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Technology Transfer and Economic Benefits: A Descriptive Analysis of Joint Venture and Production Sharing Contract in Nigerian Oil and Gas Industry

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Abstract

Concession was the earliest arrangement between governments of developing countries and Multi National Oil Companies (MNOCs) for the exploration and production of oil and gas resources of the former. However, in their quest to achieve technology transfer and more economic benefits, developing countries came up with other contractual agreements such as Joint Venture and Production Sharing Contracts (JVCs and PSCs). The aim of this study is to assess the best contract that provide Nigeria highest benefits. To achieve this aim, provisions of the contracts and data from Nigerian National Petroleum Corporation (NNPC) and Central Bank of Nigeria (CBN) were descriptively analysed. The analysis indicates that JVCs provide Nigeria the best opportunity of achieving technology transfer through active participation of Nigerians in management of operations. Similarly, the contract gives Nigeria more economic return in form of Petroleum Profit Tax (PPT), royalties, equity margin and lower production cost per barrel of oil.

Keywords: Joint Venture Contracts, Production Sharing Contract, Technology Transfer, Economic Benefit

1. Introduction

Most developing countries endowed with oil and gas resources lack the needed capital and technological expertise for their exploration and development. Consequently, Multinational Oil Companies (MNOCs) which have adequate capital, technology and expertise in managing investment risks are granted development rights by developing countries (Johnston, 1994). Concession rights was the first dominant global petroleum arrangement under which MNOCs were granted right to explore and develop oil and gas resources in most developing countries (Johnston, 1994). However, to gain more economic benefits and participate in management of their petroleum operations, host countries sought for alternative contractual agreements (Tordo, 2007). National Oil Companies (NOCs) predominantly formed in 1960's and 1970's serves as vehicles for achieving these strategic objectives (McPherson, 2003; Waelde, 1996). The formation of Organisation of Petroleum Exporting Countries (OPEC) and gaining of independence by most developing host countries catalysed the quest for achieving these objectives (McPherson, 2003). This resulted into the emergence of such forms of agreements

among others as the joint venture, risk service contracts and production sharing contracts (Saidu, 2014; Johnston, 1994). However, with profit maximization been the main goal of MNOCs, conflict of interests between host countries and MNOCs became evident, each trying to maximize benefits from the agreements (Sulaimanov, 2011; Saidu, 2014). Thus, to further maximize existing benefits or achieve other objectives, host countries shift from one contractual agreement to another (Saidu, 2014). Nigeria is an OPEC member country blessed with huge oil and gas natural resources with oil reserves of 37.1 billion barrels and 186.4 trillion cubic feet of gas as at end of December 2015 (BP, 2016). Nigerian National Oil Company (NNOC), the precursor of Nigerian National Petroleum Corporation (NNPC) was formed in 1971. The country envisaged to through equity participation of the then NNOC (NNPC) in its oil operations; achieve technology transfer, develop the country from the gains of more economic benefits and ensure employment of indigenous workers (IDCH, 2005; NNPC, 2015).

However, the country is shifting from one contractual arrangement to another in the last 60 years. This study assesses joint venture and production sharing contracts to assess the contractual agreement that best offer the country the highest benefits in terms of technology transfer and revenue economic benefits. The remainder of the paper is structured such that next section two is background on common oil and gas exploration and production arrangements. Section three is brief description of past and some existing oil and gas contracts in the Nigerian oil and gas industry. Section four is descriptive analysis of variables of technology transfer and revenue economic benefits offered by joint ventures and production sharing contracts while section five is conclusions and recommendations of the study.

2. Background on common oil and gas contracts

Multinational Oil Companies (MNOCs) are the dominant companies exploring and producing oil and gas natural resources in many developing countries endowed with such resources (Johnston, 1994). Exploration and production of these resources are undertaken under different arrangements (Umar, 2005). However, Johnston (1994) contend that concession agreement is the most dominantly practiced for decades until 1960's when there was shifts to Production Sharing Contracts (PSC) and in some cases, Joint Ventures (JVs) or Joint Operating Agreements (JOAs) and Service Contract (SC); below is brief overview of the arrangements.

2.1 Concession

Concessions are contracts whereby the government grant an investor exclusive right to exploit and produce natural resources in an area for a specified time frame (Cotula, 2010). This is consistent with Mazeel (2010) who described concession as an arrangement in which the state grant a concession or license which gives right to an international oil company to explore for and produce hydrocarbons in an area for a specified period. Concession is also defined as a planning whereby an oil company is granted the right to explore and exploit oil and gas in exchange for the payment of all costs and specific taxes related to the operation (Blinn, 1986). It is also seen as an arrangement in which although the government owns its mineral resources, it transfer title of produced minerals to the company involved in its exploration and production receiving only royalties (Johnston, 1994). Concession granted to Colonel Edwin Drake in Titusville, Pennsylvania, U.S.A in 1859 is documented as the first known concession arrangement globally (Blinin et al 2009; Umar 2005). However, the concession granted to Williams Knox D'Arcy by the Persian Empire in 1901 is the first arrangement in modern day developing countries (Gao,

1994; Johnston 1994). Algeria, Brazil, Norway, USA, UK, Russia, Australia, New Zealand, South Africa, Colombia and Argentina are among countries practicing this system (Sulaimanov, 2011; Johnston 1994).

It could be noted that in all the definitions, the government has no control over its produced minerals, receiving only specified and agreed taxes and royalties which may be economically insignificant compared to overall value of produced minerals. From this perspective, Machmud (2000) emphasized that under concession arrangements, governments are excluded from participating in the undertaking, management of petroleum operations and sharing of profits. To overcome these disadvantages suffered by governments, a modernized version was introduced by host governments of developing countries. For Instance, in 1940's Venezuela imposed profit sharing to derive more economic benefits (Machmud, 2000). The modernized concession is characterized by small concession area, short duration of concession, provision for elongating concession, relinquishment provision, state control and participation in form of investment, and improved financial benefits to the state. These benefits notwithstanding, a clearer participatory contractual arrangement also evolved referred to as the Joint Venture Agreement (JVA) or Joint Venture (JV).

2.2 Joint Venture (JV)

The term joint venture is described as a commercial arrangement between two or more separate entities, each party contributing resources to the venture thereby creating a new business sharing the risks and benefits associated with the venture (HM Treasury, 2010). It is also defined as the coming together of people for executing a single venture (Black and Dundas, 1992). It is also seen as entities created, owned and controlled jointly by two or more separate entities that represent the partial combination of their resources within a common legal organisation (Kogut, 1988; Groot and Marchant, 2000; Johnson and Houston, 2000). The usual elements of a joint venture include: community interest in the object of the undertaking; pro-rata right to direct and govern the conduct of each other with respect there to; and share to the extent of their relationship (HM Treasury, 2010; Black and Dundas, 1992). The motives of forming joint ventures among others include risk/cost sharing, transfer of knowledge, gaining access to market, shaping competition, strategic linkages and facilitating internationalization (Groot and Merchant, 2000; Palmer, Owen and Kervenoael 2010). Joint venture arrangement is widely practiced in the petroleum industry of developing countries as a mechanism for participation, control and earning of more benefits by the state (Umar, 2005). However, it is commonly referred to as Joint Operating Agreement (JOA) in the petroleum industry (Waqas, 2014; Wright and Gallun, 2005).

JOA is an agreed framework for the exploration and production of petroleum, usually between the state-owned oil corporations and MNOCs defining the respective parties' rights and obligations in terms of extent or limits of participating interest, control and management of the venture, cost, profit and loss sharing formula (Waqas, 2014; Umar 2005). Consistent with joint venture, the overall objective of JOA is to establish contractually the rights and responsibilities of the parties to the agreement (Wright and Gallun, 2005). Some common features of JOAs may include stating how authority for decisions is to be delegated or shared by the parties; how cost, production, and revenue will be shared, how equipment and materials will be managed; and designating, appointing and establishing the powers, duties and compensation of an operator (Wright and Gallun, 2005). However, giving a broader perspective of the features of JOA; the Association of International Petroleum Negotiators (AIPN) contend that the common features are

first, the operating committee composed of representatives of parties to a joint venture charged with overall supervision and direction of joint venture operations; second, the operator responsible for day to day management and control of joint operations; third, work programme and budgets prepared by the operator on commercial discovery and presented to the operating committee for approval; fourth, decommissioning/abandonment cost which is provided for by joint venture parties based on contractual or laws/regulations governing it; and fifth, general provisions and accounting procedures as determined by parties to the joint venture (Ahmadov et al., 2012). The advantages of this type of contract are government count on the expertise of the contractor which are mostly MNOCs and share the profits in addition to other remuneration like taxes or royalties (Radon, 2005). However, risks of non-commercial discovery and payment of financial obligations are disadvantages of JVs in the petroleum industry (Radon, 2005). These may perhaps be reasons that some governments are emphasizing on an arrangement that relieve them of these risks referred to as Production Sharing Contract (PSC).

2.3 Production Sharing Contract (PSC)

Joint venture agreements afforded host governments to participate in the operations of their oil and gas resources through state owned oil companies (Umar, 2005). Production sharing agreements is another contractual arrangement that creates an image of national control by host governments over their petroleum operations (Gao, 1994). PSC is a contractual agreement in which a firm commits to undertake and finance at its own risk the exploration, development and production of hydrocarbons and other extraction activities. The firm is compensated by recovering its costs using an appropriate share, not exceeding a certain percentage of the production (Ing, 2014). The contract is also described as an arrangement in which a state contracts an international or domestic oil company to provide the requisite finance and technical skills to explore for and produce oil and/or gas within a defined area. The contracted firm bears the entire risk of the project, financial and otherwise and on commercial discovery, the firm becomes entitled to a portion of any oil produced as payment for its efforts, if otherwise, the firm receives nothing (Geraghty et al., 2013). It is also defined as a contractual agreement between a contractor and a host government in which the contractor bears all exploration, development and production costs in return for a stipulated share of the production resulting from this effort (Johnston 2003). Thus, in this type of contract, host governments do not partake in financial risks associated with exploration and production at the same time possessing legal title of discovered oil and gas (Sulaimanakov, 2011).

The history of PSC's dates to 1966 when it was first implemented in the agricultural sector of Indonesia (Johnston, 1994, 2003; Gallun and Wright, 2005; Ahmadov et al., 2012). Since then the arrangement is widely practiced in the hydrocarbon industries of developing countries such as Malaysia, Oman, Egypt, Libya, Angola, Peru, Philippines, Sudan, Nigeria, Thailand (Sulaimanakov, 2011). PSC's differ widely in their terms and conditions across the countries practicing such arrangements (Ahmadov et al., 2012). However, it is contended that PSC's have eight common provisions, first, the state retains legal title to the unproduced natural resources and only transfers title to the contractor's share of the oil once it has been produced. Second, the contractor usually bears the risk at the exploration stage, third, PSCs, once signed, often become part of national legislation. Fourth, it is the state or its NOC that grant right to the contractor to explore, develop and extract oil. Fifth, the contractor invests capital and initial capital expenditures and on-going maintenance costs which are deducted from production in the form of

cost oil. Sixth, the contractor receives a share of the produced oil in accordance with the agreed formula referred to as profit oil. Seventh, cost and profit oil are normally calculated based on actual oil produced and eighth, profit oil is shared throughout the duration of the contract while tax is paid to government on received oil (Ahmadov et al., 2012). Therefore, the contract is composed of four key financial aspects of royalty, cost oil, profit oil and income tax (Geraghty et al., 2013). The advantages of this type of contract to host governments are transfer of risks to the contractor and sharing in profit oil (Radon, 2005). Where the contract is enacted into law the contractor get the advantage of legal security (Radon, 2005). However, one of the major disadvantage of this type of contract is the need for government to have data and technical knowledge of discovered reserves which are lacking in most developing countries (Radon, 2005; Umar, 2005). Service contract is another contractual agreement in the oil and gas industry.

2.4 Service Contract (SC)

Service contracts is a contract in which the state contract the services of the contractor in the development of a country's hydrocarbon resources bearing all risks in the operations (Johnston, 2003; Umar, 2005; Hassan 2012). Upon commercial discovery, the contractor is paid incurred expenses and receive a fee normally determined based on volume of production (Umar 2005, Sulaimankov, 2011; Hassan 2012). Payment of fees rather than sharing profit oil constitute the major difference between PSC and SC (Gallun and Wright, 2005; Sulaimankov, 2011; Hassan, 2012). Service contract is reported as commonly practiced in Middle East and Latin American countries such as Iran, Iraq, Kuwait, Argentina, Brazil and Indonesia (Sulaimanakov, 2011; Geraghty et al., 2013). Nigeria is as an oil and gas resources rich country has adopted concession, JVCs, PSCs and services contracts petroleum exploration and development arrangements; thus, it is imperative to consider the Nigerian oil and gas industry.

3. Nigerian oil and gas industry

The history of the Nigerian oil and gas industry dates 1908 when Nigerian Bitumen Corporation (NBC) commenced prospecting for oil (Umar, 2005; Hassan 2012). This was however disrupted by the first World War I, resuming in 1937 this time by Shell D'arcy which was granted sole concession rights to prospect for oil in the entire Nigerian landscape (Hassan, 2012). The eruption of World War II interrupted this effort resuming in 1947 through collaboration between Shell and British Petroleum (Okonmah, 1997; Hassan 2012). Commercial oil was successfully discovered in Oloibiri of present Bayelsa state of Niger Delta in 1956 (Okonmah, 1997; Umar, 2005; Hassan 2012). Initial quantity of produced oil was 5,100 barrels per day, progressively increasing to over two million barrels per day in 2015 (NNPC, 2015). Similarly, the importance of oil to the economic, social and political spheres of the country kept rising. The contribution of oil to Nigeria's total foreign revenue was less than 10% in the early 1960's contributing 4.10% in 1963 and 5.90% in 1964 (Graf 1988, Robinson 1996) with bulk of the total revenue coming from agriculture (Iwaloye and Ibeanu, 1997). However, beginning 1970's, the contribution of oil to total foreign revenue and total national revenue began to increase accounting for 93% of Nigeria's total foreign revenue earnings and 70% of its total national revenue in 2013 (CBN, 2015). Table 2.1 indicates the contribution of oil and gas to foreign, total national revenue earnings and Gross Domestic Product (GDP) 2005 - 2015 (CBN, 2016).

Table 1: Contribution of oil and gas to foreign, total national revenue earnings and Gross Domestic Product (GDP) 2005 - 2015

Year	Total Foreign Earnings (Billion \$)	Contribution of Oil to Foreign Earnings (%)	Contribution of Oil to Total Revenue (%)	Contribution of Oil to GDP (%)
2015	19b	19	55	4
2014	33b	21	61	8
2013	98b	93	70	33
2012	119b	91	75	37
2011	105b	88	80	41
2010	89b	94	74	43
2009	67b	70	69	30
2008	109b	91	83	38
2007	74b	40	78	37
2006	59b	56	87	38
2005	52b	98	85	39

Data in Table 1 clearly shows the significant role that Nigeria's oil and gas industry is playing in its national economic sphere which in turn transcends to its social and political landscapes. The industry is expected to continue playing these significant roles based on the country's enormous oil and gas reserves. The country was reported to have 37.10 billion barrels of proved oil and 180.50 trillion cubic feet of gas reserves respectively placing it in the tenth and ninth positions in global ranking of countries with oil and gas reserves as at end of December, 2015 (BP, 2016). However, despite the importance of the industry, the country has been shifting from one contractual agreement to the other over the last six decades (Umar, 2005; Saidu, 2014). Below are brief description of past and existing oil and gas exploration and production arrangements in Nigeria.

3.1 Concession in the Nigerian oil and gas industry

The first concession in Nigerian oil and gas industry was granted to a German concern, the Nigerian Bitumen company in 1908 (Umar, 2005; Hassan, 2012). This was followed by the concession granted to Shell-BP in 1937 pursuant to the Mineral Oil Ordinances No. 17 of 1914, 21 giving the company exploration right over the whole mainland of Nigeria comprising 357,000 square miles or 925,000 square kilometres for a period of forty years (offshore) and thirty years (onshore) with an option to renew (Umar, 2005). In return for these concession rights, the concessionaires were required to pay some yearly rent for the entire term of the concession and royalty," in respect of each year of the said term the certain rent of five shillings. In respect of each year of renewal of the said term the certain rent of ten shillings", and "a royalty of four shillings a ton of 2,240 lbs of all crude oil won and saved by the licensee from the said lands within such year" (Gidado, 1999; Umar, 2005). Additionally, in compliance with Nigerian tax legislations, the concessionaires pay Petroleum Profit Tax (PPT) and other relevant payable taxes. Furthermore, as an investment incentive, companies granted concession could operate in the country as unincorporated businesses (Hassan, 2012).

However, concession arrangement in developing countries in general is viewed as colonialist and exploitative especially in the wake of independence granted colonized countries in the 1960's and 1970's (Umar, 2005). Nigeria is not an exception as the country's promulgation of the Petroleum Act 1969 paved the way for participation in its petroleum operations (Umar, 2005; Hassan 2012). Similarly, Nigeria's quest to becoming a member of OPEC that requires member countries to nationalize their oil industry resulted in the formation of NNOC in 1971 and the country joined OPEC same year (Nwokeji, 2007). Consequent to these, Nigeria started participating in its oil and gas operations by acquiring 35% equity in Foreign Multinational Oil Companies (FMOC) in 1973 (Hassan, 2012). However, to have more participation and control over its oil and gas resources, Nigeria came up with Joint Venture (JV) arrangement (Umar, 2005; Hassan, 2012).

3.2 Joint venture contracts in the Nigerian oil and gas industry

Pursuant to the Petroleum Act 1969 and NNPC Act 1973, government through the national oil company converted; all pre-1969 concessions into joint ventures to have more participations in its oil and gas operations (Umar, 2005). The essential elements of the contract are first; community interest in the object of the undertaking. Second, appointment of an operator, usually a MNOC, with full responsibility to carry out joint operations for and on behalf of the parties in a safe, technically sound, and financially prudent manner. Third, pro-rata right to direct and govern the conduct of each other with respect thereto; fourth, contribution of funds by each party to finance the operations to the extent of their respective interest and share to the extent of their respective percentage interest in the losses or profits from the operation. Fifth, the operator has freedom of action in specific matters and can commit the joint venture up to a certain limit of authority; sixth, close, possibly fiduciary, relationship between the parties, although the liability of the partners is not joint but several. Seventh, technical and policy matters are discussed at a meeting of operating committee or its sub committees where parties are equally represented; and eight, subject to payment of Petroleum Profits Tax (PPT) each partner can lift and dispose its share of production (Gidado, 1999; Umar, 2005). These provisions are broadly categorized into management and fiscal components; the focus of this study is on the management aspects. Gidado (1999) broadly delineated the management aspect as encompassing the establishment of management board/operating committee composing of representatives from all the parties meant to provide overall supervision and direction on all matters. This is the first advantages of JVs as it allows government (NNPC) active participation in its oil industry (NNPC, 2005). Second, government now gain more economic benefits from the proceeds of its share in addition to tax and royalties (McPherson, 2004). Third, JVs provide a good platform of attracting foreign direct investment in the form of large risk capital, technological and management expertise, essential to the industry (Gidado, 1999). Fourth, JVs enabled government to legislate on policy issues in the industry for overall national development (NNPC, 2005). However, the contract has its disadvantages such as allegation of gold plating of operating costs by venture operators (Ameh, 2005). JV is the dominant contractual agreements between Nigerian National Petroleum Corporation (NNPC) and MNOCs notably, Shell, Exxon Mobil, Chevron, Agip, Elf, and Texaco (Astegbua, 1993; Okonjo, 2001; Umar, 2005; Hassan, 2012). NNPC has 60 percent interest in all the JVs except the JV with Shell in which it is holding 55 percent (NNPC, 2005) as indicated in Table 2.

Table 2: Nigerian oil and gas production joint ventures with NNPC

Operator (% interest)	Other partners (% interest)	NNPC (% interest)
Shell (30%)	Total (10%), Agip Oil (5%)	55%
ExxonMobil (40%)	None	60%
Chevron (40%)	None	60%
Agip Oil (20%)	ConocoPhillips (20%)	60%
Total (40%)	None	60%

However, despite opportunities of achieving technology transfer through participation offered by joint venture, timely payment of cash call obligations by NNPC is identified as a major challenge of this contractual agreement (Umar, 2005; Nwokeji, 2007). Perhaps, this may be one of the reasons for apparent shift to PSC contractual agreements that began in 1973.

3.3 Production sharing contract in the Nigerian oil and gas industry

The first PSC in the Nigerian oil and gas industry is in 1973 between NNOC, the precursor of the NNPC and Ashland Oil Nigeria Company. The contract was for OPL 98/118 for duration of 20 years and renewable for another five years (Umar, 2005). However, the contract is more widely implemented from 1990's with the execution of the first round in 1993 and the second round in 2000 (Umar, 2005). Similarly, there other versions in 2005, 2006 and 2007 (Oji, 2013). In Nigeria, PSC is a blend of statutorily predetermined and contractually negotiated terms between the NNPC and the MNOCs. Legislated areas include, government participation; title to petroleum; exploration licenses and mining leases; commerciality; royalty; taxation; Investment Tax Credits/Allowance (ITCA); ring fencing; domestic obligations; environmental protection and safety; training of Nigerian personnel; local content; and arbitration (Umar, 2005). Areas that are subject to negotiations include, term /duration; work commitment; relinquishment; insurance; title to equipment; certain rights and obligations of the parties; composition functions and powers of the management committee; bonus payments; cost recovery limits; production sharing; accounting procedure; lifting obligations; and project implementation procedure (Umar, 2005).

Although there are various rounds of PSCs in Nigeria, their main elements are the same (Umar, 2005). These includes; NNPC holds all rights in the contract area; NNPC appoints the contractor with an exclusive right to conduct petroleum operations in the contract area; the contract permits the contractor to operate for 30 years; the contract requires the contractor to provide funds and guarantees and bears risks of operating costs; the contract requires contractor to employ and train Nigerians and the contractor is allowed to recover all its operating expenses within five years and take an agreed percentage share of the profit (Umar, 2005). However, PSCs rounds of 2005 and 2006 provides a ceiling of 80% cost recovery (Oji, 2013). These are the typical legislative and negotiable provisions of PSCs in Nigeria. PSCs eliminated cash call burden on Nigeria and this considered as an advantage. Another advantage is, the contract allows government to retain title to oil on ground and the right to exercise overall control and oversight of the project and the contractor, while conceding the day to day management of the project to the contractor (Umar, 2005). Likewise, the contract has the advantage of increasing government revenues by reducing incidences of tax evasion by MNOCs as each party receives its entitlement in oil rather than in

cash (Gidado, 1999). Conversely, one of the disadvantages of PSCs is MNOCs could be wasteful in their expenditures or engage in transfer pricing as a means of enhancing their returns knowing that such are reimbursable (Gidado, 1999). Similarly, control under PSC is largely seen as political as MNOCs practically exercise the same control as in concession arrangements (Muttitt, 2005). Having had insight into JVs and PSCs in Nigeria, it is of significance to look at the volume of crude oil production from these contracts. This is imperative as volume of production is a key determinant of oil revenue vital to the development of the country. However, data on crude oil production from the two types of contracts available on NNPC website is from 1997 to 2015 as presented in Table 3.

Table:3 Crude oil production from JVs and PS contracts 1997 to 2015

Year	Total annual production	Production from JV operations	% of JV from total	Production from PSC operations	% of PSC from total	Share of NPDC from Total production	% of NPDC from Total
2015	796,398,950	380,491,756	48	321,598,954	40	34,432,305	4.32
2014	699,486,203	405,418,032	58	217,673,413	31	28,064,795	4.00
2013	639,745,147	397,727,669	62	192,677,988	30	21,405,995	3.35
2012	636,563,715	445,119,895	70	167,278,545	26	20,219,509	3.18
2011	592,208,419	472,425,369	80	96,130,141	16	20,244,780	3.42
2010	599,804,797	503,040,733	84	85,934,334	14	9,029,006	1.51
2009	780,347,940	331,554,144	42	268,792,256	34	21,869,008	2.80
2008	768,745,932	471,900,351	61	195,127,693	25	1,494,438	0.19
2007	803,000,708	581,468,061	72	192,621,306	24	15,853,124	1.97
2006	869,196,506	662,491,651	76	162,532,458	19	333,700	0.04
2005	837,584,019	791,571,597	95	9,767,820	1	22,184,571	2.65
2004	911,044,764	845,528,042	93	14,598,760	2	2,809,275	0.31
2003	759,283,530	740,471,003	98	13,767,735	2	5,044,792	0.66
2002	699,726,792	693,294,356	99	-	-	6,432,436	0.92
2001	863,744,500	813,837,330	94	8,796,332	1	2,221,265	0.26
2000	823,031,182	781,572,652	95	6,127,477	0.7	1,913,847	0.24
1999	732,404,018	728,515,934	99	2,067,546	0.3	1,820,538	0.25
1998	359,461,825	350,422,239	97	6,249,839	2	2,850,847	0.37
1997	855,736,287	837,940,399	98	16,069,964	2	1,725,924	0.20

From Table 3, Nigeria's crude oil production is predominantly from joint ventures, however, production volume from PSCs is increasingly becoming significant. Conversely, production from independent/sole risk contract operated by Nigerian Petroleum Development Company (NPDC)¹ is contributing insignificant volume and percentage of total volume of production. On the overall, volume and percentage of oil production from PSC is increasing while that of joint venture contract is decreasing in recent years. This could be suggesting a policy shift by NNPC

¹ The Nigerian Petroleum Development Company (NPDC) Ltd is a fully-owned subsidiary of the Nigerian National Petroleum Corporation (NNPC) engaged in Oil & Gas Exploration and Production activities in the hydrocarbon-rich regions of coastal Nigeria, both onshore and offshore (NNPC 2015).

away from joint venture to PSC. However, this is happening even though onshore oil reserves is about 25 billion barrels or two third of the country's total oil reserves of 37.1 billion barrels as at end of December 2015 (NNPC, 2015; BP, 2016). Similarly, the apparent shift is occurring when almost all drilled wells showing different levels of prospect outside the Niger Delta are onshore (NNPC, 2015). The next section is descriptive analysis of variables of technology transfer and gaining of economic benefits from joint ventures and production sharing contracts.

4. Descriptive analysis

This section descriptively analyses Nigeria's prospects of achieving technology transfer and gaining more economic benefits from joint ventures and production sharing contracts. The analysis is framed within what is previously presented, literature and happenings within national and global oil and gas industries.

4.1 Technology transfer

Technology transfer broadly refers to series of processes allowing and easing the flows of skills, knowledge, ideas, know-how and technology among different stakeholders such as international organisations, research institutions and universities (Gorzka and Piotrowski 2016). Consistent with this broad definition, successful transfer of technology requires more than just the moving of high-tech equipment from the developed to the developing world, or within the developing world (UNEP, 2003). Enhanced knowledge, management skills and technical and maintenance capabilities of those receiving the technology constitute other requirements of an effective technology transfer (UNEP, 2003). Similarly, integrating human skills, organisational development and information networks are also essential for effective technology transfer (UNEP, 2003). Thus, technology transfer is a broad and complex process which must be followed if it is to avoid creating and maintaining the dependency of the recipient. It is only after this is done that transfer of technology can contribute to sustainable and equitable development (UNEP, 2003). Relating this to Nigerian oil and gas industry, the country started participating in its oil and gas industry operations in early 1970's through joint venture contractual agreements between the then NNOC and MNOCs. The joint ventures provided for the establishment of management board/operating committee composing of representatives from all the parties meant to provide overall supervision and direction on all matters. Thus, this provision if efficiently harnessed will serve as a good platform for NNPC to train Nigerian citizens in all aspects of its petroleum operations as one of the objectives of its establishment. Similarly, joint venture agreements vested control of oil and gas resources to Nigeria with almost 60% in all the ventures. Therefore, this dominant control is an added leverage for NNPC to ensure training of citizens to achieve effective technology transfer.

However, the country appeared not to have achieved the desired benefits of technology transfer under the joint venture operations. For instance, the Nigerian Oil and Gas Industry Content Development Act (NOGICDA) which seeks to achieve 70% local content components in the Nigerian oil and gas industry is yet to be achieved (Proust and Osahon, 2015). This may perhaps be an explanation on why NPDC Nigeria Limited as a subsidiary of NNPC saddled with exploration and production activities is producing insignificant volume of crude oil as indicated in Table 3. This is coming at a time when similar NOCs formed almost at the same time with the precursor of NNPC are not only efficiently exploring and producing locally, but are important market players in global exploration and production of oil and gas. For example, through

technology acquired during its joint venture operations, Petronas Malaysia went into oil and gas exploration and production joint venture with Vietnam and Myanmar governments in 1989 after its formation in 1974 (IDCH, 2005). Similarly, Saudi Arabia acquired 25% stake in American Oil Company (Aramco) in 1973 as participating equity, increasing it to 60% in 1974 and 100% in 1988 becoming a state-owned company, Saudi Aramco. The company is now playing significant role in oil and gas and exploration and production in the country (IDCH, 2005). Therefore, it could be argued that if there was effective technology transfer, NPDC may not only be exploring and producing oil and gas in Nigeria, likely doing so abroad. Efficient exploration and production capabilities by NPDC could have help the country achieve its much quest of increasing its oil reserve to 40 billion barrels, a target set to be achieved in 2010, but not yet realized (NNPC, 2010). Indeed, increase in volume of crude production by NPDC in the year 2005 and most of the years with high volume of production was sequel to joint activities between NPDC and Agip Energy and Natural Resources (AENR) limited. Despite not achieving much on technology transfer portrayed by NNPC's inability to effectively undertake significant exploration and production activities under JVs, the country is emphasizing on PSC as depicted by its increasing significant production output 1997 – 2015.

Under PSC arrangement, contracted MNOCs provide funds and guarantees and bears risks of operating costs, thus, the NNPC has no any financial risk to bear. PSCs in Nigeria contain provisions requiring the training of Nigerian citizens in aspects of its oil operations. However, giving the poor performance of joint ventures in which government has controlling financial obligations, this requirement is unlikely to be meaningfully implemented by MNOCs. For the same reason of non-financial stake, representatives of Nigeria in the PSCs management committee may be technically manipulated not to articulate the recruitment and training of Nigerians to ensure technology transfer. Similarly, with MNOCs bearing all risks associated with exploration and production, they are most likely to be using more expatriates in their operations as means of providing employment to their citizens. Likewise, they may not be willing to give adequate and expert training to the few Nigerian citizens they employ as a strategy to continue using foreign manpower. These are more likely to occur as it is asserted that MNOCs are benefitting from the inefficiencies and problems associated with NNPC operations (Nwokeji, 2007). Thus, despite the poor performance of joint venture as vehicles for technology transfer in the Nigerian oil and gas industry, it is perhaps a better option than PSCs in realizing this goal. Another important aspect that resulted in shift from concession arrangement to contractual agreements is the quest for increased economic benefits.

4.2 Economic benefit

Economic benefit denotes quantifiable benefits in monetary terms such as revenues, net cash flow, net income or cost savings consequent to taking a decision or course of action (Daske, 2006). Relating this to contractual arrangements in the Nigerian oil and gas industry, this implies the receipts of more revenues and cost savings by Nigeria sequel to adopting a specific contract. This study considers volume of production and cost savings accruing to government from joint ventures and production sharing contract.

4.2.1 Production volume

Volume of goods produced or services rendered and price of the goods or services are the main determinants of total revenue generation. Within the context of the Nigerian oil and gas industry,

this depicts the volume of barrels of oil produced and prevailing price of barrel of oil. In addition, to this, more volume of oil production means more petroleum profit tax revenues accruing to the government. Below is a hypothetical demonstration holding price constant of how volume of oil produced affects Nigeria's economic benefits. It is reported that at a price of \$18.00 per barrel government total take on one barrel produced under joint venture is \$12.72. This is composed of Petroleum Profit Tax (PPT) and royalty \$11.30 and equity margin of \$1.42 (NNPC, 2005; Umar, 2005). Therefore, assuming a production of 1,000 barrels under JVs, Nigerian government will earn \$12,720.00 (1,000 x \$12.72). However, if under the same price of \$18.00 per barrel, 800 barrels are produced from JV operations, government take will be \$10,176.00 (800 x \$12.72). Conversely, under PSCs at the same price of \$18.00 per barrel of oil, total government earnings on a barrel of oil produced is \$5.80. This is made up of PPT and royalty \$4.00 and maximum profit oil of \$1.80 (NNPC, 2005). Consequently, if 1,000 barrels of oil are produced under PSCs total government earnings is \$5,800.00 (1,000 x \$5.80). While if production goes down to 800 barrels, government take will be \$4,640.00 (800 x \$5.80). Table 4 further demonstrate the impact of volume of production from JVs and PSCs on government take on the highest and lowest production volumes 2006 – 2015 assuming a constant price of \$18.00 per barrel.

Table: 4 Demonstration of the impact of volume of production from JVs and PSCs on government take on the highest and lowest production volumes 2006 – 2015

Joint Venture and PSC Operations 2006 - 2015	
Highest production volume is in 2006	
JVs	
Production Volume:	662,491,651 barrels (Highest 2006 – 2015)
PPT and royalty:	662,491,651 x \$11.30 = \$7,486,155,653.30
Equity margin:	662,491,651 x \$1.42 = <u>927,483,311.40</u>
Total government take	\$8,413,643,964.70
PSCs	
Production Volume:	662,491,651 barrels (Highest 2006 – 2015)
PPT and royalty:	662,491,651 x \$4.00 = \$2,649,966,604.00
Equity margin:	662,491,651 x \$1.80 = <u>1,192,484,971.80</u>
Total government take	\$3,842,451,575.80
Lowest production volume is in 2009	
JVs	
Production Volume:	331,554,144 barrels (Lowest 2006 – 2015)
PPT and royalty:	331,554,144 x \$11.30 = \$3,746,651,827.20
Equity margin:	331,554,144 x \$1.42 = <u>470,806,884.48</u>
Total government take	\$4,217,458,711.68
PSCs	
Production Volume:	331,554,144 barrels (Lowest 2006 – 2015)
PPT and royalty:	331,554,144 x \$4.00 = \$1,326,216,576.00
Equity margin:	331,554,144 x \$1.42 = <u>470,806,884.48</u>
Total government take	\$1,797,023,460.48

As depicted in Table 4, Nigerian government economically benefits more by producing more of its oil from the joint venture operations than from PSCs. Total government take with the highest production volume of 662,491,651 barrels of oil in 2006 was \$8,413,643,964.70. However, if the same volume is produced from PSCs, total government earnings will be \$3,842,451,575.80. Similarly, at the lowest volume of production in 2009 with 331,554,144 barrels, government total take is \$4,217,458,711.68 under JVs. This is higher than \$1,797,023,460.48 the government could have taken if the same volume is produced under PSCs. Ability to save production costs is an important component of achieving higher investment returns. Thus, the type of contract that avails the government with the most efficient cost savings, give it the most total economic benefits.

4.3.2 Cost efficiency

Cost denotes the amount of money required to buy, do or produce something, while efficiency means the ratio of output to input (Rumble, 1997; Hjeltnes, 2005; FT 2017). A system is cost efficient if, relative to another system its output cost less per unit of input (Rumble, 1997; FT, 2017). Therefore, within the context of this study, the idea is to determine the type of contract which cost less to produce a barrel of oil between JVs and PSCs. Lower production cost of a barrel of oil means government and MNOCs are bound to reap more revenue economic benefits. For instance, if it cost \$40.00 to produce a barrel of oil under contract type A while it cost \$50.00 to produce the same barrel of oil under contract type B when the price of barrel of oil is \$100, it means that \$60.00 is generated from contract type A and \$50.00 from contract type B as revenue. Umar (2005) contend that cost monitoring is better controlled under JVs and has lower risk of after event approval while PSCs have higher risk of after event approval as the contractor fund 100% of the cost of the contract. However, JVs are characterised with gold flattening of costs while PSCs are enmeshed with instances of inflated contract cost. For example, the final contract cost of Shell Bonga which is the first offshore PSC contract that started production in December 2005, is \$3.6 billion against an initial cost of \$2.9 billion (NNPC, 2005; Alike, 2017). Shell is entitled to cover 100% of its cost under the contract and the final cost of \$3.6 billion is generating lots of disputes between Shell on one hand and Nigerian Senate and NNPC on the other. The dispute centres on the fact that the inflated final contract cost of \$3.6 billion means Nigeria must wait longer before reaping economic benefits from the field. This portrays the negative effects of cost on revenue accruable to government.

Shedding more light on new Alternative Funding (AF) for joint venture operations to free government from the burden of cash call obligations, Nigeria's minister of petroleum resources stated that current cost of producing a barrel of oil under JVs is \$27.00 (Udo 2017). Conversely, it is documented that Nigeria's cost per barrel of oil is \$31.60, the highest among OPEC members (Kristopher, 2016). The cost per barrel of \$31.60 could be argued as an overall production in Nigeria irrespective of the type of contract from which the oil is produced. Coming from this perspective, with JVs and PSCs being the contracts that accounts for over 90% of Nigeria's oil production volume, if cost per barrel of oil in PSCs is the same \$27 as in JVs, the overall cost per barrel would have been \$27 ($\{\$27 + \$27\}/2 = \27). Thus, it could further be argued that production cost under PSCs is higher than \$27 to arrive at an overall production cost of \$31.60. This study contends that although it could not access any data in public domain on the actual cost per barrel of oil under PSCs, it could be estimated as costing \$36.20 per barrel ($\{\$27 + 36.20\}/2$

= \$31.60)². Therefore, production cost per barrel from PSCs could be reasoned as higher than production cost in JVs. Indeed, Ahmad (2014) found that non-Joint Venture Contracts spend twice as much as the Joint Venture Contracts to produce a barrel of crude oil in Nigeria. This is further suggesting higher cost of producing a barrel of oil under PSCs than under JVs. Below is a hypothetical demonstration of impact of production cost per barrel of oil on revenues from JVCs and PSCs holding above assumption at a price of \$50 per barrel.

	JVs	PSCs
	\$	\$
Price per Barrel	50.00	50.00
Production cost	<u>27.00</u>	<u>36.20</u>
Revenue	23.00	13.80

From the forgoing, Nigerian government tends to derive more revenue or economic benefits through cost savings from JVs more than from PSCs.

5. Conclusions and recommendations

This study analyses JVCs and PSCs in Nigerian oil and gas industry to determine the contract that gives the country the highest benefits in terms of technology transfer and revenue. Provisions in the contracts and other secondary data from NNPC and CBN are descriptively analysed to achieve the objective of the study. On technology transfer, the study reveals that JVs are better options to achieving technology transfer than PSCs. First, joint ventures offer Nigeria more controlling leverage financially and on its resources which could be utilized to ensure adequate training of citizens to achieve technology transfer. Second, with government representation in management committee that oversee daily activities of joint ventures, the country has more power to ensure training of its citizens to achieve effective technology transfer. Third, two third of Nigeria's oil reserve is onshore dominantly exploited through joint ventures. This implies more exploration and production activities in joint ventures, therefore, Nigeria is more likely to achieve the objective of effective technology transfer through training its citizens in joint venture contracts. Looking at revenue economic benefits, volume of oil production from JVs is still dominant in the industry and may continue to remain dominant considering that bulk of the country's reserves are onshore produced through JVCs. Therefore, volume of production as a determinant of revenue, Nigeria stands to benefits more from JVCs than PSCs. Likewise, total cost of producing a barrel of oil in Nigeria is lower in JVCs compared to PSCs; thus, lower production cost in JVCs is a cost saving which increases revenue economic benefit. Therefore, this study concludes that Nigeria stand to gain technology transfer and economic benefits in JVCs more than in PSCs. This may have policy implications as government drive towards PSCs may mean dumping the path of technology transfer availed by JVCs. This may mean that the country may perhaps not be able to acquire the necessary skills to drive its vital industry and will continue to be in the control of MNOCs. Similarly, government will be losing lots of revenues from the sharp practices of inflating PSCs as demonstrated by inflated contract sum of Bonga Shell PSC

² Nigerian government has no financial commitments in PSCs; thus, may not be interested in how much a barrel of oil cost to produce. Likewise, MNOCs are not keen in giving breakdown of cost per barrel as they are concerned with cumulative contract cost which is reimbursed by means of cost oil.

oil field. This will in turn lead to negative consequences on how government implement its budget with less revenue coming from oil. Therefore, this study recommends that government should address all problems associated with JVCs and concentrate on it as it is the best option for the country to achieve technology transfer and reap more economic benefits.

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