositional change implies a transitional change from resource extraction and processing to a manufacturing and service-oriented economy. That is, long-term growth in globalisation generally causes economies to transform from agricultural to industrial economies and later to service economies, which facilitate an inverse U-shaped relationship between globalisation and environmental degradation (Tisdell 2001; Antweiler, Copeland, and Taylor 2001). Third, the technology effect refers to the degree to which globalisation facilitates the transfer of modern technologies across regions which potentially leads to a decline in environmental pollution (Cole 2006; Panayotou 2000). Hence, globalisation facilitates the transfer of eco-friendly production processes and technologies across countries. Altogether, Antweiler, Copeland, and Taylor (2001) note that the environmental quality effect of countries has not just been influenced by environmental policies but has also been influenced largely by globalisation.

Despite the effects of globalisation on environmental outcomes, Shahbaz et al. (2019) note that relatively few studies have used panel data and time series techniques to examine the globalisation-environment relationship. That said, recent papers (eg. Balsalobre-Lorente et al. 2020;Akadiri, Alola, and Akadiri 2019; Ahmed et al. 2015)

have reported mixed outcomes. Bommer and Schulze (1999) demonstrate that trade liberalisation and environmental degradation reduction are mutually compatible. The view is that trade liberalisation agreements generate opportunities for governments to use domestic policies as trade barrier substitutes. As a result, trade liberalisation agreements incite endogenous policy reactions from governments that dampen the effects of trade liberalisation on environmental pollution (Copeland 2005). Consequently, McCarney and Adamowicz contend that reducing environmental degradation through trade openness is only possible if environmental policies are effectively implemented. Panayotou (2000) describes this as the regulatory effect.

Empirically, the studies that have investigated the relationship between globalisation and the environment have provided conflicting empirical findings. Ahmed et al. (2019) found that globalisation has no effect on ecological footprint but significantly increases the ecological carbon footprint in Malaysia. Balsalobre-Lorente et al. (2020) investigated the impact of globalisation in OECD countries. They demonstrated that through the technological effect, globalisation has a positive impact on environmental quality in OECD countries. Akadiri, Alola, and Akadiri (2019) revealed that globalisation has no significant impact on CO_2 emissions in Turkey. Shahbaz et al. (2015) also examine the effect of globalisation on environmental quality in India. The study reveals that globalisation increases CO_2 emissions in India. A similar result was reported by Rana and Sharma (2019) who report that international trade increases CO_2 emissions in India. Lv and Xu (2019) find that trade openness intensifies CO_2 emissions in middle-income countries hence, promoting environmental pollution. Furthermore, Koengkan, Fuinhas, and Santiago (2020) examine the asymmetric relationship between globalisation and CO_2 emissions by using panel ARDL in 18 Latin American countries. Their results indicate that globalisation improves environmental quality by lowering CO_2 emissions. Shahbaz et al. (2019) investigated the globalisation-environment relationship in 87 countries and reported conflicting outcomes. They reported that globalisation improves environmental quality in sixteen high, and middle-income countries, but increases environmental degradation in another seven high, middle, and low-income countries, and has no effect on the environment in sixty-seven other countries. The study by Yao et al. (2019) corroborates the evidence by Shahbaz et al. (2019) and reveals that trade liberalisation promotes environmental degradation in low-income countries but promotes environmental quality in high-income countries. Kohler (2013) examines the effects of trade liberalisation on CO_2 emissions in South Africa, their results reveal that trade liberalisation is good for the environment. The elasticity shows that trade openness exerts a negative impact on CO_2 emissions. Similarly, Dogan and Turkekul (2016) also report that trade openness improves environmental quality by reducing CO_2 emissions in the United States for the period 1960–2010 using the cointegration method.

2.2. Institutional quality and the environment

The channels through which institutional quality impacts the environment can be both direct and indirect. Directly, weak institutions can promote environmental degradation through the ineffective enforcement of environmental laws and regulations and indirectly through bureaucratic bottlenecks and high transactional costs (Rothstein and Teorell 2008; Damania, Fredriksson, and List 2003). This suggests that the relationship between globalisation and the environment is not independent of institutions. Quality institutions directly ensure that production and business activities as

a result of globalisation are conducted in accordance with environmental laws and regulations to promote environmental quality. Hence, trade liberalisation policies implemented in countries with effective and well-functioning institutions can mitigate the negative effects of globalisation on the environment. This generally suggests that the avenues by which institutional quality affects the environment can be both direct and indirect.

Within this framework, Claessens and Feijen (2007) showed that improvement in institutions and governance structures can reduce environmental degradation. Dasgupta, Laplante, and Mamingi (2001) revealed that the publication of environmental performance of firms by environmental institutions in developing countries has incited firms to improve their environmental performance. Similarly, Bhattarai and Hammig (2004) demonstrated that improved bureaucratic quality facilitates better management of the environment. Adams and Klobodu (2017) discovered that improvement in bureaucratic quality has a negative effect on carbon dioxide emissions in Africa. Assa (2018) investigated forest resource degradation in sub-Saharan Africa. The results showed that deforestation is higher in countries with a weak rule of law. A similar outcome was reported by Castiglione, Infante, and Smirnova (2015) who found that rule of law lowers carbon dioxide emissions in high-income countries. Thus, countries that can establish rules and impartially enforce them can reduce the negative impact of globalisation on the environment (Bhattarai and Hammig 2004). This suggests that the quality of institutions is a significant requirement for monitoring economic activities as a result of globalisation and enforce environmental regulations and policies (Amegavi and Mensah 2020; Knack and Keefer 1995). Related studies by Cole, Elliott, and Fredriksson (2006) examined the foregoing analysis by exploring the effect of institutional quality on trade and environmental regulation. The study was predicated on the corruptibility of local government institutions. The scholars found that high levels of corruption lead to weak enforcement of environmental regulations, and thus contribute to environmental degradation. Damania, Fredriksson, and List (2003) found empirical and theoretical evidence to conclude that the relationship between environmental quality and trade liberalisation is contingent on institutional quality. That is, the higher the level of institutional quality, the greater the negative effect of trade liberalisation on environmental degradation. They also discovered that irrespective of the level of trade liberalisation, poor institutions are associated with weak enforcement of environmental policies and regulations. Given the existing literature, we hypothesise that institutional developments could influence the impact of globalisation on the environment. Considering the evidence, countries with quality institutions appear more likely to mitigate the negative impact of globalisation on the environment.

3. Data, model, and econometric methods

3.1. Data and model specification

The literature review demonstrates the theoretical relationship between the environment, globalisation, and institutional quality. Globalisation promotes and expedites economic activities through industrialisation which consequently leads to economic growth. The growth in the economy leads to more economic activities causing more extraction of natural resources which leads to environmental degradation. The growth in production activities also leads to an increase in energy demand which causes more

pollution. Strong institutions through the effective enforcement of environmental policies and regulations can mitigate the negative effect of the impact of globalisation on the environment. Globalisation also promotes urbanisation which causes the demand for goods and services to grow. The demand for goods and services causes production activities to expand which leads to further degradation of the environment given that the production process relies on the environment for production resources.

Annual data from the KOF Swiss Economic Institute Database, the Global Footprint Network (GFN), the International Country Risk Guide (ICRG), and the World Bank's World Development Indicators database (WDI) were obtained for the period 1984–2016 due to data availability. The ecological footprint is the dependent variable while the independent variables are economic globalisation, bureaucratic quality, GDP per capita, urbanisation, and energy consumption. Ecological footprint (measured in global hectare per capita) is employed as a proxy for environmental degradation. Greater ecological footprint levels indicate higher levels of environmental degradation. The ecological footprint data is obtained from the Global Footprint Network.

The KOF economic globalisation index by Dreher (2006) is one of the independent variables and is considered the most reliable and extensive measure of economic globalisation. The globalisation variable was sourced from the KOF Swiss Economic Institute Database. Bureaucratic quality is employed as a proxy for institutional quality. Bureaucratic quality refers to the autonomy of state institutions, the competence of public officials, and the efficient implementation and enforcement of policies and regulations. Thus, the ability of state institutions to impartially enforce environmental policies depends on their degree of independence from political interference and the effective management of unethical acts like bribery, clientelism, and rent-seeking (Rothstein and Teorell 2008). Bureaucracies with low competence and high corruption are more likely to enforce environmental laws partially and ineffectively. The resulting distortions may cause environmental degradation. The index is measured on a scale of 0 (low bureaucratic quality) to 4 (high bureaucratic quality). Thus, high bureaucratic quality suggests effective enforcement of policies and an independent public administration system free from political interference while the opposite is the case for the low bureaucratic quality. The bureaucratic quality variable is from the ICRG.

Economic growth, urbanisation, and energy consumption are included in the models as standard covariates as noted in the extant literature as important influencers of the environment (see. Langnel, Amegavi, and Agomor 2021; Adams and Klobodu 2017; Dogan and Turkekul 2016; Ahmed et al. 2015). In this paper, urbanisation is the number of people living in urban spaces and is measured as the percentage of the total population. Energy consumption (measured as the kilogram of oil equivalent per capita) is the primary energy before transformation to other energy use fuels and GDP per capita measured in constant 2010 USD were all sourced from the World Bank Development Indicators database. The general form of the relationship between the series is specified as follows:

$$\mathrm{EF_t} = f(\mathrm{EGlo_t}, \mathrm{BQ_t}, \mathrm{GDPpc_t}, \mathrm{Urb_t}, \mathrm{EC_t}) \quad (1)$$

To stabilise the variance of the series and also address the problem of data skewness, all the variables except bureaucratic quality (BQ) are transformed into their natural logarithm (Asteriou and Hall 2007). The bureaucratic quality variable was not transformed into its natural log because it ranges from 0 to 4, hence transforming the variable will produce some negative figures which can affect the estimation of the regression models.

Thus, the functional form of the empirical model of the paper is expressed as follows:

$$\ln EF_t = \alpha_o + \alpha_1 \ln EGlo_t + \alpha_2 BQ_t + \alpha_3 \ln GDPpc_t + \alpha_4 \ln Urb_t + \alpha_5 \ln EC_t + \varepsilon_t \quad (2)$$

Where ln is the natural logarithms, EF represents ecological footprint, EGlo denotes economic globalisation, BQ bureaucratic quality, GDPpc represents economic growth, Urb embodies Urbanisation, EC denotes energy consumption and ϵ is the error term.

3.2. Econometric methods

The paper employs the ARDL bounds testing technique proposed by Pesaran, Shin, and Smith (2001) to review the presence of cointegration between the series. The ARDL technique offers some advantages over the other cointegration techniques. First, it is an efficient technique for establishing cointegration in small series (Pesaran and Shin 1999). Second, employing a simple linear transformation that features both short run adjustment and long run equilibrium without losing long run information, the error correction model (ECM) can be determined. Third, the ARDL can be used irrespective of the order of integration of the variables, whether $I(0)$, $I(1)$, or a combination of both (Pesaran, Shin, and Smith 2001). Fourth, considering that ARDL is free of residual correlation, the issue of endogeneity is not much of a problem. Pesaran and Shin (1999) established that the selection of appropriate lags in the ARDL model addresses both endogeneity and serial correlation problems. The ARDL model is estimated as follows:

$$\begin{aligned}\Delta lnEF_t = \alpha_0 &+ \sum_{i=1}^{p} \delta_1 \Delta lnEF_{t-i} + \sum_{i=1}^{p} \varphi_2 \Delta lnEGlo_{t-i} \\ &+ \sum_{i=1}^{p} \omega_3 \Delta lnBQ_{t-i} + \sum_{i=1}^{p} \gamma_4 \Delta lnGDP_{t-i} \frac{n!}{r!(n-r)!} \\ &\sum_{i=1}^{p} \theta_5 \Delta lnUrb_{t-i} + \sum_{i=1}^{p} \theta_6 \Delta lnEC_{t-i} + \lambda_1 lnEF_{t-1} + \lambda_2 lnEGlo_{t-1} \\ &+ \lambda_3 lnBQ_{t-1} + \lambda_4 lnGDP_{t-1} \\ &+ \lambda_5 lnUrb_{t-1} + \mu_t \end{aligned} \quad (3)$$

Where the drift component is represented by α_o and the white noise is μ_t. The error correction dynamics are denoted by the terms with the summation signs, while the long run relationship is presented in the second part of the equation with λ_t. The presence of cointegration or otherwise between the series is premised on the critical bounds tabulated by Pesaran, Shin, and Smith (2001). The null hypothesis of no cointegration between the variables is H_0:$\lambda_1 \quad \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = 0$ and the alternative hypothesis of cointegration is H_0:$\lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq \lambda_5 \neq \lambda_6 \neq 0$. A comparative analysis of the F-statistic with the lower critical bound (LCB) and the upper critical bound (UCB) proposed by Pesaran, Shin, and Smith (2001) is conducted. The presence of a long run relationship between the series is established if the computed F-statistic is greater than the UCB. However, if the computed F-statistic is lower than the LCB then the null hypothesis of no cointegration is accepted. The decision of cointegration becomes inconclusive if the computed F-statistic falls between the LCB and UCB. After establishing the presence

Table 1. Descriptive Statistics and correlation results.

	EF	EGlo	BQ	GDPpc	Urb	EC
Panel A						
Mean	30764166	41.218	2.320	1057.895	4.281	334.075
Minimum	52562896	51.594	3.000	731.345	5.112	408.254
Maximum	13955463	28.658	1.000	1644.598	3.556	266.119
Std Dev.	13091354	7.214	0.548	289.986	0.486	40.553
Panel B						
EF	1.000					
EGlo	0.844	1.000				
BQ	0.210	0.261	1.000			
GDPpc	0.553	0.381	0.243	1.000		
Urb	0.422	0.695	−0.036	−0.511	1.000	
EC	−0.487	−0.481	0.024	0.358	0.528	1.000

of a long run relationship between the variables, the error correction model (ECM) is estimated as follows:

$$\begin{aligned}\Delta lnEF_t = \alpha_0 &+ \sum_{i=1}^{p} \delta_1 \Delta lnEF_{t-i} + \sum_{i=1}^{p} \varphi_2 \Delta lnEGlo_{t-i} + \sum_{i=1}^{p} \omega_3 \Delta lnBQ_{t-i} \\ &+ \sum_{i=1}^{p} \gamma_4 \Delta lnGDP_{t-i} + \sum_{i=1}^{p} \theta_5 \Delta lnUrb_{t-i} \\ &+ \sum_{i=1}^{p} \vartheta_6 \Delta lnEC_{t-i} + \psi ECM_{t-1} + \mu_t \end{aligned} \tag{4}$$

where ψ represents the parameter that shows the speed of adjustment and the residual derived from the estimation of the cointegration model of eq. (4) is ECM. The ECM coefficient must be statistically significant and negative to be statistically meaningful. The study conducts some diagnostic and stability tests to ensure the goodness of fit of the estimated models. The diagnostic tests include the test for functional form, serial correlation, and heteroskedasticity associated with the estimated models. Table 1 reports the descriptive statistics and correlation matrix of the variables.

4. Empirical results and discussion

To avoid conducting a spurious regression, the empirical analysis started with an evaluation of the unit root properties of the variables. The Augmented Dickey and Fuller (1979) and Phillips and Perron (1988) unit root tests were employed to ascertain the stationarity or otherwise of the series. Table 2 presents the results where all the variables are stationary at the first difference as reported by both the ADF and PP results.

The Zivot and Andrews (2002) unit root test with a single structural break date validates the outcomes of the ADF and PP test. Table 3 presents the results. The dependent variable's break is in 1989. Ghana was characterised by political and economic instability in the 1980s. This period witnessed the implementation of the Structural Adjustment Programme (SAP) by the World Bank in Ghana. Given that the structural break of ecological footprint is in 1989, a dummy variable was created for the structural break and included in the estimations.

Table 2. Unit root test.

	ADF				Phillips-Perron			
	At Level		First Difference		At Level		First Difference	
Variables	Constant no trend	Constant with trend	Constant no trend	Constant with trend	Constant no trend	Constant with trend	Constant no trend	Constant with trend
lnEF	−1.380	−0.742	−3.672**	−4.334***	−1.712	−1.029	−5.289***	−5.715***
lnEGlo	−0.826	−1.822	−3.872***	−4.959***	−0.949	−1.911	−5.806***	−6.325***
BQ	−1.315	−2.611*	−4.103***	−4.324**	−2.949**	−3.702**	−4.316***	−4.815***
lnGDPpc	−1.112	−1.814	−3.897***	−4.622**	−1.323	−2.416	−4.208***	−4.752**
lnUrb	−1.602	−2.230	−3.686**	−4.235***	−1.320	−4.826***	−3.555**	−4.325***
lnEC	−1.458	−1.965	−3.831***	−4.163**	−1.743	−1.676	−6.330***	−7.004***

Note: ***, **, and * indicate the level of significance at 1%, 5%, and 10% respectively.

Table 3. Zivot and Andrews unit root test with structural breaks.

	At Levels		1st Difference	
	Constant (no trend)		Constant (no trend)	
	t-stat	Structural break year	t-stat	Structural break year
lnEF	−3.088	2002	−7.276***	1989
lnEGlo	−4.543	2003	−5.933***	1989
BQ	−3.261	1998	−6.138***	1991
lnGDPpc	−3.019	2000	−7.852***	1991
lnUrb	−7.079***	2004	−7.710***	1988
lnEC	−2.152	2000	−7.578***	1988

Note: ***, **, and * indicate the level of significance at 1%, 5%, and 10% respectively.

Table 4. Bounds cointegration test.

Estimated model	F-statistic	Optimal lag	Decision
Model 1:(lnEF/lnEGlo, lnGDPpc, lnUrb, lnEC)	5.390***	1 0 1 1 1	Yes
Model 2:(lnEF/ BQ, lnGDPpc, lnUrb, lnEC)	6.684***	1 1 1 1 1	Yes
Significance level	Lower bounds *I*(0)	Upper bounds *I*(1)	
1% level	3.41	4.68	
5% level	2.62	3.79	
10% level	2.26	3.35	
Model 3:(lnEF/lnEGlo, BQ, lnGDPpc, lnUrb), lnEC	7.139***	1 0 1 1 1 1	Yes
Significance level	Lower bounds *I*(0)	Upper bounds *I*(1)	
1% level	3.15	4.43	
5% level	2.45	3.61	
10% level	2.12	3.23	

Note: ***, **, and * indicates 1%, 5%, and 10% level of significance, respectively. Optimal lag order selection is premised on Akaike Information Criterion (AIC).

After establishing the order of integration of the series, it presents the opportunity to apply the ARDL bounds test to ascertain the long run relationship between the variables. In applying the ARDL bounds testing technique of cointegration, the selection of appropriate lag length is important because the calculated ARDL F-statistic is generally sensitive to the selected lag order. The lag selection order was premised on the Akaike Information Criterion (AIC). For small sample data, Lütkepohl (2006) asserts that the AIC criterion is the most superior. The ARDL bounds test is presented in Table 4. The estimates in Table 4 reveal that the F-statistic of 5.390 and 6.684 in models 1 and 2 are both greater than the upper critical value of 4.68 at a 1% significance level. The F- statistic of 7.139 in model 3 is also greater than the upper critical value of 4.43 at a 1% significance level. The results indicate the rejection of the null hypothesis. Therefore, the test results confirm cointegration and validate the long run relationship between ecological footprint, economic globalisation, bureaucratic quality, economic growth, urbanisation, and energy consumption in Ghana for the period 1984–2016.

Having established the cointegration relationship between the variables, the next step is to report the marginal impacts of economic globalisation, bureaucratic quality, economic growth, urbanisation, and energy consumption on ecological footprint. We estimated three models as reported in Table 5. Model 1 estimates the impact of economic globalisation (lnEGlo) on ecological footprint, independently of institutional quality. The analysis provides evidence that economic globalisation significantly increases ecological footprint. That is, economic globalisation promotes environmental degradation.

Table 5. Estimated long-run results.

Dependent variable: Ecological footprint			
Variable	Model 1	Model 2	Model 3
lnEGlo	0.266*		0.517***
	(0.125)		(0.175)
BQ		0.823*	0.056**
		(0.407)	(0.019)
lnGDPpc	1.356***	1.119***	1.430***
	(0.253)	(0.396)	(0.258)
lnUrb	0.355	0.527	0.379
	(0.515)	(0.711)	(0.348)
lnEC	0.428***	0.145*	0.425**
	(0.094)	(0.082)	(0.080)
DM	0.028*	0.019*	0.039***
	(0.014)	(0.007)	(0.011)

Note: ***, **, and * show 1%, 5%, and 10% level of significance. Standard errors are reported in parentheses.

The coefficients are significant and positive at a 10% significance level. This suggests that the more globalised economically Ghana becomes the more likely the country will experience higher ecological footprint levels. Specifically, if all other factors are controlled for, a percentage growth in economic globalisation will lead to a 0.266% rise in ecological footprint.

Model 2 investigates the impact of bureaucratic quality (lnBQ) on the ecological footprint in the absence of economic globalisation. The results demonstrate that bureaucratic quality has a significant and positive effect on ecological footprint. That is, the current level of bureaucratic quality appears to facilitate environmental degradation in Ghana. Precisely, ceteris paribus, the level of ecological footprint, in the long run, will increase by 0.823% with a percentage decline in bureaucratic quality at a 5% level of significance.

In model 3, we jointly considered the effect of economic globalisation and bureaucratic quality on ecological footprint. Jointly considering both variables in the same model facilitates the exploration of the contingency effect on the relationship between the variables. Jointly considering these variables, is important because the environmental effect of economic globalisation on ecological footprint is conditional on the level of bureaucratic quality in a country. We observed that the direction of impact of both variables is positive and statistically significant. However, it is important to note that although the direction of the impact of economic globalisation remained positive, its coefficients significantly increased from 0.266–0.517 when compared to the coefficients in model 1. This appears to imply some degree of influence of bureaucratic quality on the relationship between economic globalisation and environmental quality in a country. In statistical terms, if all other factors are controlled for, a 1% increase in economic globalisation will cause a 0.517% rise in ecological footprint in the long run at a 1% significance level. Considering that the bureaucratic quality appears to influence the relationship between economic globalisation and ecological footprint by increasing the deleterious effect of economic globalisation on ecological footprint; this could imply that the current level of bureaucratic quality in Ghana may be low hence this outcome.

Furthermore, the relationship between the other covariates and ecological footprint reveals that GDP per capita (lnGDPpc) has a positive and statistically significant effect on ecological footprint. This suggests that growth in GDP per capita appears to promote

Table 6. Estimated short run results.

Dependent variable: Ecological footprint			
Variable	Model 1	Model 2	Model 3
lnEGlo	0.120**		0.135***
	(0.051)		(0.047)
lnBQ		0.643***	0.028**
		(0.162)	(0.008)
lnGDP	0.612**	0.399*	0.708***
	(0.216)	(0.201)	(0.198)
lnUrb	0.161	0.164	0.147
	(0.242)	(0.732)	(0.500)
lnEC	0.365***	0.052	0.301**
	(0.092)	(0.098)	(0.107)
Dummy 1989	0.019**	0.100**	0.036***
	(0.0079)	(0.045)	(0.006)
Constant	4.709***	4.070	5.446***
	(1.249)	(2.701)	(1.404)
$ECT_{(t-1)}$	−0.451***	−0.357**	−0.495***
	(0.116)	(0.162)	(0.108)
R-Squared	0.843	0.417	0.809

Note: ***, **, and * show 1%, 5%, and 10% level of significance. Standard errors are reported in parentheses.

environmental degradation in Ghana. The urbanisation (lnUrb) coefficients are positive but insignificant across the three models. The coefficients of energy consumption (lnEC) are the most consistent and robust across all the models in terms of their values and statistical significance. It exerts a strong positive effect on ecological footprint. Hence, it promotes environmental degradation in Ghana. The dummy variable (DM) used for the structural break caused by the implementation of the Structural Adjustment Programme (SAP) by the World Bank in Ghana is significant and positive in all three models. The Structural Adjustment Programme was introduced to accelerate economic development and led to investments in industrial development projects causing environmental degradation.

The next section estimates the short-run relationships between the variables based on the error correction model (ECM). Table 6 presents the results. The error correction terms (ECT) for all three models are negative and statistically significant. The ECT coefficients illustrate the speed of adjustment if the series undergo any disequilibrium from their long-run equilibrium points. The estimated coefficients suggest that any deviation from the long-run is adjusted by 45%, 35%, and 49% in models 1, 2, and 3 respectively. The results show that economic globalisation and bureaucratic quality both have a significant and positive effect on ecological footprint, suggesting that both appear to have a reducing effect on environmental quality in Ghana. GDP per capita and energy consumption also promote environmental degradation in Ghana. Last, we find that urbanisation is insignificant indicating its insignificant role in influencing the ecological footprint in the short run.

The diagnostic tests for serial correlation, heteroskedasticity, and functional form specification are also reported in Table 7. The results do not reveal the presence of heteroskedasticity and serial correlation. The estimated models pass the test of functional form specification.

Table 7. Diagnostic test.

Test	Model 1	Model 2	Model 3
ARCH LM test	1.014 (0.314)	0.070 (0.935)	0.828 (0.362)
Ramsey RESET test	1.305 (0.637)	0.719 (0.327)	2.370 (0.138)
Breusch-Godfrey test	0.454 (0.503)	2.443 (0.118)	1.716 (0.271)

4.1. Discussion

This paper complements previous research examining the impact of globalisation and institutional quality on environmental degradation. The role of institutional quality in promoting trade and environmental quality is fundamental to sustainable development in every economy. The behaviour of business actors in an economy is shaped by the quality of institutions. The study investigates the relationship between economic globalisation, institutional quality, and ecological footprint. The results indicate that the impact of economic globalisation is statistically significant and positive on ecological footprint. This implies thateconomic globalisation promotes environmental degradation which is consistent with previous studies by Langnel and Amegavi (2020), Ahmed et al. (2019), and Lv and Xu (2019). However, the result contradicts previous results by Balsalobre-Lorente et al. (2020); Koengkan, Fuinhas, and Santiago (2020), and Shahbaz et al. (2019). Comparing the empirical results with the previous studies indicates that the effect of globalisation on the environment may be context-dependent. Considering the negative effect of economic globalisation on the ecological footprint in Ghana, a plausible explanation for this result is that because Ghana is a developing country with many development challenges that include high poverty, unemployment, famine, and diseases (World Bank 2020; UNEP 2017), this creates a trade-off between the demand for environmental quality and the demand for economic growth and employment opportunities. As a result, the priority of the government might be on achieving economic growth and development to improve the living standards of the people. Furthermore, the results reasonably support the race-to-the-bottom hypothesis which contends that countries tend to relax their environmental regulations and standards to attract more foreign investments (Daly 1993). It also confirms the scale effect considering that globalisation leads to growth in economic activities which propels industrialisation and the rise in the demand for natural resources. This depletes the natural resources since the demand exceeds the regenerative capacity of the natural resources, causing an ecological deficit. Similarly, this result substantiates the composition effect of economic globalisation, where natural resources are shifted to industries to gain competitive advantage, causing high consumption of natural resources, and the use of obsolete technologies (Tisdell 2001). This increases environmental degradation.

Furthermore, the research substantiates the role of institutional quality in promoting or derailing environmental quality. The result of the increasing effect of bureaucratic quality on ecological footprint could indicate a potential weakness in the enforcement of environmental laws and regulations in Ghana hence, this result. The paper lends support to the pollution-haven hypothesis which contends that countries with a weak institutional environment are characterised by high levels of environmental pollution (Copeland 2005; Antweiler, Copeland, and Taylor 2001). This result may be explained by the fact that Ghana has been experiencing substantial growth in corruption (Transparency International 2018) and political interference in the enforcement

of environmental laws and policies has been endemic in the last few years (Amegavi 2021; Eduful et al. 2020). Ghana's corruption score has increased from 39 in 2009–43 in 2016 (Transparency International 2018). Regulatory institutions have substantial discretionary power and corrupt officials may support and prioritise choices that create opportunities for rent-seeking at the detriment of impartially enforcing environmental laws and regulations. This trading of short-term benefits for long-term costs due to weak institutions creates a vicious cycle of constant environmental destruction. This evidence is supported by previous qualitative studies that have reported that the weak enforcement of laws and regulations in Ghana has led to a rise in illegal mining ('galamsey') activities and this is causing significant destruction to forests, farmlands, and water bodies in the country (Eduful et al. 2020; Teschner 2012). This finding implies that institutional development is critical for environmental sustainability. Considering the trade-off between economic development and environmental sustainability, Ghana can adopt a trade liberalisation strategy for its development. However, this strategy needs to be complemented through reforms that improve the quality of institutions to mitigate the potential negative effects of trade liberalisation on environmental quality.

5. Conclusions and policy implications

Globalisation and the quality of institutions are among the many factors that can either promote or impede environmental sustainability. The effects of these factors on the environment have been of significant interest for decades. While there have been demands to improve institutional quality in many developing countries, the expectation has been for countries to support the globalisation agenda. This paper investigates the relationship between economic globalisation, institutional quality, and ecological footprint in Ghana for the period 1984–2016. The autoregressive distributive lag (ARDL) technique was applied to investigate the relationship. Although the literature reveals inconclusive evidence on the globalisation-environment relationship, the evidence demonstrates that economic globalisation and bureaucratic quality both have a significant positive effect on ecological footprint.

The evidence from the paper has important policy implications, especially at a time when concerns are growing about ways to promote environmental sustainability. The increasing effect of economic globalisation on ecological footprint suggests that Ghana appears to be drifting away from environmental sustainability. As economic globalisation is considered a significant facilitator of economic growth in developing countries like Ghana, the government needs to focus on attracting and licensing investors that employ environmentally friendly technologies. Similarly, technologies imported into the country for trade should be environmentally friendly, to eliminate the potential for negative environmental externalities. Furthermore, the government should set emissions standards, and firms that disregard these standards and pollute should be sanctioned, employing sustainable environmental strategies such as carbon taxes, polluter payments, and pollution credits. Such a policy has the potential to halt and improve environmental quality while propelling economic growth.

Given the increasing effect of bureaucratic quality on ecological footprint, the paper flags the need to pay attention to formal accountability mechanisms in regulatory institutions in Ghana. This calls for an urgent need to strengthen internal control systems with anticipatory management mechanisms to monitor and check the enforcement

of environmental and trade laws and regulations. Sound administrative and governance values of transparency and accountability must be integrated into institutional reforms. Although the study illustrates the impact of bureaucratic quality and economic globalisation on environmental quality, the paper cannot discount that the results are country-specific. Future research might consider the role of institutional quality and the other domains of globalisation by exploring these issues in panel studies.

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