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The Effects of Foreign Direct Investment and Economic Growth on Environmental Degradation in Cameroon

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Abstract

Developing countries, like Cameroon, usually face a dilemma between promoting economic growth and development and conserving their natural environment. Two key factors that influence this dilemma are foreign direct investment (FDI) and economic growth. Nowadays, it is obvious that sustainability is a vital development goal for every society. This study is designed to assess the effect of foreign direct investment (FDI) and economic growth on environmental degradation in Cameroon. Data for this study is gotten from the World Development Indicators and Environmental Footprint Network over the period 1961 to 2017. Based on a structural equation model technique, it was found that FDI has a negative and statistically significant effect on environmental sustainability, and economic growth has a negative and statistically significant effect on environmental sustainability. The Baron and Kenny approach reveals that there is partial mediation of economic growth on the effect of foreign direct investment on environmental degradation in Cameroon.

Keywords: foreign direct investment, economic growth, environmental degradation

1. Introduction

Developing countries, like Cameroon, usually face a dilemma between promoting economic growth and development and conserving their natural environment. Two key factors that influence this dilemma are foreign direct investment (FDI) and economic growth. FDI helps countries grow economically by supplying much-needed capital, technology, and experience. However, FDI can also have unintended repercussions in a situation wherein polluting firms relocate to take advantage of the host country's low environmental rules (Fazaalloh, 2024). Economic expansion is necessary to raise living standards and lower poverty, but it can also make matters worse. The "Environmental Kuznets Curve" (EKC) hypothesis, which contends that environmental quality first declines and then improves as a nation's wealth level rises, is frequently used to describe this relationship (Nginyu *et al.*, 2024).

Efforts to remedy environmental degradation remain critical as a result of the strong correlation between environmental degradation and economic growth. The consequences of the increasing economic activities on the environment have therefore become considerably vital (Fonchamnyo & Nginyu, 2023). The relationship between foreign direct investment, economic growth and environmental degradation is one of the most essential questions in trade policy for the past two decades (Le *et al*., 2022; Ssali *et al*., 2019; Phuong, 2018). Addressing this issue is vital in achieving sustainable development (Ojewumi & Akinlo, 2017). Due to the high global economic interdependence between nations and high level of trade liberalisation as well as the use of natural resources and growing pressure on the environment, there is an ever-growing edge on the relationship between trade openness and environment quality (Managi *et al.*, 2009). Environmental degradation is a problem for both developed and

developing countries and foreign direct investment (FDI) and economic growth are usually accused of being an important determinant of this environmental scandal especially in the less developed countries with poor institutions (Hassaballa, 2014). Nevertheless, host countries also benefit from FDI such as capital and advanced technology (Aydemir & Zeren, 2017; Acharyya, 2009) which increases economic growth. Trade openness has negative and positive impacts on the environment from the pollution of foreign companies and imported technology respectively (Gupta & Chatterjee, 2017; Chatterjee, 2019).

The effect of foreign direct investment on environmental degradation has therefore over the past years have become a widespread issue in the world due to its consequences on humanity and its environment (Hao & Liu, 2015). Despite the fact that the relationship between foreign direct investment and environmental degradation has been a preoccupation among policymakers and researchers for a long time now, there is yet no consensus about this relationship. This may be due to the mediating role of economic growth which has not yet been adequately studied.

The treasures of Cameroon nations depend on their ability to manage and conserve their environment. Environmental degradation has not only led to a decrease in food production but has also led to droughts, ecological imbalance and consequently the poor functionality of ecosystems (Njeuma & Ngwa, 2019; Tchamba, 2017; Akonjande & Tchinda, 2020; Fomundam & Ndangali, 2018; Baharanyi & Nguimkeu, 2021). Throughout the region, irrespective of the climatic zone, meteorological records show that environmental degradation is a critical issue in Cameroon (Awazi et al., 2021; Vondou, et al., 2021; Molua, 2022). Cameroon suffers from a series of serious environmental issues, including soil erosion, deforestation, and desertification, among others (Njeuma & Ngwa, 2019). Efforts to tackle these environmental problems have however been handicapped by a real failure to understand their causes as well as possible remedies (Akonjande & Tchinda, 2020).

The objective of this paper is therefore to investigate the effect of foreign direct investment and economics on environmental degradation in Cameroon. Specifically, to investigate the effect of foreign direct investment on environmental degradation, to investigate the effect of economic growth on environmental degradation and to investigate the mediating role of economic growth in the relationship between foreign direct investment and environmental degradation in Cameroon.

2. Literature Review

In the literature, this relationship is explained by the pollution halo hypothesis and pollution haven hypothesis. The pollution haven hypothesis postulates that high-polluting firms transfer their investment from developed countries to developing countries to escape from high environmental regulations in developed countries (Suresh & Kharas, 2019; Swanson, 2018; Cole & Elliott, 2003). In other words, low environmental regulations and high environmental pollution in developing countries stimulate the FDI inflows of high-polluting firms, which emit more CO2 emissions. On the other hand, FDI inflows can decrease environmental degradation when foreign direct investment brings advanced and environment-friendly technologies to host countries with low environmental regulations (Zeng & Quan, 2019; Gomez & D'Arcy, 2020). In the literature, this relationship is explained by the pollution halo hypothesis and the pollution haven hypothesis. The pollution haven hypothesis postulates that high-polluting firms transfer their investment from developed countries to developing countries to escape from high environmental regulations in developed countries (Acharyya, 2009; Hanif, Raza, Gago-de-Santos, & Abbas, 2019).

The exist an ample literature which found that FDI promotes economic growth (Pradhan, 2009; Agrawal & Khan, 2011; Iamsiraroj, 2016; Alfaro, Chanda *et al.*, 2004). For example, using a panel of 17 Asia countries from 1980 to 2014, Kha & Ozturk (2020) found from a fully modified ordinary least squares that FDI has a statistically positive significant effect on environmental pollution and therefore validating the pollution haven hypothesis. Based on an unrestricted VAR model Adams (Adams, 2009) examined the effect of FDI and domestic investment on economic growth in Sub-Saharan Africa over the period 1990-2003. He found that foreign direct investment has a statistically positive significant on economic growth in the OLS but not in fixed effects estimation. Based on their fixed effects regression model, Jugurnath *et al.* (2016) found a significant positive effect of FDI on economic growth in some selected Sub-Saharan African countries, over the period 2008 to 2014. However, by employing a static random effect model and dynamic panel GMM estimation, the effect between foreign direct investment, domestic investment on economic growth was found to be positive and statistically significant. In addition, among others, Raza & Hanif (2021), Akinlo (2021), Khan & Furuoka (2023), Raza and Hanif (2021) and Khan and Furuoka (2023) found that FDI has a positive effect on the economy.

Osabohien & Efobi (2022) found a positive effect in some regions and a negative in others accounted for by weak institution and Javed & Wang (2022) found both positive and negative impacts of FDI, suggesting that the effects vary based on country-specific factors. More so, other studies like those of Osabohien and Efobi (2022) and Moussa and Karam (2023) showed that, in the presence of weak institutions FDI has detrimental effects on economic growth. More so, other studies like those of Osabohien and Efobi (2022) and Moussa and Karam

(2023) showed that, in the presence of weak institutions FDI has detrimental effects on economic growth.

Regarding the relationship between foreign direct investment and environmental quality, Dhrifi (2020) found from a panel of 98 developing countries over the period 1995 to 2017 that there is a bi-directional causality between poverty and FDI as well as between CO2 emission and poverty. Nevertheless, there is unidirectional causality that runs from FDI to CO2 emission and there is significant negative relationship between FDI and poverty for all groups of countries with the exception of the African countries. More so using an Autoregressive Distributive Lag, Hanif *et al.* (2019) found that foreign direct investment increases of environmental degradation in fifteen developing Asian countries for the period from 1990 to 2013. Many others authors found that found FDI has a positive effect on environmental degradation (Baek & Koo, 2009; Sami & Ozturk, 2015; Zhang & Wang, 2015; Maqbool & Haseeb, 2021; Al-Mulali & Saboori, 2021; Oliviera & Santos, 2022; Ighodaro & Eriabie, 2023; Kumar & Gupta, 2023).

On the other hand, the literature seems to be dominated with the view that FDI has a negative effect on the environment, FDI can contribute to a cleaner environment, especially when FDI comes with green technologies. For example, Zhu *et al.* (2016) investigated the effect of foreign direct investment, energy consumption and economic growth on carbon emissions in five selected member countries in the Association of South East Asian Nations. Based on a panel quantile regression it was found that, FDI has a negative effect on carbon emissions, except at the 5th quantile, and becomes significant at higher quantiles and among the high-emissions countries, greater economic growth reduces emissions. Demena & Afesorgbor (2020) also found meta-analysis that FDI significantly reduces environmental emissions. Using a generalized method of moment.

More so, Azman-Saini *et al.* (2010) found that, FDI has no direct effect on output growth, but the effect is dependent on the level of economic freedom in the host countries. García et al. (2022) showed that green FDI reduce carbon emissions and promote the use of renewable energy in host countries. Zhu et al. (2016) found that, FDI contributes to lower carbon emissions in ASEAN countries due to the adoption of cleaner technologies and efficient production techniques. Morrison et al. (2017) also found that FDI reduces greenhouse gas emissions. On the other hand, an ample literature has also found that FDI leads to increased pollution, especially in developing countries week environmental regulations. For instance, Dean (2002) argued that multinational corporations often relocate to countries with lower environmental standards.

Despite this numerous research done in pass years, to the best of our knowledge little have been done on the indirect effect of foreign direct investment on environmental degradation through economic growth especially in Cameroon. In other words, the mediation effect of economic growth on the effect of foreign direct investment on environmental sustainability.

3. Methodology

Data for this study are collected all from WDI and therefore, it should be noted that the data is all secondary data. To attain the objective of this work, the following model will be employed. FDI and economic growth both influence environmental degradation, and environmental degradation is determined by economic growth this therefore requires a method that can capture these interdependencies. SEM (structural equation modeling) is therefore well-suited to examine these complex relationships (Kline, 2016). SEM corrects for simultaneity among variables, which occurs in a scenario where variables interact with each other another (Bollen, 1989). In this case, FDI might enhance economic growth, which in turn could impact environmental degradation. One of the advantages of SEM is its ability to account for measurement errors in observed variables, which improves the reliability of the results (Satorra & Bentler, 1994).

Several methods can be used for the estimation of a structural equation model including maximum likelihood (ML), weighted least squares (WLS), generalized least squares, unweighted least squares (GLS) and asymptotic distribution free (ADF) (Hoyle, 2012a; Weston & Gore, 2006). Some studies have compared the performance of different estimation techniques of SEM; for example, Sugawara and MacCallum (1993) compared ML, GLS, ADF, and ordinary least squares (OLS); Ding et al. (1995) and Fan et al. (1999) compared GSL and ML; Hu and Bentler (1998) compared GLS, ML and ADF; Olsson et al. (2000) compared ML, GLS, and WLS. Among all the methods, ML estimation is currently the most commonly used method (Anderson & Gerbing, 1988; Hoyle, 2012a) and the default in most SEM computer programs (Byrne, 2010; Hoyle, 2012a; Kline, 2011; Ullman, 2006). Ullman (2006) claimed ML is a good choice even with non-normality of errors, but only if the sample size is larger than 120.

Considering those apparent advantages, the maximum likelihood (ML) was chosen as the method for the model estimations for this study. SEM has an advantage in that both measurement and structural models can be estimated at the same time; in other words, the process of estimation can be implemented in one step. However, if researchers are not confident that the measures represent the constructs of interest, there is little reason to use them to examine the structural relationships (Hair et al., 2011).

Because of the critical importance of the decision to accept or reject a specified model, a plenty of indices has been developed as measures to describe how well the statistical model fits the observed data (Bentler, 1990; Browne & Cudeck, 1993). Among the absolute indices, the χ^2 and Root-Mean-Square Error of Approximation (RMSEA) are the two most commonly reported measures (Jackson et al., 2009). The chi-square ($\chi 2$) likelihood ratio statistic is usually used to evaluate model fit. The chi-square ($\chi 2$) likelihood ratio statistics is the most essential absolute fit index, and tests for the difference between the empirical and the theoretical model (Meyers et al., 2013). A significant $\chi 2$ indicates that the theoretical model does not fit the empirical data, while a non-significant $\chi 2$ indicates a good fit. According to Schumacker and Lomax (2004), "the initial (full) model represents the null hypothesis (Ho)". The GFI shares conceptual similarities with the R2 in multiple regression (Khine et al., 2013). It measures the comparative amount of variances and covariances accounted for by the model.

On the other hand, a χ^2 may not be the best guide to model adequacy (Hu & Bentler, 1998) because it is usually significant (indicating a poor fit) (Iacobucci, 2010). This is why many alternative measures of fitness has been developed and recommended as reasonable additional measures of model validity (Hu & Bentler, 1998). The RMSEA is the one absolute fit index that is highly recommended (MacCallum & Austin, 2000). RMSEA represents the degree to which lack of fit is due to misspecification of the model versus being due to sampling error. It is sensitive to model misspecification and can build confidence intervals to assess the precision of RMSEA estimates (Hu & Bentler, 1998).

Standardized Root Mean Square Residual (SRMR) is also an important absolute index and is highly recommended (Hu & Bentler, 1998, 1999). The SRMR index is based on covariance residuals and indicates how much difference exists between the observed data and the model (Weston & Gore, 2006). SRMR is relatively less sensitive to violations of distributional assumptions (Iacobucci, 2010).

4. Presentation and Discussion of Results

As a preamble to the estimation procedures, the study performs a descriptive analysis of the variables employed.

Table 1. Descriptive Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
ES	57	3.283	1.378	1.6	5.98
EG	57	3.675	5.538	-10.912	22.003
EG2	57	43.632	76.95	1.401	484.132
Resource Rent	48	7.181	2.407	3.458	13.104
Trade	53	46.509	7.711	26.159	65.025
FDI	48	1.058	1.108	-.916	4.069

The table above shows that the sample size was just 57 observations though some variables had missing observations.

Table 2. Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) ES	1.000					
(2) EG	0.038	1.000				
(3) EG2	0.162	0.593	1.000			
(4) Resource Rent	-0.373	-0.170	-0.177	1.000		
(5) Trade	0.182	0.515	0.178	0.222	1.000	
(6) FDI	-0.221	0.266	0.024	0.035	0.381	1.000

More so, the correlation coefficient among the independent variables as presented on Table 2 is within

acceptable values of correlation among the independent variables to ensure the absence of multicollinearity of variables in a model. The rule of thumb is that the correlation coefficient between the independent variables should be less than 0.8 to ensure the absence of multicollinearity (Maji, 2019). Therefore, our model is less likely to suffer from the problem of multicollinearity.

Table 3. Regression analysis

	Direct effect		Total effect	
VARIABLES	EG	ES	EG	ES
EG		-0.08815***		-.08815***
		(0.03379)		(.03378)
FDI	1.34591*	-0.31717***	1.3459*	-.43581***
	(0.70500)	(0.10569)	(.70500)	(.12492)
EG2		0.00600***		.00600***
		(0.00191)		(.00191)
Trade		0.08424***		.08423***
		(0.01806)		(.01806)
Resource Rent		-0.21763***		-0.21763***
		(0.04852)		(0.04852)
var(e.EG)		28.67968***		28.67968***
		(5.85421)		(5.85421)
var(e.ES)		0.53370***		0.53370***
		(0.10894)		(0.10894)
Constant	2.55441**	0.90285		
	(1.07430)	(0.73475)		
Observations	48	48		
p_bs	0	0		
chi2_ms	51.84	51.84		
Prob>chi2	0	0		

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1.

From the second of the table, foreign direct investment has a positive and statistically significant effect on economic growth. From the third column, it is found that economic growth has a negative and statistically significant effect on environmental sustainability. The effect of economic growth square is negative showing a turning point in the effect of economic growth on environmental sustainability. This means that at lower levels of development economic growth exerts a negative effect on the environment until beyond a threshold where the effect turns to be positive. It was also found that economic growth has a negative and statistically significant effect on environmental sustainability. In addition, trade openness has a positive and statistically significant effect on environmental sustainability. On the other hand, natural resource exploitation captured by resource rent has a negative and statistically significant effect on environmental sustainability. More so from column four, it was found that the total effect of foreign direct effect of has a negative and statistically significant on environmental sustainability.

Table 4. Testing of indirect effect

Estimates	Delta	Sobel	Monte Carlo
Indirect effect	-0.098	-0.098	-0.097
Std. Err.	0.057	0.056	0.057
z-value	-1.723	-1.755	-1.693
p-value	0.085	0.079	0.090
Conf. Interval	-0.209, 0.013	-0.207, 0.011	-0.222, -0.002

From the Baron and Kenny approach to testing mediation as pointed out in chapter three effect of foreign direct investment on economic growth (X on M) has coefficients B = 0.266 and p = 0.044 (STEP 1), the coefficients of the effect of economic growth on environmental sustainability (M on Y) is B = -0.368 and p = 0.000 (STEP 2) and the coefficients of the effect of foreign direct investment on environmental sustainability (X on Y) is B = -0.262 and p = 0.005 (STEP 3). Since STEP 1, STEP 2 and STEP 3 as well as the Sobel's test above are significant, there is therefore partial mediation of economic growth on the effect of foreign direct investment.

The objective of this study was investigating the effects of foreign direct investment and economic growth on environmental degradation in Cameroon. It was found that FDI has negative and statistically significant effect on environmental sustainability in Sub-Saharan Africa. Our finding is in line with those of authors like Adefabi (2011), Li and Liu (2005) who found a strong complimentary connection between FDI and economic growth. On the other hand, the study is contrary to those of authors like Alkhasawneh (2013) who found a strong and positive relationship between economic growth and FDI inflows in Qatar period 1970-2010 as well as those of Roy and Van den Berg (2006) who found that that gains from FDI are very substantial in the long run and the sustainability of the U.S. current account deficit was enhanced by FDI's positive effect on productivity. The study further found that economic growth has a negative and statistically significant effect on environmental sustainability. The effect of economic growth square is negative showing turning point on the effect of economic growth on environmental sustainability. This is therefore in line with the Pollution Haven Hypothesis. These results are contrary with the work of Waqih et al. (2019) who confirms the absence of Pollution Heaven Hypotheses and existence of Environment Kuznets Curve in the South Asian region by using panel data from 1986 to 2014. From the Baron and Kenny there is partial mediation of economic growth on the effect of foreign direct investment. Our results are in line with those of authors like Chang (2015) found that increasing foreign direct investment will increase carbon dioxide emissions and that of Muhammad *et al.* (2021) who found that that FDI causes environmental degradation in BRICS and developing countries and contrary to that of Muhammad *et al.* (2021) who found that developing countries while in developed countries, FDI helps environmental degradation reduction.

5. Conclusion and Recommendations

It is obvious today that sustainability is a vital development goal to every member of every society. Despite the complexity of the concept of sustainable development, this study was designed to assess the effect of foreign direct investment and economic growth on environmental degradation in Cameroon. It was found that, there is partial mediation of economic growth on the effect of foreign direct investment. Specifically, was found that FDI has negative and statistically significant effect on environmental sustainability in Cameroon. More so, it is found that economic growth has a negative and statistically significant effect on environmental sustainability.

The adoption of environmental laws is therefore a safe path for environmental sustainability and inclusive development in Cameroon. The governments of Cameroon should foster its environmental laws to help foster environmental sustainability and reduce the environmental haven hypothesis effect from the developed countries.

The population of Cameroon should participate in the inclusive fight for environmental sustainability by going for the planting of environmentally friendly trees, use of organic manure and stope the boning of farms which pollutes the environment and also exposes the soil to erosion.

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