

## استخدام أثر ضريبة القيمة المضافة على عوائد حكومة المملكة العربية السعودية في توقع العوائد الممكن تحقيقها لحكومة الكويت من الضريبة

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### المستخلص

تهدف الدراسة إلى توقع أثر فرض ضريبة القيمة المضافة على تخفيف عجز ميزانية حكومة دولة الكويت، ونظرا لانعدام الضرائب على المبيعات في الكويت، فقد تم اختيار تجربة المملكة العربية السعودية كمثال لتوقع النتائج. يأتي اختيار السعودية للتشابه الكبير بين الاقتصاديين رغم اختلاف الحجم. تستخدم الدراسة طريقة المربعات الصغرى Ordinary Least Squares (OLS) في النظر إلى أثر فرض ضريبة القيمة المضافة بواقع ٥٪ على مردود حكومة المملكة العربية السعودية بعد فرضها في عام ٢٠١٨. توصلت الدراسة إلى أن فرض ضريبة القيمة المضافة بواقع ٥٪ أدى إلى زيادة مردود حكومة المملكة العربية السعودية بواقع ١٤٪. تفيد هذه النتائج أن فرض الكويت ٥٪ ضريبة القيمة المضافة سيحقق عائدا تقريبا بواقع ٧,٤٦ مليار دولار، وهذا العائد سيغطي ٦٣٪ من العجز الحكومي في السنوات الخمس الأخيرة. زيادة قيمة ضريبة القيمة المضافة إلى ١٥٪ بدلا من ٥٪ قد يغطي كامل العجز ويضيف فوائض إلى خزانة الدولة.

**الكلمات الدالة:** ضريبة القيمة المضافة؛ عجز ميزانية حكومة الكويت؛ أثر ضريبة القيمة المضافة على السعودية.

**Using VAT Effect on the Kingdom of Saudi Arabia's  
Government Revenue  
To Predict the Effect of VAT on Kuwait's Government  
Revenue  
by  
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**Abstract**

This study aims to explore the effect of value-added tax (VAT) implementation on Kuwait government's budget deficit. To achieve this aim, the effect of VAT on the revenue of the Kingdom of Saudi Arabia's (KSA's) government was chosen as an example, due to its economy's close similarity to that of Kuwait and its earlier introduction of VAT. Ordinary least squares (OLS) regression was used to identify the effect of a 5% VAT rate on the revenue of KSA's government. The study analyzes the effects of oil prices, oil production, and VAT on the revenue of KSA's government, using time series data from 1980 to 2019, except 1990–1991. The OLS model analysis showed a strong and statistically significant relationship between government revenue and oil prices. A USD 1 increase in oil price could potentially raise government revenue by 9.3 billion Saudi Arabian riyals (SAR) (USD 2.5 billion). Furthermore, the analysis showed a statistically significant relationship between government revenue and oil production, wherein an increase in oil production by 1 million barrels annually has shown to raise government revenue by SAR 76 million (USD 20 million). In addition, it showed a statistically significant relationship between government revenue and the introduction of a 5% VAT rate in 2018 that raised government revenue by SAR 127.7 billion (USD 34 billion). In terms of percentage, VAT has contributed to a 14% increase in KSA's government revenue. Based on the results, it is predicted that the introduction of VAT in Kuwait will contribute USD 7.46 billion to government revenue, equivalent to approximately 63% of the country's budget deficit. Increasing the VAT rate to 15% could both cover the whole deficit and add more revenue to Kuwait's reserves. In KSA, the increase in the 15% VAT rate came into effect in July 2020, which resulted in increased revenue for the country's government.

**Keywords:** VAT; Kuwait Deficit; KSA VAT.

## 1 Introduction

With a series of deficits recorded between the 2014/15 and 2019/20 fiscal years and amid a far from promising future for oil, the Kuwaiti government has sought ways to diversify its income sources to fulfill its promises to its citizen. Kuwait as a welfare state grants citizens jobs, housing, food, healthcare, and many other services. This paper shows how the introduction of value-added tax (VAT) would impact the economy of Kuwait. The following sections will provide a brief overview of the macroeconomic performance of Kuwait's economy, followed by a description of the relationship between oil prices and gross domestic product (GDP), and then discussing the importance of oil reserves. In addition, the study will estimate the impact of falling oil prices and oil production on the revenue of the Kuwaiti government. Later, we will assess the effect of VAT on the Kingdom of Saudi Arabia's (KSA) government revenues. KSA was chosen due to its economy's considerable similarity with that of Kuwait. The study also discusses the optimal tax rate by looking at the effect of KSA's VAT rate changes from 5% to 15% on the country's economy. Finally, the study will assess the impact of a 5% VAT rate on Kuwait's government revenues.

## 2 Literature Review

Kuwait had planned to introduce VAT at 5% on April 1, 2021, the first day of the 2021/22 fiscal year. However, due to political conflicts with the parliament, the government delayed the implementation. Since Kuwait has no prior experience with sales tax, the impact of VAT is bound to be significant for consumers, companies, and government non-oil revenues. Oil was first discovered in the Burgan field of Kuwait in 1938, and Kuwait's first crude oil export was in 1946. Since then, the government has not needed to seek additional sources of income. However, this has changed in the last decade.

According to the **Indian Monetary Fund (IMF) staff team of the Middle East and Central Asia (2020)**<sup>1</sup>, oil demand is expected to decrease and eventually decline in the next two decades. The IMF estimates oil demand using panel data of 135 countries from 1971 to 2016. This decline can be attributed to several factors described below:

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<sup>1</sup> IMF staff team of the Middle East and Central Asia. (2020). The Future of Oil and Fiscal Sustainability in the GCC Region. International Monetary Fund, Publication Services, No. 20/01

- Technological improvements have led to increased oil supply from old sources and new ones.
- Governments have introduced strict regulations and policies to address climate change.
- Renewable sources of energy have become more common.

Therefore, the IMF paper strongly encourages oil-exporting countries to prepare for a post-oil economy without further delay. In addition, economic diversification and private sector development will be critical to ensure sustainable growth in the future, which needs to be supported by wide-ranging reforms. Hence, half of the Gulf Cooperation Council (GCC)<sup>1</sup> countries have already imposed VAT, and the rest are on the way to do so. As they prepare for this, many questions have surfaced concerning the potential results of VAT in the region, and since more than 140 global countries currently implement VAT, many studies are investigating its different aspects. To draw maximum benefit from VAT, the Kuwaiti government should learn from other trials.

**How efficient will VAT collection be?** A study conducted by **Aizenman & Jinjarak (2005)**<sup>2</sup>, using panel data of 44 countries, including developed, showed a positive correlation between VAT collection efficiency and other political and economic factors, including durability of political regimes, ease and fluidity of political participation, urbanization, trade openness, and GDP per capita. Another study conducted by **Tagkalakis (2014)**<sup>3</sup> showed that each increase of 1% in Greece's GDP improved VAT efficiency by 0.63 of a percentage point.

**Should we expect compliance?** This is an important question since government revenue from VAT depends on the compliance of all

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<sup>1</sup> The GCC is a regional, intergovernmental political and economic union consisting of six Arabian Gulf states: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.

<sup>2</sup> Aizenman, J., & Jinjarak, Y. (2005). The Collection Efficiency of the Value Added Tax: Theory and International Evidence. National Bureau of Economic Research, Working Paper 11539

<sup>3</sup> Tagkalakis, A. O. (2014). The Determinants Of Vat Revenue Efficiency: Recent Evidence From Greece. Bank of Greece - Economic Analysis and Research Department – Special Studies Division

sectors paying their taxes. Since Kuwait imports the vast majority of its consumer goods, which tend to be easier to track than domestically manufactured ones, it is easier to collect VAT. A study conducted by **Morrow, Smart, & Swistak (2019)**<sup>1</sup> used aggregate time-series data for several countries. They found that the correlation between VAT revenue performance and share of imports in final consumption to be informative because VAT compliance tends to be higher at borders.

#### **Why choose VAT over other types of taxes, such as tariffs?**

According to **Davies & Paz (2011)**<sup>2</sup>, transforming the economy by moving from tariffs to VAT tends to work better with trade agreements, because VAT is applied to all producers and does not only target foreign ones. In addition, the study observed several useful findings concerning the issue of informal economy by cutting tariffs and implementing VAT. First, tariff cuts alone can lead to a decline in the informal economy. Second, shifting from tariff to VAT does not necessarily lead to an increase in the informal sector. This could be attributed to the fact that penalties for nonpayment are typically proportional to the VAT rate itself. Third, replacing tariffs with VAT increases welfare because it gives people access to a broader basket of goods to consume from all over the world. This is an advantage to welfare, compared to tariff distortions. Fourth, replacing tariffs with VAT gives consumers an advantage because it removes the penalty for buying imported goods. Hence, they get access to a broader basket of goods at competitive prices, which in turn increases their welfare. Thus, the distortion to welfare from VAT is lower than the distortion from tariffs.

**What effects does VAT have on aggregate consumption and economic growth?** A study conducted by **Miki (2011)**<sup>3</sup> empirically determined the effects of a country's VAT rate change on its aggregate

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<sup>1</sup> Morrow, P., Smart, M., & Swistak, A. (2019). VAT Compliance, Trade, and Institutions. CESifo Working Papers: Munich Society for the Promotion of Economic Research - CESifo GmbH, 7780.

<sup>2</sup> Davies, R. B., & Paz, L. S. (2011). Tariffs Versus VAT In The Presence Of Heterogeneous Firms And An Informal Sector. *International Tax and Public Finance*, 533-554.

<sup>3</sup> Miki, B. (2011). The Effect of the VAT Rate Change on Aggregate Consumption and Economic Growth. Columbia University In The City Of New York, Working Paper Series No,297.

consumption and economic growth. Using panel data of 14 developed countries from 1980 to 2010 and monitoring the effects of 53 VAT rate changes, Miki showed that aggregate consumption and economic growth follow three trends. First, when the government announces an increase to the VAT rate, both aggregate consumption and economic growth will rise before the new rate is imposed; second, it decreases after imposition; and third, it gradually increases again. The study also found the opposite trend of all three stages to be true.

To the best of our knowledge, it is essential to note that no prior study has investigated the effect of VAT implementation on government revenues in Kuwait. Hence, this study hopes to fill in the literature gap and help researchers as a reference for further studies in the same field.

### 3 Background to the Kuwait Economy

Kuwait is a small but rich country in the Middle East that controls more than 6% of the world's oil reserves. Oil makes up 94% of Kuwait's export revenues and almost 89% of government revenues. The nominal GDP of Kuwait in 2019 was USD 137.6 billion. With a total population of 4.7 million, 70% of whom are foreigners, GDP per capita was USD 29,299 in 2019. Table 3.1 shows the government revenue, expenditure, and net profit and loss for the 12 fiscal years from 2008/09 to 2019/20.

**Table 3.1: Kuwait Government Budget**

Kuwait Government Budget Accounts in Kuwaiti Dinars (Millions) (2008/09 to 2019/20)					
Year	Revenue	Expenditures	Net Profit (Loss)	10% of Revenue Future Generations Fund (FGF)	Net Profit (Loss) After FGF Revenue Cut
2008/09	21,005	18,262	2,743	2,100	643
2009/10	17,687	11,250,	6,437	1,768	4,668
2010/11	21,501	16,221	5,280	2,150	3,130
2011/12	30,236	17,007	13,228	3,023	10,205
2012/13	32,008	19,307	12,700	3,200 + 4,801**	4,698
2013/14	31,811	18,903	12,908	3,181 + 4,771**	4,955
2014/15	24,925	21,415	3,510	2,492 + 3,738**	(2,721)
2015/16	13,633	18,245	(4,611)	1,363	(5,975)
2016/17	13,099	17,707	(4,608)	1,309	(5,918)
2017/18	15,999	19,247	(3,247)	1,599	(4,847)
2018/19	20,558	21,848	(1,290)	2,055	(3,345)
2019/20	17,220	21,140	(3,919)	1,722	(5,641)

\* FGF is the national savings fund that receives a minimum of 10% of state revenue annually, as mandated by law. All investment revenue from FGF activities is reinvested by the fund and not included in Kuwait's closing accounts.

\*\* Additional 15% of revenue added to FGF in 2012/13, 2013/14, and 2014/15.

Data Source: Kuwait Minister of Finance

### *3.1 Kuwait Sovereign Wealth Fund*

Founded on February 23rd, 1953, as an investment vehicle for the state's surplus oil revenues, the Kuwait Investment Authority runs the oldest sovereign wealth fund in the world. In 2019, it held an estimated USD 592 billion in investments<sup>1</sup>. The Kuwait Future Generations Fund (FGF) was devised by the government to provide for the welfare of the country once oil revenues decline, and it receives 10% of total government revenue each year. Its main tactic is to accumulate wealth through investments while the oil can still provide for outgoings. Moreover, the annual returns on assets are reinvested and do not count as revenue in the government's budget at the end of each fiscal year.

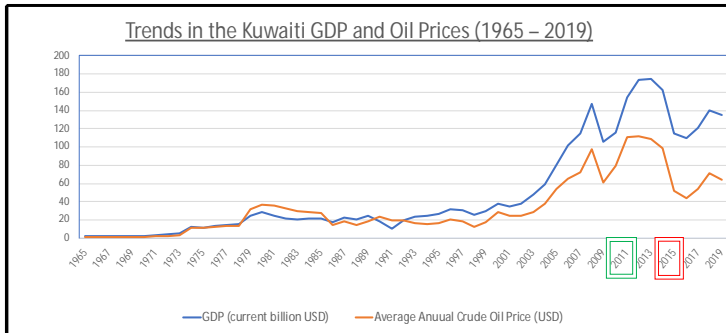
### *3.2 GDP and Oil Prices in Kuwait*

Figure 3.1 shows the relationship between oil prices in US dollars and the GDP of Kuwait from 1965 to 2019. A substantial correlation between oil prices and the country's output can be seen. The GDP series tracks oil prices for all the given years; clearly, oil is the backbone of the economy, and any oil crisis will affect the real economic situation of Kuwait.

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<sup>1</sup> [Reuters Business News Articles August 2019](#)

Figure 3.1 Trends in Oil Prices (Current USD) and GDP (Current USD) of Kuwait



Author graphing

Data Source: World Bank Indicator

### 3.3 The Impact of Oil Prices and Oil Production on Government Revenue

Due to the coronavirus disease 2019 (COVID-19) pandemic, oil prices fell to USD 11 per barrel in April 2020, which had a critical effect on Kuwait's government. The country's finance minister announced that Kuwait might not be able to afford salaries in November 2020 without availing of loans or selling fund assets owned by the government to get the necessary liquidity. This shock shows how vulnerable Kuwait's economy can be to any drop in oil price. To best predict the effect of oil prices and oil demand on government revenue, basic linear regressions in the following form are used.

#### 3.3.1 Econometric Model

$$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \epsilon_t$$

In the level model,  $Y_t$  is the total government revenue at year  $t$ ;  $\beta_0, \beta_1$ , and  $\beta_2$  are all constant;  $X_{1t}$  is Kuwaiti oil production in year  $t$ ;  $X_{2t}$  is the oil price at year  $t$ ; and  $\epsilon_t$  is a random disturbance term that captures all non-oil revenue for the government. Using log for the government revenue, oil prices and oil production, the log model is derived.

The equation above is estimated using OLS. We estimate a linear model with all variables at levels excluding the constant. Our dependent variable in each case is government revenue. Oil price and oil production are the independent variables.

Using Stata to test for heteroskedasticity, the results below are derived:



**Table 3.2 Test for Heteroskedasticity**

<b>Breusch-Pagan / Cook-Weisberg test for heteroskedasticity</b>	
<b>Ho: Constant variance</b>	
<b>Variables: fitted values of Government Revenue</b>	
<b>Results</b>	
chi2(1)	1.39
Prob > chi2	0.2387

Author calculation

The chi-square in the results is small, hence the heteroskedasticity in this model is not present; thus, satisfying the homoskedasticity assumption in this OLS model. Furthermore, a weak correlation between oil prices and non-oil revenue and between oil production and non-oil revenue is seen, which is expected. Non-oil revenue is mostly stable and does not get affected by oil prices.

**Table 3.3 Correlation Between Non-Oil Revenue and Oil Production**

<b>Correlation Between Non-oil Revenue and Oil Production</b>		
<b>Variable</b>	<b>Non-Oil Revenue</b>	<b>Oil Production</b>
Non-Oil Revenue	1	
Oil Production	0.18	1

Author calculation

**Table 3.4 Correlation Between Non-oil Revenue and Oil Prices**

<b>Correlation Between Non-oil Revenue and Oil Prices</b>		
<b>Variable</b>	<b>Non-Oil Revenue</b>	<b>Oil Prices</b>
Non-oil Revenue	1	
Oil Prices	-0.28	1

Author calculation

### 3.3.2 Data Sources

The data used in the model are as follows:

- Government revenues comes from the Kuwait Minister of Finance for fiscal years (April to March) from 2008/09 to 2019/20. The choice of this period was mainly driven by data availability.

- Oil prices comes from World Bank’s monthly average oil prices. To match the fiscal government year, the calculation is as follows:

$$\text{Oil price at year } t = \frac{\text{Sum oil price from April to March}}{12}$$

- Kuwait’s monthly crude oil production comes from the U.S. Energy Information Administration. To match the fiscal government year, the calculation is as follows:

$$\text{Oil production at year } t = \text{Sum of daily oil production from April to March}$$

### 3.3.3 Results

In this section, we interpret the results obtained from our regression in Table 3.5.

As expected, the level regression results show that oil prices do have a positive and significant impact on government revenue. An increase in the average annual oil price by USD 1 would increase government revenue by 338.13 million Kuwaiti dinars (KWD) (USD 1.1 billion). In addition, we can see that oil production levels do have a positive and significant impact on government revenue. An increase in annual oil production by 1 million barrels would raise government revenue by KWD 24.33 million (USD 80 million).

**Table 3.5 The Effect of Oil Price and Oil production on Government Revenue (Million KWD)**

Dependent Variable: Government Revenue		
Variables	Coefficient (Level Model in Million KWD)	Coefficient (Log Model)
Intercept	(27,356.22) *** (7,161.73)	(2.16) (1.91)
Oil Price	338.13 *** (20.39)	1.15 *** (0.06)
Oil Production	24.33 *** (6.57)	1.05 *** (0.26)
Observations	12	12
R-squared	0.97	0.97
Adjusted R-	0.96	0.97

Dependent Variable: Government Revenue		
Variables	Coefficient (Level Model in Million KWD)	Coefficient (Log Model)
squared Residual Std. Error	1260.6	0.05
F Statistic	153.21 ***	193.30 ***

Note: \*p<0.1, \*\*p<0.05, \*\*\*p<0.01

Author calculation

Furthermore, log regression results show that oil prices do have a positive and significant impact on government revenue. A 1% increase in average annual oil production would increase government revenue by 1.05%. The oil price level does have a positive and significant impact on government revenue. An increase of annual oil price by 1% would increase government revenue by 1.15%.

#### 3.3.4 Predicted Effects of Oil Price and Production Changes

Using the regression results of government revenue, oil prices, and oil production, as shown above, the predicted effects of falls in oil price and production on government revenue are calculated.

According to the public record for the fiscal year 2020/21, Kuwait oil production is expected to decrease by 144 million barrels and oil prices are expected to fall by \$15 per barrel. Therefore, the government's revenue is expected to fall by KWD 8.6 billion (USD 28.5 billion). Using the log model, decreases in oil price and oil production by 26% and 14.5%, respectively, will lead to government revenue reduction by 45%.

#### (2-1) 4 GCC VAT Agreement

In response to the oil price crises of 2015, the GCC countries established an agreement in November 2016 to impose VAT and excise tax in a bid to move away from their heavy dependence on oil. KSA and the United Arab Emirates applied the agreement in January 2018, followed by Bahrain in January 2019. Kuwait and Oman are still working on VAT implementation. Both national debt and VAT are correlated and were the central topic of discussion in Kuwait in 2020 because VAT can potentially help in paying back national debt.

Kuwait is struggling with a cash shortage after oil prices reached USD 11 in April 2020. In November 2020, the finance minister stated that the government might not be able to afford public salaries if

the parliament did not approve the national debt. Another alternative would be to sell some of the assets that the country owns, though experts strongly argue against this option. With the global pandemic, many of the assets have lost value, and their annual gains are higher than the yearly interest rate cost of the national debt, given Kuwait's economic position.

Understanding the VAT effect will help determine which strategies the government should adopt. First of all, is implementing VAT worth a potential political crisis for the government? If the effect is very minimal, then probably not. Focusing on other economic reform plans might be a better approach. On the contrary, if VAT provides a more stable economy, perhaps members of the parliament should not fight against it.

Kuwait and KSA have similar economic structures. Thus, to better estimate the effect of VAT on Kuwait's economy, this present study focuses on the impact of VAT on KSA, which introduced a 5% VAT rate in January 2018, and determine whether the effect is significant.

#### 4.1 Kuwait and KSA Similarities and Differences

Kuwait and its bigger sister, KSA, share many similarities in terms of economic structure. Prior to 2018, governments of both countries generated more than 80% of their revenues from oil. In addition, both the countries have a high number of foreign workers as shown in Table 4.1.

**Table 4.1 Comparisons Between KSA and Kuwait**

Comparisons between KSA and Kuwait in key factors of VAT efficiency		
Factors	KSA	Kuwait
Total Population (2020 in million)	34.175*	4.420*
Citizen (% of Total Population)	61.7%*	30%*
Foreigner (% of Total Population)	38.3%*	70%*
Political Participation (2020 out of 1000 point)	535 **	192 **
Urbanization (2020)	100%*	84.3%*
Percentage of Trade Openness (2018)	100.5% ***	66.7% ***
GDP Per Capita (2019)	USD 32,000***	USD 23,140***

\*CIA Factbook

\*\* Gulf House Studies & Publishing

\*\*\* World Bank

A study conducted by **Aizenman & Jinjarak (2005)**<sup>1</sup>, using panel data of 44 countries, including developed, showed a positive correlation between VAT collection efficiency and other political and economic factors, including durability of political regimes, ease and fluidity of political participation, urbanization, trade openness, and GDP per capita. As shown in Table 4.1, Kuwait fares much better in all factors, thus giving the Kuwaiti government advantage in expecting a better VAT efficiency.

#### 4.2 VAT Effect on Low-Income Foreign Workers

One major concern is the effect of VAT on low-income foreign workers. Since Kuwaiti citizens receive a supported price for food and services, how about the foreigners? Looking at the nature of Kuwait, this might not be a huge concern for many factors. First, according to the Central Bank of Kuwait in 2019, 25% of foreign workers are employed in the family sector. Family sector workers are mostly housemaids and drivers, and their food and shelters are provided by their employers. Other workers are in the government sector or private sector. The minimum wage in Kuwait is USD 216, and if we assume that a worker spends 90% of his salary on goods that will get affected by VAT, this suggests that the expenses will increase by less than USD 10 a month. Given these facts, a 5% VAT should not be a huge concern for foreigners and this increase can easily be handled by employers.

#### 5 KSA Econometric Model

$$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 VAT_t \text{ Dummy} + \beta_4 TimeTrend_t + \varepsilon_t$$

In model (1),  $Y_t$  is the real KSA government revenue at year  $t$ ;  $\beta_0, \beta_1, \beta_2, \beta_3$ , and  $\beta_4$  are all constant;  $X_{1t}$  is KSA oil production in year  $t$ ;  $X_{2t}$  is the real oil price at year  $t$ ; *Time Trend* captures government growth over years; *VAT Dummy* is a dummy variable to represent the tax reform system = 1 in 2018 and 2019 and zero in the rest of the years; and  $\varepsilon_t$  is a random disturbance term that captures all non-oil revenue to the government. Adding logs in model (2) to the real government revenue and real oil price to see the effects in percentage. in model (3), the time trend is removed to observe the upward biased of VAT in that case.

The equation above is estimated using OLS. A linear model is estimated with all the variables in levels excluding the constant. The

<sup>1</sup> Previously mentioned

dependent variable in each case is KSA real government revenue. Real oil price, oil production, time trend, and VAT are all independent variables, and assuming that  $E(\varepsilon/X) = 0$ . To check the validity of this assumption, the focus is on the correlation between real non-oil revenue and real oil prices and the correlation between real non-oil revenue and oil production.

**Table 5.1 Correlation Between Real Non-Oil Revenue and Oil Production**

Correlation Between Real Non-oil Revenue and Oil Production		
Variable	Real Non-oil Revenue	Oil Production
Real Non-oil Revenue	1	
Oil Production	0.50	1

Author calculation

**Table 5.2 Correlation Between Real Non-oil Revenue and Real Oil Price**

Correlation Between Real Non-oil Revenue and Oil Prices		
Variable	Real Non-oil Revenue	Real Oil Prices
Real Non-oil Revenue	1	
Real Oil Prices	0.37	1

Author calculation

As seen in Tables 5.1 and 5.2, the correlation is moderate between real non-oil revenue and both real oil prices and oil production. In the case of KSA, the correlation is higher than that of Kuwait, which is expected because the investment returns are included in the KSA government budget, unlike Kuwait. When the global economy is performing well, the investment returns and oil prices tend to be higher, which might affect the assumption that  $E(\varepsilon/X) = 0$ . This may cause some estimation biases concerning VAT effects. To solve this issue, I will use the real non-oil revenue as an independent variable instead of time trend and observe the difference. Using the real non-oil revenue, the assumption of  $E(\varepsilon/X) = 0$  is currently valid since I am in control of all government revenue variables.

Hence, model (4) is as follows:

$$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 VAT_t \text{ Dummy} + \beta_4 X_{3t} + \varepsilon_t$$

where  $X_{3t}$  represent the real non-oil revenue. Model (5) is only adding logs.

### 5.1 Data Sources

The data used in this model are as follows:

- The government revenue comes from the KSA Ministry of Finance from 1980 to 2019, excluding 1990–1991 due to Gulf War. The government budget was combined for 1990 and 1991 and is, therefore, an outlier. The real government revenue for the calculation is as follows:

$$\text{Real government revenue at year } t = \text{revenue at year } t * \left( \frac{100}{\text{CPI at year } t} \right)$$

- Consumer Price Index (CPI) (2010 = 100) for KSA comes from the World Development Indicator for 1980 to 2019 (excluding 1990–1991).
- Oil production data come from the KSA Ministry of Energy from 1980 to 2019 (excluding 1990–1991) to match the dependent variable.
- Oil price data come from British Petroleum’s historical crude oil prices for 1980 to 2019 (excluding 1990–1991) to match the dependent variable.

$$\text{Real oil price at year } t = \text{oil price at year } t * \left( \frac{100}{\text{CPI at year } t} \right)$$

- Time trend to capture the changes as government revenue grows over a period of 50 years.
- The non-oil revenue comes from the KSA Ministry of Finance from 1980 to 2019.

$$\text{Real non - oil revenue at year } t = \text{non - oil revenue at year } t * \left( \frac{100}{\text{CPI at year } t} \right)$$

### 5.2 Results

In this section, we interpret the results obtained from our regression in Table 5.3.

**Table 5.3 The effect of Real Oil Price and Oil Production on Real Government Revenue**

Variables	Dependent Variable Real Government Revenue				
	(1) Coefficient (Level Model in Million SAR)	(2) Coefficient (Log Model)	(3) Coefficient (Log Model) Removing Time Trend	(4) Coefficient (Level Model in Million SAR)	(5) Coefficient (Log Model) Adding Non-oil Revenue
Intercept	(266,947) *** (31,1878)	4.18 *** (0.53)	3.46 *** (0.46)	(277,921) *** (29,953)	1.84 *** (0.67)
Real Oil Price	9,254 *** (318.10)	0.97 *** (0.03)	1.00 *** (0.03)	9,310 *** (282.67)	0.94 *** (0.03)
Oil Production	71 *** (14.78)	0.61 *** (0.07)	0.71 *** (0.06)	76 *** (12.06)	0.66 *** (0.05)
5% VAT	142,350 *** (36,249)	0.19 ** (0.08)	0.25 *** (0.08)	127,739 *** (34,332)	0.14 ** (0.07)
Time Trend	2,103 *** (998.27)	0.005 ** (0.002)	-	-	-
Real Non-Oil Revenue	-	-	-	0.72 *** (0.23)	0.20 *** (0.04)
Observations	38	38	38	38	38
R-squared	0.98	0.98	0.98	0.98	0.99
Adjusted R-squared	0.98	0.98	0.98	0.98	0.99
Residual Std. Error	45,451	0.09	0.14	42,424	0.08
F Statistics	442.51 ***	567.15 ***	532.24 ***	508.25 ***	645.43 ***

Note: \* p<0.1, \*\* p<0.05, \*\*\* p<0.01

Author calculation

According to model (1), a USD 1 increase in the price of oil would raise government revenue by SAR 9 billion (USD 2.4 billion). An increase in oil production by 1 million barrels a year would raise government revenue by SAR 71 million (USD 18.9 million). VAT implementation in 2018 increased government revenue by over SAR 142.35 billion (USD 37.95 billion). Time trend shows an annual growth of SAR 2.1 billion (USD 560 million). For model (2) where we use logs, a 1% increase in oil price would raise government revenue by 0.97%. An increase in oil production by 1% a year would raise government revenue by 0.61%. VAT implementation in 2018 increased government revenue by 19%. Time trend shows an annual growth of 0.5% in government revenue. After removing the time trend in model (3), a 1% increase in oil prices would raise government revenue by 1.00%. Furthermore, an increase in oil



production by 1% a year would raise government revenue by 0.71%. VAT implementation in 2018 increased government revenue by 25%.

Removing the time trend shows a biased higher VAT rate than reality because governments tend to grow over time. By controlling oil revenue and adding the time trend, we stop VAT from capturing the total growth of the government over time.

In model (5), controlling the non-oil revenue shows that a 1% increase in oil prices would raise government revenue by 0.94%. In addition, an increase in oil production by 1% a year would raise government revenue by 0.66%. VAT implementation in 2018 increased government revenue by 14%. An increase of the non-oil revenue by 1% shows an increase of 0.20% in government revenue.

As it can be seen the current VAT effect is lower than the last model. Even in level model (4), the VAT is SAR 127 billion instead of SAR 142 billion and I believe this is the most accurate model. This could be attributed to the fact that the government of KSA increased the fees of electricity, water supply, and fees on forging workers in 2018, which was accurately captured when we controlled all non-oil revenue, unlike when we did not.

Using Stata to test for heteroskedasticity, the following results is obtained.

**Table 5.4 Test for Heteroskedasticity**

<b>Breusch–Pagan/Cook–Weisberg Test for Heteroskedasticity</b>	
<b>Ho: Constant Variance</b>	
<b>Variables: Fitted Values of Government Revenue</b>	
	<b>Results</b>
chi2(1)	2.31
Prob > chi2	0.1285

Author calculation

The chi-square in the results is small, hence the heteroskedasticity in this model is not present; thus, satisfying the homoskedasticity assumption in this OLS model.

(2-1) 6 OPEC Members

Since both Kuwait and KSA are members of OPEC, neither country can tailor its oil production depending on price changes. Sometimes production level changes negatively correlate to oil price changes in both countries, as shown in the appendix below.

In the case of KSA, the correlation between oil price and production is approximately 0.20% in the last 20 years. Certainly, some correlation is expected as seen in the current pandemic, when there was

an agreement among OPEC Plus members to reduce oil production in response to a fall in demand, which led to a price crisis for the industry.

#### (2-1) 7 Revenues from VAT in KSA and Its Effect on Consumption

After the Saudi government implemented VAT in 2018, revenue from taxes on goods and services shot by 200% compared to 2017. In 2019, revenue increased by 36%, as expected, since VAT did not include small businesses in 2018<sup>1</sup>.

**Table 7.1 VAT Revenue in KSA**

VAT Revenue Over Time (billion SAR)				
Year	2017	2018	2019	2020
Tax on goods and services*	38	114	155	163
Increase rates**	-	200%	36%	5%

\*Data Source: Saudi Arabia Monetary Authority

\*\* Author calculation

A study conducted by **Miki (2011)**<sup>2</sup> empirically determined that changes in a country's VAT rate affect its aggregate consumption and economic growth. Using a panel data model of 14 developed countries from 1980 to 2010 and monitoring the effects of 53 VAT rate changes, Miki showed that aggregate consumption and economic growth follow three trends. First, when the government increases the VAT rate, aggregate consumption and economic growth increase before the new rate is imposed; second, it will decrease after the imposition; and third, it will gradually increase again. The study also found the opposite trend for all three stages to be true.

The KSA case is not an exemption to the rule as in table 7.2 the rate of change does not show a decrease in consumption after VAT was implemented in 2018. Also, when VAT got effective on small business in 2019, we can still see a higher consumption. In July 2020, VAT increased from 5% to 15% and the transactions still increased. However, 2020 might be miss leading since more people used point-of-sale to avoid cash with COVID-19 concerns.

<sup>1</sup> [General Authority of Zakat & Tax VAT guide](#)

<sup>2</sup> Previously mentioned

Table 7.2 Point-of-sales Transactions and Change Rates

Year	Point of Sales (%Change)	
	Transaction in Billion SAR*	% Change**
2015	172.835	-
2016	182.748	6%
2017	200.467	10%
2018	232.305	16%
2019	287.794	24%
2020	357.297	24%

\*Data Source: Saudi Arabia Monetary Authority

\*\* Author calculation

To understand the VAT effects better, I will run a regression with seasonal dummies to see whether the VAT effects are significant or not.

The regression will be as follow:

$$\begin{aligned}
 POSttransactions(BSAR) &= \beta_0 + \beta_1 VAT5\% L + \beta_2 VAT5\% A \\
 &+ \beta_3 VAT15\% + \beta_4 Ramadan\&Eid \\
 &+ \beta_5 Pandemic + \beta_6 Curfew + TimeTrend
 \end{aligned}$$

- $POSttransactions(BSAR)$  is the point-of-sales transactions in billion SAR from January 2017 to December 2020.
- $VAT5\% L$  is a dummy of 5% VAT implementations in the beginning of 2018 on **Large** businesses, the variable =1 if January 2018 or after & =0 O.W.
- $VAT5\% A$  is a dummy of 5% VAT implementations in the beginning of 2019 on **All** businesses, the variable =1 if January 2019 or after & =0 O.W.
- $VAT15\%$  is the dummy of the new VAT rate implementation in July 2020, the variable =1 if July 2020 or after & =0 O.W.
- $Ramadan\&Eid$  is the dummy of the Ramadan and Eid month, the variable =1 if Ramadan and Eid month & =0 O.W.
- $Pandemic$  is the dummy of the Covid-19 pandemic, the variable =1 if Feb 2020 or later & =0 O.W.

- *Curfew* is the dummy of the curfew months in KSA, the variable =1 if April-June 2020 & =0 O.W.
- *TimeTrend* to capture the people adoption of new payment methods in KSA.

Results:

**Table 7.3 The effect of VAT on Consumption**

<b>Dependent Variable</b>	
<b>Point-of-Sales Transactions in Billion SAR</b>	
<b>Variables</b>	<b>Coefficient in BSAR</b>
Intercept	(13.59) ***
	(1.43)
<i>VAT5%L</i>	(.12)
	(1.53)
<i>VAT5%A</i>	1.85
	(1.74)
<i>VAT15%</i>	(3.45)
	(2.16)
<i>Ramadan&amp;Eid</i>	4.10 ***
	(1.11)
<i>Pandemic</i>	10.60 ***
	(2.31)
<i>Curfew</i>	(8.65) ***
	(1.91)
<i>TimeTrend</i>	2.78 **
	(1.30)
Observations	48
R-squared	0.91
Adjusted R-squared	0.90
Residual Std. Error	2.00
F Statistics	57.22 ***

Note: \* p<0.1, \*\* p<0.05, \*\*\* p<0.01

Author calculation

From the results as we expected, the VAT effect is not significant on consumption, and the model suggest that the effect prior to the implementation or the rate change is only temporary and after a while people get used to the new prices and consumption go back to its normal trajectories.

### 7.1 Compliance with VAT in KSA

VAT compliance can be indicated by monitoring cash withdrawals. As seen in the graph below, withdrawals followed along the same trajectory and did not increase after VAT was implemented. Only increases corresponding to normal economic growth in the country can be seen.

Table 7.4 shows an increase of almost SAR 20 billion in 2018, which is expected because some sellers and consumers will try to avoid paying taxes. However, it is not a concerning high percentage. Moreover, in 2019 it decreased again even though VAT introduced to small businesses. The drop in 2020 could be attributed to the pandemic when people made all attempts to spend less cash to reduce the risk of COVID-19.

**Table 7.4 Cash Withdrawals Transactions and Change Rates**

Year	Cash Withdrawals (%Change)	
	Withdrawal in Billion SAR*	% Change**
2015	777.200	-
2016	753.449	(3%)
2017	728.511	(3%)
2018	748.325	2%
2019	740.640	(1%)
2020	628.891	(15%)

\*Data Source: Saudi Arabia Monetary Authority

\*\* Author calculation

Again, to understand the VAT compliance better, I will run a regression with Seasonal dummies to see whether the VAT effects are significant or not.

The regression will be as follow:

$$\begin{aligned}
 \text{CashWithdrawals (BSAR)} &= \beta_0 + \beta_1 \text{VAT5\% L} + \beta_2 \text{VAT5\% A} \\
 &+ \beta_3 \text{VAT15\%} + \beta_4 \text{Ramadan\&Eid} \\
 &+ \beta_5 \text{Pandemic} + \beta_6 \text{Curfew}
 \end{aligned}$$

- *CashWithdrawals (BSAR)* is the cash withdrawals transactions in billion SAR from January 2017 to December 2020.

- **VAT5% L** is a dummy of 5% VAT implementations in the beginning of 2018 on **Large** businesses, the variable =1 if January 2018 or after & =0 O.W.
- **VAT5% A** is a dummy of 5% VAT implementations in the beginning of 2019 on **All** businesses, the variable =1 if January 2019 or after & =0 O.W.
- **VAT15%** is the dummy of the new VAT rate implementation in July 2020, the variable =1 if July 2020 or after & =0 O.W.
- **Ramadan&Eid** is the dummy of the Ramadan and Eid month, the variable =1 if Ramadan and Eid month & =0 O.W.
- **Pandemic** is the dummy of the Covid-19 pandemic, the variable =1 if Feb 2020 or later & =0 O.W.
- **Curfew** is the dummy of the curfew months in KSA, the variable =1 if April-June 2020 & =0 O.W.

**Results:**

**Table 7.5 VAT compliance**

<b>Dependent Variable</b>	
<b><u>Cash Withdrawals Transactions in Billion SAR</u></b>	
<b>Variables</b>	<b>Coefficient in BSAR</b>
Intercept	60.11 *** (1.08)
<b>VAT5%L</b>	(1.65) (1.51)
<b>VAT5%A</b>	(1.12) (1.44)
<b>VAT15%</b>	(3.66) (4.00)
<b>Ramadan&amp;Eid</b>	7.14 *** (2.05)
<b>Pandemic</b>	(11.27) *** (3.83)
<b>Curfew</b>	(21.70) *** (2.93)
Observations	48

Dependent Variable	
<u>Cash Withdrawals Transactions in Billion SAR</u>	
Variables	Coefficient in BSAR
R-squared	0.68
Adjusted R-squared	0.64
Residual Std. Error	3.70
F Statistics	15.15 ***

Note: \*p<0.1, \*\*p<0.05, \*\*\*p<0.01

Author calculation

From the results, the VAT implementation did not affect cash withdrawal significantly, which indicate that the compliance was high in KSA case.

### 7.2 Optimal VAT Rate

In July 2020, the KSA government decided to triple the VAT rate from 5% to 15% in response to the devastating effect of COVID-19. Table 7.4 shows the revenue breakdown from 2017 till end-2020 and the impact of changes in VAT rate.

**Table 7.4 Effects of VAT Rate Changes in SAR (Millions)**

VAT Rate Change Effect on Revenue

Year	VAT Rate	Q1	Q2	VAT Rate	Q3	Q4
2017	0%	5,690	8,084	0%	11,725*	12,501
2018	5%	22,653	29,744	5%	30,895	31,696
2019	5%	41,133	36,504	5%	37,596	40,183
2020	5%	30,604	10,558	15%	51,572	70,612

Tax revenue on goods and services includes fees on oil products, excess tax, and VAT.

\* Beginning of excess tax

Data Source: KSA Ministry of Finance

Evidently, after VAT was implemented in 2018, tax revenue shot by around 200% compared to 2017. In 2019, it increased again throughout all quarters because small businesses were not included in 2018. However, there was a drop in the first 2 quarters in 2020 due to the pandemic and the lockdowns. The most interesting period corresponds to the third and fourth quarters of 2020. If VAT continued at the old rate of 5%, we should expect a decline because the economy would still be suffering from the pandemic effect. In fact, the new VAT rate increased revenue by 37% compared to 2019 in the third quarter

and by 75% in the fourth quarter. This difference is explained by the Laffer curve, which predicts optimal tax rates. The idea is to determine a rate that is considered to be a revenue maximizer. From the table above, the KSA government would be better off keeping the 15% rate over the 5% rate.

(2-1) 8 Predicted VAT Revenue in Kuwait

Our analysis of KSA can potentially help us predict VAT revenue in Kuwait, and since the Saudi and Kuwaiti economies share many similarities, we can expect similar figures when VAT is implemented in Kuwait.

- It is worth noting that the standard rate of VAT will be 5% in Kuwait.
  - Excess taxes are as follows:
  - Tobacco products, energy drinks, e-cigarettes, and e-liquids attract a 100% VAT rate.
- Soft drinks and sweetened drinks attract a 50% rate of VAT.

**Table 8.1 Kuwait Government Budget**

<b>Kuwait Government Revenue, Expenditures, and Net Profit/Loss</b>			
<b><u>Accounts in Kuwaiti Dinars (Millions) (2015/16 to 2019/20)</u></b>			
<b>Year</b>	<b>Revenue</b>	<b>Expenditures</b>	<b>Net Profit (Loss)</b>
2015/16	13,633	18,245	(4,611)
2016/17	13,099	17,707	(4,608)
2017/18	15,999	19,247	(3,247)
2018/19	20,558	21,848	(1,290)
2019/20	17,220	21,140	(3,919)
Average	16,102	19,637	(3,535)

Data Source: Kuwait Minister of Finance

Table 8.1 indicates that the average government revenue for the last 5 years is KWD 16.102 billion, and based on model (5) results, VAT contributed to a 14% increase in revenue of the government of KSA.



If we apply these results to Kuwait, the following is observed:

$$\begin{aligned} \text{Average Gov.Reve. for the last 5 years} \times 14\% &= \\ \text{KWD 16.102 billion} \times 14\% &= \\ &= \text{KWD 2.25 billion (USD 7.46 billion)} \end{aligned}$$

From model (5), 14% of Kuwait government revenue on average for the last 5 years is around KWD 2.25 billion (USD 7.46 billion). The average government budget deficit in the last 5 years has been KWD 3.54 billion (USD 11.7 billion), as shown in Table 8.1. Therefore USD 7.46 billion in VAT revenue would be able to cover approximately 63% of the deficit (USD 11.7 billion)

### 9 Conclusion

Kuwait's heavy dependence on oil has led to a series of deficits in recent years due to oil price fall. This paper utilizes OLS regression to estimate the effect of a 5% VAT rate on KSA government revenue and predict the possible effect of similar VAT on revenue for Kuwait. KSA was chosen due to the close similarity of its economic structure with that of Kuwait. This analysis is based on a time series of KSA's government revenue data from 1980 to 2019, excluding 1990–1991. The OLS model analysis shows a strong and statistically significant relationship between government revenue and oil prices, a statistically significant relationship between government revenue and oil production, and a statistically significant relationship between government revenue and the imposition of a 5% rate of VAT. Using logs with the model, VAT is shown to have contributed to a 14% increase in KSA government revenue. Predicting the effect on Kuwait, VAT is expected to generate USD 7.46 billion to government revenue, corresponding to about 63% of its deficit. Increasing the VAT rate to 15% could cover the entire deficit and add more in reserve. The 15% VAT rate has brought greater revenues to the Saudi government since it was applied in July 2020.

Considering the future, by capturing more data in the models from the KSA case, Kuwaiti decision-makers could improve the prediction of the 15% VAT rate applied in KSA in July 2020.

## خلاصة الدراسة باللغة العربية

تعتمد حكومة الكويت على النفط كمصدر وحيد للدخل، كما كان الحال في السعودية قبل عام ٢٠١٨، لقد عقد دول مجلس التعاون الخليجي الاتفاق على فرض ضريبة القيمة المضافة وبادرت بذلك الإمارات والسعودية وتبعتهما البحرين، ولأسباب سياسية تأخرت حكومة الكويت في فرض الضريبة ولم تتمكن من فرضها حتى وقت هذه الدراسة.

لقد تعاقبت العجوزات على ميزانية الكويت في السنوات الخمس الأخيرة، ومن المتوقع أن يتجه العالم نحو الطاقة النظيفة، وبالتالي ينخفض الطلب على النفط ومشتقاته كمصدر للطاقة، مما يؤدي إلى انخفاض مدخول حكومة الكويت، وفي عام ٢٠٢٠ جاءت أزمة كورونا لتكشف ضعف اقتصاد السلعة الواحدة وانهارت أسعار النفط إلى أقل من ١٢ دولار في الكويت.

تهدف هذه الدراسة إلى توقع أثر فرض ضريبة القيمة المضافة على تخفيف عجز ميزانية حكومة دولة الكويت، ونظرا لانعدام الضرائب على المبيعات في الكويت، فقد تم اختيار تجربة المملكة العربية السعودية كمثال لتوقع النتائج. يأتي اختيار السعودية للتشابه الكبير بين الاقتصاديين رغم اختلاف الحجم .

تستخدم الدراسة طريقة المربعات الصغرى Ordinary least squares (OLS) في النظر إلى أثر فرض ضريبة القيمة المضافة بواقع ٥٪ على مردود حكومة المملكة العربية السعودية بعد فرضها في عام ٢٠١٨.

توصلت الدراسة إلى أن فرض ضريبة القيمة المضافة بواقع ٥٪ أدى إلى زيادة مردود حكومة المملكة العربية السعودية بواقع ١٤٪. تفيد هذه النتائج أن فرض الكويت ٥٪ ضريبة القيمة المضافة سيحقق عائدا تقريبا بواقع ٧,٤٦ مليار دولار، وهذا العائد سيغطي ٦٣٪ من العجز الحكومي في

السنوات الخمس الأخيرة. زيادة قيمة ضريبة القيمة المضافة إلى ١٥٪ بدلا من ٥٪ قد يغطي كامل العجز ويضيف فوائض إلى خزينة الدولة. توصي هذه الدراسة بضرورة استعجال الكويت بالإصلاحات الاقتصادية وتنويع مصادر الدخل للحكومة، وعدم الاعتماد على النفط كمصدر وحيد للدخل، وبالعامل على تنويع مصادر دخل الحكومة فهذا سيؤدي إلى اقتصاد ممتن قادر على مواجهة الأزمات بكفاءة أعلى. مع توفر مزيد من البيانات ستكون دراسة التجربة السعودية بزيادة الضريبة إلى ١٥٪ بدلا من ٥٪ مجالا مهما لمزيد من الأبحاث في النظر من تأثيراته الكلية على الاستهلاك وعوائد الحكومة في مرحلة ما بعد كورونا.

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## 11 Appendix

### 11.1 Kuwait Model Data

<b>FY</b>	<b>Gov. Rev</b>	<b>Oil Price</b>	<b>Oil Production</b>
2008/2009	21005	84.19	912.85
2009/2010	17687	69.99	830.5
2010/2011	21501	84.71	833.5
2011/2012	30236	107.2	931.44
2012/2013	32008	103.15	943.8
2013/2014	31811	103.72	942.95
2014/2015	24925	83.22	961.15
2015/2016	13633	46.04	1024.21
2016/2017	13099	47.87	1036.05
2017/2018	15999	55.72	990.98
2018/2019	20558	67.32	1008.68
2019/2020	17220	58.55	997.13

### 11.2 Kuwait Model Data (Logs)

<b>FY</b>	<b>Gov. Rev</b>	<b>Oil Price</b>	<b>Oil Production</b>
2008/2009	9.95251578	4.43307615	6.81657157
2009/2010	9.78058519	4.24835237	6.72202793
2010/2011	9.97585472	4.43923366	6.7256337
2011/2012	10.3167885	4.67469625	6.83673178
2012/2013	10.3737412	4.63618424	6.84991428
2013/2014	10.3675674	4.64169496	6.84901326
2014/2015	10.1236266	4.4214877	6.86813048
2015/2016	9.5202486	3.82951058	6.93167686
2016/2017	9.48029117	3.868489	6.94317068
2017/2018	9.6802815	4.02033915	6.89869435
2018/2019	9.93100544	4.20945737	6.91639782
2019/2020	9.75382678	4.06988109	6.90488115

**11.3 KSA Model Data**

year	Real Gov. Rev.	Real Non-oil Rev.	Real Oil Price	Oil Production	VAT	Time Trend
1980	491328.054	40642.8938	54.1512972	3623.8	0	11
1981	505281.764	54113.6962	50.7136369	3579.89	0	12
1982	334597.881	81788.1166	45.2686634	2366.41	0	13
1983	280018.04	83151.1913	40.1628364	1656.88	0	14
1984	236345.535	69123.6518	39.0415571	1492.9	0	15
1985	189864.874	64167.2624	37.9786656	1158.8	0	16
1986	112341.864	49980.9539	20.5124855	1746.2	0	17
1987	154848.314	54304.5315	27.0729521	1505.4	0	18
1988	125057.503	53511.6028	22.2609524	1890.1	0	19
1989	167672.672	56622.4467	26.9422247	1848.5	0	20
1992	232068.083	55890.2054	28.268554	3049.4	0	23
1993	191467.738	48012.7909	23.216294	2937.4	0	24
1994	173629.483	45074.1281	21.4116099	2937.9	0	25
1995	188042.89	52333.6839	22.905453	2928.54	0	26
1996	227092.76	54657.7281	26.5294353	2965.45	0	27
1997	260440.041	57683.3502	24.2107848	2924.28	0	28
1998	180135.422	78372.291	16.1151698	3022.27	0	29
1999	190107.534	55447.4936	22.8592139	2761.1	0	30
2000	336500.225	56905.0677	36.7382342	2962.6	0	31
2001	300877.386	58345.3604	31.8732677	2879.46	0	32
2002	280194.337	61695.3728	32.9986185	2588.98	0	33
2003	383086.413	81062.654	37.9258204	3069.74	0	34
2004	510275.136	81025.4339	50.0300396	3256.3	0	35
2005	730561.444	77407.7836	70.9186709	3413.94	0	36
2006	853268.011	87662.11	84.3324273	3360.9	0	37
2007	781578.852	98018.3534	91.6861145	3217.77	0	38
2008	1218432.25	130170.559	118.253285	3366.34	0	39
2009	537025.614	79410.1194	68.2495328	2987.27	0	40
2010	740872	70637	83.7401315	2980.43	0	41
2011	1056002.04	78586.3873	111.255598	3398.52	0	42
2012	1145089.06	93441.5634	105.521776	3573.4	0	43
2013	1022680.74	104311.285	99.815393	3517.62	0	44
2014	902701.311	110039.995	87.7920554	3545.14	0	45
2015	525397.741	142572.469	45.4646013	3720.28	0	46

year	Real Gov. Rev.	Real Non-oil Rev.	Real Oil Price	Oil Production	VAT	Time Trend
2016	436417.046	156063.724	37.5030139	3828.43	0	47
2017	585876.585	216564.475	45.529283	3635.29	0	48
2018	748862.24	149150.773	60.4169055	3765.13	1	49
2019	782810.275	150694.479	53.0967268	3579.96	1	50

#### 11.4 KSA Model Data (Logs)

year	Real Gov. Rev.	Real Non-oil Rev.	Real Oil Price	Oil Production	VAT	Time Trend
1980	13.1048673	10.6125793	3.99178193	8.19527848	0	11
1981	13.1328715	10.8988426	3.92619485	8.18308735	0	12
1982	12.7206847	11.3118872	3.81261504	7.76912932	0	13
1983	12.5426093	11.3284158	3.6929421	7.41269159	0	14
1984	12.3730501	11.1436522	3.66462665	7.30847582	0	15
1985	12.1540679	11.0692484	3.63702457	7.05514027	0	16
1986	11.6293019	10.8193973	3.02103375	7.46519728	0	17
1987	11.9502013	10.902363	3.29853515	7.31681392	0	18
1988	11.7365289	10.8876538	3.10283413	7.54438502	0	19
1989	12.029769	10.9441608	3.29369475	7.52212978	0	20
1992	12.3547861	10.9311444	3.34175002	8.02270013	0	23
1993	12.1624746	10.7792227	3.14485436	7.98528012	0	24
1994	12.0646789	10.7160637	3.06393329	7.98545032	0	25
1995	12.1444254	10.8653955	3.13137501	7.98225928	0	26
1996	12.3331138	10.9088459	3.27825488	7.99478407	0	27
1997	12.4701279	10.9627239	3.18679819	7.98080358	0	28
1998	12.1014642	11.2692257	2.77976105	8.01376348	0	29
1999	12.1553452	10.9231918	3.12935427	7.92338443	0	30
2000	12.7263541	10.9491397	3.60381802	7.99382254	0	31
2001	12.6144581	10.9741351	3.46176766	7.96535806	0	32
2002	12.5432387	11.0299642	3.4964657	7.85901925	0	33
2003	12.8560159	11.3029776	3.63563216	8.02934815	0	34
2004	13.1427053	11.3025184	3.91262362	8.08834686	0	35
2005	13.5015686	11.2568426	4.26153374	8.13562233	0	36
2006	13.656829	11.381245	4.43476646	8.11996407	0	37

year	Real Gov. Rev.	Real Non-oil Rev.	Real Oil Price	Oil Production	VAT	Time Trend
2007	13.5690713	11.49291	4.51837094	8.07644385	0	38
2008	14.0130755	11.7766009	4.77282881	8.12158138	0	39
2009	13.1938011	11.2823811	4.22317059	8.00211521	0	40
2010	13.5155831	11.1653094	4.42771833	7.99982286	0	41
2011	13.8700007	11.2719538	4.71183024	8.13109532	0	42
2012	13.950993	11.4450915	4.65891734	8.1812728	0	43
2013	13.8379379	11.5551348	4.60332241	8.1655399	0	44
2014	13.713147	11.6085992	4.47497101	8.17333293	0	45
2015	13.1719109	11.8676057	3.81693403	8.22155421	0	46
2016	12.9863536	11.9580197	3.6244213	8.25021008	0	47
2017	13.2808644	12.2856436	3.8183557	8.19844417	0	48
2018	13.5263103	11.912713	4.10126896	8.23353767	1	49
2019	13.5706456	11.9230097	3.97211528	8.18310691	1	50