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Impact of Production Sharing Contract Price Sliding Royalty: The case of Nigeria's Deepwater Operation

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ABSTRACT

Petroleum fiscal regime has been a controversial issue in Nigerian economy. The basic issue is which regime will lead to the greatest benefit to the government without negatively affecting the performance of the international oil companies. Nigeria has in the past used different regime and had adopted the current price sliding royalty regime in 1996. The aim of this study is to examine how the new price sliding royalty affects the stake of government and contractors. This study adopts ex-post research design approach using data from various sources between 1980 and 2019. The autoregressive distributed lag (ARDL) regression approach was adopted for the data analysis. The unit root results reveal that the time series data consists of a mix of I(1) and I(0) variables. The ARDL bound cointegration test shows that all the variables specified in the models have long run relationship. Estimates from the models indicate that the royalty regime in the Deep Offshore and Inland Basin Production Sharing Contract has positive and significant impact on the stake of government in the long and short runs, but negative impact on the stake of contractors. Furthermore, the royalty regime has negative impact on contractors' performance in the long run. However, the impact on the three fiscal indicators (oil revenue, government expenditure, and deficit-GDP ratio) is positive. The study therefore recommends the repeal of the Nigerian petroleum fiscal policy with the new price sliding royalty to encourage investment and development of the petroleum sector.

Keywords: Deepwater, Fiscal Sustainability, Government and Contractor Takes, Price Sliding, Royalty Regimes
JEL Classifications: P28, O22, O38

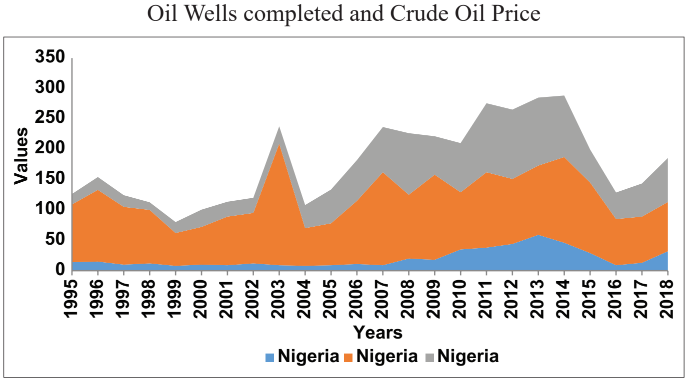
1. INTRODUCTION

Oil companies are often confronted with the challenges of making investment decisions for projects under uncertain price conditions. Fiscal regimes are key factors in determining the success of investment decisions in an international oil and gas setting (Isehunwa and Uzoalor, 2011; Okoro et al., 2017). In most fiscal regimes there are two key participants, an international oil company (IOC) and the host government national oil company (NOC). A common type in recent years is the production sharing contracts (PSCs) fiscal regime, where the oil resource is owned by the host government and the international oil company undertakes all risks as well as the associated cost of the entire exploration process, while the production is split at an agreed rate (Mingming et al., 2012). This has been adopted by Nigeria government as the appropriate upstream petroleum contract regime for offshore and inland basin development, since it would not bring about any financial burden on the government like the joint venture (Ogunleye, 2015; Mamudu et al., 2019). Before the early 1990s, Nigeria has witnessed two eras of PSC as the contractual framework in the Nigerian Petroleum Industry (1973, 1993 and post 1993 PSCs).

The Federal Government of Nigeria in their response to the demand of stable regulations for foreign investments in the Petroleum Industry deepwater development enacted the Deep Offshore and Inland Basin Production Sharing Contract Act on March 23, 1999 (Lukman, 2000). The main contract elements include royalty, cost oil, profit oil and income tax. There are two common types of royalty applied in PSCs and they are price and production royalty sliding regimes. Sliding scales imply a scale in which royalty, varies in accordance with crude oil price or production output, meaning that within a certain range of oil price or production the royalty is the same and as the range of the oil price or production fluctuates royalty slides into a new rate (Iledare, 2010). The basic idea of a sliding scale is to capture uncertainty during the project life irrespective of whether this uncertainty is technical or commercial (Wang et al., 2010). It is a rule of thumb that when oil price increases, more investment, expansion, and exploration activities are carried out. The opposite is true with lower oil prices. Figure 1 shows the oil field development (oil wells completed) and active rigs counts in Nigeria between 1995 and 2018 with respect to the spot crude oil price. The stacked area plot (Figure 1) shows the relationship between the active rig count, oil wells complete and crude oil price over 23 years. The trend shows that the field development and number of active rigs increase as oil price increases. This shows that the more money the IOCs make from their PSC agreement, the more they re-invest for other field development.

Royalty is one of the most basic elements of PSCs, and literature has shown that among the two types (price and production royalty sliding regimes), the production royalty sliding regime promotes increase in production and development of medium fields. According to an evaluation by Gowharzad and Al-Harthy (2011) of the different methods of calculating a production royalty sliding scale, the elements in these legal instrument provides and protects the interest of both host government and contractor. In other words, the contractor pays less royalty for small fields, which this is an incentive while more fields are developed for the host government. But, with the oil price-based sliding scale royalty regime the rates vary according to the crude oil prices (Adubisi et al., 2020). The oil price sliding scale approach was adopted by the Nigerian government in the fiscal legislation in Nigeria is the Deep Offshore and Inland Basin Production Sharing Contract (DOIBPSC) Act enacted in 1999 and amended in 2020. The royalty by price was

Figure 1: Stacked Area Chart Relationship between Active Rigs count, Oil Wells completed and Crude Oil Price



Source: 1995 – 2019 OPEC Annual Statistical Bulletin.

adopted to enable the government capture windfall in oil price spike and also ignore royalty deduction when oil price is less than or equal to $ 20/barrel. IOCs are in a country to make profit and not merely recover their costs, thus there are several perceived disadvantages to the crude oil price-based royalty regimes. The IOC is extremely exposed to changes in hydrocarbon prices which affect revenue and recovery; thus, in a period of low prices, the IOC might be inclined to shut in hydrocarbon production and to wait for higher prices which can adversely affect field development.

A common assumption in upstream regime debate is that countries with large reserves can afford to impose whatever terms they desire and IOCs will continue to bang on the door requesting entry (Leighty and Lin, 2012; Smith, 2014). But, Russia and Brazil situations are examples of how IOCs can lose interest in a country where they have no protection against future opportunistic behaviour by its sovereign counterparty (Da Hora et al., 2019). This study examine the government and contractor takes in the new amended DOIBPSC Act by Nigeria government using econometric model. The results evaluate the effect of Nigerian petroleum fiscal policy with emphasis on the government and contractor takes and if the Act is part of resource nationalism. Stevens (2008) highlights that resource nationalism can define as relative bargaining power switch in favour of the host government which increases it fiscal take by changing the terms of the original contract, after discovery and investment sunk in development. The outcome also validates the effectiveness and appropriateness, of the policy and thereby contribute to the development of the Nigerian petroleum industry.

The remaining part of the paper is structured as follows: section 2 gives an expose on different fiscal regimes, Section 3 presents and explains the method employed for the collection and analysis of the study data. Section 4 presents the results and discusses the empirical findings, while section 5 summarizes with policy recommendations.

2. FISCAL REGIME ELEMENTS

The two broad classifications of Petroleum Fiscal Arrangements are the concessionary and contractual systems. These systems are used to describe the legislative, tax, contractual and fiscal elements under which petroleum operations are conducted in a petroleum region

Table 1: Petroleum fiscal regime of a typical concessionary system

Items		$	IOC	Government
Gross revenue		200		
Royalty	10%			20
Net revenue		180		
Deductions:				
Capital exp.				
Operating exp.				
Deductions: 35%	35%		63	
Taxable income		117		
Income tax rate 50%				58.5
Net income after tax			58.5	
Share			121.5	78.5
Take			43%	57%

Source: Authors' computations

or province (Dongkun and Na, 2010). From Table 1, it is clear that the basic elements of the concessionary system are gross revenue, royalty, deductions (capital expenditure and operating cost), and income tax rate allowed. Government take for Canada, the United States, and Australia are 58.36%, 72.74%, and 43.92% respectively, and their royalties are 27.5, 20%, and 6.25% respectively; while tax rates are 15%, 35%, and 30% (Phillips, 2008). Literature has shown that Australian petroleum fiscal policy is more attractive (Kraal, 2017; Swe and Emodi, 2018). Australia allows for accelerated depreciation, immediate write off of exploration expenditure, research and development (R&D) incentive, and expenditure uplift. The concessionary system requires auditing and transparency, and it may be difficult to implement in developing countries. It could be fraught with gold-plating, over- invoicing, transfer pricing and low saving index (Kaiser, 2007; Abd Manaf et al., 2014).

In the pure service contract, the IOC is in business with the host government for a predetermined fee, which includes the cost of the investments. The IOC provides the financial, technical and managerial skill for the field development (Floricel and Lampel, 1998). In the service contract with risk, the contractor provides all the technical, financial, and managerial skill, however, contractor is compensated out of profit, rather than from production, generated from the crude oil output, or a share of the revenue, or oil generated from the operations (Nasir and Hadikusumo, 2019). This implies that if no oil is generated, the contractor bears the cost. Price of oil can also be a serious challenge in this case. The buy-back contract was popular in Iran from the seventies to late eighties (Van Groenendaal and Mazraati, 2006). Under the Iranian model, the IOC enters into agreement with the national oil company to develop a field and the national oil company supervises the operations of the IOC. The oil produced from the operation is sold to the IOC at the international oil price under the crude oil sale agreement to cover the cost, expanses, and agreed upon profit of the project (Khah and Amiri, 2014). The IOC is also entitled to purchase 5% of the oil production at a discount as a reward for the risk taken, usually at 5% discount. If the operation is not successful, the contract is terminated and the IOC bears the loss. The main elements in the three strands of the PSC are presented in Table 2.

Table 2 shows that the basic and important elements of PSC include royalty, corporate income tax, cost oil, and profit sharing. Others are government participation, bonuses, environmental taxes and duties, and community liability. Except for the PSC and SC that are forms of contractual systems, the other arrangements are forms of the concessionary systems. Regardless of the system in place, the crux is on how to recover costs and share the profit, which is the "Economic Rent": the difference between the value of production and the cost of extraction (Schwab and Werker, 2018; Schwerhoff et al., 2019).

Nigeria's deep water licenses were first issued in the mid-1990s. Most of the assets were initially realized in the form of product sharing agreements (PSCs), while some were on a sole risk license basis. the promulgation of the Deep Offshore Inland Basin Production Sharing Contract (DOIBPSC) Act of 1999 converted all licenses in deep-water operations beyond 200 meters' water depth to become a deep offshore asset. Interestingly, this law was enacted and back-dated to 1993 so as to cover assets approved at the time. Prior to the amendments to the DOIBPSC law in Nigeria, the governing royalty schemes for deep offshore assets progress with water depth. The Act fixed a royalty rate of 12 percent for assets mined between 201 and 500 meters; 8% for assets between 501 and 800 meters; 4% flat royalty rate for oil production from assets at water depth of 801-1000 meters. There is no flat royalty rate for assets in water depth more than 1000 meters. A fixed royalty rate means that the calculated rate is stable regardless of the production volume from the asset (Clancy, 2007). In addition, although the previous DOIBPSC law included a clause that could trigger a windfall profit capture to the economic rent; but the amended version of the DOIBPSC Act provides a 10 percent fixed royalty rate for all deep offshore production in water depths more than 200 meters. As a result, many large offshore deep-water facilities operating at depths of more than 1,000 meters are subject to royalties.

3. METHODOLOGY AND DATA

This section explains the method employed for data collection and analysis in this study.

Table 2: Production sharing contract models

Elements	Indian model	Indonesian model	Peruvian model Determined using
Royalty	1st 7 years=5% after 7 years=10%	No	Production sliding scale, RRE & R-factor
Companies Income Tax	40%	25%	32%
Ring Fencing	No	No	No
Cost oil	100%	100%	No
Profit oil	Biddable	57% NOC, 43% IOC	RSC-70% NOC, 30% IOC.
Dep.	Accelerated	Accelerated	Straight line (20%)
New invest.	15%	Investment credit (8.8%)	
Incentives	Yes	-	Yes
R&D	Yes	-	Yes
Tax holiday	Before 2017	No	No
Site restoration	Yes	Interest recovery, VAT Reimbursement	Vat recovery
Losses	Carried fwd.(8 years)	Carried. fwd.(10 years)	Carried. fwd. (without limit)
Domestic Market Obligation	NO	25%	No
FTO	No	20% (NOC&IOC according to Agreement)	No

Source: Authors' Computations from Global Oil and Gas Tax Guide, 2018

3.1. Model Specification

We specify the empirical model of the relationship between the Deep Offshore Inland Basin Production Sharing Contract royalty regime with respect to the IOC and government's stake implicitly as:

$$NPIOC_i = f(OO, OPR, PV, RTY) \quad (1)$$

$$NPNOC_I = f(OO, OPR, PV, RTY) \quad (2)$$

Where $NPIOC_i$ is net profit per barrel of the IOC or the contractor take, $NPNOC_I$ is the net profit per barrel of the national oil company or the government's stake, OO is oil output, OPR is the oil price, RTY is royalty level per barrel, and PV is the royalty regime (the policy variable). The first model enables us examine the impact of the royalty regime on the contactors' take; while the second model examines the impact of the royalty regime on the government's stake. The implicit model specified in equations (1) and (2) are transformed explicitly as:

$$NPIOC_i = \lambda_0 + \lambda_1\, OO_i + \lambda_2\, OPR_i + \lambda_3\, PV_i + \lambda_4\, RTY_i + \mu_i \quad (3)$$

$$NPNOC_I = \beta_0 + \beta_1\, OO_i + \beta_2\, OPR_i + \beta_3\, PV_i + \beta_4 RTY_i + \mu_i \quad (4)$$

Where, $NPIOC$, $NPNOC$, OO, OPR and PV are as earlier defined. λ_0 is constant term; λ_1, λ_2, λ_3 are coefficients of the various variables and measures the marginal effect of the oil output, oil price, and the royalty regime respectively on the contractors' take, whereas μ_1 is a stochastic error term. On the other hand, β_0 is a constant term which measures the level of the government take when other variables influences area are at zero level. β_1, β_2, β_3 are the coefficients of the variables in the government take model (equation 4) and also measures the marginal impact of the oil output, oil price, and the royalty regime respectively on the government's take.

To identify the effect of the Deep Offshore Inland Basin Production Sharing Contract royalty regime on the contractors and the government performance, we deploy three fiscal performance indicators: oil revenue, government expenditure, and deficit-GDP ratio.

The empirical model for the effect of the royalty regime on contractor's performance is stated explicitly as:

$$OO_i = \gamma_0 + \gamma_1\, NPIOC_i + \gamma_2\, OPR_i + \gamma_3\, PV_i + \gamma_4\, RTY_i + \varepsilon_i \quad (5)$$

The empirical model for the royalty regime impact on government's performance is stated as:

For government revenue

$$ORG_i = \phi_0 + \phi_1\, NPIOC_i + \phi_2\, OPR_i + \phi_3\, PV_i + \phi_4\, RTY_I + \varepsilon_i \quad (6)$$

For government expenditures:

$$GEXP_i = \psi_0 + \psi_1\, NPIOC_i + \psi_2\, OPR_i + \psi_3\, PV_i + \psi_4\, RTY_i + \varepsilon_i \quad (7)$$

For government Deficit-GDP ratio

$$GDi_i = \chi_0 + \chi_1\, NPIOC_i + \chi_2\, OPR_i + \chi_3\, PV_i + \chi_4\, RTY_i + \varepsilon_i \quad (8)$$

Where, ORG_i, $GEXPi_i$, GDi_i are government oil revenue, government expenditure, and fiscal deficit –GDP ratio. γ_1, γ_2, γ_3 are parameters measuring the effect of IOC take, oil price, and royalty regime on IOC oil output.

3.2. Nature and Sources of Data

Data for the analysis are secondary in nature and they consist of annual time series of the variables in the model. Data were collected from 1980 to 2019. Data for government oil revenue, government deficit-GDP ratio, and government total expenditure were collected from the Central bank of Nigeria Statistical bulletin. Data for oil price, and oil output were collected from the OPEC Annual Statistical bulletin (various issues) and BP Statistical Review of World Energy June 2019. Contractors' take was calculated as 35% of profit oil; while government take is 65% of profit oil. Royalty regime was represented as a dummy variable which takes the value of "0" before the introduction of price sliding royalty (royalty by price), 1980-1995, and "1" thereafter, 1996-2019. The royalty for the two periods were calculated accordingly.

3.3. Method of Data Analysis

The study adopted the autoregressive distributed lag (ARDL) econometric regression techniques developed by Pesaran et al. (2001) to analyze the data because of its inherent advantages over the traditional approaches (Sahoo and Das, 2012; Adeleye et al., 2020a,b; Okoye et al., 2020). One advantage of the ARDL- Bound test approach is that it can be applied in case of fractional mixed order of integration [$I(0)$ and $I(1)$]. However, it breaks down in the presence $I(2)$ series and it is efficient in small sample and requires just one equation for both long run and the short run.

3.3.1. Unit root test

Kirchgässner et al. (2013) observed that time series data are fraught with unit root. They argue that estimating a time series model without treating the data for unit root will likely produce spurious results. The study adopted the augmented Dickey-Fuller (ADF) approach to unit root investigation. However, several studies have highlighted the need to compliment the ADF approach (Xiao and Phillips, 1998; Libanio, 2005; Adeleye et al., 2020a,b); thus, the ADF was complemented with Phillips-Perron test.

3.4. ARDL/Bound Cointegration Test

The functional form of the ARDL-bounds cointegration model for this study is specified as follows:

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \beta^{'} \boldsymbol{X}_{t-1} + \sum_{i=1}^{i=n} \eta_i \Delta Y_{t-1} + \sum_{i=1}^{i=m} \theta^{'} \Delta \boldsymbol{X}_{t-1} + v_t \quad (9)$$

Where, ΔY is the first difference operator of dependent variable, α_1, and β'are long-run parameters, η_i and θ' are short-run parameters to be estimated; Y_{t-1} is the lagged dependent variable while $\boldsymbol{X}_{t-1}$

is the vector of explanatory variables, and v_t is the error term that is independently and identically distributed (i.i.d). So, in one equation we have an estimator that captures both the short- and long run impact of the variables.

The empirical bounds F-statistics obtained from the cointegration test is compared with the critical values of the upper and lower bounds at the 5% probability level. If the empirical F-statistics is greater than the upper critical value for I(1) series, the null hypothesis of no cointegration is rejected at the 5% probability level but if the empirical F-statistics is less than the lower critical value of I(0) series, then, the null hypothesis is maintained (Pesaran et al., 2001). It is only when there is cointegration that the long run parameters can be estimated. Otherwise, only the short run estimations suffice.

4. RESULTS AND DISCUSSION

4.1. Unit Root Test

The results of the unit root test the augmented Dickey-Fuller (ADF) and the Phillips- Perron (PP) procedures are presented in Table 3. Findings show that the variables are of mixed level of integration.

The ADF unit root test in Table 3 shows that the fiscal deficit-GDP ratio (GD), government expenditure (GEXP) and contractors take (NPIOC) are stationary at their levels, which implies that they are *I*(0) series. Oil price (OPR), royalty (RTY), oil output (OO), oil revenue (ORG), and government take were not stationary at level, an indication that they have unit root. However, they became stationary after 1st differencing (*I*(1) series). On the other hand, results from the Phillips-Perron test indicated that only oil output (OO) and contractors take are stationary at level. Other variables became stationary after 1st differencing. Thus, this study has a mix of *I*(1) and *I*(0) series in the model. The results indicate that the ARDL-Bound test cointegration procedure is the most appropriate method for examining cointegration among the integrated series.

Table 3: Unit root test results

Variable	Augmented Dickey-Fuller (ADF)		Phillips-Perron (PP)	
	Level	First difference	Level	First difference
OPR	–2.312835	–7.09558**	–2.250076	–7.207769**
OO	–3.303501	–5.678877**	–3.579678*	-
RTY	–2.390448	–6.286575**	–2.320222	–6.589332**
ORG	–1.892841	–6.879179**	–1.983439	–6.906524**
GD	–3.677331*	-	–3.439217	15.99685**
GEXP	–4.666724*	-	–3.12831	–7.477777**
NPIOC	–5.284372*	-	–5.300562*	-
NPNOC	–2.287138	–7.472131**	–2.198647	–7.746986**
RESERV	–1.039973	–4.702829**	–1.580249	–4.778209**

Source: Authors' computations. *Indicate significance at level. **Indicates significance at 1st difference. 1%=–4.211868, 5%=–3.529758, 10%=–3.196411

4.2. ARDL/Bounds Cointegration Test

The results of ARDL-bounds cointegration tests for the models/equations are presented in Table 4. The results show that all the models are cointegrated and implies that there is a stable long-run relationship among the variables in each of the models. If the variables are cointegrated, their long run coefficient can, therefore, be estimated.

4.3. Impact of Price Sliding Royalty on Contractor and Government Takes

This section presents a comparative analysis of the impact of price sliding royalty (royalty by price) regime on host government and contractor takes in the long and short run. The regression results tabulated in Table 5 shows the long-run impact of the price sliding royalty regime on the host government's and contractors' stakes. First, the result indicates that there is a positive difference between the royalty regime before royalty by price regime and after its introduction. The positive sign of the policy variable coefficient (PV) indicates that the current regime is impacting more on the takes now than before the introduction of the price sliding royalty regime. However, the change in royalty regime is not significant for both the host government and contractors.

The royalty payout by the IOC (RTY) has negative impact on the contractors take, but the impact is not significant in the long run. However, the price sliding royalty regime had significant positive contribution to government take. This implies that there is a transfer of surplus from contractors to the host government. That is, the royalty by price regime (price sliding royalty) increased the host government take through the economic rent from the oil resources. According to Yang et al. (2017), the negative impact on contractors' stake would decrease their financial investments due to conservative capacity strategy. On the other hand, it makes the host government suffer from new capital intensive project shortage from the IOCs because capital investment is the key decision influencing exploration and production (E&P) industry business and it requires substantial capital resources from the contractor. Another very important variable is the oil price (OPR), which has a positive and significant impact on both parties. The analysis shows that the government will benefit from all output levels. The costs of finding and developing petroleum and mineral resources can be enormous and to meet expected returns on investment, contractors will be attracted to fiscal regimes that provide for early pay-back of these up-front costs (Daniel et al., 2010).

Table 4: ARDL/bounds cointegration test

Model	Equation	Sample size (n)	No. of Variables (k)	F-Statistic	5% Upper critical Bound	Remarks
NPIOC	3.3	35	4	10.2041	4.544	Cointegrated
NPNOC	3.4	37	4	8.2716	5.594	Cointegrated
OO	3.5	37	4	5.9338	5.226	Cointegrated
ORG	3.6	35	4	6.4533	4.57	Cointegrated
GEXP	3.7	35	4	5.7904	5.07	Cointegrated
GD	3.8	35	4	8.7101	5.304	Cointegrated

Source: Authors' computations

Having seen the long run impact, Table 6 shows the results from the short run analysis. The short run impact of the price sliding royalty regime is not significantly different from the long run impact. In the short run, all the coefficients are positive and significant**.** However, the short run impact on government is lower than the long run impact for the royalty level and the regime change. The short run impact of the royalty level and the regime change on the contractors is higher and significantly negative. This is expected since the royalty regime is based on long term benefits in oil and gas industry. The analysis on the price sliding scale royalty regime shows that the amended Deep Offshore and Inland Basin Production Sharing Contract (DOIBPSC) Act ultimate goal is to increase government take both for long and short run.

The contractors in the long-run will adjust and reduce some of the negative impact by restructuring, closing unproductive wells, and even divesting in some areas. Cost Recovery is unique approach for long-run adjustments, because it comprises one of two ways through which the contractor's share usually gets determined, that is, the cost oil and the profit oil split (Blake and Roberts, 2006). Oil price has higher impact on both the contractor and the host government takes. Oil output has positive and significant impact on the contractor and government takes in the short run.

Table 5: Long-run impact of price sliding royalty regime on government and contractors' stakes

Variable	Host government Impact coefficient	P-value	Contractor Impact coefficient	P-value
OPR	0.0343*	0.0005	0.1446*	0.0043
RTY	3.9582*	0.0025	–0.6688	0.6546
PV	7.9592	0.1392	0.7104	0.8128
OO	0.0046*	0.0016	–0.0078*	0.028

Source: Authors' computations. *5%, significance level

Table 6: Short run impact of price sliding royalty regime on government and contractors takes

Variable	Host government		Variable	Contractor Impact coefficient	P-value
	Impact coefficient	P-value			
OPR(–3)	0.1181	0.0010	OPR(–3)	0.322	0.001
RTY(–1)	2.1204	0.0001	RTY(–1)	–12.7293	0.0001
PV(–4)	2.578	0.0016	PV(–4)	–16.8896	0.0033
OO(–4)	0.0212	0.0033	OO(–4)	0.0218	0.0033

Source: Authors' computations

4.4. Impact of Price Sliding Royalty on Contractor's Output

The long and short-run impact of the price sliding royalty regime on the performance of contractors in terms of output is presented in Table 7. The table shows the contraction in the short and long run impact of the regime on the contractors' performance. In the long run, impact of the price sliding regime (PV) is negative and statistically significant. The impact of the royalty level (RTY) on output capacity is also negative and significant. This implies that the price sliding royalty regime has negative long run effect on the contractor's take, thus, reducing the amount of cash available for the contractor. It could lead to divestment in other E&P industry projects and development.

The short run effect of the price sliding regime and the level of royalty is positive and significant. Contractor can still bear the brunt in the short run, but this is not sustainable in the long run because the goal of a fiscal system from a government's point of view is to attract investment (Nakhle, 2008; Blinn et al., 2009). Output will be adjusted in the long run to accommodate the higher rates of the royalty and higher government take, because the law of supply indicates that output will fall in the long run. Oil price has positive impact on output in the long run, but negative in the short run. Mingming et al. (2012) also observed similar trends in PSC analysis based on an oil price stochastic process approach.

Table 8 presents the long run impact of the price sliding royalty regime on fiscal performance of the host government (Nigeria) during the period under review. Table 8 reveals that oil revenue

Table 7: Long run and short run impact of price sliding royalty regime on contractors performance (output)

Variable	Long run		Variable	Short run	
	Coefficient	P-value		Coefficient	P-value
OPR	1.3111	0.8167	OPR(–1)	–7.2449	0.0015
RTY	–215.8709	0.1701	RTY(–1)	398.2978	0.0000
PV	–825.6021	0.0454	PV(–4)	741.2794	0.0001
RESERV	80.8592	0.0107	RESERV(–2)	41.7658	0.0727

Source: Authors' computations

Table 8: Long run impact of price sliding royalty regime on fiscal performances

Variable	Oil revenue		Gov. Exp.		Fiscal deficit	
	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
OPR	74.8992	0.0000	0.5792	0.2367	–0.1563	0.0895
RTY	950.0664	0.0401	2.5935	0.7327	3.9881	0.0327
PV	3761.9470	0.0002	51.2245	0.3037	3.9024	0.0545
OO	6.7287	0.0000	–0.0864	0.2444	0.0044	0.0895

Source: Authors' computations

accruable to the government consequent upon the introduction of the royalty regime increased during the period under review. The sliding regime, PV, is positive and significant which implies that the introduction of the policy regime induced positive effect on the government oil revenue. Also, royalty has positive and significant impact on the government oil revenue. This is expected because of the positive impact of the oil price sliding scale royalty regime. Both oil price and oil output have positive impact on the government oil revenue during the period under review. The finding of Gab-Leyba and Laporte (2016) also supports the findings in this study because their study revealed that oil extraction sector can generate considerable income through economic rent while providing incentives for exploration.

The royalty by price regime had positive impact on government expenditure to GDP ratio. This variable measures the size of the government. What this implies is that the policy regime increased the size of the government during the period under review. The level of the royalty from the IOC contributed positively to government size during the period under review. The oil price was also found to have positive impact on the size of the government; but, oil output had negative impact on the size of the government. Aguilera (2014) also indicated the evidence of a relationship between oil prices and oil output. The non-significant impact of price sliding royalty regime on the account of government size could be explained by the growing size of the GDP relative to the host government expenditure.

The policy regime has positive and significant impact on government fiscal system sustainability. Likewise, the level of royalty from the IOCs improved the fiscal sustainability index during the period under review. However, oil price had negative impact on fiscal sustainability in the long run. This is not unexpected as the volatility in oil price always led to short fall in expected oil revenue, incessant borrowing, over spending and inability to maintain fiscal discipline. Forecasting of oil price is a difficult task for long-term investments and uncertainty should not be ignored as stressed by Larsson and Nossman (2011).

The study observed that the price sliding royalty regime favour the host government's take better than the IOCs. It increased oil revenue for the government and fiscal system sustainability in the long run, and this implies that price sliding scale royalty protects the host government interests. Thus, mutually beneficial contracts between the contractor and host government cannot be achieved at high oil price using price sliding royalty regime. There is also concern that royalties can induce inefficient investment, depletion and operation strategies. A high royalty rate linked to output, for example, may cause premature suspension or abandonment of production as a result of its insensitivity to the declining profit margins when the oil field production continues to decline (Mortenson and Pitre, 2018; Avinadav, 2020). This can have a negative impact on new hydrocarbon field exploration and development since direct investment from the contractor is required to develop these natural resources. Literature has shown the need for government to provide a more flexible tax policy so as to encourage investments in hydrocarbon exploration and production (Camen et al., 2020). Contractors have a strong and legitimate interest in a stable and reasonably predictable fiscal environment.

5. CONCLUSION

This study adopted ex-post research design approach using econometric method of data analysis. Consequently, secondary data were collected from various sources (OPEC Annual Statistical Bulletin, BP Statistical Review of World Energy, and Central Bank of Nigeria Annual Bulletin) from 1980 to 2019 Three fiscal performance indicators were employed to evaluate the impact of the price sliding royalty regime on the performance of the government. Specifically, the indicators are government oil revenue, government expenditure, and government fiscal deficit -GDP ratio. The Pesaran et al. (2001) autoregressive distributed lag (ARDL) model regression approach was adopted for estimating the models.

Our findings reveal that in both the long-run and short-run, the price sliding (royalty by price) regime had negative impact on the contractor's take. But, the royalty by price regime had positive and significant impact on the stake of government for the period under review. The impact of the royalty by price regime on the performance of the contractor in terms of output was found to be positive, and significant in the short run. Nonetheless, the long run impact was observed to be highly negative and significant. The impact of the royalty regime and volume of output on the fiscal performance was positive for the three indicators such as oil revenue, government size and fiscal sustainability. Though, the impact on government size was not significant.

The conclusion from the study, based on the result from the data analysis, is that the price sliding royalty regime in the Nigerian petroleum fiscal policy for the Deep Offshore Inland Basin Production Sharing Contract (DOIBPSC) is not favourable to the IOCs. It is a deliberate scheme to increase the government share of the economic rent from the oil resources. The current Nigerian petroleum fiscal policy in the Deep Offshore Inland Basin Production Sharing Contract is designed for fiscal consolidation and fiscal sustainability. The price sliding royalty regime transfers surplus from the contractor to the government. It is more of a redistributive policy than a policy designed for the growth and development of the oil sector. Long term application of the policy may lead to a large-scale divestment in the oil sector, with Nigeria sliding further downward in oil production league in Africa. There is the need for urgent repeal of the Nigeria petroleum fiscal policy, especially, with respect to PSC to reflect current realities and world's best practices.

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