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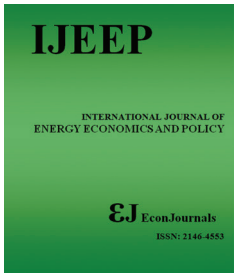

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Effects of Economic Deterrence Theory and Environmental Regulation on Tax Evasion: Evidence from Energy Sector

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ABSTRACT

Environmental regulation is the responsibility of individuals, corporations, and other entities to prevent environmental damage or improve the tarnished environment. The Environmental law of every country works to protect the natural resources of land, water, air, and soil. There is research evidence that environmental regulation influences corporate taxes. Economic deterrence theory acted as deterrent to threats of punishment for unwanted or illegal behavior. The fundamental concept of the theory is deterring the taxpayers into compliance by the risk of audit, penalty, etc. The objective of the study is to analyze the impact of economic deterrence theory and environmental regulation on corporate tax evasion, particularly petroleum profit taxes in Nigeria. The components of Economic deterrence theory (tax agents, tax complexity, tax knowledge) and environmental regulations are the independent variables and corporate tax evasion particularly PPT is the dependent variable of the study. It is quantitative research based on primary data which was collected from the oil and gas companies' representatives. Structural Equation Modelling techniques were applied, and the outcome of the research is a positive and significant relationship between tax agents, tax complexity, tax knowledge, and environmental regulations on corporate tax evasion. The result further shows a positive but non-significant relationship between tax audits and perceived petroleum profit tax evasion. The study draws the attention of policymakers to formulate environmental regulations that are more robust, simple, and flexible, to reduce adverse effects of environmental damage on the economic growth and development of oil and gas-producing countries.

Keywords: Environmental Regulation, Tax Evasion, Economics Deterrence Theory, Energy Sector
JEL Classifications: E5, E6, E7

1. INTRODUCTION

Environmental regulations are formulated by the relevant authorities to protect water, land, air, and soil from pollution. Currently, many nations are affected adversely by environmental damage, which has a great effect on people and the climate, despite leaders and relevant stakeholders working round the clock to mitigate environmental damage, caused mainly by operations of companies (Javeed et al., 2021). It was argued that environmental issues are considered as a great impediment for all nations particularly developing countries (Ahmed et al., 2022). . Globally, leaders have been discussing the aggravating effects of climate change, which was a matter of grave concern at the recent 77th United Nations General Assembly (UNGA) in 2022. Noting that there is an extensive debate regarding the importance of regulations for the protection of the environment, Chen et al. (2022) posited that environmental regulations can help to solve associated problems in many countries. For example, Nigeria, has several environmental regulations targeted at protecting its waterways, and mitigating air, land, and soil pollution. One of the reasons for the introduction of several environmental regulations is because of indiscriminate pollution which is currently occurring due to oil spillage resulted from oil and gas companies' exploration activities (Nwaichi and Osuoha, 2022).

More than 33 environmental regulations are listed under Section 34 of the National Environmental Standards Regulations and Enforcement Agency (NESREA) Act 2007. More importantly, these regulations come under the Constitution of the Federal Republic of Nigeria 1999 (Nesrea, 2023). These regulations apply to all individuals and companies, especially oil and gas companies, because of the nature of their operations. These regulations are imperative considering that Nigeria is an oil-dependent country (Otaha, 2012; Nweze & Edame, 2016; Dauda, Alege, Ewetan, & Asemota, F 2023).

Countries have different categories of environmental regulations suitable for their context and policies; some policies are more stringent which can bring about revenue through the imposition of penalties on offenders, while others can be less strict, such as regulations to encourage more investment. In line with the latter, Zhang et al. (2022) reiterated that to implement environmental regulations effectively and efficiently, there is a need to consider the economic aspect as well and not just pollution control. There is a strong connection between environmental regulations and economic development according to Song et al. (2022), who postulated that environmental regulations could lead to economic quality. Balancing the effects of regulations on the protection of the environment and on the economy, is one of the key drivers of growth and development of a country (Jiang and Lyu, 2021). The bottom line is that the employment of environmental regulations can have negative or positive effects on the economic development of a nation. This assertion is concurrent with Song et al. (2021), who stressed that environmental regulations offer both novel opportunities and constraints towards a nation's progress. It is crucial that all governments implement laws for environmental protection, to attract potential investment. Accordingly, the economic impact of such regulations on firms should be investigated to help policymakers formulate the right policies.

The energy industry comprises companies that are major polluters due to the nature of their operations; one example is the oil and gas industry in most of the oil producing countries. Activities and operations, like oil exploration, drilling, production, and transportation, are all major causes of pollution. This contention establishes a strong connection between companies in the oil and gas industry and environmental regulations. Frequently, failure to comply with environmental regulations may result in the payment of a fine or penalty. However, firms tend to treat paying fines for non-compliance of environmental regulations as another cost of doing business, which sometimes is included as an additional cost of production (Hayes et al, 2018). Extant literature has evinced those environmental regulations have a significant influence on company behavior (Ghobadian et al., 1998; Williamson et al., 2006; Lucas et al., 2008).

In line with the above background, four critical issues motivate this study: The Nigerian economy is mainly based on revenue from the petroleum industry. Examining the factors that influence oil and gas companies' behaviour in Nigeria would be of great significance since the country largely depends on the revenue from this industry (Asagunla and Agbede, 2018; Olayungbo, 2019; Idris and Oruonye, 2020; Raifu, 2021). Despite the immense contribution of tax revenue to the Nigerian economy, studies have shown that oil and gas companies are evading taxes (Mas'ud et al., 2020; Ya'u et al., 2020; Nkwoji, 2021. It is essential to the government to generate tax revenue and regulate the tax evasion from this industry; therefore, it is necessary to study the corporate tax compliance model, which comprises tax audit, tax agent, tax complexity, and tax knowledge, to examine perceived petroleum profit tax evasion (Mohd-Isa's, 2012).

The oil and gas companies have a close association with environmental regulations. A study of environmental regulations within the context of Nigeria's oil and gas industry has been conducted by Mas'ud et al. (2020) and Ya'u et al. (2020), among others. Their studies have been undertaken from different theoretical perspectives without considering that regulations could be a form of deterrence that needs to be studied from the perspective of the Economic Deterrence Theory. Based on environmental regulations from the perspective of economic deterrence, it is essential to analyse the impact of environmental regulation on corporate tax evasion.

Although the concept of tax evasion has been analysed in previous studies focused on individual tax evasion, very few studies have examined tax evasion in corporate behaviour. Thus, considering that environmental regulations are often designed to regulate the behaviour of companies in their operating environment, this study expands that of Mohd-Isa (2012) to study environmental regulations in relation to corporate tax evasion.

Most of the previous studies considered government agencies (Mas'ud et al., 2020); only a very small number of studies focused on private oil companies. In this regard, the present study deploys a larger sample and purely concentrates on private oil companies, for which such regulations are mainly designed. It is also one of the reasons to organise this research based on private oil corporations.

Consistent with these motivations, this study explores the effects of the aforementioned constructs jointly with environmental regulations on perceived corporate tax evasion as the dependent variable. The model proposed in this study is novel and the results add to the existing body of knowledge. The rest of this paper is organized as follows: the literature review is presented in section 2.0, section 3.0 is the methodology, while section 4.0 is the results and discussion. Section 5.0 discusses the implications and section 6.0 concludes the study.

2. LITERATURE REVIEW

2.1. Nigerian Petroleum Profit Tax Act

The Nigerian Petroleum Profit Tax Act (PPTA) was enacted in 1959, as amended in 2004. The main objective of this Act is to ensure that oil and gas companies operating in Nigeria pay the right petroleum profit tax (PPT) (Kyari, 2013). The relevant section in this Act is as follows:

"*Winning or obtaining and transporting petroleum or chargeable oil in Nigeria by or on behalf of any organization engaged in petroleum operations for its own account through mining, drilling, extraction or related oil exploration activities, excluding refining*

at a refinery, as a result of a business carried out by the company engaged in oil exploration and production, and all operations incidental thereto and or any sale or disposal of chargeable oil by or on behalf of the company" (FIRS, 2023).

An additional objective of this Act is to improve government revenue for the overall growth of the economy, as the oil and gas sector is the mainstream source of government revenue (Aminu et al., 2020). Several scholars have attempted to define PPT, especially in the context of Nigeria. For example, PPT is considered as the tool used by the government for the purpose of establishing economic rent balances between the oil majors and the host countries (Amiesa et al., 2018). Furthermore, PPT is a direct tax levied yearly on the petroleum companies' chargeable profit for conducting exploration activities in the host countries' territorial water and land, and it serves as an avenue for generating a huge amount of revenue from hydrocarbon fortune of the host nation (Evans and Hunt, 2011). The PPT is recognized as a tax specifically on upstream oil companies; non-upstream oil companies are not mandated to pay PPT (Odusola, 2006). Fundamentally, PPT relates to the chargeable profit related to oil mining, exploration, royalties, and rent (Gbegi et al., 2017). Following the explanation of PPT in the PPTA of 1959 as amended in 2004, as well as its definitions by some researchers, it is evident that PPT is a direct tax promulgated by law in Nigeria and imposed on oil and gas companies operating in the upstream oil sector. Consequently, this study examines perceived PPT evasion behavior of oil majors in Nigeria, considering the importance of this sector to the economic development of the country.

2.2. Environmental Regulations in Nigeria

Available literature and reports have indicated several legislations and institutional frameworks of the Nigerian petroleum industry, which regulate the activities of oil and gas companies in the country. The main ones are the Constitution of the Federal Republic of Nigeria (FRN), laws made by federal, state and local governments, and international treaties (Ite et al., 2016). The country's environmental objective is enshrined in Section 2 of the 1999 Constitution of FRN as amended, and section 20 describes the right to a healthier environment (Fagbohun, 2007). More importantly, there are several legal instruments available to protect the Nigerian petroleum industry (Ite et al., 2013). Specifically, the federal government has enacted laws to safeguard the Nigerian Petroleum Industry, and some of these laws are:

"Oil Pipelines Act 1956 as amended (1965); Mineral Oils Safety Regulations (1963); Oil in Navigable Waters Acts (1968); Petroleum Drilling and Productions (1969); Petroleum Decree (1969); Petroleum Drilling and Production Amendment Regulations (1973); Petroleum Refining Regulations (1974); Associated Gas Re-injection Act (1979); Federal Environmental Protection Agency Act (1988); National Policy Environment 1989 as amended (1999); The National Environmental Protection Effluent Limitations Regulations (1991); Environmental Impact Assessment Act (1992); and DPR Environmental Guidelines and Standards for the Nigerian Petroleum Industry (2002)" (Ite et al., 2016, p. 6).

This above are the relevant laws and regulations governing the activities of oil and gas companies' operations in Nigeria, which serve as evidence of the likely influence of environmental regulations on the activities of oil majors in Nigeria. It is hoped that the findings can offer exciting and novel knowledge that can help policymakers to design appropriate environmental policies for the development of the energy industry.

2.3. Perceived Petroleum Profit Tax Evasion

Tax evasion is regarded as a complex phenomenon due to the scarcity of information that captures all its features. However, in developed countries, random stratified audits are used to measure tax evasion (Alstadsæter et al., 2019). The authors further emphasized that the random audit is essential for revealing unreported income and manipulations of tax credits, which are generally all forms of tax evasion. Alm and Malézieux (2021), after examining 70 articles using experiments to determine individual tax evasion behavior, found that tax audit is one of the key determinants of tax evasion amongst individuals. Alstadsæter et al. (2022) confirmed that enforcement is one of the vital determinants of tax evasion by Norwegian individuals. The debate on the determinants of tax evasion is on-going, depending on a country's tax policies. For instance, Kemme et al. (2020) argued that tax evasion is strongly associated with low tax morale; they evinced this through a cross-border investigation of over 21 OECD countries with low tax morale using the World Value Survey (WVS). Many scholars believe that it is hard for respondents to agree to being evaders; however, a perception of tax evasion can be measured using an instrument (Ariyanto et al., 2020; Owusu et al., 2020; Saragih and Putra, 2021). In view of this evidence, this study examines the perception of petroleum profit tax evasion (hereafter PPPTE) in oil and gas companies in the Nigerian energy sector.

2.4. Tax Audit

Tax audit is defined as the ability of the tax authority to examine the accounting documents and information of taxpayers, especially where there is suspicion that they have not filed the right tax liability. Allingham and Sandmo (1972) postulated that tax audits have significant effects on taxpayers' compliance behavior. Additionally, auditing taxpayers' prior year documents have a great impact on their reporting behavior in the subsequent year (Advani et al., 2018). Tax audit has been reported to have a great impact on both tax reporting and financial reporting of companies (Li et al., 2019). The use of audits by the relevant tax authorities has a significant impact on tax compliance behavior (Araújo Marques et al., 2020). On the other hand, Bérgolo et al., (2018) reported that there is misconception of tax audits due to lack of available information at the taxpayers' disposal. Based on the above evidence, tax audit is one of the factors affecting tax compliance behavior. The findings on its effects are not conclusive; hence, this study explores its effects on PPPTE amongst oil and gas taxpayers.

2.5. Tax Agents

Tax agents can be defined as the group of individuals with requisite knowledge about the tax system. The tax authority is responsible for formulating tax regulations, enforcing them, educating taxpayers, and collecting tax, as well the general administration of taxes. As most taxpayers may have little or no knowledge about

the entire tax system, which they are mandated to comply with, they need to hire a tax agent who is an expert in the field. Extant studies have indicated that understanding the role of tax agents in helping taxpayers to meet their tax obligations is essential (Isa et al., 2014). Tax agents are seen as professionals who possess technical competencies and act diligently (Marshall et al., 2010). Tax agents play dual roles by serving both as promoters of their clients and the tax authority (Hamid, 2014). The author further reiterated that with the implementation of the self-assessment system (SAS), the tax agent's role is becoming more challenging, since the numerous responsibilities have been transferred to taxpayers by the tax authority. Tax agents have a great influence on tax compliance, especially in countries which use the SAS in their tax regimes (McKerchar et al., 2005). Available literature on tax agents has demonstrated their importance towards tax compliance behavior. Hence, this study investigates their effects on PPPTE in oil and gas companies, which to the best knowledge of the researcher, has not been undertaken previously.

2.6. Tax Complexity

Tax complexity is a situation in which the taxpayers perceive the tax system to be so difficult to understand due to its sophisticated nature. A Malaysian study has indicated that most of the individual taxpayers perceive the SAS as complex (Saad, 2014). In the US, the social taxes, tax rates, estimated tax, and self-employment taxes, are perceived to be less complex (McKerchar et al., 2005). In some cases, a complex tax system increases taxpayers' cost of compliance, although in some jurisdictions like the US, companies can make claims of their costs associated with tax complexity (Zwick, 2021). Furthermore, in a comparative study between the UK and Turkey, it has been found that the tax complexity level is high in Turkey; hence, it would be worthwhile to simplify the tax system (Budak and James, 2018). Tax complexity appears to be one of the main factors affecting salaried taxpayers in Malaysia (Mat Jusoh et al., 2021). Tax complexity is a multi-dimensional phenomenon, and each country has different tax systems, their level of complexity being varied as well. The Nigerian tax system is not too different from other countries; hence, this study examines the influence of tax complexity on PPPTE amongst oil and gas companies.

2.7. Tax Knowledge

Tax knowledge refers to the ability of taxpayers to become acquainted with the relevant tax laws and regulations in force. With increased tax knowledge, taxpayers may consider tax evasion to be more difficult (Eriksen and Fallan, 1996). Tax knowledge provides direction to taxpayers on the applicable tax rules and regulations; it also serves as an important channel for tax compliance in the future (Saad, 2014). Moreover, an increase in public awareness of tax regulations can enhance voluntary tax compliance (Palil, 2010). Similarly, tax knowledge implies basic economic awareness, comprehension of the procedures, the obligation to be tax- compliant, and to be clear about tax rules and regulations (Bornman and Ramutumbu, 2019). Evidence from extant literature has indicated that taxpayers have little or no knowledge about the tax regulations, and hence, they are extremely misinformed (Fauziati et al., 2020). Making tax knowledge readily available to taxpayers would help the tax authorities to recognize elements of tax evasion of taxpayers (Wassermann and Bornman, 2020). Also, increasing the understanding of the tax system by taxpayers, can increase the level of their acceptance of the tax policies, thereby also increasing compliance (Musimenta, 2020). From the above review, it is evident that tax knowledge is a means of ensuring that taxpayers are adequately acquainted with tax policies and procedures to help them to comply, thereby reducing the tendency of tax evasion. Consequently, this study examines the effect of tax knowledge on PPPTE amongst oil majors.

2.8. Environmental Regulations

Countries around the globe have implemented numerous standards and laws to protect their environment. Environmental regulations are imposed across countries due to global environmental deterioration which poses a danger to public health (Zhou et al., 2021). Due to this, and the need to achieve sustainable economic growth, several developing countries globally are trying to make their environmental regulations more stringent (Liu et al., 2021). In related studies, some scholars have reported that environmental regulations on carbon emission have a significant influence on green technology innovation (Chen et al., 2022). Thus, reduction of carbon emission by enforcing environmental regulations is vital for sustainable development (Nie et al., 2021). On the other hand, the implementation of poorly thought-out environmental regulations will increase environmental problems (Wu et al., 2021). Several industrial business activities which have a direct and significant impact on environmental quality, such as distribution, consumption, and production, are largely affected by environmental regulations (Farooq et al., 2022). Fundamentally, from the above review, one can deduce that environmental regulations can be considered as the existing laws, rules, guidelines, decrees, acts, and standards formulated by relevant authorities to safeguard the environment. Oil and gas companies operating in Nigeria must comply with all kinds of environmental regulations; hence, this study explores its effects on PPTE for the first time.

2.9. Theories

2.9.1. Economic deterrence theory

The economic deterrence theory emanated from the work of Allingham and Sandmo (1972), which is an extension of the work of Becker (1968) on the economics of crime approach. This theory advocates that taxpayer need economic factors to be able to decide whether to comply with tax obligations. The action taken by taxpayers on whether to comply is dependent on the likelihood of the expected utilities (Mitchell, Voon & Hepburn, 2019). The most well-known deterrence approach that makes taxpayers comply is the general deterrence approach, which is related to the effect of likely sanctions and punishment (Alm, 2019). Basically, the general view is that taxpayers around the globe are rational and demonstrate non-compliance attitude, especially in countries where the deterrence level is low (Ebimobowei and Peter, 2013). The central argument of the deterrence theory is that variables, such as tax rate, penalty, and detection probability, are the function of taxpayers' decision-making behavior (Allingham and Sandmo, 1972). Mohd-Isa (2012) argued that tax audits, tax agents, tax complexity, and tax knowledge, have deterrence elements. This study hence uses the economic deterrence theory of Allingham and Sandmo (1972) to support the findings from these constructs.

2.9.2. Economic theory of regulations

The economic theory of regulations describes how regulations have a negative or positive impact on industry (Stigler, 1971); a regulation which is beneficial to the industry is regarded as positive and vise-versa. The researcher further reiterated that each industry is regulated by certain regulations which are designed to control the activities of that industry for the benefit of all stakeholders. Therefore, because of the polluting nature of the oil and gas industry, the Nigerian government has designed numerous environmental regulations for oil and gas companies to comply with, thus safeguarding the country's territorial waterways and land. The economic theory of regulations would support the findings on environmental regulations as a construct in the current study.

2.10. Hypotheses Development

2.10.1. Tax audits and perceive petroleum profit tax evasion

Literature on the influence of tax audits on tax compliance, has reported mixed findings from several jurisdictions across the globe. For instance, using data from UK's self-assessment returns for random audit program, the finding reveals that within 5 years after the audit reports, the magnitude of tax evasion declined (Advani et al., 2018). Additionally, Li et al. (2019), examined the corporate tax audit determinants and its consequences in China, and found that after company audits, their effective tax rates significantly increased and reduced their income. Siregar et al. (2019) found a non-significant difference between tax audits and tax compliance amongst corporates taxpayers. Using a sample of 6,181 companies from Uruguay, the authors found a great misunderstanding and overestimation of probability of audits amongst the firms (Bérgolo et al., 2018). Another empirical finding has shown that tax audits have a wide disparity effect with respect to post-audit compliance. Thus, tax audits can bring about two outcomes: An ineffective tax audit decreases post-audit tax compliance; while an effective tax audit increases post-audit tax compliance (Kasper and Alm, 2022).

Based on the above empirical findings, and the absence of studies which have examined the effects of tax audits on PPPTE in the non-renewable energy sector, this study develops the following hypothesis:

H_1: There is a negative relationship between tax audits and perceive petroleum profit tax evasion

2.10.2. Tax agents and perceive petroleum profit tax evasion

There has been a growing concern regarding the paucity of empirical literature on the influence of tax agents on tax compliance. Consequently, some of the available studies were systematically reviewed. A comparative study between New Zealand and Malaysia has found that the approach to comply with the relevant tax law appears to be the most significant element towards demonstrating tax agents' compliance behavior in both New Zealand and Malaysia with regards to under-statement of income and over-statement of expenses (Hamid, 2014). Additionally, it has been found that tax agents' attitude can be considered as contradictory; on the one hand, they assist in mitigating tax non-compliance, and on the other hand, they sometimes use their relevant tax knowledge to offer tax incentives to their clients during tax planning, which can lead to increased tax evasion (Borrego et al., 2013). Moreover, evidence has indicated that the tax agent is critical for tax compliance, as taxpayers perceive tax payment as difficult, and use the tax agents for better tax returns reporting (Niemirowski and Wearing, 2003). The authors further found three vital roles of tax agents, i.e., they offer tax advice, help in their client's tax preparation and remittance, and serve as risk managers for tax maximization.

Following the findings above, coupled with the fact that the variable has not been critically examined for its nexus with PPPTE, the following hypothesis is developed:

H_2: There is a negative relationship between tax agents and perceive petroleum profit tax evasion

2.10.3. Tax complexity and perceive petroleum profit tax evasion

Tax complexity has been found to have a great influence on tax compliance behavior of salaried taxpayers under the SAS in Malaysia (Mat Jusoh et al., 2021). Abdul and McFie (2020) reported that tax complexity has a significant effect on the fairness perception of the taxpayers, which may invariably affect their compliance behavior. In another development, due to the lack of solid knowledge by taxpayers, they see the tax system as extremely complex, which affects their compliance behavior (Saad, 2014). From the US tax practitioners' viewpoint, deferred tax exchange and retirement plan are some of the tax systems which are regarded as complex, while accrual methods and corporate capital gain are considered as the least complex tax systems (McKerchar et al., 2005). Notwithstanding, knowledgeable tax practitioners upsurge the claiming attitudes of small business owners, while through the interaction of refund claims nexus with the audit process, tax complexity reduces the take-up amongst big companies (Zwick, 2021).

Based on the available literature, tax complexity appears to have significant influences on tax compliance behavior, and hence, the following hypothesis is developed:

H_3: There is a positive relationship between tax complexity and perceive petroleum profit tax evasion

2.10.4. Tax knowledge and perceive petroleum profit tax evasion

Extant literature on the influence of tax knowledge and tax compliance has shown a significant relationship between the two constructs. For example, Eriksen and Fallan (1996), found that due to the increase of tax knowledge among taxpayers, they regard tax evasion as something not to do, and their perception on fairness of the tax system increases significantly. Musimenta (2020) reiterated that helping taxpayers to gain tax knowledge makes them understand the tax policies, and in turn, increases their level of tax compliance. Wassermann and Bornman (2020) found that the tax authority needs to make available specific tax knowledge on all aspects of the tax system to ensure smooth tax compliance amongst the taxpayers. In brief, tax knowledge is the act of making taxpayers understand the tax system, which eventually can increase tax compliance (Bornman and Ramutumbu, 2019). Moreover, tax knowledge has been found to have a significant influence on tax compliance (Palil, 2010). However, tax knowledge has also been reported to have no significant impact on tax compliance behavior (Fauziati et al., 2020). Hence, the following is hypothesized:

H_4: There is a negative relationship between tax knowledge and perceive petroleum profit tax evasion

2.10.5. Environmental regulation and perceive petroleum profit tax evasion

There is lack of empirical evidence in the current literature on the influence of environmental regulations on PPPTE. Available empirical evidence on environmental regulations was reviewed. Consequently, environmental regulations have a significant effect on green technology innovation and air pollution (Chen et al., 2022). Additionally, environmental regulations appear to not have significant effects on pollution haven, and the prevailing regional dissimilarities on the costs of production resulting from an increase in environmental regulations, are inadequate to establish pollution haven (Hu et al., 2022). Also, environmental regulations have significantly improved the air pollution condition, especially in the eastern and northern regions. More importantly, the partial spillover, a consequence of decomposition, clearly shows environmental regulations are improving the air quality in the regions (Zhang et al., 2021). Environmental regulations constrain agglomeration innovation, more especially when an industrial agglomeration endorses green technology innovation (Li et al., 2021). It has been found in China that the government promotes environmental regulations assiduously, which helps in carbon emission reduction, in turn, improving sustainable development (Nie et al., 2021). More so, a result shows that an environmental protection law needs to be established to protect mangrove plantation in Sri Lanka (Nesha Dushani et al., 2022). Often than note, there is strong relationship between economic income (such as taxes) and environmental regulation, and this has been in the existing literature (Agboola and Alola, 2022).

Based on the empirical literature presented above, it is evident that environmental regulations have a great influence on companies' behavior, especially towards green technology innovation, as well as air, water, and land pollution. Following this evidence, coupled with the lack of empirical analysis on the effect of environmental regulations on PPPTE, the following hypothesis is developed:

H_5: There is a relationship between environmental regulations and perceive petroleum profit tax evasion

2.11. Theoretical Framework

The framework of this study is derived from the extant literature and theory which jointly formed the current study model as presented in Figure 1.

3. METHODS

The research employed the quantitative method, using predetermined measurements adapted from previous research. Close-ended questions were formulated to permit analysis of the data using statistical tools (Berman et al., 2000; Creswell and Creswell, 2003). The instruments used for the purpose of this study were rearranged and modified to be aligned with the perceptions of the oil and gas industry respondents. For better assurance that the right measurements were used, a content validity was carried out to ensure that the measurements are appropriate for the study, as well as to ensure that the respondents can fully understand the questions. To do this, three groups were selected: The first group comprised three academicians who have expertise in conducting research using a questionnaire; the second group comprised three oil companies; and the last group consisted of private research consultants specialized in primary data research using a questionnaire. All the three groups offered useful suggestions, which collectively improved the acceptability of the instrument and made it simpler and more understandable. The population of the study comprised 312 local and international upstream oil and gas companies operating in Nigeria. According to the Federal Inland Revenue Service (FIRS), companies pay PPT based on oil license, and any company with multiple licenses must pay PPT on each oil well. As a result of the low number of the entire population, all companies were used as a sample to get adequate numbers required to perform analysis. Therefore, a total of 312 questionnaires were issued to the respondents which achieved a response rate of 67.62%, as depicted in Table 1 below. Both SPSS and PLS-SEM was used to analyze the data.

3.1. Descriptive Statistics

Beginning with the age group, Table 2 below shows that the age group of most respondents is within the range of 40-49 years, followed by 30-39 years, as well as below 30 years, which indicates that they are relatively young with fresh ideas. As for gender, about 69.7% are male while the remaining are female, showing that there are more men than women in the accounting unit of oil and gas companies operating in Nigeria. In terms of qualification of the respondents, the highest is respondents with master's degree at 62.6%, followed by those with a bachelor's degree at 30.8%,

Table 1: Response rate

Response	Rate
Number of questionnaires distributed	312
Number of questionnaires returned	211
Invalid response	0
Valid response rate	67.62%

Table 2: Descriptive statistics table

Demographic variables	Frequency	(%)
Gender		
Male	147	69.7
Female	64	30.3
Total	211	100
Age		
Below 30 years	25	11.8
30-39 years	66	31.3
40-49 years	111	52.6
50-59 years	6	2.8
60 above	3	1.4
Total	211	100
Qualification		
Bachelor's	65	30.8
Master's	132	62.6
PhD	14	6.6
Total	211	100
Positions		
Director	12	5.7
Deputy director	38	18
Head of accounting unit	27	12.8
Chief accountant	40	19
Principal accountant	54	25.6
Senior accountant	40	19
Total	211	100

which shows the respondents are well educated. For rank of the respondents, principal accountants constitute 25.6%, followed by chief accountants and the rest are deputy directors. This indicates that the respondents are senior staff and must have vast knowledge and experience in their job.

4. RESULTS

The data collected was analyzed using SPSS for preliminary analysis, and PLS-SEM for the analysis of the measurements and structural models.

4.1. Normality

For the PLS-SEM measurement model result, tolerance and Variance Inflation Factor (VIF) are regarded as the most useful techniques to determine whether or not abnormality exists in the data by observing the multicollinearity level of the data (Hair et al., 2013). A tolerance value lower than or equivalent to 0.20, and VIF ≥5 is a clear sign that multicollinearity exists (Hair et al., 2013). Table 3 presents the multicollinearity result:

Based on the SPSS output as depicted in Table 3, it is evident that multicollinearity does not exist in the current model, and hence, the data is set for subsequent analysis.

4.2. Measurement Model

This section explains indicator reliability, Cronbach's alpha, convergent and discriminant validity, and model fit evaluation (Hair et al., 2020).

4.2.1. Indicator reliability

Indicator reliability is extracted from the outer loadings of the measurement model output (Hair et al., 2013), where the loading threshold must be within the range of 0.5-0.7 (Hair et al., 2011). Following Hair's (2011, 2013) recommendation, 27 items were deleted from the total 72 items because of low loadings and to improve composite reliability, which has a threshold of 0.7 (Hair et al., 2020). Table 4 presents the indicator loadings.

4.2.2. Cronbach's alpha and composite reliability

As documented in the literature, the best ways of assessing reliability are through composite reliability and Cronbach's alpha with a threshold of 0.7 (Nunnally, 1978; Peterson and Kim, 2013; Hair et al., 2013). This is presented in Table 4 which shows reliability is achieved in the current model.

4.2.3. Convergent validity

Average variance extracted (AVE) is reported as the most popular technique for assessing convergent validity of instruments in a model, and the threshold is 0.5 and above (Hair et al., 2011, 2013). Based on this, convergent validity was attained in the current study (Table 4).

Table 3: Multicollinearity statistics

Collinearity		
Independent variables	**Tolerance**	**VIF**
Tax audits	0.739	1.353
Tax agents	0.947	1.056
Tax complexity	0.718	1.393
Tax knowledge	0.809	1.236

From Table 4 above, internal consistency reliability, indicator loadings, and convergent validity of the study's instruments are acceptable, because all the criteria and threshold values are met. This will permit other researchers to validate these instruments in other sectors and report their findings, which eventually can further evince that the measurements are reliable for use in the oil and gas sector, as well as other economic sectors.

4.3. Discriminant Validity

One of the most frequently used ways of determining discriminant validity is through the heterotrait monotrait (HTMT0 ratio (Hair et al., 2013). Table 5 presents the HTMT ratio which meets the recommended criteria.

This result indicates that each construct's measures are not related to each other; to put it differently, the figures show that the variable instruments stand alone, and are not measuring the same thing; hence, the measures used in this study have achieved the discriminant validity criterion.

4.3.1. Model fit evaluation

It is important to measure how well the hypothesized model fits the data of the current study. Two ways are recommended-using either goodness of fit (GoF) and standardized root mean square residual as recommended by Henseler et al. (2014). For this work, GoF was selected to measure the GoF of the measures using the following formula:

$$GOP = \sqrt{\bar{R}^2} \times Average\,Communality\,(\overline{AVE})$$

The threshold of GoF is 0.10 (small), 0.25 (intermediate) and 0.36 and above which is considered as great (Wetzele et al., 2013). The current study's GoF is 0.4635, which is regarded as great (Table 6). Figure 2 shows the measurement model of the study.

4.4. Structural Model

Assessment of path coefficient, R square, predictive relevance, and assessment of effect size, was conducted using a 5000-bootstrapping sample, which is larger than the original sample of the current study as recommended by Hair et al. (2013).

4.4.1. Path coefficient

The assessment of path coefficient was conducted by analyzing t-statistics and P-value (Hair et al., 2011). Figure 3 presents the result.

Figure 3 depicts the structural model. The constructs investigated in this study are targeted at expanding the work of Mohd-Isa (2012), with the additional construct of environmental regulations to formulate the new model. The results suggest that all the exogenous constructs have significant relationships with the endogenous variable, except for the tax audits construct, which

Table 4: Indicator loadings, Cronbach's alpha, Composite reliability, and AVE

Items code	Standardized loading	Cronbach's alpha	Composite reliability	AVE
ER1	0.911	0.953	0.961	0.755
ER2	0.896			
ER3	0.883			
ER4	0.893			
ER5	0.885			
ER7	0.863			
ER9	0.798			
ER11	0.813			
PPPTE1	0.898	0.975	0.978	0.801
PPPTE2	0.911			
PPPTE3	0.942			
PPPTE4	0.917			
PPPTE5	0.860			
PPPTE6	0.847			
PPPTE7	0.881			
PPPTE11	0.857			
PPPTE12	0.878			
PPPTE13	0.936			
PPPTE14	0.915			
TAD4	0.740	0.909	0.926	0.613
TAD 6	0.720			
TAD 10	0.860			
TAD 12	0.772			
TAD 13	0.812			
TAD17	0.844			
TAD18	0.799			
TAD19	0.701			
TAG9	0.764	0.719	0.843	0.643
TAG10	0.884			
TAG11	0.745			
TC1	0.772	0.937	0.949	0.725
TC2	0.879			
TC3	0.802			
TC4	0.882			
TC5	0.872			
TC6	0.860			
TC7	0.886			
TK1	0.813	0.938	0.947	0.693
TK2	0.912			
TK3	0.867			
TK4	0.760			
TK5	0.810			
TK6	0.863			
TK7	0.862			
TK8	0.759			

Table 5: Heterotrait monotrait (HTMT) ratio

Constructs	Environmental regulations	PPPTE	Tax agents	Tax audits	Tax complexity	Tax knowledge
Environmental regulations						
PPPTE	0.549					
Tax agents	0.298	0.464				
Tax audits	0.375	0.438	0.436			
Tax complexity	0.511	0.521	0.285	0.412		
Tax knowledge	0.300	0.466	0.546	0.418	0.309	

shows an insignificant relationship with the dependent variable. Table 7 presents the t-statistics and P-values.

4.4.2. Assessment of R-square value

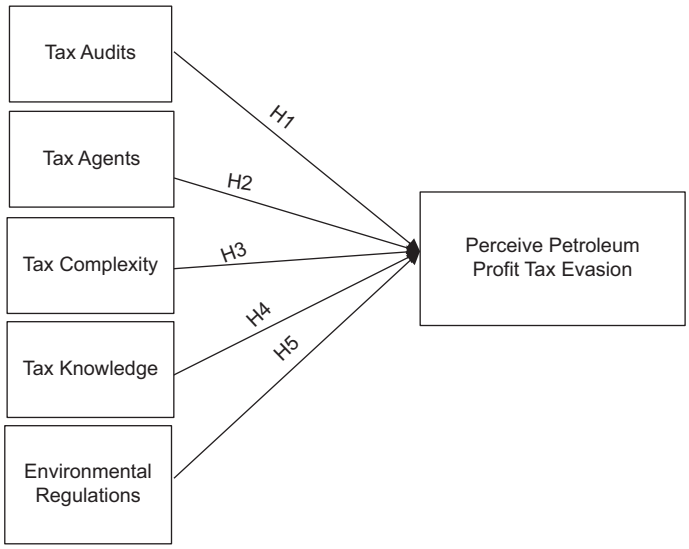
Past literature has reported that determining R-square value is important for social science studies. This is because the value indicates the level at which the exogenous constructs explain the dependent variable, which eventually can give room for expansion using other unexplained constructs. Researchers, such as Chin (1998) characterized R-square value into three categories: A value of 0.19 is regarded as weak; 0.33 as average; and 0.67 as large. Figure 2 shows the R-square value of the current model is 46.4%, which is above average based on Chin's (1998) recommendation.

4.4.3. Effects size of the exogenous constructs (F^2)

The effects size formula is $F^2 = R^2$ included - R^2 -1 R^2 included (Cohen, 1988; Chin, 1998). Effects size is characterized by: 0.02 is considered weak; 0.13 as average; and 0.35 as large (Cohen, 1988). Table 8 presents the F^2.

Table 8 above indicates that the environmental regulations variable has the highest effects size value at 0.111, followed by tax complexity at 0.074, and tax knowledge at 0.060. These three constructs are considered the highest variables with great effects on the current model.

Figure 1: Theoretical framework



4.4.4. Predictive relevance (Q^2)

Predictive relevance has been used in social science research since 1974, for instance, by Geisser (1974) and Stone (1974). The Q^2 method is one of the well-known ways of assessing predictive relevance of a model. The Q^2 formula is Q^2=1-SSE/SSO. Table 9 presents the predictive relevance of the current model.

Based on Table 9, the Q^2 value of 0.350 is an indication that the independent variables have a robust predictive relevance on the dependent construct of the current research model (Hair et al., 2011).

5. DISCUSSION OF RESULTS

This section discusses the general findings of the current research based on the five hypotheses developed in section 2.0 above. The first hypothesis postulates that there is a negative relationship between tax audits and PPPTE; the P=1.64, and hence the hypothesis is not supported. This result is in line with Siregar et al. (2019), who found a non-significant difference between tax audits and tax compliance behavior amongst corporate taxpayers. However, the findings contradict that of Advani et al. (2018), Bérgolo et al. (2018), Li et al. (2019), and Kasper and Alm (2022),

Figure 2: Measurement model

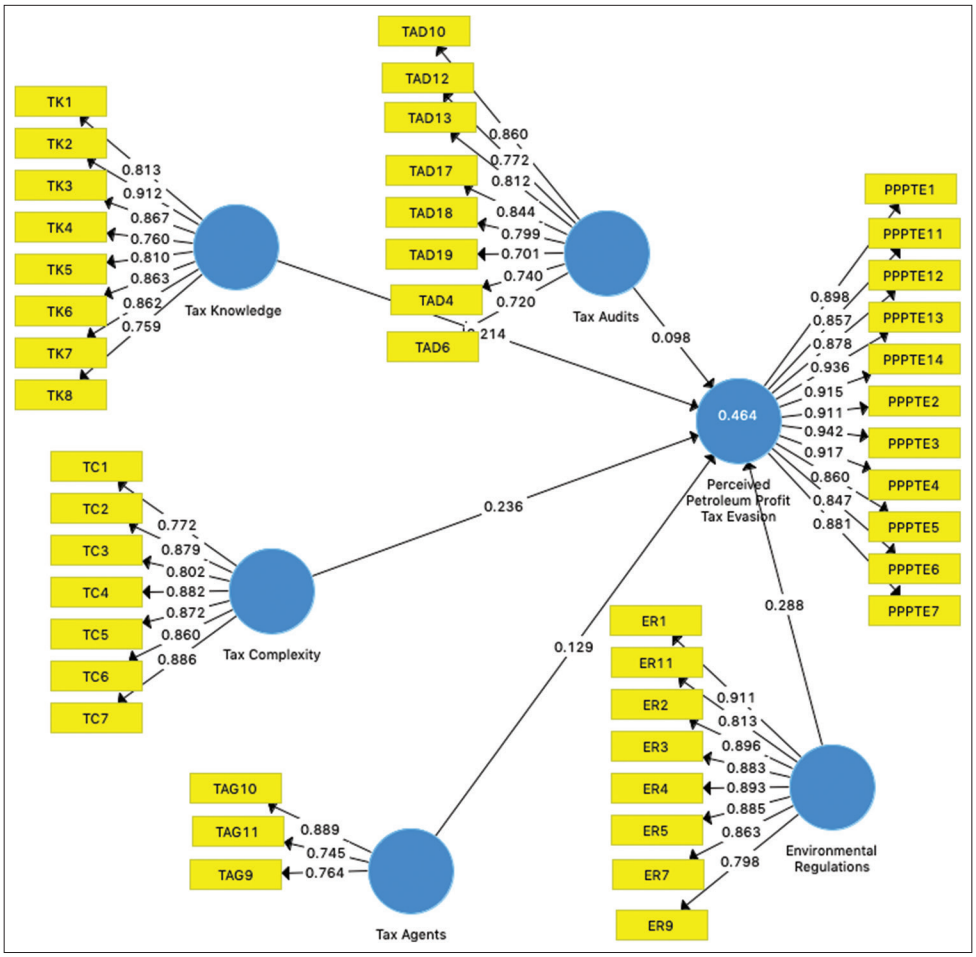


Figure 3: Structural model

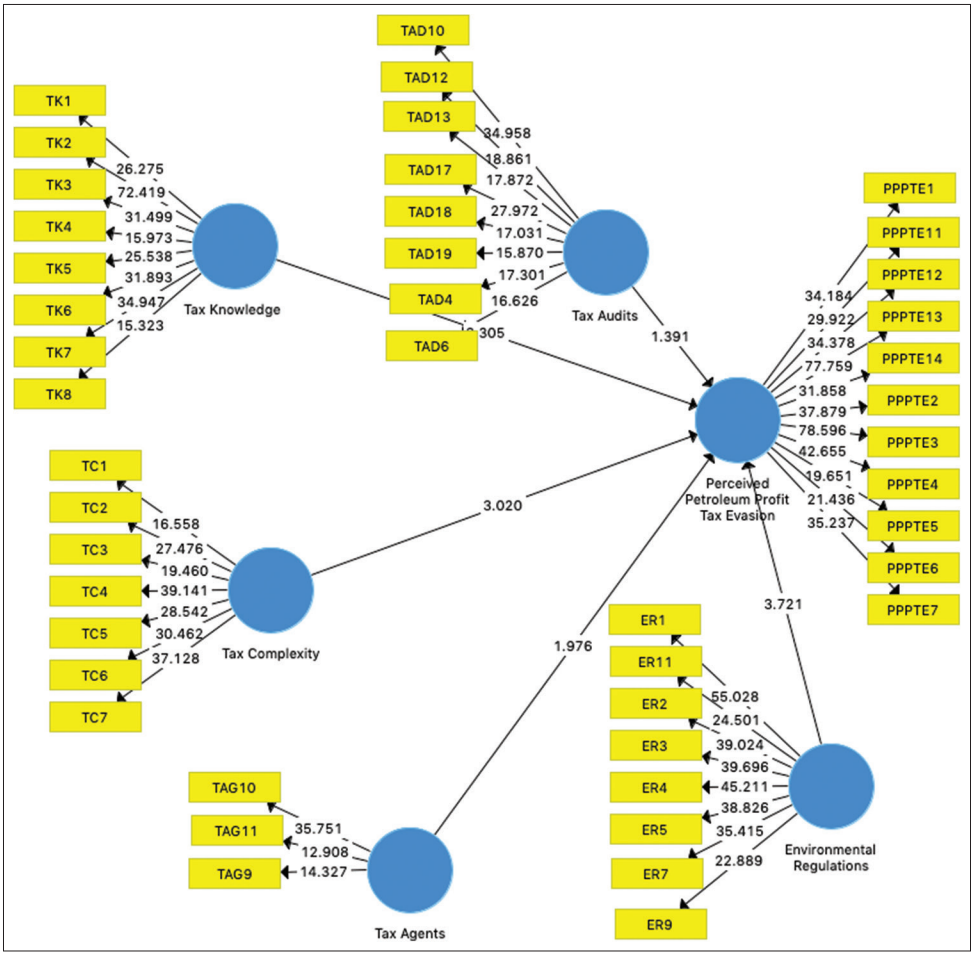


Table 6: Goodness of fit

Constructs	Communality	R-square
PPPTE	0.704	0.464
ER	0.573	
TAG	0.098	
TAD	0.478	
TC	0.522	
TK	0.404	
Geometric mean	0.4631	0.464
	GoF =√0.4631×0.464	
	Gof=0.4635	

who collectively found a significant influence between tax audits and tax compliance behavior amongst individual taxpayers. The findings further indicate that oil and gas companies operating in Nigeria perceive tax audits as not vital in influencing their tax compliance behavior, which has a great implication for policymakers.

The second hypothesis is that there is a negative relationship between tax agents and PPPTE; the P=0.048, and thus, the hypothesis is supported. The result is in line with previous studies (Niemirowski and Wearing, 2003; Borrego et al., 2013; Hamid, 2014) which have found a significant relationship between tax agents and tax compliance behavior. The findings suggest that oil and gas companies perceive tax agents as instrumental towards influencing their compliance behavior. The finding further implies that tax agents' activities reduce the extent of tax evasion amongst corporate taxpayers.

The third hypothesis postulates that there is positive relationship between tax complexity and PPPTE; the P=0.003, and thus, the hypothesis is supported. In essence, the results show the existence of a positive and significant relationship between tax complexity and PPPTE. Consequently, the finding is in tandem with the finding of several researchers (Mat Jusoh et al., 2021; McKerchar et al., 2005; Saad, 2014; Abdul and McFie, 2020; Zwick, 2021). The result suggests that oil and gas companies perceive the Nigerian tax system as complex, which in turn, affects their compliance behavior. Fundamentally, the finding implies that tax complexity is very serious since it encourages oil majors to avoid or evade tax, and policymakers should take note of this.

The fourth hypothesis is that there is a negative relationship between tax knowledge and PPTE; the P=0.001, and hence, the hypothesis is supported. The result suggests that oil and gas companies have inadequate staff with the requisite tax knowledge, thereby leading to tax evasion behavior. The finding is in line with past literature (Palil, 2010; Ramutumbu, 2019; Musimenta, 2020; Wassermann and Bornman, 2020; Fauziati et al., 2020). These studies have also found a significant relationship between tax knowledge and tax compliance behavior. Basically, the result implies the need for oil and gas companies to have staff with

Table 7: Assessment of path coefficients

Hypothesis	Relationship	Beta	S E	t-statistics	P-values	Findings
H_1	Tax audits -> PPPTE	0.102	0.071	1.391	0.164	Not supported
H_2	Tax agents-> PPPTE	0.130	0.065	1.976	0.048	Supported
H_3	Tax complexity -> PPPTE	0.236	0.078	3.020	0.003	Supported
H_4	Tax knowledge-> PPPTE	0.216	0.065	3.305	0.001	Supported
H_5	Environmental regulation-> PPPTE	0.285	0.077	3.721	0.000	Supported

Table 8: F^2 value

Predictor constructs	F^2 value	Effects size
Environmental regulations	0.111	Large
Tax agents	0.023	Moderate
Tax audits	0.013	Small
Tax complexity	0.074	Large
Tax knowledge	0.060	Large

Table 9: Assessment of predictive relevance (Q^2)

	SSO	SSE	1-SSE/SSO
PPPTE	2,156.000	1,401.686	0.350

adequate tax knowledge, especially in the oil and gas industry, as it has a great influence on corporate tax compliance behavior.

The fifth hypothesis postulates that there is a relationship between environmental regulations and PPPTE; the P=0.000, and hence, the hypothesis is supported. The finding suggests that oil and gas companies are affected by environmental regulations, which eventually influence their tax compliance behavior. Considering the novelty of this finding, comparison with previous literature may be difficult. The result concurs with the view of the economic theory of regulations, which asserts that regulations have either a negative or positive impact on the industry (Stigler, 1971). The fact here is that the result reveals a positive and significant relationship between environmental regulations and oil and gas companies' perception of tax evasion. In other words, environmental regulations affect the amount of petroleum tax collected from the industry, which is at the heart of the nation's economy (Stigler, 1971).

6. CONCLUSION AND POLICY IMPLICATIONS

This research examines the relationship between corporate tax compliance variables proposed by Mohd-Isa (2012), and environmental regulations and PPPTE. Essentially, the economic deterrence theory of Allingham and Sandmo (1972) is expanded to accommodate environmental regulations as a new construct in the model with the support of the economic theory of regulations (Stigler, 1971). Findings from this research add to the scant literature with respect to environmental regulations from the perspective of the oil and gas industry. Of the five main hypotheses proposed in this research, four have a positive and significant relationship with PPPTE, while one, i.e., the tax audits construct, has a positive but insignificant relationship with PPPTE.

Fundamentally, the findings of this research have several implications, ranging from theoretical, contextual, to practical, as well as general policy implications for policymakers, which can help various stakeholders, and enhance economic growth and development in their own countries, especially countries with abundant natural resources. From the theoretical point of view, two theories are integrated to develop a new corporate tax compliance model, which takes into cognizance the environmental influence on company's tax compliance behavior. This essentially can assist future researchers to find an appropriate model to underpin their studies. From a practical viewpoint, the new model can solve multiple environmental-related issues prevailing between host countries and oil majors. For instance, oil and gas companies' activities cause considerable damage to the land, water, air and soil, and more seriously, affects human health and their economic livelihood. This situation encourages most of the host countries to issue more stringent environmental regulations, in turn, compelling the polluting companies to pay for their transgressions. Governments can use the same procedure for the remediation and restoration of the affected areas.

Findings from this research should serve as a wake-up call for any nation with a similar situation, to ensure that in trying to enforce environmental regulations on companies, other economic indices, such as tax payment, should be taken into consideration. Explicitly, in Nigeria, the results show that the current environmental regulations are the cause of the huge negative effects on the oil and gas industry; hence, policymakers should reconsider the existing environmental policies and make necessary adjustments to reduce the level of tax evasion perpetrated by oil majors. Failure to take prompt action may have massive detrimental effects on the country's oil and gas industry, as such stringent regulations can chase some oil majors out of Nigeria's shores, thereby causing significant reduction in PPT which remains the main source of government revenue. The findings from this study can assist over 98 countries across the globe with natural resources, particularly those in a similar situation as Nigeria, to design appropriate and robust tax and environmental policies which can further enhance the relationship between host countries and companies operating within their shores, which in turn, may increase the revenue derived from the activities of those firms rather than deplete it.

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