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Environmental Protection and Economic Growth of OIC Member Countries

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ABSTRACT

Environmental degradation continues to threaten the existence of humans, biodiversity, businesses and national economies. This is evident in the dedication of four out of the seventeen Sustainable Development Goals for tackling environmental issues. Islamic Worldview provides principles and rules for protecting the environment against all vices. Islamic tenets call on humans to protect the environment as part of their religious obligations, and show of benevolence to all creatures of Allah. However, previous studies on the impact of environmental protection on economic growth seem to have ignored the experience in Islamic countries. This study aims to estimate the impact of environmental protection on economic growth of OIC countries, and analyze how government effectiveness affects this relationship. Employing data from 14 OIC countries over the period 2016-2020, augmented Cobb-Douglas production function, and System General Method of Moments technique, the results show the existence of a negative impact of environmental protection on economic growth. However, the moderating effect of government effectiveness in the aforementioned relationship is not significant. Governments of OIC countries are advised to draw appropriate policies for improving government effectiveness in agencies of state associated with environmental protection.

ملخص

يواصل التدهور البيئي في فرض تهديدات للوجود البشري والتنوع البيولوجي والشركات والاقتصادات الوطنية. وينعكس ذلك في تخصيص الأمم المتحدة لأربعة من أصل أهداف التنمية المستدامة السبعة عشر لمعالجة القضايا البيئية. وتوفر مؤسسة Islamic Worldview مبادئ وقواعد لحماية البيئة

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من جميع المساوئ. كما تدعو التعاليم الإسلامية الإنسان إلى حماية البيئة باعتبار ذلك من صميم من واجباته الدينية ومظهرا من مظاهر الإحسان إلى جميع مخلوقات الله. ومع أهمية الموضوع، يبدو أن الدراسات السابقة حول أثر حماية البيئة على النمو الاقتصادي قد أغفلت تجربة البلدان الإسلامية في هذا الصدد. لذلك تهدف هذه الدراسة إلى تقدير أثر حماية البيئة على النمو الاقتصادي في بلدان منظمة التعاون الإسلامي، وتحليل مدى تأثير فعالية الحكومة في هذه العلاقة. وباستخدام بيانات من 14 بلدا عضوا في المنظمة تغطي فترة 2016–2020، واعتماد دالة الإنتاج الموسعة لكوب-دوغلاس (Cobb-Douglas) وتقنية النظام المعمم للعزوم (System General Method of Moments)، تبرز النتائج وجود تأثير سلبي لحماية البيئة على النمو الاقتصادي. إلا أن الأثر المخفف لفعالية الحكومة في العلاقة المذكورة ليس ذا دلالة إحصائية. لهذا على حكومات بلدان منظمة التعاون الإسلامي العمل على تطوير سياسات مناسبة لتحسين فعالية الحكومة في مؤسسات الدولة المعنية بحماية البيئة.

RÉSUMÉ

La dégradation de l'environnement continue de menacer l'existence des êtres humains, la biodiversité, les entreprises et les économies nationales. Cela ressort clairement du fait que quatre des dix-sept objectifs de développement durable sont consacrés à la lutte contre les problèmes environnementaux. La vision islamique du monde fournit des principes et des règles visant à protéger l'environnement contre tous les fléaux. Les principes islamiques appellent les êtres humains à protéger l'environnement dans le cadre de leurs obligations religieuses et à faire preuve de bienveillance envers toutes les créatures d'Allah. Cependant, les études antérieures sur l'impact de la protection de l'environnement sur la croissance économique semblent avoir ignoré l'expérience des pays islamiques. La présente étude vise à estimer l'impact de la protection de l'environnement sur la croissance économique des pays de l'OCI et à analyser comment l'efficacité des gouvernements influe sur cette relation. À partir des données de 14 pays de l'OCI pour la période 2016-2020, d'une fonction de production de Cobb-Douglas augmentée et de la technique de la méthode générale des moments, les résultats montrent l'existence d'un impact négatif de la protection de l'environnement sur la croissance économique. Toutefois, l'effet modérateur de l'efficacité gouvernementale dans la relation susmentionnée n'est pas significatif. Il est conseillé aux gouvernements des pays de l'OCI d'élaborer des politiques appropriées pour améliorer l'efficacité gouvernementale au sein des agences d'État associées à la protection de l'environnement

Keywords: Environmental protection, Economic growth, Islamic Worldview, OIC, GMM, Augmented Cobb-Douglas production function

JEL Classification: Q5, Q4, Z12, H11, C13

1. Introduction

The environment provides habitation and sustenance for all creatures of Allah (God). The wellbeing of humans, animals of all kinds, plants, water bodies, land, air, mountains, and the rest of biodiversity depends on how healthy the environment is. More importantly, the sustainability of businesses and national economies depends largely on the environment for the availability of a healthy workforce, essential raw materials, minerals and sources of energy. Thus, pollution and environmental degradation continue to threaten the very existence of not only humans, but those of economies, firms and biodiversity as a whole. About 1.6 million deaths in the Organization of Islamic Cooperation (OIC) member countries in 2019, are said to have been caused by pollution (SESRIC, 2022). Indeed, four out of the seventeen Sustainable Development Goals (SDGs) of the United Nations (UN) for dealing with sustainability issues of concern to all generations (Fallah Shayan et al, 2022), appear to directly address environmental challenges. They include SDG-6 (Ensure availability and sustainable management of water and sanitation for all), SDG-13 (Take urgent action to combat climate change and its impacts), SDG-14 (Conserve and sustainably use the oceans, seas and marine resources for sustainable development), and SDG-15 (Promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, land degradation and biodiversity loss). No doubt, the importance attached to issues of the environment is the reason for which the Organization for Economic Cooperation and Development (OECD) calls on central governments to take a central role in activities aimed at environmental protection of their respective countries (Wen, 2021).

However, in an attempt to protect the environment, countries must avoid situations of undermining the achievement of other national objectives. One such national objective for almost every nation is ensuring the achievement of sustained economic growth, which appears to align with SDG-8 (Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all). The attainment of economic growth, which is a priority for countries, is undermined by environmental protection efforts especially in lower-income countries (Cabelkova et al, 2023). This assertion is based on the Environmental Kuznets Curve (EKC) hypothesis (Stern, 2017; Anwar et al., 2022; Cabelkova et al, 2023) which posits that the relationship between

economic development and environmental degradation follows a U-shape path. The EKC framework implies that countries must attain a certain level of economic development in order to have the capacity of protecting their environment. Below this critical level of development, environmental protection efforts impact economic growth negatively. The tradeoff faced by such countries between the pursuance of increasing environmental protection and economic growth can be resolved through the nexus approach, allowing the simultaneous pursuant of several SGDs without conflict of interest (Van Zanten & van Tulder, 2021). The first step in this process is by investigating the impact of environmental protection on economic growth. Thus, the main objective of this paper is to measure the impact of environmental protection on economic growth of Organization for Islamic Cooperation (OIC) countries.

In theory, the Barro's (1981) framework suggests that an increase in economic growth is likely to occur if government expenditure positively influences private agents' productivity. To the extent that public expenditure intended for environmental protection is tailored towards investments in environmentally friendly, energy-efficient and cost-effective equipment programs that lead to an enhanced environmental quality, can cause an increase in economic growth (Ansuategi & Marsiglio, 2017). However, there is the assumption that high public environmental protection expenditure if deployed for pollution abatement activities, causes a crowding out effect leading to a decrease in economic growth (Ansuategi & Marsiglio, 2017). This inconsistency is observed in empirical studies as well. Findings of Ansuategi and Marsiglio (2017) indicate environmental protection has a long run positive impact on economic growth, whereas Peng, Sheng and Wei (2020) report the existence of a negative impact in the relationship. The inconsistencies both in theory and empirical works notwithstanding, appropriate attention appears to have not been given to Islamic countries in the body of knowledge. According to Islamic tenets, all creatures and creations found in the environment worship Allah (God), and hence are required to be protected and treated with benevolence (Wani, 2022; Mohamad & Ismail, 2023). In this regard, the Quran states;

> "The seven heavens and the earth and all that dwell therein proclaim His glory: There is not a thing that does not celebrate His praise, but you cannot understand their praises…" (Quran 17:44).

Moreover, as khalifa (representative of Allah), humans have been charged with the responsibility and trusteeship (Mohamad & Ismail, 2023) of caring for the wellbeing of all other creatures, a responsibility they would have to account for on the Day of Judgment. Good treatment of the environment and its inhabitants shall attract rewards from Allah, while the reverse shall be met with punishment (Raj & Subin, 2022). The following hadith (sayings of the Prophet Mohammed) provides evidence of accountability to Allah for man's treatment of the environment and any other creature;

> "Hadith from Anas (May Allah be pleased with him (r.a)), he said: Rasulullah (peace be upon him (pbuh)) said: A Muslim does not grow a tree or sow seeds on the ground, and then a bird or a human or an animal consumes some of it; what is eaten is charity." (Narrated by Imam Bukhari).

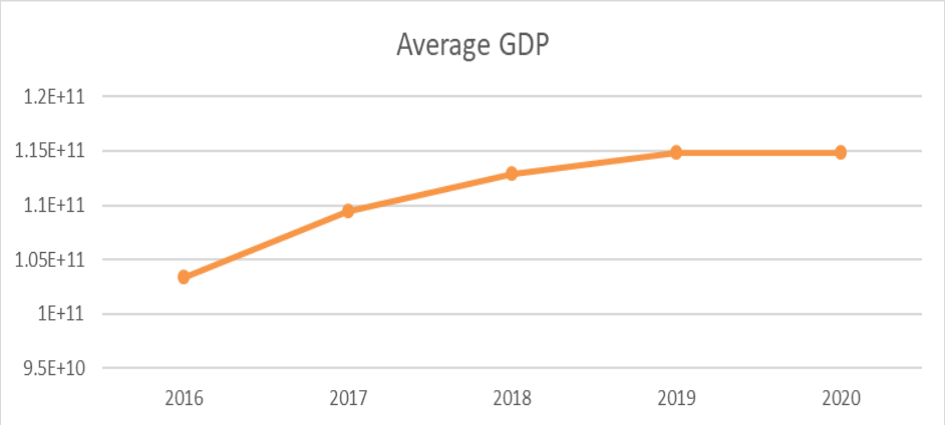
Islam's perspective on environmental protection as an act of religious duty and benevolence to all creatures, is different from that of the Western and non-Islamic worlds. For instance, in Islam, all other creatures apart from humans worship God, and humans are under religious obligation to ensure their protection. This is rarely acknowledged in other religions. Environmental protection provides the means by which such creatures are protected. Because religious beliefs lead to higher preference for environmental protection (Cabelkova et al, 2023), it is expected that the latter activity would be higher in Islamic countries. This provides the motivation for investigating the relationship between environmental protection and economic growth in the context of OIC member countries whose policies and programs are largely dictated by Islamic tenets.

The OIC member countries face several challenges including low levels of economic development, education, science and technology, environmental quality and governance (Wibowo, 2020). In the opinion of the current authors, addressing the issues of governance is important for resolving the challenges of the OIC. Specifically, government effectiveness is an important organ of governance that is necessary for all the systems of state to operate optimally for the achievement of set targets. Enhanced government effectiveness sharpens the managerial competences of civil and public service organizations (Liou, 2017) required for successfully executing and operationalizing public policies. In this regard, the current study intends to determine the intermediating

impact of government effectiveness of OIC member countries on the relationship between environmental protection and economic growth.

Figures 1 and 2 display data of average GDP and government environmental protection expenditure of OIC countries in the sample over the period under investigation. Based on Figure 1, GDP has followed an increasing trend from an average of USD 103 billion to USD 115 billion from 2016 to 2020. This approximates to 11.7% of GDP growth over the period. Figure 2 exhibits a similar trend with environmental expenditure moving upwards from about USD 8.4 billion in 2016 to USD 14.1 billion in 2020. The percentage increase over the period is approximately 67.9%. Figure 3 is a graphical representation of estimated government effectiveness scores obtained for the OIC sample countries in the year 2020. Information from figure 3 indicates only three out of the fourteen countries obtained positive scores. Though commendable, these positive scores are far below the maximum value of 2.5.

Figure 1: Average GDP of an OIC Member Country in the Sample Over 2016-2020 in USD Constant at 2015 Values.

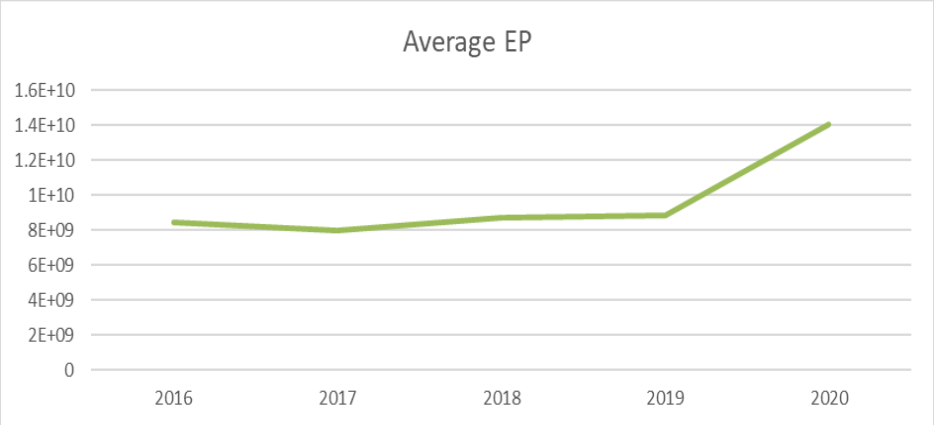


Source: Authors' generation with data from the World Bank

The study employed an extended version of the Cobb-Douglas production function, and Generalized Method of Moments (GMM) to analyze data of 14 OIC countries (indicated in figure 3) spanning from 2016 to 2020. Data availability especially, for government environmental protection expenditure, was the basis for selecting countries into the sample and the period under investigation. The results show that environmental

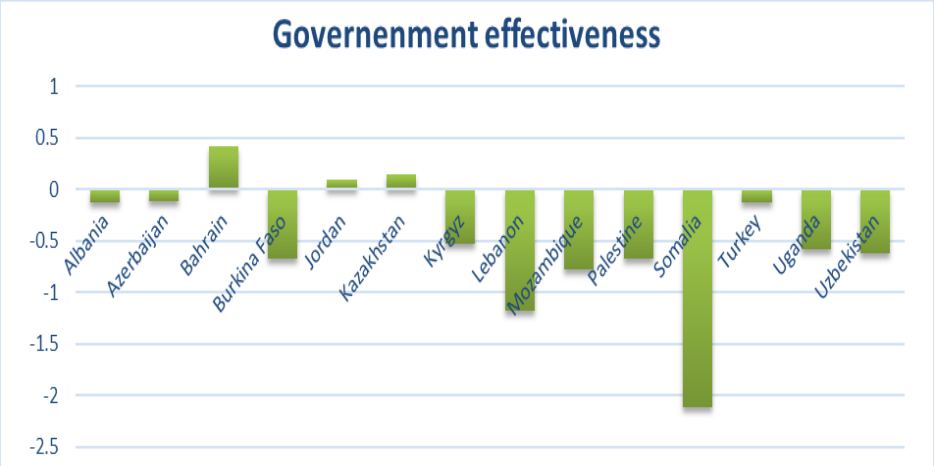
protection has a negative impact on economic growth. In addition, government effectiveness does not seem to have a moderating impact in the aforementioned relationship.

Figure 2: Average Government Environmental Protection Expenditure (EP) of an OIC Member Country in the Sample over 2016-2020 in USD Constant at 2015 Values.



Source: Authors' generation with data from the World Bank.

Figure 3: Government Effectiveness scores of the Sampled OIC Countries in 2020



Source: Authors' generation with data from the World Bank.

By way of policymaking, Islamic countries are required to adhere to principles underlined in Islamic tenets for dealing with inefficiency, corruption, apathy, and lack of professionalism in government agencies, especially in those involved in environmental protection activities.

This paper contributes to literature by augmenting the Cobb-Douglas production function with the government environmental protection expenditure variable, in the case of OIC countries. By integrating Islamic perspectives in explaining the outcomes in the current investigation, this paper extends knowledge in the environmental protection-economic growth nexus. The rest of the paper is organized as follows: Section 2 reviews relevant literature in the body of knowledge. Section 3 dedicates to methodology for estimations. In section 4, results and discussions are presented. Concluding remarks and policy implications are provided in section 5.

2. Literature Review

2.1 The OIC and Environmental Protection

Fifty seven (57) member countries spread across four continents make up the OIC. With a population of about 1.41 billion, the OIC countries are endowed with 70% and 40% of the world's energy and mineral resources respectively (Naim & Rahman, 2008, November). Despite the immense wealth, about 40% of the member countries have been categorized as low income developing countries (Ismail, Saputra & Abdul Aziz, 2019). Islam binds these countries together.

Already, some member states have been overwhelmed by desertification and deforestation (Abdullahi, 2019). There is therefore an urgent need for immediate action to curtail environmental problems in the OIC (Nihayah & Diastuti, 2023). A recent report shows that 90% of the ten most toxic countries belong to the OIC (Abdullahi, 2019). Apart from Albania, Azerbaijan and Turkmenistan, the environmental performance of all the upper-middle-income and high-income countries of the OIC have dropped from the year 2006 to 2018 (Ismail, Saputra and Abdul Aziz, 2019). Major challenges faced by OIC member countries in resolving environmental problems, include high cost in adopting environmental-friendly technologies, machinery for preventing desertification and

deforestation, and policies for reducing pollution, which especially may appear too heavy for poor countries to bear (Konac, 2004).

Other barriers to improving environmental performance among OIC members in Sahelian Africa especially, include the prevalence of corruption, crop failures, high interest rates, and low access to credits (Abdullahi, 2019). By far however, a major challenge is found in the low budget allocation for financing environmental protection activities (Nihayah & Diastuti, 2023). The experiences of Albania, Azerbaijan and Turkmenistan which focus on three important areas; renewable energy use and efficiency, national-international policy collaboration, and development of Protected Areas (Pas) could prove useful for the OIC in tackling the challenges (Ismail, Saputra and Abdul Aziz, 2019). These remedies require active support from governments through a systematic regulation that specifies the extent of public finances budgeted towards environmental protection activities (Nihayah and Diastuti, 2023).

2.2 Relationship between Expenditure on the Environment and Economic Growth

Environmental protection expenditure refers to the amount of money or economic resources expended for purposes of prevention, reduction and eradication of pollution, and other forms of environmental degradation resulting from production and consumption of goods and services (Moe & Braathu, 2014). Theoretically, high public environmental expenditure targeted at pollution abatement, is assumed to lower a country's rate of environmental quality and economic growth (Ansuategi & Marsiglio, 2017). This theory argues that such expenditure deprives growth-enhancing activities of resources, leading to a crowding out effect, which eventually has a negative impact on economic growth (Wen, 2021). From the perspective of Barro's (1981) theory however, the government puts an economic agent's private capital into the production process, and takes steps to prevent its marginal productivity from falling. Increase in economic growth is expected, if government expenditure influences an increase in the private agent's productivity otherwise, a decrease in economic growth would occur. Going by Barro's (1981) assumptions, only productive government spending has the capacity to cause an increase in economic growth. To the extent that environmental expenditure leads to improvements in environmental quality, the former has the capacity to increase productivity (productivity effect) (Ansuategi

& Marsiglio, 2017). Even though this is in line with Barro's theory, Ansuategi and Marsiglio (2017) suggest that the positive impact caused by environmental protection expenditure on economic growth is possible only if the productivity effect is large enough to surpass the crowding out effect.

Empirically, findings on the impact of environmental spending on economic growth are contradictory. In Kutasi and Marton (2020), the results indicate environmental spending has a negative impact on economic growth, but the impact is neither significant nor robust. Peng, Sheng and Wei (2020) also report the existence of a negative relationship between environmental spending and economic growth. On the contrary, findings of Ansuategi and Marsiglio (2017) and Lee, Won and Jei (2019) show that environmental protection expenditure has a positive impact on economic growth. According to Constant and Davin (2019), when an environmental tax is imposed on citizens followed by the simultaneous deployment of the tax revenues for education and environmental protection expenditures, an enhancement in the long-term growth rate is likely to occur. Also, the findings of Wen (2021) indicate the combination of green financial policies and green fiscal policies (public environmental protection expenditure) can cause an increase in the rate of economic growth. Employing a theoretical model, Bhattacharyya and Gupta (2021) find that the labor union's concern for the environment, and its employment orientation bias, produces a positive impact on economic growth. Finally, Tohamy Mohammed Eltayb (2021) suggests the impact of environmental protection expenditure on economic growth is dependent on governance quality, institutional performance and the structure of public expenditure.

The inconsistencies existing both in theory and empirical findings, provide motivation for undertaking further enquiry into the relationship between government environmental protection expenditure and economic growth, which appears to be lacking in the case of Islamic countries.

3. Methodology

3.1 Estimation Method and Models Specification

A quantitative panel data analysis approach using secondary data would be used in estimating the coefficients. An advanced technique is required

for dealing with issues such as cross-section dependence, heteroscedasticity and autocorrelation associated with panel data analysis (Tuncsiper, 2023). The General Method of Moments (GMM) is an advanced technique capable of overcoming these problems. Between the Difference and System GMM, the latter is preferred when the panel data to be analyzed has the number of units or countries (N) higher than the number of time series or periods (T). Specifically, the System GMM model developed by Arellano–Bover (1995)/ Blundell–Bond (1998) is equipped to resolve problems such as the presence of fixed effects, endogeneity of control variables, correlation between independent variables and past and current error terms, possible bias of omitted variables persistent over time, heteroskedasticity and autocorrelation within individuals (Roodman, 2009; Konstantakopoulou, 2022).

To eliminate the correlation between the differenced error term and lagged-dependent variable, Arellano and Bover (1995) and Blundell and Bond (1998) introduced the System GMM which deploys two equations for the purpose. In the differenced equation, the explanatory variables are instrumented using the lags of their level forms while in the levels equation, the instruments are the lagged first-differences of the variables. This results in the moment condition being solved (Konstantakopoulou, 2022). Also, the Windmeijer (2005) method for finite sample correction to eliminate the downward bias residual generated in one-step Difference GMM, can be performed in the two-step System GMM procedure, yielding a more robust estimate (Roodman, 2009). The Sargan test of over-identification for the validity of instruments, and the Arellano–Bond (AR2) autocorrelation to eliminate the presence of second-order autocorrelation for residuals, are the two essential diagnostic tests suggested by Arellano and Bond (1991) and Arellano and Bover (1995) that must be conducted to ensure the consistency of estimated coefficients. However, the Sargan test may be inconsistent. This inconsistency is dealt with by giving priority to the Hasen test which is technically superior to the Sargan, and the former is available in the two-step System GMM estimations (Roodman, 2009).

The data to be employed consists of information on 14 OIC countries covering the period 2016-2020. This implies the number of units (N = 14) is greater than the time series (T = 5). On this basis, this study would employ the two-step System GMM method, which proves to be the most suitable. Based on Konstantakopoulou (2022), the general System GMM

model given below provides the framework for estimating the impact of government environmental protection on economic growth of OIC countries;

$$y = \lambda y_{t-i} + \beta x_{it} + \gamma z_{it} + \eta_i + \varepsilon_{it} \quad (1)$$

$\mu_{it} = \eta_i + \varepsilon_{it}$

$\eta_i \backsim IID(0, \sigma^2\eta)$, $\backsim IID(0, \sigma^2\varepsilon)$ and $E[\eta_i\varepsilon_{it}] = 0$

For i = 1 . . . N and t = 2, ...T, where y_{it}, y_{it-1}, x_{it} and z_{it} represent dependent variable, lagged dependent variable, a matrix of independent variables, and a matrix of control variables respectively. μit is the error term, εit represents the random disturbance term, and ηi is an unobserved country specific effects or fixed effects which is correlated with y_{it-1}.

3.2 Specification of Models

This paper relies on the pioneering work of Cobb and Douglas (1928) for specifying the estimation models. The Cobb-Douglas production function is modeled around the assumption that productivity depends on two factors; capital stock and labor stock (Douglas, 1976). Recently, many studies including Tirfi and Oyekale (2022) have employed the extended version of the Cobb-Douglas production function for their regression models. Following these studies, the current paper employs augmented Cobb-Douglas production functions as follows;

$$GDP = B.FCF^{\beta 1}.FP^{\beta 2}.EP^{\beta 3} \quad (2)$$

$$GDP = B.FCF^{\beta 1}.FP^{\beta 2}.EP^{\beta 3}(EP * EFF)^{\beta 4} \quad (3)$$

Based on the GMM estimation model given in (1), the models to be estimated are specified in linear forms as given below;

$$LGDP = \beta_0 + \beta_1 LGDP_{T-I} + \beta_2 FCF + \beta_3 FP + \beta_4 EP + \lambda Z_{it} + \eta_i + \varepsilon_{it} \quad (4)$$

$$LGDP = \beta_0 + \beta_1 LGDP_{t-i} + \beta_2 FCF + \beta_3 FP + \beta_4 EP + \beta_5 EFF + \beta_6 EP * EFF + \lambda Z_{it} + \eta_i + \varepsilon_{it} \quad (5)$$

where LGDP, $LGDP_{t-1}$, FCF, FP, EP, EFF, and EP*EFF, are natural logarithm of GDP, natural logarithm of first lag of GDP, gross fixed

capital formation (proxy for capital stock)), labor force participation rate (proxy for labor stock), government environmental protection expenditure, government effectiveness, and the interaction variable of EP and EFF respectively. B_0 is constant, and β_1, β_2, β_3, β_4, β_5, β_6 and λ are coefficients to be estimated.

3.3 Variables and Data

Gross domestic product, environmental protection and government effectiveness represent dependent, independent and intervening variables respectively in this study. Following Solarin and Bello (2020), the current study would employ gross domestic product (GDP) as a proxy for economic performance. In line with Gholipour and Farzanegan (2018), government expenditure on environment protection is adopted as a proxy for environmental protection. Government effectiveness is an indicative quantitative measure of the level of a country's governance quality (Olaoye et al, 2021). This implies, government effectiveness is important for effectively utilizing available resources for achieving public policy goals, and an efficient market system through ensuring property rights, rule of law, and reduction in corruption (Sasmaz and Sagdic, 2020). Following Sasmaz and Sagdic (2020), this paper employs government effectiveness estimates as a proxy for government effectiveness. The World Bank describes government effectiveness as a measure that "captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies." The higher a country's score, the better its government effectiveness.

Being a fundamental aspect of the Cobb-Douglas production formulation, capital and labor variables would feature in all the various estimations to be undertaken. This paper follows Oryani et al (2021) and utilizes gross fixed capital formation as a proxy for capital stock. As in Verma et al (2022), total labor force (labor force participation rate) would be used as a proxy for labor stock. Several control variables which have proven to exert impacts on economic growth in previous studies, have been adopted as controls in this paper as well. They include FDI,

Table 1: Summary Description of Variables in the Study

Variable	Proxy	Unit of Measurement	Sources of Data
Economic performance	Gross domestic product (GDP)	United State dollars (US$), constant at 2015 prices	World Bank
Environmental expenditure	Central government expenditure on environment protection (EP)	Percentage of GDP	IMF
Government effectiveness	Government Effectiveness (EFF)	Units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5	World Bank
Capital stock	Gross fixed capital formation (FCF)	Percentage of GDP	World Bank
Labor stock	Labor force participation rate, total of 15-64 years economically active (FP)	Percentage of total population ages 15-64	World Bank
Trade openness	Sum of exports and imports (TOP)	Percentage of GDP	World Bank
Savings	Gross domestic savings (SAV)	Percentage of GDP	World Bank
Government consumption	General government final consumption expenditure (CSM)	Percentage of GDP	World Bank
Life expectancy	Life expectancy at birth (LEX)	Years	World Bank
Rule of law	Rule of Law (ROL)	Units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5	World Bank
Foreign direct investments	Foreign direct investment, net inflows (FDI)	Percentage of GDP	World Bank

Source: Authors'

Government consumption, life expectancy, trade openness, gross domestic savings and rule of law. Table 1 contains a summary description of, units of measurement, and sources of data for all variables in this study. The 14 countries under investigation include Albania, Azerbaijan, Bahrain, Burkina Faso, Jordan, Kazakhstan, Kyrgyzstan, Lebanon, Mozambique, Palestine, Somalia, Turkey, Uganda, and Uzbekistan.

4. Presentation of Results and Discussions

4.1 Descriptive Statistics

Descriptive statistics are presented in Table 2. The information puts the average GDP for the fourteen countries at about US$ 111.1 billion. Average environmental protection expenditure stands at 0.086 percent of GDP. Moreover, at an average score of -0.480, it appears government effectiveness for the OIC countries is very weak. This aligns with the suggestion that OIC member states are bedeviled with poor quality in public governance and services delivery, and high level of corruption (Wibowo, 2020).

Correlations between the variables are exhibited in Table 3. The information shows that government environmental protection expenditure is negatively correlated with GDP. This may seem to suggest that a rise in environmental expenditure would cause a fall in GDP. At this point though, it would be incorrect to assume a negative impact of environmental protection on economic growth since correlation is dissimilar to causation (Fuest, Neumeier & Stöhlker, 2018). Also government effectiveness and GDP are positively correlated.

Correlation values within the range 0.7-0.8 are regarded as high (Baur, & Hoang, 2021). Values exceeding 0.8 lead to the phenomenon of collinearity between the respective variables. Since collinearity leads to misleading regression results (Basagaña, & Barrera-Gómez, 2022), it is inappropriate to feature in the same regression variables between which there exist collinearity (Konstantakopoulou, 2022). According to information from Table 3, the correlation values between savings and government effectiveness, and between rule of law and government effectiveness are 0.828 and 0.886 respectively. Thus, collinearity may exist between the two pairs.

Table 2: Descriptive Statistics

	GDP	FCF	FP	EP	TOP	SAV	CSM	FDI	LEX	ROL	EFF
Mean	111.1	23.8	51.4	0.086	78.6	11.2	14.8	4.6	70.7	-0.611	-0.480
Std. dev.	245.5	5.4	13.3	0.106	27.8	23.2	4.7	5.4	7.7	0.636	0.615
Min.	5.79	8.1	34.6	0.000	29.1	-53.8	7.1	-5.2	55.0	-2.370	-2.251
Max.	1016	39.2	79.2	0.562	150.8	43.9	26.4	26.2	80.0	0.489	0.422

Source: Authors' calculation

Table 3: Correlations between Variables

Variable	GDP	FCF	LFP	EP	TOP	SAV	CSM	FDI	LEX	ROL	EFF
GDP	1.000										
FCF	0.253	1.000									
FP	-0.034	0.394	1.000								
EP	-0.206	0.077	0.501	1.000							
TOP	-0.265	0.111	0.057	0.169	1.000						
SAV	0.295	0.534	0.769	0.059	-0.053	1.000					
CSM	-0.054	0.352	0.068	0.273	0.301	0.064	1.000				
FDI	-0.185	-0.123	0.275	0.553	0.261	-0.132	0.207	1.000			
LEX	0.265	0.301	-0.001	-0.411	0.061	0.401	0.067	-0.307	1.000		
ROL	0.134	0.328	0.337	-0.107	0.026	0.713	0.217	-0.299	0.605	1.000	
EFF	0.277	0.439	0.458	-0.093	-0.005	0.828	0.121	-0.229	0.728	0.886	1.000

Source: Authors' calculation

4.2 Regressions Results

Prior to estimating the regression coefficients, data on GDP was transformed into its logarithmic form to make interpretation of the results easier based on the percentage change in economic growth. Table 4 and 5 contain regression results of the impact of environmental protection on economic growth, and the intervening effect of government effectiveness in the relationship respectively. Each table has seven columns. In Table 4, column (1) represents a regression estimation with the main independent variables namely capital stock, labor stock and environmental protection. In the subsequent columns, various control variables are introduced in succession to test the specificity and accuracy of the impact from environmental protection.

According to the results from Table 4, the first lag of GDP has a positive impact on economic growth across all columns. It means the incorporation of dynamics in the model is justified. The results provide evidence that government environmental protection expenditure has a significant negative impact on economic growth. This can be seen in the coefficient exhibited by EP. Based on column (7) where the Chi-square test value is the highest, the results show that a 1 unit increase in environmental expenditure causes economic growth to decrease by about 0.949 %.

On the whole, results from Table 4 appear to support the Cobb-Douglas framework, as all the coefficients of FCF and FP show positive impacts on GDP. The figures in column 7 show both variables have significant positive impacts on economic growth. With regards to the impacts of the remaining control variables, trade openness, government consumption, rule of law, and government effectiveness have positive but not significant impact on GDP. On the whole, gross domestic savings, foreign direct investments, and life expectancy have negative impacts on GDP. Similarly these impacts are not significant. In the case of FDI however, the impact is seen to be significant in only one of the four columns in which the variable was featured. As a result, it would seem reasonable to declare the impact as insignificant.

Both the null hypotheses for Arellano-Bond test for AR (2), and Hansen test implying there is absence of second-order autocorrelation, and that instruments used are valid respectively, have been upheld in all columns. This makes the results robust. On this basis, the results suggest that government environmental protection expenditure has a negative impact on economic growth.

Table 4: Two-step System GMM Estimations of the Relationship between Environmental Protection and Economic Growth

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$LGDP_{t-1}$	0.856***	1.087***	1.227***	1.053***	0.986***	1.086***	1.100***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FCF	0.006	0.020	0. 024*	0.005	0.006	0.010*	0.010**
	(0.332)	(0.510)	(0.079)	(0.713)	(0.513)	(0.060)	(0.025)
FP	0.010*	0.024*	0.025**	0.028*	0.027*	0.030**	0.029**
	(0.073)	(0.079)	(0.039)	(0.084)	(0.097)	(0.022)	(0.046)
EP	-0.854**	-0.810*	-0.932*	-0.962*	-0.935**	-0.965**	-0.949**
	(0.016)	(0.019)	(0.098)	(0.073)	(0.043)	(0.031)	(0.045)
TOP		0.001	0.001	0.001	0.000	0.001	0.001
		(0.855)	(0.700)	(0.792)	(0.897)	(0.784)	(0.775)
SAV		-0.021	-0.020	-0.014	-0.012	-0.019	-0.020
		(0.457)	(0.199)	(0.165)	(0.386)	(0.169)	(0.166)
CSM			0.026	0.005	0.005	0.001	0.001
			(0.580)	(0.680)	(0.608)	(0.868)	(0.914)
FDI				-0.009	-0.010*	-0.007	-0.007
				(0.108)	(0.089)	(0.145)	(0.196)
LEX					0.004	-0.004	-0.006
					(0.482)	(0.685)	(0.736)
ROL						0.176	0.173
						(0.366)	(0.430)
EFF							0.031
							(0.884)
Wald chi2 test	302.79	2102.50	456.91	8043.19	2483.33	26018.63	44818.79
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Arellano-Bond test for AR(2)	0.085	0.847	0.507	0.878	0.830	0.901	0.987
Sargan test	0.942	0.846	0.151	0.787	0.611	0.823	0.718
Hansen test	0.946	0.930	0.404	0.837	0.911	0.974	0.838

Notes: ***, **, and * are significance level at 1%, 5% and 10 respectively. $LGDP_{t-1}$, is the natural logarithm of GDP_{t-1},

In column (1) of Table 5, apart from the lag-dependent variable, capital stock, and labor stock, there are also environmental protection expenditure and the interactive variable (EP*EFF) constituting the explanatory variables in the estimation. The results in column (7) show the impact of capital and labor stocks remain the same as in Table 4. As expected, government environmental protection expenditure shows a consistent significant negative impact on economic growth. The results indicate that a 1 unit increase in environmental expenditure, would cause economic growth to decline by 0.947%. This impact is marginally lower than what was observed in the first model, which was without the interactive variable.

The impact exhibited by EP*EFF is not significant, indicating that government effectiveness does not moderate the relationship between environmental protection and economic growth. Also, government effectiveness does not contribute to economic growth as the impact of EFF is not significant. Again, the Arellano-Bond test for AR (2), and Hansen test outcomes in Table 5 indicate the results are robust. In summary, the regression analyses reveal two important findings;

1. Government environmental protection expenditure has a significant negative impact on economic growth and
2. Government effectiveness has no moderating impact on the relationship between environmental protection and economic growth.

The finding of a negative relationship between government environmental protection expenditure and economic growth, contravenes findings in Ansuategi and Marsiglio (2017), Lee, Won and Jei (2019), and Constant and Davin (2019) where the relationship appeared positive. Of course, this is understandable, and can be explained in terms of jurisdiction. In Ansuategi and Marsiglio (2017), and Lee, Won and Jei (2019), the objects of investigations are EU countries, and Korea and China respectively. In these countries, technology, quality of governance, government effectiveness, infrastructural development, and quality of education are relatively advanced compared to those of the countries sampled in the current study. In addition, the level of corruption is far lower than what prevails in many of the OIC countries. While in the EU, Korea and China, a higher portion of the resources deployed for environmental protection would reach their intended destinations, and therefore enhance environmental quality and economic growth, such cannot be guaranteed in the OIC.

Table 5: Two-step System GMM estimations of the Mediating Role of Government Effectiveness in the Relationship between Environmental Protection and Economic Growth

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$LGDP_{t-1}$	0.855***	0.854***	1.032***	1.017***	1.037***	1.077***	1.096***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FCF	0.007	0.007	0.007	0.008***	0.007	0.007*	0.010**
	(0.489)	(0.127)	(0.122)	(0.008)	(0.185)	(0.071)	(0.011)
FP	0.011	0.010**	0.024	0.026**	0.029	0.029*	0.029*
	(0.124)	(0.049)	(0.136)	(0.022)	(0.112)	(0.083)	(0.061)
EP	-0.727*	-0.823*	-1.042***	-1.009***	-1.055**	-1.072*	-0.947**
	(0.081)	(0.057)	(0.008)	(0.002)	(0.018)	(0.052)	(0.030)
EP*EFF	0.239	0.090	-0.071	-0.174	-0.102	-0.146	-0.004
	(0.524)	(0.868)	(0.763)	(0.430)	(0.729)	(0.722)	(0.991)
EFF		0.025	0.103	0.091	0.092	0.145	0.029
		(0.792)	(0.275)	(0.253)	(0.314)	(0.476)	(0.857)
TOP			0.000	0.000	0.000	0.001	0.001
			(0.914)	(0.981)	(0.932)	(0.759)	(0.690)
SAV			-0.014	-0.014	-0.016	-0.018	-0.020
			(0.337)	(0.127)	(0.261)	(0.144)	(0.101)
FDI				-.007**	-0.009*	-0.008	-0.007
				(0.037)	(0.074)	(0.154)	(0.193)
CSM					0.005	0.004	0.001
					(0.603)	(0.668)	(0.919)
LEX						-0.003	-0.006
						(0.813)	(0.648)
ROL							0.170
							(0.282)
Wald Chi2 test	383.18	361.46	3532.58	8781.16	9816.49	61592.32	936454.16
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Arellano-Bond test for AR(2)	0.086	0.078	0.380	0.769	0.912	0.976	0.964
Sargan test	0.827	0.763	0.628	0.864	0.868	0.756	0.710
Hansen test	0.841	0.874	0.619	0.970	0.959	0.851	0.840

Note: ***, **, and * are significance level at 1%, 5% and 10 respectively. $LGDP_{t-1}$, is the natural logarithm of GDP_{t-1}. EP*EFF is an interaction variable formed from EP and EFF.

Though the findings of Constant and Davin (2019) are largely based on theoretical models, they provide logical comparison for the current findings. Constant and Davin (2019) rely on the assumption that the government takes absolute responsibility for protecting the environment, while at the same time imposing an environmental tax for purposes of meeting environmental expenditure. However, in the OIC where policies are mainly guided by Islamic principles, the responsibility for protecting the environment seems to have been placed in the hands of individuals or humans, this may seem to relegate the government's role in environmental protection to the background. The lack of clarity on the role of the state in environmental protection from the Islamic perspective, could lead to government apathy towards ensuring that public expenditure on environmental protection bears good fruits.

However, the finding aligns with the results in Peng, Sheng and Wei (2020) where environmental spending is found to have a negative impact on economic growth. Peng, Sheng and Wei (2020) conducted the study on the Chinese province of Jiangsu, and concluded that among other measures, promotion of scientific and technological innovation, and cultivation of high-end talents are required to reduce the negative impact of environmental protection on economic growth. The problems identified by Peng, Sheng and Wei (2020) relating to Jiangsu province equally afflict many of the OIC countries. The finding regarding the intervening role of government effectiveness is also in line with Cabelkova et al (2023), whose results show that government surveillance in public areas promotes both environmental protection and economic growth. Government surveillance in this regard, is as an activity indicative of deploying government effectiveness towards environmental protection endeavors, while ensuring economic growth is not derailed. Even though the moderating effect of government effectiveness in the current paper is not significant, the overall negative sign of the coefficient of the interactive variable (EP*EFF) suggests that improvement in government effectiveness in the sample OIC countries, could prove useful in reducing the negative impact in the relationship.

5. Conclusion

The havoc caused to lives, businesses and economies by environmental degradation is alarming. Not surprisingly, four out of the seventeen SDGs namely, SDG-6, SDG-13, SDG-14, and SDG-15 are directly related to

environmental protection. Under Islamic tenets, environmental protection is viewed both as an act of benevolence towards creatures of Allah, and worship to the Creator of all beings (Allah), though the role of an Islamic state in this regard appears vague. Policies of the OIC are largely guided by Islamic principles, and member countries are envisaged to hold environmental protection in high esteem. OIC countries are exposed to a tradeoff between environmental protection and economic growth following the perspective of Cabelkova et al (2023). Thus, this paper investigated the impact of environmental protection on economic growth of OIC countries.

The results show that environmental protection by the government has a negative impact on economic growth. Further, the results indicate government effectiveness does not moderate the impact in the relationship mentioned above. The findings have policy making implications for the OIC, especially the sampled countries. Governments of OIC countries would have to take urgent measures in reversing the negative impact observed, and the solution is not far-fetched. There is the need for governance reforms in the OIC, specifically in the area of government effectiveness. Governments would have to roll out policies that seek to improve the administrative capacity of state agencies which are affiliated to environmental protection activities.

Finally, the OIC would have to encourage its member countries to formulate environmental sustainable regulatory policies, derived from Islamic jurisprudence, that make environmental abuse of all forms punishable by law. Such policies should also spell out the role of the state in environmental protection from the perspective of Islamic Worldview that makes it obligatory for state authorities to shoulder the primary responsibility of protecting the environment, in line with the recommendations of the OECD. In that way, leaders of OIC member countries would be discharging their individual religious responsibilities towards Allah, while at the same time, acting on behalf of the state to show benevolence to all creatures of Allah.

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