Effect of Petroleum Business Arrangements and Tax Instruments on Investment Climate of Marginal Oil Fields in Nigeria

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ABSTRACT

This study examines the effect of petroleum business arrangements and tax instruments on the investment climate of Marginal Oil Fields (MOFs) in Nigeria via a quantitative approach using PLS-SEM to analyse data collected from key stakeholders, including government officials, industry players and practitioners involved in MOFs. The petroleum business arrangements, attractiveness of petroleum fiscal regimes, tax incentives and types of profit-based taxes were investigated in relation to investment climate of marginal oil fields. The findings reveal that petroleum business arrangements and tax incentives have a significant positive effect on the investment climate of MOFs. Attractiveness of petroleum fiscal regimes showed the strongest influence, while types of profit-based taxes had no significant impact. The model's R-squared value was 0.57, indicating a good level of explanatory power. The study contributes to the literature by filling geographical and methodological gaps and offers practical insights for policymakers to improve investment conditions in Nigeria's marginal oil fields. The study concludes that fiscal policies and petroleum business arrangements play critical roles in enhancing investment in Nigeria's MOFs and recommends targeted tax incentives like reduced royalty rate, distinct tax regime and favourable business terms such as stabilisation clauses and reduced bureaucratic hurdles to attract investment.

Keywords: Attractiveness of Fiscal Regime, Investment Climate, Marginal Oil Fields, Petroleum Business Arrangement, Tax Incentives and Types of Profit Based Taxes.

INTRODUCTION

Nigeria holds significant oil reserves, ranking second in Africa and 11th globally (NUPRC, 2023). With 37.50 billion barrels of crude oil and 209.26 trillion cubic feet of natural gas reserves (NUPRC, 2024), the petroleum sector drives over 85% of Nigeria's foreign exchange earnings. However, issues in crude oil output and refining led to the introduction of the "Marginal Oil Field Programme." This initiative engages indigenous companies to boost efficiency, oil revenue and job creation. Although Nigeria has around 251 marginal oil fields, at one time, only 17 out of 30 awarded fields were producing (NUPRC, 2022).

Marginal oil fields, though smaller and technically challenging, are increasingly vital as major reserves mature globally. Factors influencing investment in Nigeria's marginal fields include regulatory frameworks, fiscal incentives and the licensing process. Investors face technical, financial and security challenges, yet the government offers tax breaks, royalty reductions and other incentives to attract both domestic and international investment.

Several studies have explored marginal oil fields. Ezekiel and Okwuchukwu (2020) critiqued the legal framework for developing marginal oil fields, emphasizing challenges like financing. Ebere (2021) examined

the Petroleum Industry Act, 2021, focusing on regulatory changes. Manaf et al. (2014) analysed investment climates in Malaysia, comparing production-sharing contracts and risk-service contracts.

This study examines how petroleum business arrangements, attractiveness of fiscal regimes, tax incentives and profit-based taxes affect the investment climate of marginal oil fields in Nigeria. Understanding the relationship among these variables is essential for policymakers and investors to optimize development in this critical sector.

Statement of the Research Problem

The implementation of the Marginal Oil Fields Development (MOFs) Programme in Nigeria has created opportunities for indigenous companies to participate in the upstream petroleum sector, traditionally dominated by foreign entities. This initiative holds the potential for significant economic benefits, including job creation, increased competition and technology transfer from multinational corporations acting as technical partners. However, the programme has faced challenges, such as production shortfalls and revenue losses, which have hindered its overall success.

Despite Nigeria's prominence in the global oil and gas sector, there is limited research on petroleum business arrangements and tax instruments concerning marginal oil fields in the country. This study aims to address that gap by empirically examining how these factors affect the investment climate for marginal oil fields. The research will offer valuable insights for both local and international investors, providing a clearer understanding of the Nigerian marginal oil field investment environment.

Furthermore, the study identifies several key gaps in existing literature. Geographically, there is a lack of studies focused on Nigeria's marginal oil fields, despite their significance to the nation's economy. There are no studies in the public domain that have examined the two decades of marginal oil field operations since the initiative's start, which further restricts the time scope of earlier study. Additionally, gaps in the variables and measurement approaches of earlier studies leave room for improvement, particularly regarding petroleum business arrangements, fiscal regimes and tax incentives.

By addressing these research gaps, the study seeks to offer a better understanding of how petroleum business arrangements and tax instruments shape the investment climate in Nigeria's marginal oil field sector. This analysis will help stakeholders navigate the challenges and opportunities within this critical segment of the country's oil and gas industry.

Research Questions

1. To what extent do the petroleum business arrangements affect investment climate in Nigerian Marginal oil fields?
2. To what extent the attractiveness of fiscal regime affects investment climate in Nigerian Marginal oil fields?
3. What is the nature and degree of relationship between types of profit-based taxes and investment climate of marginal oil fields?
4. What is the nature and degree of relationship between tax incentives and investment climate of marginal oil fields?

Objectives of the Study

1. Extent to which the petroleum business arrangements affect investment climate in Nigerian Marginal oil fields.
2. Extent to which attractiveness of fiscal regime affect investment climate in Nigerian Marginal oil fields.
3. Relationship between types of profit-based taxes and investment climate of marginal oil fields.
4. Relationship between tax incentives and investment climate of marginal oil fields.

Research Hypotheses

H_{01}: Petroleum Business Arrangements do not significantly affect investment climate in Nigerian Marginal oil fields.

H_{02}: Attractiveness of fiscal regime do not significantly affect investment climate in Nigerian Marginal oil fields.

H_{03}: There is no significant relationship between types of profit-based taxes and investment climate of marginal oil fields.

H_{04}: There is no significant relationship between tax incentives and investment climate of marginal oil fields.

LITERATURE REVIEW

Concept of Marginal Oil Fields

The concept of marginal oil fields (MOFs) varies across countries, operators and technical contexts. They are typically characterized by lower production potential, smaller reserves, and constraints that make conventional development less attractive. Udo (2013) notes that such fields may fail to meet desired returns or are nearing the end of their commercial life. Mobolaji and Okoro (2020) highlight that marginal fields are shaped by technical, commercial and regulatory factors like reservoir characteristics and high development costs. In Nigeria, Nigerian Association of Petroleum Explorationist (NAPE) defines marginal fields as non-producing or low-producing fields that are not economically viable under existing fiscal regimes (Nwaozuzu, 2014). This definition underscores the economic challenges for multinational companies and the potential viability offered by changes in economic, technological or regulatory conditions.

Concept of Investment Climate

The investment climate generally refers to factors affecting investment risks and returns, encompassing policy, institutional and behavioural elements (Stern & Stern, 2002). Policy factors cover fiscal procedures and exchange rates, institutional factors involve legal systems and bureaucracy and behavioural factors include essential infrastructure such as transport and communication (Phillips, 2006). A favourable investment climate attracts domestic and foreign investors by creating a profitable environment (Hallward-Driemeier, 2005), with the World Bank defining it as location-specific factors that incentivize investment and foster economic growth (Mundial, 2004). Ho (2006) identifies policy and resources as primary dimensions, while Dammer and Carus (2014) add corruption, finance access and infrastructure as crucial for investment appeal.

In Nigeria, oil sector investments have dropped by 74% from 2014 to 2022, largely due to competition, corruption and bureaucratic obstacles like bribery and port delays (NUPRC, 2023). With Nigeria ranking 154th in Transparency International's 2021 Corruption Index, corruption remains a significant barrier to investment. However, reforms under the Petroleum Industry Act (PIA) 2021 and initiatives by the Nigerian Upstream Petroleum Regulatory Commission aim to revive the sector, projecting over $50 billion in investments in the next five years. Nigeria's marginal field bid round in 2020, offering 57 fields to local companies, aims to enhance production and encourage local participation (Opeoluwani, 2022).

The investment climate for Nigeria's marginal oil fields depends on economic viability, regulatory support, infrastructure, technology, risk management and stakeholder engagement. Improvements in regulatory frameworks and infrastructure can increase investor confidence, enhance production and promote economic growth. This study investigates the effect of petroleum business arrangements and tax instruments on the investment climate of Nigeria's marginal oil fields.

Concept of Petroleum Business Arrangements

Petroleum business arrangements refer to fiscal and contractual frameworks that govern the exploration, development and distribution of petroleum resources, shaping revenue generation and allocation between

governments, investors and stakeholders (Russell & Bertrand, 2012; NRGI, 2015). These arrangements are guided by a petroleum fiscal regime (PFR), which includes tools like taxes, royalties, dividends and bonuses that allow governments to capture economic rent from petroleum resources while promoting sector development (NRGI, 2015). PFRs aim to balance the host government's revenue needs with incentives for private investment, ensuring favorable conditions for investors (Ripley, 2011).

These arrangements take various forms, including concessionary systems, production sharing agreements (PSAs), service contracts and sole risk contracts. In concessionary arrangements, investors typically own resources and pay royalties and taxes, whereas PSAs allow governments to retain resource ownership, offering investors a share in production or profits. Service contracts involve the government paying investors for petroleum development without transferring ownership rights (McPhail et al., 2009). Flexibility and investor-friendly regimes are especially critical for marginal oil fields, which are often smaller, more technically challenging and require substantial capital investments to achieve viability (Manaf et al., 2016; Nwete, 2010).

The structure of a PFR also considers factors like revenue timing, risk allocation, and adaptability to price fluctuations, balancing revenue needs with risk-sharing to foster a steady investment flow (NRGI, 2015). For instance, a combination of royalties and production sharing can provide stable revenue while reducing risk for investors (Likosky, 2009). However, overly strict fiscal regimes may deter investment, particularly for high-cost, lower-return projects like marginal oil fields (Smith, 2012). Additional considerations include maintaining revenue for governments, attracting future investments, and equitably distributing risk between the government and investors (Kaiser & Pulsipher, 2004).

Therefore, well-designed petroleum business arrangements are crucial for managing petroleum resources, defining revenue distribution and creating a conducive investment climate. For fields with high costs and complex conditions, such as marginal oil fields, tailored arrangements are essential to balancing government revenue goals with investor incentives. This balance is fundamental to attracting and sustaining investment in the sector, especially under challenging economic conditions.

Concept of Attractiveness of Fiscal Regime

The attractiveness of a petroleum fiscal regime (PFR) is determined by its ability to create a fair and equitable distribution of oil and gas wealth between the host government and investors, fostering a conducive investment climate. As Nakhle (2010) points out, an attractive PFR ensures balanced wealth sharing, encouraging both state revenue and private investment. This balance is especially vital in capital-intensive industries like petroleum, where fiscal terms significantly influence investment decisions. According to the Natural Resource Governance Institute (NRGI, 2015), governments must consider several key factors when selecting fiscal tools, including a mix of royalties, taxes, production sharing and bonuses that govern the sector, the timing of revenue (such as early revenue streams provided by royalties even during exploration or loss-making periods), investment risk-sharing that defines mutual benefits between the government and investors and the adaptability of the regime in response to oil price changes.

A flexible and investor-friendly regime, particularly in high-cost sectors like marginal oil fields, is crucial to attracting new investments (Manaf et al., 2016). An overly strict fiscal framework may deter investors, reducing both investment and sector growth. Therefore, the fiscal design should avoid exploitable loopholes to ensure investors meet their financial obligations (NRGI, 2015). The principles underpinning the attractiveness of fiscal regimes are rooted in Adam Smith's canons of taxation of equity, certainty, convenience and economy which remain relevant today in assessing effective petroleum sector fiscal systems (Miller & Alalade, 2003). Building on these principles, Manaf et al. (2016) developed an assessment scale for fiscal regimes, measuring administration, certainty, efficiency and equity/neutrality. A regime that is adaptable, certain, efficient, flexible, neutral, progressive and transparent is considered attractive, supporting optimal resource development and maximizing state revenue.

Thus, the attractiveness of a PFR is defined by how well it balances fairness, stability, efficiency and adaptability for mutual benefit. A regime that incorporates these qualities fosters a favourable investment

climate, supports industry growth and ensures a steady flow of government revenue, meeting the needs of both the government and investors.

Concept of Profit Based Taxes

Profit-based taxes, levied on a company's profits after deducting production costs and other allowable expenses, are significant in the oil and gas industry for enabling governments to capture a fair portion of profits while distributing economic benefits from resource extraction. Unlike revenue-based taxes, which apply to gross revenue without considering expenses, profit-based taxes are more equitable by accounting for profitability (World Bank, 2020). In Nigeria, Petroleum Profit Tax (PPT) has traditionally been the primary profit-based tax for oil and gas, but the 2021 Petroleum Industry Act (PIA) introduced Hydrocarbon Tax and Companies Income Tax (CIT) as additional profit-based taxes. Nigeria's petroleum tax system aims to balance fairness for both the government and oil companies (Kyari, 2020).

Key profit-based taxes in Nigeria's oil industry include PPT/HCT, which captures economic rent and is progressive, applied on profits rather than production or gross revenue, thus attracting investors by sharing investment risks (Phina, 2005; Menezes, 2005). CIT, although applied broadly like other businesses, is considered regressive as it isn't tied to specific petroleum projects (Tordo, 2007). Hydrocarbon Tax, introduced under the PIA, is another profit-based levy, further ensuring fair government economic rent capture. Additionally, a 3% Tertiary Education Tax applies to all Nigerian companies, with variations in treatment under PPT or CIT per the PIA (2021).

Profit-based taxes provide advantages for investment in oil and gas by reducing tax burdens during low profitability periods, making them attractive for companies investing in marginal oil fields. By taxing profits rather than revenue, the system fosters a favorable investment climate and aligns with companies' financial performance. Consequently, taxes like PPT/HCT and CIT are pivotal in shaping the investment climate for marginal oil fields, influencing investor perceptions and sector attractiveness. This study evaluates the impact of these taxes on the investment climate of Nigeria's marginal oil fields.

Concept of Tax Incentives

Tax incentives are critical in the oil and gas industry, designed to boost exploration, production, and investment, while fostering economic growth, energy security, and technological advancement. These incentives reduce companies' tax burdens, thereby mitigating risks and promoting innovation. In Nigeria, incentives in the oil and gas sector such as deductions for exploration and development costs, tax credits, tax holidays, accelerated allowances and exemptions help lower operational costs, increase profitability and attract foreign direct investment (FDI), making Nigeria a competitive investment destination. Studies show that even a one percent reduction in the effective tax rate can raise FDI inflows by around 2 percent. This underscores the role of incentives in enhancing financial viability, as Esrar et al. (2023) noted that profitability without incentives often falls below minimum requirements.

However, while tax incentives spur exploration and production, they also invite debate. Some argue they benefit established companies without adequately promoting environmental sustainability or renewable energy shifts. Wilson (2010) describes tax incentives as policies aimed at reducing the tax burden to encourage investments, while Ihe (2012) views them as strategies for fostering economic development through tax reductions. In Nigeria, tax incentives are essential, as the oil and gas sector supports much of the economy (Anyanwu, 2015). Empirical research, such as Arzizeh et al. (2018), has demonstrated that these incentives significantly drive FDI in the oil and gas sector, influencing business location and enhancing competitiveness. Therefore, tax incentives are instrumental in guiding industry behaviour, supporting sectoral growth and boosting economic development, but they require careful design to balance economic growth, energy security and environmental goals.

REVIEW OF EMPIRICAL LITERATURE AND THEORETICAL FRAMEWORK

This section reviews studies related to marginal oil fields, highlighting key findings on fiscal regimes and investment climates in Nigeria and other countries.

Petroleum Business Arrangements and Investment Climate of Marginal Oil Fields

Fiscal policies significantly impact investment climates by influencing risk-sharing between governments and investors. Some studies found positive impacts of fiscal regime changes. For example, Kemp and Stephen (2011) showed that fluctuating oil prices made marginal fields more attractive for investment. In Malaysia, Mas'ud (2016) and Abd Manaf et al. (2014) reported that petroleum taxes, contracts and incentives had a positive relationship with investment in marginal fields, particularly benefiting smaller firms.

Conversely, some studies documented negative effects. Onaiwu (2009) found that Nigeria's 2005 PSC reduced profitability compared to the 1993 PSC. Nakhle and Hawdon (2004) and Kemp and Stephen (2012) found similar negative impacts in small fields due to fiscal package changes and tax increases in the UK and Nigeria.

Some studies found no significant effects of fiscal regime changes. Mead et al. (1982) reported no substantial improvements in after-tax earnings despite favourable oil prices. Emeka et al. (2012) also found minimal impact of fiscal regime changes on NPV, IRR and PI.

Overall, the literature shows mixed results, with fiscal regime effects varying by country due to differences in tax policies and reserve prospects. The present study will evaluate Nigeria's marginal oil fields within this context.

Attractiveness of Fiscal Regime and Investment Climate of Marginal Oil Fields

Investment decisions often depend on the attractiveness of a country's petroleum fiscal regime (PFR), which includes taxation, fiscal arrangements and state participation. A stable and attractive PFR is crucial for securing investment, even in times of declining oil prices (Akhigbe, 2007).

Different countries use various petroleum fiscal systems (PFSs), such as concessionary contracts, production-sharing contracts, or service contracts. The specific terms of these regimes, like tax structures and government involvement, determine their attractiveness to investors, leading to competition among oil-producing nations (Babajide et al., 2014).

Research shows that an attractive fiscal regime correlates with a favorable investment climate in marginal fields. Mas'ud (2016) found that a desirable PFR could enhance the investment climate even with regressive taxes. Offering incentives, as shown by Mas'ud et al. (2018), also boosts investment attractiveness. Conversely, unattractive regimes, even with progressive tax systems, may deter investment.

This forms the basis for investigating the relationship between Nigeria's fiscal regime and the investment climate of its marginal oil fields.

Types of Profit-Based Taxes and Investment Climate of Marginal Oil Fields

Governments levy profit-based taxes on Oil and Gas Companies (OGCs) based on net profits. Profit-based taxes, such as Petroleum Profit Tax (PPT), can ensure fair returns for investors while allowing governments to capture economic rent. PPT is considered progressive as it taxes profits rather than production (Phina, 2005). Sharing investment risks with investors and deferring rent collection until expenses are recouped also helps attract investment (Menezes, 2005).

In contrast, Companies Income Tax (CIT) is seen as regressive, as it is not tied directly to petroleum projects (Tordo, 2007). CIT has been introduced to OGCs under Nigeria's Petroleum Industry Act (PIA 2021), but production-based taxes like production bonuses and training fees are also considered regressive due to their focus on total income rather than profits. These taxes can distort investment decisions and prolong payback periods (Akhigbe, 2007).

Studies show mixed results regarding profit-based taxes and investment climate. For instance, Mas'ud (2016) found a positive relationship between investment climate and petroleum income tax in Malaysia, while other taxes may introduce distortions. This suggests that different types of profit-based taxes influence the investment climate of marginal oil fields in varied ways.

Tax Incentives and Investment Climate of Marginal Oil Fields

Tax incentives generally improve investment attractiveness (Babatunde, 2012; Ghani & Azlan, 2015). However, some studies argue that incentives have limited impact in underdeveloped nations (Ricupero, 2000). Investors' preferences for incentives vary, with new companies preferring incentives that reduce initial expenses, while established firms prioritize profitability-enhancing incentives (Manaf et al., 2014).

Empirical studies show significant effects of tax incentives on foreign direct investment (FDI) in the oil and gas sector (Arzizeh et al., 2018; Patrick, 2023). These incentives, particularly in Uganda's oil and gas industry, have been shown to attract FDI but need to be aligned with local capacity building and skill development to ensure broader economic benefits (Dorcas, 2023).

While there is limited research on the specific impact of tax incentives on marginal oil fields, studies like Mas'ud (2016) in Malaysia found a positive relationship. Smaller firms operating in marginal fields may be more responsive to incentives, making it essential to examine their effects on the investment climate for these companies.

The theories that underpinned this study are; the economic theory of regulation, economic rent theory, bargaining theory and game theory. The Economic Theory of Regulation, introduced by Stigler (1971), explains government intervention in markets, highlighting how political and economic forces shape regulations, including who benefits and how it impacts resource allocation. While critics argue it oversimplifies the regulator-industry relationship (Coglianese, 2021), supporters point to regulatory capture, where industries sway regulations to their advantage (Kenton, 2021). This theory is relevant to Nigeria's marginal oil fields, suggesting that flexible fiscal terms, like tax incentives, can enhance the investment climate. This study applies the theory to examine how petroleum business arrangements and tax policies influence investment in marginal oil fields, advocating for favorable fiscal terms to encourage investment (Jaskow & Noll, 1981).

Economic Rent Theory, introduced by David Ricardo, describes the surplus income earned by a production factor beyond what is needed to keep it in use, driven by resource scarcity and varying productivity. Critics argue it oversimplifies by focusing on land (Stratford, 2023), but supporters find it relevant, especially in monopolistic sectors like oil and gas (Hayes, 2023). Commonly used to analyze petroleum fiscal regimes, the theory explains how royalty rates affect government revenue and investor behavior (Nakhle, 2008; Nwete, 2005). This study uses the theory to examine petroleum business arrangements and tax instruments impacting Nigeria's marginal oil fields investment climate.

Bargaining Theory, rooted in game theory and advanced by John Nash, explores negotiations between conflicting parties to achieve agreements. It is applied in real-world scenarios like labor and business negotiations, emphasizing resource allocation and cooperation. While criticized for simplified assumptions (Crawford, 2015), its adaptability to complex contexts is widely acknowledged. In the oil and gas sector, the theory explains the shifting power dynamics between host governments and multinational oil companies (MOCs). Initially, MOCs hold greater power due to technological expertise, but over time, host countries gain leverage through experience and regulatory capacity (Hosman, 2006; Vivoda, 2011). Moran's Dynamic Balance of Power Theory further illustrates this shift (Moran, 1974; Abdul Karim, 2009). Bargaining Theory is crucial for understanding how economic rent is shared in marginal oil fields, shaping the investment climate and resource distribution.

Game Theory, introduced by Von Neumann and Morgenstern in 1944, analyzes strategic decision-making among players whose actions impact one another (Esmaeili et al., 2015). Despite criticism for idealized assumptions, it is valued for addressing complex interactions, such as those in the oil and gas industry (Hayes, 2024). In Nigeria's upstream petroleum sector, game theory helps evaluate the decision-making of stakeholders, including government bodies, MOCs and local companies, often collaborating under joint ventures. It provides a framework to balance conflicting interests and assess the effectiveness of Nigeria's fiscal regime in generating revenue and attracting investment (Willigers et al., 2009; Ripley, 2011). This study applies game theory to evaluate how Nigeria's fiscal strategies align with its goals for a stable and attractive investment climate.

The literature review reveals several significant gaps in the study of Nigeria's marginal oil fields. Despite Nigeria's crucial role in the global oil and gas sector, there is limited academic focus on the effects of petroleum business arrangements and tax instruments on the investment climate of its marginal oil fields. In contrast, countries like Malaysia, Myanmar and the UK have received substantial attention, with numerous studies examining their fiscal arrangements and their impact on investment climates (Nakhle, 2007). This geographical gap is the first that this study seeks to address by focusing on Nigeria's marginal oil fields and replicating similar research conducted elsewhere.

Another gap identified is the lack of studies covering a two-decade period. Since the inception of Nigeria's marginal oil fields in 2001, there are no publicly available studies that span such a long period. This study addresses this time scope gap by analyzing the investment climate of marginal oil fields from 2003 to 2023, thus providing a comprehensive understanding of the evolution of these fields over two decades. Furthermore, there is a gap in variables and measurements, as key variables such as investment climate, petroleum business arrangements, fiscal regime attractiveness, profit-based taxes and tax incentives have not been explored in Nigerian studies. This research introduces these variables, which have not been addressed in prior studies in Nigeria.

Finally, there is also an analytical method gap. While most previous studies on marginal oil fields use scenario analysis (Nakhle, 2007), this study applies a survey-based approach to broaden the analytical perspectives.

Addressing these gaps will contribute to a more complete understanding of the challenges and opportunities within Nigeria's marginal oil fields. This will help inform policy decisions aimed at improving the investment climate and fostering growth in this sector.

METHODOLOGY

In examining the effect of petroleum business arrangements and tax instruments on the investment climate of Nigeria's marginal oil fields, the study adopts a survey research design. Previous studies on similar topics have employed both qualitative and quantitative methods (Kemp & Stephen, 2012; Khazikhanova, 2012; Kyari, 2013; Mas'ud, 2016). However, this study exclusively uses a quantitative survey method to achieve objective data collection and analysis of the relationships between variables.

By employing a survey approach, this study aims to establish the statistical relationships between petroleum business arrangements, attractiveness of fiscal regime, types of profit-based taxes and tax incentives, and indeed their effect on the investment climate. The use of structured questionnaires allows the collection of empirical data, providing clear and reliable insights into the factors affecting marginal oil field investment.

Population of the Study

The study's population included staff involved in the management, regulation, accounting and taxation in Nigeria's marginal oil fields. It was divided into three clusters: government (NUPRC and FIRS staff dealing with marginal oil fields), industry (staff of marginal oil fields) and practitioners (audit firms auditing marginal oil field financials). The total population, as provided by contact persons in the various organizations, was approximately 227. These organizations were selected for their relevance to the research and their use in previous related studies (Nakhle, 2004; Kyari, 2013; Mas'ud, 2016).

Table 3.1Survey Clusters and Population

Cluster	Organisations	Population
Government	NUPRC	30
	FIRS	112
Industry	MOFs	60
Practitioners	Audit Firms	25
Total		227

Source: Field Survey 2024

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Sample Size

The study has a total population of 227 staff from three clusters of government (NUPRC & FIRS), audit firms and marginal oil companies. A sample of 144 was identified from the population using the sample size selection table developed by Krejcie and Morgan (1970). However, in light of the poor response rate observed in survey studies conducted in Nigeria (Ajumobi et al., 2018; Raimi et al., 2013), a decision was made to increase the sample size by 30% (43), resulting in a total of 187 expected respondents.

Research Instrumentation and Administration

The primary instrument used in this study was a structured survey questionnaire adapted from Mas'ud (2016), which was designed to gather data from participants involved in the management, regulation and taxation of marginal oil fields in Nigeria. The questionnaire focused on key variables such as petroleum business arrangements, tax instruments and the investment climate of marginal oil fields.

The survey was administered online to respondents across three key clusters: government (NUPRC and FIRS staff), industry (marginal oil field operators) and practitioners (audit firms handling marginal oil field audits). The administration process included sharing the survey link via email and WhatsApp with designated contact persons for each group. Follow-up reminders were sent to ensure a higher response rate and data accuracy.

Table 3.2 Measurement of Variables

Variable	Description	Measurement	Source
Marginal Oil Fields Investment Climate	Dependent Variable	10	Mas'ud (2016)
Types of Petroleum Business Arrangements	Independent Variable	1	Mas'ud (2016)
Attractiveness of Petroleum Fiscal Regime	Independent Variable	14	Mas'ud (2016)
Types of Profit-Based Tax	Independent Variable	1	Mas'ud (2016)
Tax Incentive	Independent Variable	12	Mas'ud (2016)

Source: Field Survey 2024

Techniques for Data Analysis

In this study, quantitative data analysis techniques were employed to examine the relationships between petroleum business arrangements, tax instruments and the investment climate of marginal oil fields in Nigeria. The collected data was first cleaned and coded to ensure accuracy and consistency. Descriptive statistics, such as means and frequencies, were used to summarize the data, providing insights into the characteristics of the respondents and key variables.

For hypothesis testing, inferential statistical method was applied. Partial Least Squares Structural Equation Modeling (PLS-SEM) was utilized to assess the effect of independent variables (petroleum business arrangements and tax instruments) on the dependent variable (investment climate of marginal oil fields). This technique allowed for the estimation of relationships and the determination of the significance and strength of associations between variables. The results were interpreted based on beta coefficients, T-statistics and P-values to determine the support for each hypothesis.

SPSS software was used to perform the statistical analysis, ensuring precise computation and interpretation of the results.

Justification for methods used

The methods used in this study are justified by their appropriateness in addressing the research objectives and the nature of the data involved. The use of PLS-SEM (Partial Least Squares Structural Equation Modeling) was particularly suitable due to its ability to handle complex relationships between multiple variables and its

effectiveness in testing theoretical models in exploratory research. PLS-SEM also allows for the analysis of small to medium sample sizes, which aligns with the study's sample. This method was chosen because it can assess both the measurement and structural models simultaneously, providing robust insights into the effects of petroleum business arrangements and tax instruments on the investment climate of marginal oil fields.

Additionally, the survey method used for data collection is well-suited for gathering quantitative data from a diverse group of respondents. This method ensures that the perceptions and experiences of stakeholders in the industry, government and professional sectors are captured effectively. The combined use of PLS-SEM and survey data collection allows for a comprehensive analysis of the study's variables and provides valid and reliable results.

RESULTS AND DISCUSSION OF FINDINGS

Demographic Profile of Respondents

The study involved participants from government (NUPRC, FIRS), industry (staff of marginal oil fields) and practitioners (audit firms). This selection provided a comprehensive view of those directly engaged in the management, regulation and taxation of marginal oil fields.

Measurement Model Evaluation

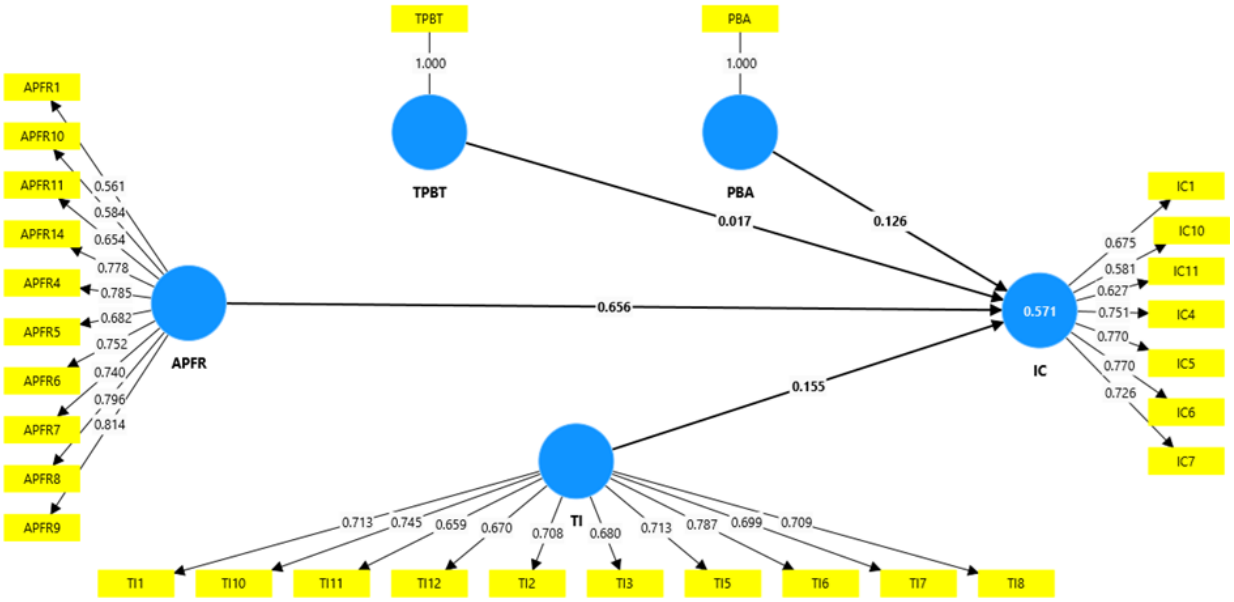

Figure 4.1 Measurement Model for Reflective Latent Constructs

The validity and reliability of the constructs were assessed using PLS-SEM. Key results include:

Composite Reliability (CR): All constructs met the threshold of 0.7, confirming internal consistency.

Average Variance Extracted (AVE): AVE values exceeded 0.5, demonstrating adequate convergent validity.

Discriminant Validity: The Fornell-Larcker criterion confirmed that each construct was distinct from the others.

Structural Model Results

Evaluation of the Significance of Path Coefficients

Using 5,000 bootstrapped data, the structural model of PLS-SEM was used to determine the significance of path coefficients using t-statistics and p-values (Hair et al., 2011; Preacher & Hayes, 2004, 2008) Hence, the

statistical estimates of the path coefficients for the structural model are shown in Figure 4.2 and Table 4.1 below.

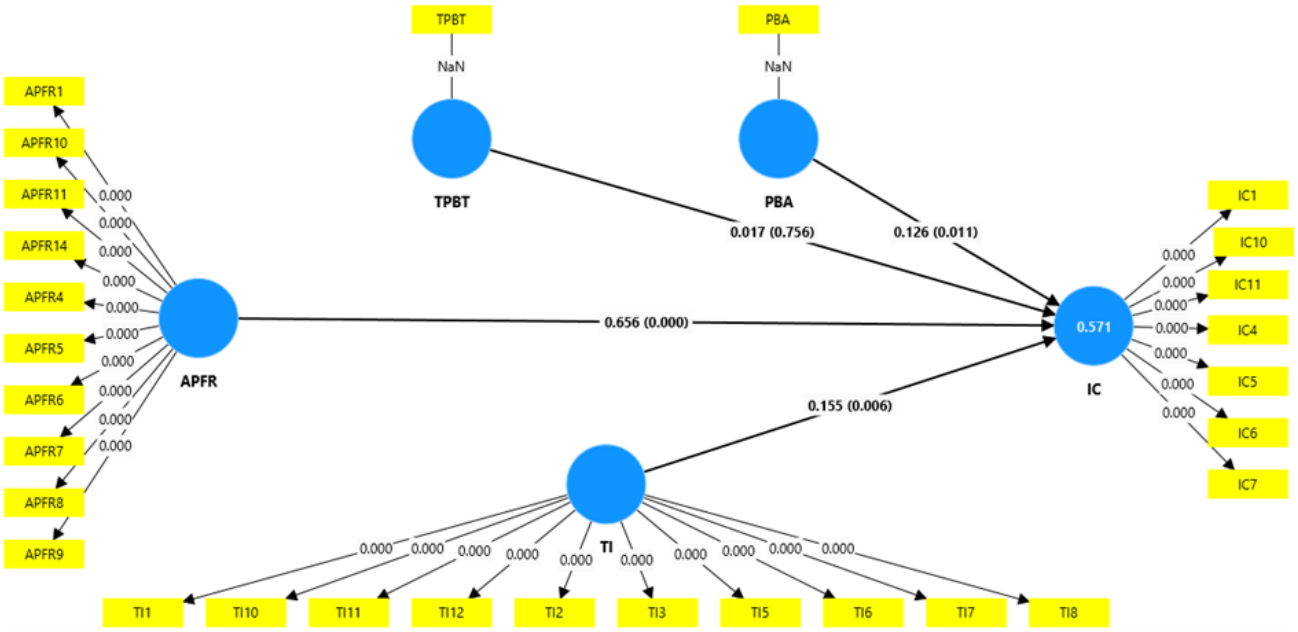

Figure 4.2 Structural Model of the Direct Effect

Table 4.1Significance of Path Coefficients for Hypothesis Testing

Hypotheses	Relationship	Beta	Standard Error	T statistics	P values	Decision
H_{01}	PBA -> IC of MOFs	0.13	0.05	2.54	0.01	Supported
H_{02}	AFR -> IC of MOFs	0.66	0.05	12.38	0.00	Supported
H_{03}	TPBT -> IC of MOFs	0.02	0.05	0.31	0.76	Not Supported
H_{04}	TI -> IC of MOFs	0.15	0.06	2.75	0.01	Supported

Evaluation of R^2 (Coefficient of Determination):

The R^2 values reflect the proportion of variance in the Investment Climate explained by the predictor variables. In the model, the R^2 value was 0.56, indicating that 56% of the variance in the investment climate of marginal oil fields is explained by the combined influence of Petroleum Business Arrangements, Tax Incentives and the Attractiveness of the Fiscal Regime.

Table 4.2 R-Squared of the Model

Dependent Variable	R-square	R-square adjusted
Investment Climate of MOFs	0.57	

Evaluation of Q^2 (Predictive Relevance)

Q^2 measures the model's predictive accuracy using blindfolding. With a Q^2 value of 0.53, the model demonstrates good predictive relevance, meaning the constructs significantly contribute to predicting the investment climate of marginal oil fields.

Table 4.3 Predictive Relevance Q^2

Dependent Variable	Q^2predict
Investment Climate	

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Evaluation of f^2 (Effect Size)

The effect size (f^2) measures the individual impact of each predictor variable on the dependent variable. The Attractiveness of the Fiscal Regime had a large effect ($f^2 = 0.87$), while Petroleum Business Arrangements ($f^2 = 0.04$) and Tax Incentives ($f^2 = 0.05$) had small but notable effects on the investment climate.

Table 4.4 Effect Size (f^2)

Independent Variables	f-squared Values	Effect Size (f^2)
Attractiveness of Petroleum Fiscal Regime	0.87	Strong
Petroleum Business Arrangements	0.04	Small
Tax Incentives	0.05	Small
Types of Profit-based Taxes	0.00	None

These statistics highlight both the explanatory power and the predictive strength of the model.

DISCUSSION OF FINDINGS

The study investigated the relationships between petroleum business arrangements, attractiveness of the petroleum fiscal regime, types of profit-based taxes and tax incentives on the investment climate of marginal oil fields (MOFs**)** in Nigeria. The results highlighted varying degrees of influence from these factors on investment decisions in marginal oil fields.

The effect of petroleum business arrangements on the investment climate of marginal oil fields revealed a positive and significant relationship. With a beta value of 0.13, a T-statistic of 2.54 and a p-value of 0.01, it is evident that structured and favourable business arrangements positively impact investment climate. This underscores the role of clear petroleum business arrangements in boosting investor confidence in Nigeria's marginal oil sector. This result is consistent with previous studies that emphasize the importance of flexible and favorable business terms in encouraging investment in marginal fields (Kyari, 2013; Nakhle, 2004).

The attractiveness of the petroleum fiscal regime, showed the strongest positive relationship with the investment climate. The beta value of 0.66, a T-statistic of 12.38 and a p-value of 0.00 emphasize the critical importance of fiscal attractiveness in fostering a conducive investment environment. Additionally, the strong effect size ($f^2 = 0.87$) further confirms that a favourable fiscal regime is a significant determinant of investment in marginal oil fields. This finding stresses that fiscal policies can be a powerful tool for attracting investors and it is consistent with global research among which is Kemp and Stephen (2012) that concluded that favourable fiscal regimes are a primary determinant of oil field development, this is particularly true in Nigerian environments like marginal oil fields.

The results of impact of profit-based taxes on the investment climate were not significant. With a beta value of 0.02, a T-statistic of 0.31 and a p-value of 0.76, the types of profit-based taxes currently implemented do not significantly affect the investment climate. Furthermore, the lack of effect size ($f^2 = 0.00$) reinforces this conclusion, suggesting that profit-based taxes in Nigeria’s oil sector may not be a critical factor for investment decisions.

Finally, the effect of tax incentives on the investment climate, showed a positive and significant relationship. The beta value of 0.15, a T-statistic of 2.75 and a p-value of 0.01 indicate that tax incentives play a supportive role in encouraging investment, albeit with a small effect size ($f^2 = 0.05$). This highlights that while tax incentives do not have the strongest influence, they are still relevant in shaping the investment environment for marginal oil fields. This also aligns with the literature highlighting tax incentives as key levers in promoting investments in capital-intensive industries like oil and gas (Mas’ud, 2016).

The R^2 value of 0.57 demonstrates that 57% of the variance in the investment climate is explained by the independent variables, indicating a solid explanatory power. Additionally, the Q^2 predictive value of 0.53

affirms that the model has strong predictive relevance, meaning that it can accurately forecast the investment climate based on the examined factors.

CONCLUSION

This study explored the effects of petroleum business arrangements, attractiveness of fiscal regimes, profit-based taxes and tax incentives on the investment climate of marginal oil fields in Nigeria. The findings demonstrated that petroleum business arrangements, the attractiveness of the fiscal regime and tax incentives have significant positive effects on the investment climate, with fiscal attractiveness being the most influential factor. However, profit-based taxes showed no significant impact. These results suggest that enhancing fiscal policies and business arrangements is crucial for fostering a favourable investment environment in Nigeria's marginal oil sector, while profit-based taxes may require reconsideration for their relevance.

RECOMMENDATION

Based on the study's findings, several key recommendations can enhance the investment climate of Nigeria's marginal oil fields. First, improving the attractiveness of petroleum fiscal regimes is crucial, as it has a strong influence on investment. The government should focus on offering competitive fiscal terms like reduced royalty rate that align with global standards to ensure Nigeria remains an appealing destination for investors. Additionally, refining petroleum business arrangements by enhancing collaboration between the government, operators and stakeholders can foster a more conducive business environment and promote long-term growth in the sector.

Furthermore, the study reveals that profit-based taxes have a minimal impact on the investment climate, indicating a need for policymakers to review the current tax structure. Adjustments like introducing distinct tax regime for marginal oil fields and favourable business terms such as stabilisation clauses and reduced bureaucratic hurdles should be made to ensure these do not hinder investment. Additionally, tax incentives have been found to positively affect investment in marginal oil fields, so the government should continue to offer well-structured and relevant incentives. These should be regularly reviewed to maintain their effectiveness in attracting and sustaining investment. By addressing these areas, Nigeria can create a more favourable and sustainable investment climate for marginal oil fields.

FUTURE RESEARCH

Several areas for further research can be explored based on the findings of this study. Firstly, future studies could investigate the long-term effects of petroleum fiscal regimes on investment sustainability in marginal oil fields, considering broader economic and environmental factors. This would provide deeper insights into how fiscal policies can be adapted to evolving global energy demands and sustainability goals.

Additionally, further research could focus on comparative studies between Nigeria and other oil-producing countries to assess how different petroleum business arrangements and tax instruments impact investment climates. This comparative analysis could offer valuable lessons and best practices that can be adapted to Nigeria's context. Lastly, studies could also examine the role of technological advancements and innovation in enhancing the profitability and efficiency of marginal oil fields, particularly in relation to tax incentives and fiscal policies.

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