Natural Resource Extraction and Economic Performance of the Niger Delta Region in Nigeria

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ABSTRACT

The effect of natural resource extraction on regional and sub-national economic growth has only recently started to generate discussions in energy and regional economics literatures. This paper investigates this issue for the oil producing (Niger Delta) region in Nigeria using a panel data modelling framework. Empirical results from the analysis show no significant relationship between direct extractive activities on the internally generated revenue of each state. However, there is strong statistical evidence that show extractive activities impact positively on the total state level revenue - in the form of production-based derivation fund that accrues to oil producing states. In addition, the extractive activities positively and significantly affect each state's gross domestic product and its disaggregated industries (petroleum and services). However, the impact of the natural resource extraction on the non-oil industry (manufacturing) is negative and not statistically significant. So, the results obtained renders inconclusive, the argument of a possible existence of the "resource curse" at the subnational level in Nigeria. Conclusively, natural resource extraction has positive significant impact on the economic performance of states in the oil-producing region, in contrast to the negative impact at the national level. The results bring to the fore, the need for diversification away from oil to other sectors – especially in within petroleum resource-rich regions/states of the Nigeria. The outcome of the study further highlights another policy issue of better managing oil-resource revenues towards achieving national economic goals including SDGs.

Keywords: Crude Oil Extraction, Economic Performance, Niger Delta, Panel Data, Regression Modelling, Nigeria
JEL Classifications: Q32, Q35, R11, R15

1. INTRODUCTION

There is considerable interest in understanding how natural resource extraction affects economic growth, as resource development influenced the industrial revolution in the 19th century. Natural resource exploitation has also affected economic growth negatively in some developing mineral-exporting countries. The empirical evidence on this subject has revealed both positive and negative channels through which natural resource development can affect economic growth. On the one hand, there is evidence to suggest that petroleum resource exploitation positively affects economic outcomes and improves the welfare of a nation's populace. This happens through job creation and revenue generation from exports

and windfalls from price shocks expended on productive economic activities. The notion that natural resource acts as a stimulus for economic growth is consistent with the existing positive relationship between both in Norway and Botswana (Van Der Ploeg, 2010). On the other hand, however, evidence of negative experiences reveal that natural resource development and dependence leads to deindustrialization and extreme rent-seeking behavior that further slows economic growth. (Sachs and Warner, 1995; Karl, 1997). This negative perspective has been widely observed in developing countries and associated with poor institutions such as Nigeria.

Despite the several findings on natural resource development and economic growth, the subject has remained inconclusive and

hugely debatable. Further fueling this debate are recent evidences from within country studies, showing positive and negative outcomes that are different from country level studies. While, the effects of natural resource development on economic growth at the national level has been extensively studied, recent studies based on regional and subnational economy, have revealed important transmission mechanism at the subnational level differ from the national level. This suggests that the impact of natural resource development at the national level, is not necessarily the same for the regional and subnational level. It is plausible that some of the negative consequences from resource development (Ejemeyovwi et al., 2018) could be best addressed at the subnational level rather than the national level. Thus, understanding the potential benefits and costs of natural resource extraction at the national and subnational have become crucial to resource producing economies.

The effect of natural resource extraction on regional and sub-national economic growth has only recently started to generate discussions in energy and regional economics literature. This paper therefore, seeks to evaluate the economic impact of petroleum resource extraction on the producing region in Nigeria. The general assertion of petroleum resource development impact on the Nigeria economy has been revealed to be negative (Akinyemi et al., 2017). However, these assertions are solely based on national level studies, which might not be a true representation for the producing subnationals and regions. Thus, this paper affirms the likelihood of the economic impact of petroleum resource extraction on the producing region (Niger Delta) in Nigeria.

The remainder of the paper is structured as follows: Section 2 reviews literature on natural resource development and regional economic growth while, Section 3 discusses the methods adopted for the study. Section 4 presents the estimated result and discussion of findings and Section 5 contains the conclusions.

2. REVIEW OF NATURAL RESOURCE EXTRACTION AND SUBNATIONAL ECONOMIC PERFORMANCE

The relationship between natural resource abundance and economic growth have remained a conceptual puzzle due to the conflicting findings of several national studies (Sachs and Warner 1995, 2001; Karl 1997; Van Der Ploeg, 2011). Thus, the empirical literature on natural resource extraction and economic growth has recently shifted from national level studies to focus on regional studies, to investigate the existence of 'resource curse' at the subnational level. The outcomes from these subnational studies have shown contrasting evidences from the national level studies. It has thus, become pertinent to empirically analyze macroeconomic indicates at the sub-national (state) levels, as this could be distinct from the aggregate. As such, this issue based on proposed natural resource transmission channels have been addressed using several empirical methods (Fleming and Measham 2013; Papyrakis and Gerlagh, 2004).

The literature reviewed for this on paper were based on ex-post studies using regression analysis, as the ex-ante studies using

the input-output analysis were consulting studies criticized by Kinnaman (2011) for overestimating the multiplier of resource extractive activities. Iledare and Olatubi (2004) investigated the effects of offshore oil and gas production on the economic performance of the U.S. Gulf States using vector-autoregression model. The study revealed that petroleum production positively affects personal income and state revenue. However, the paper revealed an insignificant effect of petroleum production on aggregate unemployment. On the other hand, Black et al., (2005) investigated the effects of boom and bust in coal industry for 1970s and 1980s Appalachia counties and revealed an evidence of a direct and indirect employment effect of the boom. The study however revealed a small positive spillover into the local non-traded sector and negative spillover into the traded sector.

In another study, Papyrakis and Gerlagh (2007) investigated the same issue for all states in the United States using different economic performance indicators (investment, schooling, openness, R&D, and competition) and concluded that resource abundance was detrimental to state economic growth. Caselli and Michaels (2009) examined the relationship between oil abundance and standard of living in Brazilian Municipalities and found that offshore oil production had no appreciable linkage with the local economy. Nevertheless, oil abundance generates significant revenue for the municipalities through taxes and royalties. Michaels (2010) in another paper for the southern US, find that oil discovery is largely beneficial. He posited that oil abundance has a positive relationship with local employment, population growth, per capita income and quality infrastructure in Southern US. James and Aadland (2011) however tested the resource curse hypothesis at a disaggregated county level and showed evidence that resource dependent counties exhibit anemic economic growth. Marchand (2012) studied the local labour market impacts of energy boom and bust in Western Canada and revealed that boom induces labour demand shocks which yields direct and indirect impacts on the earnings and employments within the energy and non-energy extractive sectors.

On the other hand, the investigation by Papyrakis and Raveh (2012) on regional Dutch disease in Canada discovered evidence of resource curse at the regional level subsequent to resource windfall. Weber (2012) studied the effects of natural gas production on employment and income in Colorado, Texas and Wyoming and established there is a modest increase in employment, wage and salary income and household income due to petroleum production. In addition, Weber (2014) examined South-Central US and observed that natural gas production increases employment rate and population. However, the study also showed evidence of the emergence of the resource curse.

Cust and Rusli (2014) examined the economic consequences of resource extraction and associated revenue windfalls at the subnational level in Indonesia using a panel data set. Their empirical results showed that resource endowments do contribute to increased economic activity at the subnational level in Indonesia. Haggerty et al., (2014) studied the relationship between oil and natural gas specialization and socio-wellbeing in US West and revealed that long term petroleum specialization has a negative

effect on per capita income, crime and education rate. Hartley et al., (2014) showed an evidence of increase in employment attributed to shale gas development in Texas. In addition, they pointed that the same significant effect was not found for wages.

Weinstein (2014) investigated the impact of shale development on US counties using the difference-in-difference method and observed a modest impact on employment with a multiplier of 1.3. Paredes et al., (2015) studied the effect on income and employment of shale gas windfalls from the Marcellus Region and noted a negligible direct income and substantial employment effects from shale fracking activities. Lee (2015) concluded that oil and gas boom in Texas has a positive effect on employment and income. Munasib and Rickman (2015) aligned with the findings of Lee (2015) and revealed that there is a positive significant effect on the economies of oil and gas producing counties in North Dakota and Arkansas. Norman and Jamele (2016) study on the local impact of mining in Peru, found a positive average and mining distributional effect from mining activities. Feyrer et al., (2016) studied the effects of oil and gas production on income in producing counties in the United States and discovered a substantial increase in employment an income in the counties and regions.

Agerton et al., (2017) concluded that positive impacts on employment accrues from drilling activities in the United States. Hunt and Keniston (2017) examined the local economic effects of natural resource booms in Modern American and found that local wages rise during natural resource boom without crowding out the manufacturing sector.

From the cited literature above, at the results at the subnational as well as at the national level are inconclusive with respect to resource extraction and economic growth. Thus, given the non-existence of publishable subnational study on this subject matter for Nigeria, this paper aims to fill this gap and contributes to the growing literature by investigating the effect of natural resource extraction on economic performance of oil producing states in the Niger Delta region of Nigeria.

The Niger Delta is the petroleum-rich region and major hub of all oil and natural gas extractive activities in Nigeria. The region contains enormous amounts of petroleum resources located onshore, shallow offshore and deep offshore. It is situated in the southern part of Nigeria, with a south border to the Atlantic Ocean and eastern border to Cameroon. The region occupies about 12% of the entire nation's surface area and cartographically comprises of six constituents state of Akwa Ibom, Bayelsa, Cross River, Edo and Rivers. However, the region is expanded to include three additional states-Abia, Imo and Ondo, as a result of crude oil and natural gas exploitation activities.

The major economic activities in the region include fishing, farming and trading. The discovery of petroleum resources in 1956, however, increased the presence of oil and gas operating companies, which through their corporate social responsibility create community development programmes that encourage improvement and growth in education, agriculture, health, social welfare, micro-credit and small business development etc. (NDRDMP, 2010). The region contributes substantially to the national treasury through resource development windfalls from the exploitation and production activities within the region.

The ownership of the natural resource in this region is held in trust by the central government and as such royalties are collected by the central government. The producing states in this region are compensated for the production activities through the allocation of a derivation fund based on production volume from the states. Figure 1 shows the contribution of petroleum industry to the gross domestic product of the four highest oil producing states in the Niger Delta region and Nation.

Figure 1 show that the petroleum industry contributes more significantly at the state level than the national level. It is plausible to assume that the impact of petroleum extractive activities on subnational economies than on the national economy. Thus, a robust tool is employed in section 3 to analyze the effects of natural resource exploitation on a state's economic performance.

Figure 1: Petroleum Industry Contribution to the National and State Gross Domestic Product
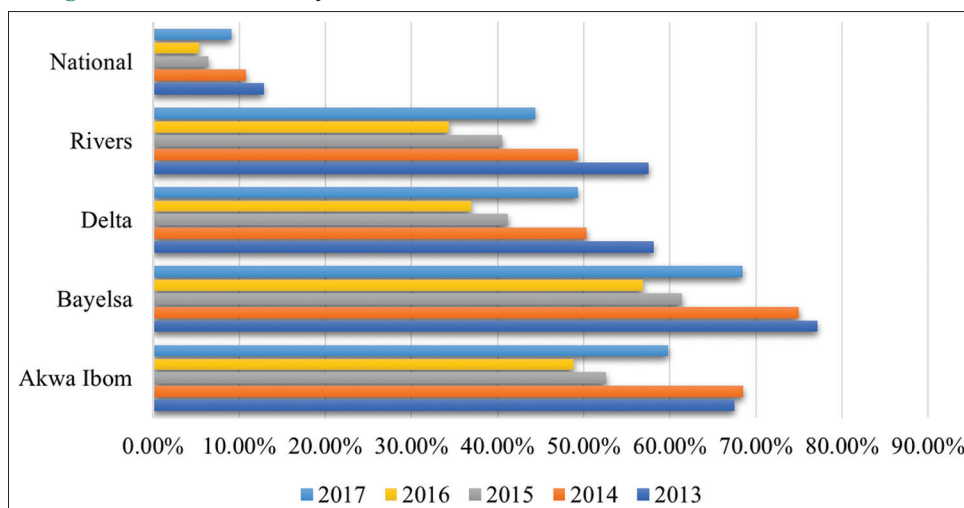
3. METHODS

The purpose of this paper is to evaluate the effects of petroleum extractive activities on key local economic indicators such as internally generated revenue and state gross domestic product of producing states within the Niger Delta in Nigeria. So, panel data technique is employed to estimate the regional economic effect of petroleum resources extractive activities.

3.1. Data
This study adopted state level data to estimate the effect of extractive activities on local economic performance. The measures for economic performance for the producing states adopted in the study, include State Internally Generated Revenue (IGR) and State Gross Domestic Product (SGDP). The State IGR and SGDP data was obtained from the National Bureau of Statistics. It comprises of taxes, fines, levies. Licenses, sales and rent on government property, interest and dividends.

The SGDP is compiled based on the guidelines and recommendation of the System of National Accounts 2008 (SNA, 2008), International Standard Industrial Classification of economic activities, and Central Product Classification System. It measures the sum of gross value added of all resident industries within the economic borders of a state during a given period. Furthermore, the study has adopted the crude oil production data by states from the Department of Petroleum Resources as the proxy for natural resource extractive activities. Gross State Revenue comprising of internally generated revenue, federal allocations to state and loans was obtained from the Nigeria Extractive Industries Transparency Initiative. The panel data for the IGR, GSR, DF and Crude oil production were obtained for the period 2007-2017 for the eight oil producing states in the Niger Delta. The Data for the State gross domestic product and its industrial classification were obtained for a period of 5 years from 2013 to 2017. Table 1 shows the descriptive statistics and data sources.

3.2. Panel Estimation
The panel data estimation technique adopted in this study applies data from 2007-2017 and 2013-2017 to estimate the effect of crude oil production on key economic performance indicators at the state level. The first specification measures the effect of crude oil production using pooled ordinary least square (OLS) model as follows:

$$Y_{it} = \alpha + \beta X_{it} + \varepsilon_{it} \qquad (1)$$

Where Y_{it} is a measure for economic performance (the natural logarithm of state gross domestic product, gross state revenue and internally generated revenue) in state i at time t. The Independent variable, X_{it} is the natural logarithm of crude oil production in state i at time t. β is the estimated parameter, which interprets the percent change in economic performance indicators attributed to the production activities in the state. Finally, α is the intercept and ε_{it} is a random disturbance term.

The second specification uses a fixed effect model to examine the effects of natural resource extraction on key economic

Table 1: State level descriptive statistics

Variables	Mean	SD	Source
IGR	19913.76	21425.51	NBS
Gross State Revenue	130686.4	86045.71	NEITI
Crude Oil Production	69.2556	63.6519	DPR
SGDP	16896.0	6402.88	NBS
SGDP (Petroleum Industry)	9487.30	4660.65	NBS
SGDP (Manufacturing Industry)	1487.09	989.89	NBS
SGDP (Service Industry)	5921.57	2022.46	NBS

IGR: Internally Generated Revenue, SGDP: State Gross Domestic Product

Table 2: Panel data regression (Internally generated revenue and gross state revenue)

Variables	Internally generated revenue	Gross state revenue	Derivation fund
Pooled OLS			
Oil production	0.2771***	0.4241***	0.9056***
	(1.054)	(0.033)	(0.038)
Intercept	18.479***	18.053***	8.2450***
	(1.054)	(0.569)	(0.663)
R-squared	0.195	0.784	0.877
F-test	20.83	167.12***	565.33***
Fixed-effect			
Oil production	0.0906	0.9851***	0.9084***
	(0.608)	(0.1571)	(0.1031)
Intercept	20.762	8.049***	17.748***
	(0.942)	(2.895)	(1.927)
R-squared	0.944	0.911	0.912
F-test	65.14	50.11***	98.46***
F-test fixed	54.73	46.94***	4.93**
Observations	88	88	88

All variables are in natural logarithm. The standard errors are in parentheses.
.**.* indicates 10%, 5% and 1% level of significance. OLS: Ordinary least square

performance indicators.

$$Y_{it} = \alpha + \beta X_{it} + \mu_i + \lambda_t + \varepsilon_{it} \qquad (2)$$

Panel data was used to control for unobserved heterogeneity that could possibly yield an estimation bias. The state fixed effect, μ_i controls the observable differences across states that are constant over time. The time fixed effect, λ_t controls for possible shocks that affect the economic performance in all states but vary over time. The models are estimated using the OLS and least square dummy variable (LSDV). All the estimation results are performed using Stata version 11.

4. EMPIRICAL RESULTS

4.1. Oil Production and State Revenue
The regression results for the state revenues are displayed in Table 2. The regression models that control for internally generated revenue and gross state revenue show that the coefficient on the crude oil production variable is positive and statistically significant at 1% level, supporting the notion that petroleum extractive activities yields direct and indirect economic benefits at the state level in Nigeria. The crude oil production coefficient for the internally generated revenue model is 0.277, implying that a one percent increase (decrease) in crude oil production, increases (decreases) internally generated revenue by 27.7%. The

Table 3: Panel-pooled OLS regression (State gross domestic product)

Variables	SGDP	SGDP (Oil industry)	SGDP (Service industry)	SGDP (Non-oil industry)
Oil production	1.004** (0.276)	1.331*** (0.342)	0.715*** (0.312)	−0.3441 (0.644)
Intercept	4.8765	−1.790	9.1964	5.4539
	(5.112)	(6.340)	(5.786)	(3.032)
R-squared	0.424	0.456	0.225	0.016
F-test	13.24***	15.11***	5.24**	0.29
Observations	20	20	20	20

All variables are in natural logarithm. The standard errors are in parentheses. ***,***,* indicates 10%, 5% and 1% level of significance. SGDP: State gross domestic product, OLD: Ordinary least square

resource coefficient for the gross state revenue model is higher at 0.424 which implies that a 1% increase (decrease) in crude oil production, increases (decreases) gross state revenue.

The higher elasticity for gross state revenue is attributed to the component of the State revenue which includes federal allocation, loans and IGR. Where, in the case of oil producing states, the federal allocation includes resource windfalls in form of derivation fund which constitute a direct benefit of extractive activities. Bearing in mind, that the pooled OLS does not account for the heterogeneity of the states. Table 2 also shows the estimated LSDV results for the internally generated revenue and gross state revenue.

For the LSDV model that controls for IGR, the coefficient for crude oil production remains positive but not statistically significant at all conventional level of significance. This implies that crude oil production activity might not be a possible channel for internal revenue generation of producing state. On the hand, the LSDV model for gross state product shows that the resource coefficient remains positive and significant. The magnitude of the resource coefficient at 0.9851 further depicts that a one percent increase (decrease) in crude oil production will yield a 0.985 percent increase (decrease) in gross state revenue. The increase in gross state revenue was analyzed and presented in the third column of Table 2. In addition, the effect of oil production on the derivation fund was considered. The increase in the derivation fund accounted for half of the overall increase in state revenue due to oil production. Furthermore, oil production contributes about 85% of federally collected revenue, which is also distributed to states as federal allocation, attributes to the state revenue increase.

4.2. Oil Production and State Gross Domestic Product
Table 3 shows the effects of oil production on the productive side of the local economy. Due to data paucity for the producing states in the Niger Delta, the panel regression for this model is focused on states with available gross state product data. Thus, the annual panel for this section is for 4 states (Akwa Ibom, Bayelsa, Delta and Rivers State) and a 5-year time period (2012-2017). Given the small data sample, the pooled OLS regression was the only estimator adopted. Table 3 reports the estimated for the state gross domestic product and disaggregated industries (manufacturing, petroleum and service).

The resource coefficient for the State GDP is positive and statistically significant. The magnitude of the resource coefficient at 1.004 implies that a 1% increase (decrease) in crude oil production, yields 1.004 increase (decrease) in State Gross Domestic Product. In investigating the high increase in State gross domestic product from crude oil production, compared to the impact at the national level shows that the 4 states considered are the top oil producing states in Nigeria and the oil industry contribution from these states constitutes almost 95% of the oil industry contribution to the National Gross Domestic Product. Evidently, oil production yields a higher benefit at the subnational (state) level than the national level.

The effects of the oil production on the state oil sector and service sector GDP were also positive and statistically significant. With the magnitude of resource coefficient for the oil sector GDP at 1.3306 and service sector GDP at 0.7148. This implies that oil production does have a significant impact on the oil and service sectors for the period under consideration in this study. Testing effect on the oil production on the non-oil industries, however, revealed a negative and statistically not significant at all level of significance. Hence, given the statistical insignificance, the existence of a "resource curse" at the state level as denoted by the negative sign of the resource coefficient at the state level remains largely inconclusive.

5. CONCLUSION

This study provides a pioneering investigation of the effect of natural resource extraction on subnational (state) economic performance in Nigeria. The empirical results show no indication that natural resource extractive activities affect the internally generated revenue of oil producing states. However, the empirical results show a strong evidence of a positive and significant influence of natural resource extraction on gross state-government revenue, mostly through the derivation fund that accrues to producing states. Regardless of the transmission mechanism through which natural resource extractive activities influences state government revenue, increase production activities leads to increase in state level revenue that could be utilized for productive activities to generate huge multiplier effect for the state. This finding validates other natural resource investigation and studies as espoused by (Iledare and Olatubi, 2004; Caselli and Michaels, 2009; Michaels, 2010; Cust and Rusli, 2014; Lee, 2015).

Contrary to the negative impacts from most national level studies, this study uniquely reveals that natural resource extractive activities (crude oil production) on economic growth in Nigeria has a positive and significant impact on the economic performance of oil producing states (subsets of the Nigerian Federation). The

positive and significant impact of crude oil production is also evident on the state gross domestic product of the petroleum and service industries. However, the impact of the crude production on the non-oil (manufacturing) State Gross Domestic Product was negative and statistically not significant, which weakens the evidence of the existence of the "resource curse" at the subnational (state) level in Nigeria.

From the analysis and empirical results, it is conclusive that natural resource extraction has a positive and significant impact on the economic performance of oil producing states in Nigeria. As such, it suggests that more attention be directed at understanding the sub-national impact of natural resource extraction in Nigeria, as a means for identifying the specific factors associated with the "resource curse" at the national level. In addition, policies can be adopted by sub-national governments to ensure diversification of local economies resulting positive aggregate impacts.

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