

# Assessment of Oil Revenue and Its Impact on Human Development in Ghana

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## Abstract

Ghana discovered oil in commercial quantities in July 2007 and production began in December 2010. Despite the rapid boom in economic activities over the last decade in the Western region of the country where the discovery and production has been taking place, the benefits of the investments of the oil revenue by government to the ordinary Ghanaian, have not been fully accessed. This research establishes the relationship between the petroleum revenue from the upstream sector collected by the government and the Human Development Index (HDI) of Ghana using simple regression analysis. Quarterly data of oil revenues from 2010 to 2018 were obtained from the Ministry of Finance while data on the livelihood of Ghanaians proxied by the HDI were obtained from the UNDP. The study revealed a weak negative relationship between petroleum revenue and HDI. It was also observed that an increase in petroleum revenue either showed little or no impact on HDI. This is against the usual notion that an increase in oil revenue should action an improvement in the livelihood of countrymen. Further probe revealed that the quality of spending was low even though government increased revenue and could not be seen in the livelihood of citizens. The study recommends government to focus on strengthening its Public Interest and Accountability Committee in exercising oversight responsibility on quality of spending to ensure value for money for the state and its impact for the citizens.

## Keywords

Development, Ghana, Oil Revenue, Regression, Time Series

## 1. Introduction

Commercial discovery of oil and its production generate additional revenue for

the state and particularly have been a major source of income to most developed and developing economies. Commercial quantities of crude oil were discovered in Ghana in July 2007 and production commenced in December 2010. Substantial rent has been collected by the government and despite numerous reportages of major gains made within the economy such as boost in government revenue, budget expenditure supports, jobs, to mention a few and as can be referred in [NKC African Economics \(2020\)](#), the trickle down to state departments, municipal, agencies, subsectors, communities and the citizenry at large seem not to be apparent. When a country's revenue increases, it is mostly expected that, the additional income will aid the country to boost its citizen's livelihood ([Votavu, Lobont, Stefea, & Brindescu-Olariu, 2019](#)). The Human Development Index (HDI) of a country or an economy was introduced by the United Nation Development Programme (UNDP) in 1990 and is a measure that tracks education, health and standard of living of a nation ([UNDP, 2019](#)). Ghana with an HDI of 0.596, ranks 142<sup>nd</sup> out of 189 countries and territories around the globe and as such falls within the Medium Human Development category ([UNDP, 2019](#)).

Few interesting works that have observed enlightening nexus between crude oil activities and revenue within sub-Saharan African economies are worthy of mention. For instance, [Okonkwo and Madueke \(2016\)](#) revealed that oil revenues have an insignificant effect on economic development of a country both in the short and long run and further reported a no causal relationship between oil revenue and the economic development of Nigeria. Their study employed single linear regression models which were used to test the impact of oil revenue on economic development using secondary data sourced from 33 years period. A somewhat conflicting opinion was registered by [Olayungbo and Adediran \(2017\)](#) who employed the Autoregressive Distributed Lag (ARDL) model to study the effect of oil revenue and institutional quality on economic growth. Their work proves an existence of long-run equilibrium amongst oil revenue, institutional quality and economic growth. The institutional quality that was proxied with corruption index promotes economic growth in the short-run and converse retards economic growth in the long-run. Oil revenue was found to promote economic growth in the short-run and reduces in the long-run. For other non-crude solutions such as fiscal and tax dynamics believed to influence human development as well as economic developments particularly in sub-Saharan African refer to ([Kizilkata, Kacak, & Sofuoglu, 2015](#); [Mwakalobo, 2015](#); [Ogbonna & Odoemelam, 2015](#); [Owusu-Gyimah, 2015](#)).

At an Annual Leadership Lecture organized by the University of Professional Studies, Accra in 2019, HRM Otumfuo Osei Tutu, indicated that the economy of Ghana has to improve, to lift citizens from poverty, create jobs, improve health care and standard of living and that Ghanaians will not judge the incumbent government only by their flagship social intervention (free senior high school policy) but also by job creation and infrastructural development ([University of Professional Studies, Accra, 2019](#)). Infrastructure and jobs creation in addition to health are pertinent issues to improve life, therefore government is advised to

raise enough revenue. The then member of parliament for Adansi Asokwa, Hon. Kwabena Tahiru Hammond, demanded a payment of \$500 million USD in tax revenue from Anadarko before the company exited the country (Petroleum Commission of Ghana, 2020). For the sales approval of Anadarko's stake in the country's Jubilee fields, prior tax owed must be paid—an indication of government's firm stance on oil revenue collection. An interesting twist to the country's revenue story occurred in year 2020, when global crude oil prices plummeted to \$30 USD per barrel. This threatened government revenue by half cuts amounting to almost GHC3526 million which necessitated a national budget review before July, 2020—pointing to the influence oil revenue has on government expenditure (Ministry of Finance, Ghana, 2020). A similar phenomenon occurred in 2015 when global crude price dropped causing oil revenue fall from GHC4.2 billion to GHC1.8 billion and resulted in the domestic financed capital being revised downwards by GHC722.8 million (Institute for Fiscal Studies, 2015). If a fall in oil revenue alone, amongst other revenue collection sectors, could make government revise its capital finance, it is obvious that a chunk of government spending is supported by oil revenue. The foregoing issues show that, Ghana has not paid attention to its revenue sources of which human development needs can be sourced.

This study aims to assess the impact of oil revenue on the human development in Ghana. A correlation study is performed using secondary data of oil revenue and human development index to establish possible relationship between them. A simple regression analysis between oil revenue and human development index in Ghana and causes and effects are established.

This research seeks to bring to light how oil revenue influences the human development index in Ghana, considering both aspects of it being positive or negative. In view of this, we also seek to educate the management of the petroleum revenue on the benefit of this free ride revenue and its ability to change the welfare of the nation in the medium and long run. Results from this research will also help management of the oil revenues in Ghana to efficiently and effectively manage the revenues, since it would bring out certain limitations. The findings of the study will help government policy maker, to make policies that will aid in the better use of the oil revenue to increase the human development index in Ghana. The research would contribute to the knowledge and will serve as a basis for further research for researchers, academics and other people interested in the study area.

## 2. Methodology

This section presents methods and techniques adopted in the research to assess the oil revenue of Ghana and evaluate its impact on the human development of the country. The data sources and analysis techniques and procedure applied in the research are mentioned in this section. The section also includes data presentation as well as research design.

## 2.1. Research Design

A research design is the total plan that connects the research problems with the empirical research and as such determines what and how data should be collected and analyzed as well as how the foregoing will answer the research question (Creswell & Plano Clark, 2007; Gray, 2014). A quantitative correlational research approach is adopted to determine the extent of the relationship between oil revenue and human development in Ghana using statistical data. This approach seeks to determine the relationship between and among oil revenue and human development and interpretations drawn. It is also important to note that this research design allows for the recognition of trends and patterns in the data sets, however, further analysis to prove causes for the observed patterns are absent (Asenahabi, 2019; Boucaud, 2017; Fleming & Zegwaard, 2018).

## 2.2. Data and Sample Size

To achieve a statistically significant result, the required sample size must be chosen. A correlational study such as this study, a sample size of not less than 30 is appropriate to achieve a clinically significant result. For a detailed read on the determination of appropriate size sizes for both qualitative and quantitative research designs refer to Burmeister & Aitken (2012), Kunzmann et al. (2021) and Singh & Masuku (2014).

The present study utilizes secondary quarterly data of Ghana's oil revenue from 2011 to 2018 which was sourced from the Ministry of Finance. The human development of Ghana was proxied via the HDI and quarterly data of it was obtained from UNDP. This sample period was used mainly because Ghana started receiving petroleum revenues from 2011.

## 2.3. Research Hypothesis

The researchers hypothesize that oil revenue have an appositive impact on the human development of Ghanaians.

$H_1$ : There is a positive relationship between oil revenue and human development in Ghana.

## 3. Data Analysis and Discussions

In **Table 1**, a descriptive statistic of the data used for the study is presented. The mean value for the HDI is 0.5778 and that of the oil revenue is \$146.23 million. The median value for the HDI is 0.577594 and that of the oil revenue is \$114.87 million. Comparatively, the HDI is less dispersed than the oil revenue. The maximum and minimum HDI recorded for the period is 0.596003 and 0.553054 respectively. The maximum oil revenue collected by the government is \$334.54 million and its minimum stood \$45.46 million. Skewness measures the shape of a distribution numerically. A negative value of skewness implies a left skewed distribution and the converse is true for a positive value of skewness. From **Table 1**, HDI is skewed to the left while oil revenue is skewed to the right. Kurtosis

**Table 1.** Descriptive statistics of oil revenue and HDI.

Observation	HDI (dimensionless)	Oil Revenue (\$ Million)
Mean	0.57738	146.23
Median	0.577594	114.87
Standard deviation	0.013107	74.99
Maximum	0.596003	334.54
Minimum	0.553054	45.46
Skewness	-0.61049	0.89
Kurtosis	-0.61049	0.21

is the measure of peakedness of a distribution. Distribution with kurtosis less than 3 is platykurtic, which means that, the distribution produces fewer extreme outliers than does the normal distribution. Distributions with kurtosis greater than 3 are leptokurtic, which means that, it produces more outliers than the normal distribution. Mesokurtic distributions are moderate in breath and curves with a medium peak height. This happens when the kurtosis is equal to zero. The HDI and oil revenue are both platykurtic.

### 3.1. Test for Stationarity

A time series data that will be used for forecasting must be stationary. Stationary data is one that has mean, variance and autocorrelation structure remains the same over time and therefore will be best candidate for forecasting. The data reverse to its mean.

The Augmented Dickey Fuller test was applied to examine the stationarity of the oil revenue and the HDI data. The presence of a unit root in an autoregressive model of a null hypothesis given a time series data show that the data is non stationary (Palachy, 2019). Consider a time series data  $y_t$ ;

$$y_t = \alpha + \beta t + \phi y_{t-1} + e_t \quad (1)$$

where  $\alpha$  and  $e_t$  are the intercept and the error associated with the data respectively. If we consider a linear regression of  $\Delta y_t$  against  $t$  and  $y_{t-1}$ , we can write Equation (1) as

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \sum_{i=1}^n \delta_i \Delta y_{t-i} \quad (2)$$

If  $\gamma = 0$ , and the null hypothesis is that the data are non-stationary, then the  $p$ -value is greater than 0.05. Both the HDI and oil revenue were stationary at first difference.

### 3.2. Regression Analysis

The knowledge obtained in the sourced data is examined from the conclusions in this section. The information is used to report on the study's research hypothesis. A multiple regression was used. A linear model that involves the lagged first differenced of variables is employed. **Table 2** presents the conclusions of the

**Table 2.** Regression analysis of oil revenue effect on HDI.

$HDI_t - HDI_{t-1}$	Coefficient	Std. Error	$t$	$p >  t $
$a_0$	$6.82 \times 10^{-21}$	0.0002543	0.00	1.000
$a_1$	$-2.71 \times 10^{-6}$	$1.38 \times 10^{-6}$	-1.97	0.060
$a_2$	-0.5878721	0.0002543	-3.64	0.001
		F(2) = 7.14		
		Prob > F = 0.0032		
		R <sup>2</sup> = 34.60%		
		Adj. R <sup>2</sup> = 29.75%		

findings obtained from the regression analysis. Although one variable (oil revenue) is thoroughly tested to determine the extent to which it can predict the human development in Ghana. The test showed that the data were distributed normally and that the dependent and independent variables had a linear relationship.

### 3.3. Model Estimation

The work focused on a single variable that influence human development in Ghana. It does so in manner that suppresses any order factors for simple purposes of the research discussion. A study of a simple linear regression was performed to determine whether adequate evidence was obtained to assist in determining the presence of a direct correlation between the dependent variable (oil revenue) and the independent variable (human development). The regression equation is then used to assess the linear relationship or bond between the variables listed in this work.

Mathematically, the linear model is stated below as;

$$HDI_t = a_0 + a_1 (R_{t-1} - R_{t-2}) + a_2 \left( HDI_{t-1} \left\{ \frac{1+a_2}{a_2} \right\} - HDI_{t-2} \right) \quad (3)$$

or simply,

$$HDI_t - HDI_{t-1} = a_0 + a_1 (R_{t-1} - R_{t-2}) + a_2 (HDI_{t-1} - HDI_{t-2}) \quad (4)$$

where;  $HDI$  is the human development index and  $R$  is the oil revenue with  $HDI_t$  as the first differenced  $HDI$  [ $DIFF(HDI)$ ] which is regressed on  $LAG(DIFF(R), 1)$  and  $LAG(DIFF(HDI), 1)$ .

### 3.4. Main Findings of the Study

With reference to **Table 2**, the study proposed a model to establish that the oil revenue projected a significant influence on human development in Ghana. The model can be stated appropriately with reference to Equation (4) and **Table 2** as

$$HDI_t - HDI_{t-1} = 6.82 \times 10^{-21} + 2.71 \times 10^{-6} (R_{t-1} - R_{t-2}) + 0.5878721 (HDI_{t-1} - HDI_{t-2}) \quad (5)$$

The model shows a substantial relation, which implies a considerable effect of oil revenue on human development; hence, the null hypothesis that the oil revenue does not influence human development may be rejected. This was revealed in a significance value ( $p = 0.0032$ ). From **Table 2**, it can be detected that the oil revenue (independent variable) has a negative and significant effect on the dependent variable (human development index). This could be easily confused if a reference is made from Equation (4) without rearranging the Equation to either  $HDI_t$  or a forecast counterpart  $HDI_{t+1}$ . This contradicts **Votavu, Lobont, Stefea and Brindescu-Olariu (2019)** as a positive relationship should exist between a country's revenue and the livelihood of the citizenry. These results statistically indicate that, the higher the oil revenue that accrues to the state, the lesser the HDI value. This indicates that, the increasing returns from the oil revenue do not have positive impact on the livelihoods of the people in Ghana. It is not far-fetched from views of experts in the petroleum industry. When it comes to oil revenue, there need to be more transparency even though on paper it seems to have a very clear flow utilization. Clearly, the government seems not to be getting a value for money from spending from the oil revenue despite proper accounting on paper. For instance, it is estimate that about GHC2 billion have been invested/spent by the government on education (**Ministry of Finance, Ghana, 2020**), but the quality of spending has been questioned (**Institute for Fiscal Studies, 2015; University of Professional Studies, Accra, 2019**). It seems that the problem of oil revenue management in Ghana is not the accountability, but rather the quality of spending and as such the argument that, to fully understand how oil revenue impacts the life of Ghanaians, a critical look at the quality of spending is necessary. The improper management of the increasing oil revenue in term of quality of spending will distance the true impact of human development in Ghana.

#### 4. Conclusion and Recommendations

Based on the findings of the study, it can be concluded that oil revenue is a significant determinant or factor that affects human development in Ghana. The study found that the oil revenue from crude production is well accounted for and well distributed on paper but the quality of spending that authenticates the real impact on human development is not felt.

The study notices that the government allocates bigger proportion of about 70% of oil revenue to the annual budget to support expenditure plans of which about 70% are allocated for infrastructure development and about 30% to recurrent expenditure. However, the quality of spending that will make the real impact on the Ghanaian is not achieved as a result leading to declining impact on human development even as oil revenue increases.

The government should structure its policies through the distribution of the oil revenue to improve the livelihood of the citizenry as government concentrates on improving and ensuring betterment of the fiscal regimes. The govern-

ment of Ghana should focus on strengthening the Public Interest and Accountability Committee in exercising oversight responsibility on quality of spending to ensure value for money for the state.

## Conflicts of Interest

The authors declare no conflict of interest.

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