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Article

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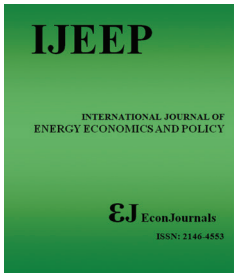

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Role of Oil Production and Government Expenditure in Improving Human Development Index: Evidence from Saudi Arabia

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ABSTRACT

The economic development of Saudi Arabia depends largely upon the receipts from the exports of crude oil being spent as government expenditure on growth needs. Saudi Arabia is included in the "very high human development" category of United National Development Programme. Using time series data from 1990 to 2016, the study finds that both government spending and oil exports are significant drivers of human development index (HDI) in Saudi Arabia. The study estimates that a 100 (million barrels) increase in oil production will increase the HDI with 4% point. Similarly, a 1% increase in total government expenditure increases 10% point in HDI. The study also reports that expenditure on education contributes the most to HDI. The study also finds an inverse relationship between health expenditure and economic growth. This finding resulted in a recommendation of streamlining the health sector. Finally, the study predicts that HDI index will be 0.94 by 2030.

Keywords: Human Development Index, Oil Production, Government Spending, Saudi Arabia
JEL Classifications: H50, I15, I25, I31

1. INTRODUCTION

Crude oil production and export is the dominant factor responsible for the transformation of the Saudi Arabian economy. The government earns 90% of its total revenue from oil. Oil export constitutes around 88% of the total exports in the country. It also contributes approximately 35% to its total gross domestic product (GDP). Meanwhile, the country has performed exceptionally well over the years in the field of development. The life expectancy has improved from 52.7 years in 1970 to 75.05 years in 2015. Infant mortality has decreased from 292 deaths per 1000 live births in 1960 to 13 deaths per 1000 live births. Literacy among the adult population has increased from 8% in 1970 to over 94.4% in 2014. Per capita income increased from $927 in 1970 to $54,000 in 2016 (MFA, 2017).

The country has improved its index value from 0.697 in 1990 to 0.853 in 2017 according to the human development index (HDI) published annually by United National Development Programme (UNDP). HDI is a composite index that accounts for a country's performance in three basic dimensions of human development: A long and healthy life denoted by average life expectancy; knowledge, denoted by adult literacy rate and expected years of schooling for children; and a decent standard of living, as measured by GNI per capita. In 2017, HDI includes 189 countries and Saudi Arabia fall in the "very high human development" category.

Saudi Arabia depends hugely on petroleum reserves that accounts for around 87% of budget revenue, 42% of GDP and 90% of export earnings (The World Factbook, 2017). In terms of GDP (at purchasing power parity), it stands at the sixteenth position

in the world. This leads to the proposition that the remarkable progress of Saudi Arabia in frontier of human development is due to government's expenditure that in turn is because of its revenue from production and exports of its petroleum reserves. The aim of this study is to examine the relationship between HDI and oil production and government expenditure.

2. REVIEW OF LITERATURE

There are many studies (Baum and Lin, 1993; Devarajan et al., 1996; Baffes and Shah, 1998; Niloy et al., 2003; Ghosh and Gregoriou, 2006) that focused on the relationship between economic growth and government expenditure. The studies such as Fan et al. (2000) on India; Hao and Fan (2001) on Vietnam; Fan et al. (2002) on China found that public expenditure has influenced human development, particularly poverty alleviation in these regions. However, studies related to oil production/exports and HDI are not found. Nevertheless, there are some studies on human development and government expenditure. Some of these studies are discussed here. Edeme et al. (2017) found that in Nigeria, government expenditure on education, health, agriculture, and rural development has a positive marginal impact on human development. Similarly, Iheoma (2014) in his study on sub-Saharan African countries found that only public health and tertiary education spending are significant in explaining human development. Qureshi (2009) asserted that higher public expenditure on human development not only improved human development indicators but also supplemented economic growth in Pakistan. In Iran, Razmi et al. (2012) found a positive and significant relationship between government health expenditure and HDI. And, HDR (2013) reported similar results and concluded that at the global level for all the economies there is a positive relationship between current HDI values and previous government expenditure. For India, Mittal (2016) found that expenditure on social sector positively impacted HDI at the individual state level. Most recent, Haile and Nino-Zarazua (2018) studied 55 low-income and middle-income countries and concluded that government social spending played a significant role in improving aggregate welfare and human development in the developing world.

In the context of Saudi Arabia, there are few studies in this area of research. Ghali (1997) investigated the relation between economic growth and government expenditure for the period 1969-2010 in Saudi Arabia and did not find any significant evidence on the role of government expenditure in increasing the country's economic growth. However, using time series data (1969-2010), Alshahrani and Lsadiq (2014) found that private domestic investment, capital expenditure as well as expenditure on health are the main driving forces in the long-run for the growth while openness to trade and public investment could also stimulate the growth in the short-run. Kireyev (1998) found that investment in government expenditure has a positive and significant effect on growth in the non-oil GDP in Saudi Arabia over the period of 1969-1997. Al-Yousif (2000) estimated that the effect of government expenditure depends on how the government size is measured using the two different measures of government expenditure; first, if the size is defined as a percentage change in the government spending, then there is clearly a positive and significant relationship between government spending and economic growth. Second, while if it is defined as the ratio of the government expenditure to GDP, then it has a negative relationship. Alkhathltan (2013) using data from 1971 to 2010 for Saudi Arabia, examined the association between the oil revenues and economic growth and found that oil revenue had a strong and positive impact on economic growth in both the short- and long-run. Similarly, Al Rasasi et al. (2018) using data from 1970 to 2017 for Saudi Arabia investigated the connection between oil production and economic growth and concluded that there is a strong relationship between government oil revenue, economic growth and development. Sultan and Haque (2018) also found that there is long run relationship between economic growth with oil exports, imports and consumption expenditure of the government in Saudi Arabia.

Thus, these studies show mixed results on economic growth and government expenditure for Saudi Arabia. The review of existing literature indicates that there is a lack of research on the relationship between HDI, oil production and government spending. Therefore, the current study tries to address this gap in literature.

3. DATA AND EMPIRICAL METHODOLOGY

To evaluate the efforts of Saudi government towards human development indicators, we attempt to understand the: (i) Role of government spending over different sectors (such as education, health, public service, defense, etc.) and (ii) oil production on growth of HDI indicator. Our analysis is based on the data we collected for the period 1990 to 2016. The HDI data is taken from UNDP, Government expenditure oil production while trade data is taken from Saudi Arabian Monetary Agency (SAMA).

We use a simple OLS regression model, with HDI as dependent variables. The model assumes, that the probability density function of $X\beta$ follows a normal distribution. Both oil production and government spending have high correlation. Therefore, we separately run the estimates. The functional estimate takes the form:

$$HDI_t=\beta_0+\beta_{1t}\ Oil\ production+u \quad (1)$$

$$HDI_t=\beta_0+\beta_{1t}\ government\ spending+u \quad (2)$$

Where β_0 is the intercept and β_1 is the estimated coefficients of the variable and u is the error term. Similarly, government spending has different components and it would be interesting to see the association of different factors of government spending on HDI. For this, we have re-specified a new model equation, where we will estimate the sector level effect on HDI. We will first show the relation of HDI with total spending and in the other model mentioned below, we will consider the different components of government spending. The functional estimate takes the form such as:

$$HDI_t=\beta_0+\beta_1\ Public\ service\ exp.+\beta_2\ education\ exp.+\beta_3\ health\ exp.+\beta_3\ defense\ exp+\beta_3\ housing\ and\ comm.exp.+\beta_4\ social\ security\ exp.+\beta_5\ economics\ services\ exp.+u \quad (3)$$

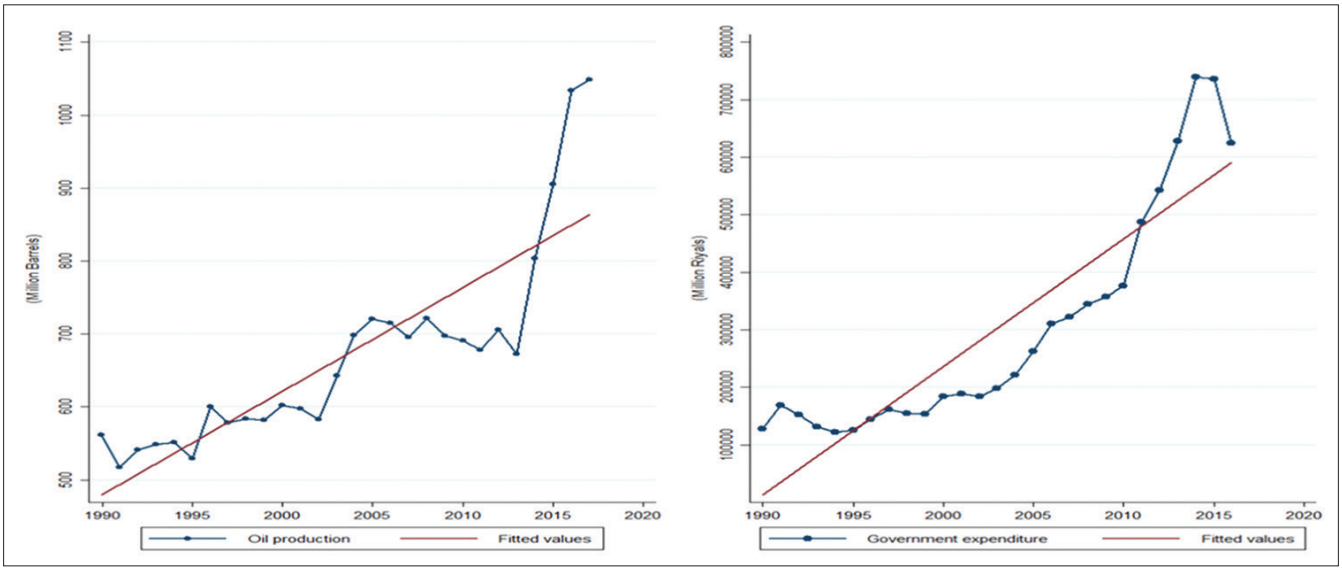
The estimated coefficients are interpreted as correlation coefficient. We can only say that there is association between the variables but cannot conclude its causal estimates. There may be other omitted variables bias that we are not controlling in our model but the growth in HDI is being explained. Therefore, this paper attempts to bridge this gap in the literature with an assessment of the reasons associated with the development of overall HDI. The paper tries to address the specific research question: What all factors influence the overall HDI and what are the key factors correlated with the development of HDI? We develop a typology that estimates factors and its magnitude on the HDI.

4. RESULTS

In Figure 1, we have shown the trends in oil production and government spending over time. Constantly, there is an increase in both oil production (refined products) and government spending. Similar trends are observed in government expenditure also. However, there is a little decline in the last 2 years (2015 and 2016). This corresponds with the fall in oil prices after 2014. In 2015, the oil prices (Arabian Light AP-34) almost halved to 49.85 from 91.18 in the previous year. Next year, in 2016 it further lowered to 40.96 (Annual Report 2017, SAMA).

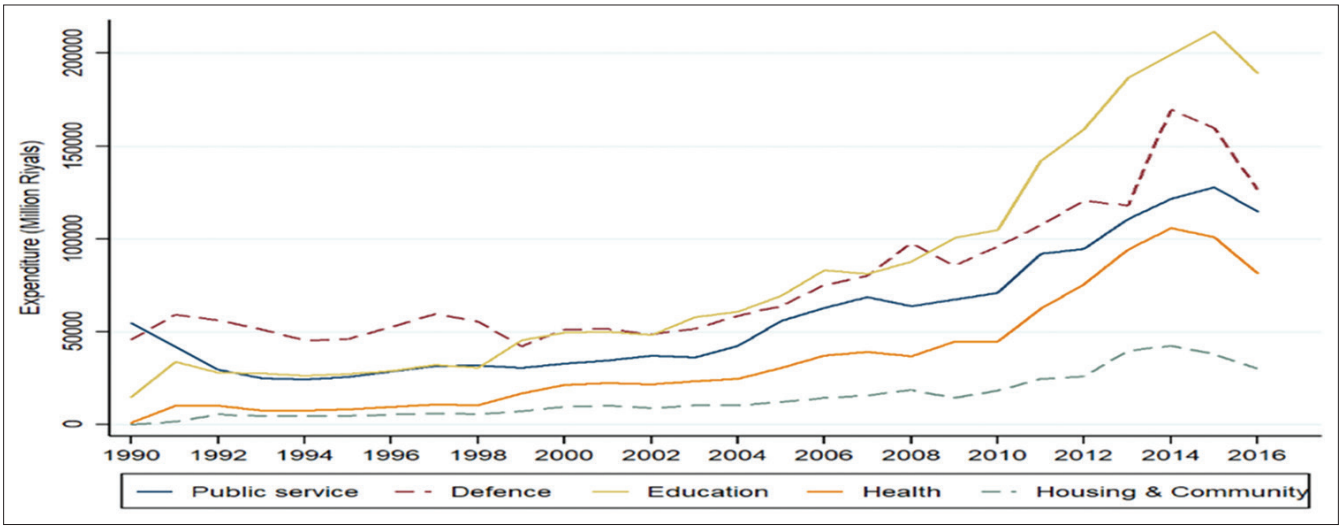
Figure 2 shows the growth in government final consumption expenditure at purchaser's value at current prices from 1990 to 2016. These five are the key sectors where government spending is higher and constitutes around 87%. Among all, the government spending on education sector is the highest. In 2016, 30% of total government spending was in education sector. Between 1985 and 2016, there is a surge of 844% in government spending in this sector. The other two big sectors, defense and public services constitute 20% and 18% and grew up to 168% and 445%, respectively for the period 1985-2016. The health sector constitutes

Figure 1: Trend in crude oil production and government expenditure



Source: Authors

Figure 2: Distribution of government expenditure on growth indicators (million Barrels)



Source: Authors

around 13% of total government spending only. The expenditure on health was initially low (5% in 1985). However, the government has increased the shares and given importance to the health sector. It has increased significantly in the last 2 decades. There is 1087% increase in health expenditure from 1985 to 2016 and more so in recent years. In the last 6 years, 2010-2016 the investment in health expenditure almost doubled. Housing and community amenities expenditure is 5% of total spending in 2016 and there is not much growth in investment over years. The economic services constitute only 3% and rest 10% share in other communities and social services purposes.

Table 1 shows the trend in oil exports. We have regressed oil export with year dummy to capture the trend in export growth. Oil exports in the last 28 years have increased by 26% and highest growth is recorded in the Asia region.

Figure 3 shows the line plot of the HDI in the left and right; it shows the linear prediction over time. The linear prediction with a 95% confidence interval (CI) estimates using least square regression. We regressed the HDI with year as dummy and estimated the marginal effect (margins) for different time periods. Margins are estimated from predictions of a least square mode at the fixed values of covariates (HDI) and averaging over the remaining covariates. The figure reveals a clear increase in the overall HDI with the change in time. This is confirmed by the estimated trend coefficients. The trend is somewhat stronger post-2000, between 1990 and 2017, the country's HDI index increased significantly at a faster rate ranging from 0.697 to 0.853, with an increase of 22.4% points.

The margins plot graphs in the right side come from the results of the immediately preceding margins command after least square model. It is shown that at the same pace, by 2030, Saudi Arabia will be in the top 5 of the HDI country list as the prediction shows that keeping everything constant, the HDI will be approximately 0.94 by 2030.

Table 2 shows the least square estimates. Our dependent variable in the natural logarithm of HDI and we have two results columns where we have shown independently the relationship of oil production and Government spending with HDI. Both the estimated coefficients are significant and positive reveals that both government expenditure and oil production have a positive relation. Oil production is in million barrels; therefore, we conclude that If production is increased by 100 (million barrels), there will be an increase in 4% point (100*.000407 = 0.0407) in HDI. In model 2, the independent variable government expenditure is also in natural logarithm. Therefore, we have a log-log model. The estimated coefficients show that a 1% increase in total government expenditure will surge 10% point in HDI. To see how the different government expenditure effect the HDI, we run the Table 3.

In Table 3, HDI is regressed with all the components of government expenditure. We find that education expenditure is a key factor that contributes in the development of the HDI. It shows that 1% change in education expenditure is likely to

Table 1: Trends in oil export

Dependent Variable: ln (oil export)	Total
Year	0.0095*** (0.0020)
Constant	−11.2264** (3.9956)
% Change in last 28 years	[26.6]
Log lik.	30.2502
Adj-R^2	0.4447

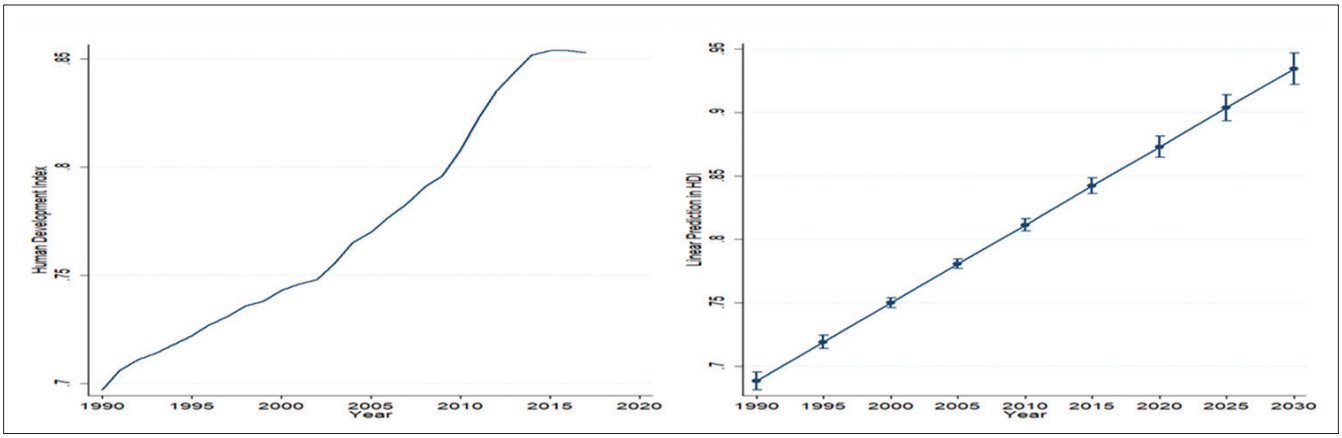
** and ** denotes significance at 1% and 5% level

Table 2: Linear regression estimates of oil production and government spending on HDI

Dependent variable: ln (HDI)	(1)	(2)
Total oil production (million Barrels)	0.0004*** (0.0001)	
Ln (total government expenditure)		0.1063*** (0.0042)
Constant	−0.5356*** (0.0346)	−1.5874*** (0.0529)
Log lik.	54.4291	80.3458
Adj-R^2	0.7043	0.9600

Figures within the parentheses are standard errors and ***denotes significance at 1% level

Figure 3: Human development index and its linear prediction



Source: Author's

Table 3: Effects of the different component of Government exp. on HDI

Dependent variable: Ln (HDI)	(1)	(2)
Ln (total government expenditure)	0.1063*** (0.0042)	
ln (total education expenditure)		0.1007*** (0.0178)
ln (total housing and community expenditure)		0.0340*** (0.0064)
ln (total social security expenditure)		0.0201** (0.0074)
ln (public service expenditure)		0.0178 (0.0155)
ln (total health expenditure)		−0.0654*** (0.0107)
ln (total defense expenditure)		−0.0031 (0.0130)
ln (economic services expenditure)		−0.0056 (0.0051)
Constant	−1.5874*** (0.0529)	−1.3172*** (0.0653)
Log lik.	80.3458	104.6712
Adj-R^2	0.9600	0.9913

** and ** denotes significance at 1% and 5% level

increase 10% point in HDI. The second important factor is the investment in housing and community services, which will increase 3.4% point change in HDI with 1% change in investment. The third important factor is the investment in social security services, which shows that a 1% increase in total social security spending will increase approximately 2% point change in HDI. However, we find a significant and negative association for health expenditure with HDI. This result can be explained with reference to related studies on the health sector in Saudi Arabia. Sebai et al. (2001) finds that some important things like "effective planning, monitoring, and systematic valuation, staff training and improvement in preventive services" do not supplement increase in health expenditure. Similarly, Jannadi et al. (2008) identified some impending issues in the health sector namely, training of local professionals, reliance on expatriate professional and realigning health services to changes in demography and disease pattern. Watson et al. (2008) concludes that there is free health service for all Saudis and this inflates the volume and intensity of services as consumers demand the utmost level of treatment which is not accompanied by any financial repercussions and this increases the overall cost. The other variables namely, investment in economic services, public services and defense do not have any significant association with HDI.

5. CONCLUSION

The objective of this paper is to evaluate the crucial factors of HDI growth in Saudi Arabia. The major emphasis is to focus on key variables namely oil exports and government spending on different social, institutional and health sectors such as spending on education, health, social security and other economics and development indicators of the economy over the period 1990–2016. The parametric and non-parametric analysis results suggest that both government spending and oil exports are significant drivers of economic growth in Saudi Arabia. These results highlight that economic activities are significantly driven by the oil sector. This study also revealed that government spending has the greatest effect on economic growth, followed by investment and export in the oil sector.

Using least squares regression, the study finds that both government expenditure and oil production has a positive relationship with the HDI. The study estimates that if the Oil production is increased by 100 (million barrels), there will be an increase in 4% point in HDI. In addition, 1% increase in total Government expenditure will increase 10% point in HDI.

We also have explored the different components of government expenditure. We find that education expenditure is a key factor that contributes in the development of HDI. It shows that 1% change in education expenditure is likely to increase 10% point in HDI. The second important factor is the investment in housing and community services and the third important factor is the investment in social security services will lead to 3.4% and 2% point change in HDI. We do not find any significant association in the other key variables such as investment in economic services, public services and defense. There is an increase in both oil production (refined products) and government spending over time.

Government spending on education sector is highest. In 2016, 30% of total government spending was for education sectors and from 1985 to 2016, there is a surge of 844% in government spending on education. The other two big sector is defense and public services constitute 20% and 18% and grew 168% and 445% from 1985 to 2016. The health sector constitutes around 13% of total government spending only. The expenditure on health was initially low (5% in 1985).

The linear prediction with a 95% CI estimates reveals a clear increase in the HDI over time. The trend is somewhat stronger post-2000. This is confirmed by the estimated trend coefficients. The current HDI ranking of Saudi Arabia is for 2017 is 0.853. In the period of the study, the HDI index improved from 0.697 to 0.853, showing a growth of 22.4%. The margins plot graphs show that at the same pace, by 2030, Saudi Arabia will be in top five of the HDI country list as the prediction shows that keeping everything constant, the HDI will be approximately 0.94 by 2030.

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