***ENERGY TRANSITION AND SAUDI ARABIA’S OIL EXPORTS***

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## Overview

Oil windfalls have opened a window of great opportunities for Saudi Arabia. With the blessing of oil, Saudi Arabia's economy has become more prosperous, has been able to build a modern infrastructure, and has laid the foundation for a modern economy. Key indicators of the Saudi economy such as economic activity, revenues, export earnings, and foreign exchange are to a large extent directly linked to the hydrocarbon sector. The oil sector continues to play a central role in the country's development, as government spending through oil revenues is the main driver of growth. Oil is blessing for the Saudi economy but may create challenges for the sustainable and long-term development due to rapid structural changes in the global energy market.

There is a growing consensus that future oil demand may slow down because of increasing energy efficiency, technological advances in energy equipments, climate change and environmental policies, government incentives for renewable energy use in certain countries, declining costs of renewable energy resources, and widespread electrification of vehicles (Dale and Fattouh 2018; Fattouh and Sen 2021, IRENA 2018).

Global concerns about climate change and CO2 emissions have triggered a revolutionary transformation in the energy system that has some important policy implications for oil exporting countries. In the long term, energy demand is going to replace the high carbon energy system dominated by fossil fuels with a low carbon energy system dominated by renewables energy. According to Saundry (2019), energy systems are dynamic and still transition, responding to changes in the cost and availability of certain energy resources, technological innovations, and public concerns about environmental quality.

Despite structural changes in the energy market, oil remains the world's most important fuel, accounting for one-third of global energy consumption (BP, 2020). Oil continues to dominate total energy consumption. In last five decades, although oil consumption increased in absolute terms, however the share of oil in total energy consumption declined from 45% in 1980 to 33% in 2018 (IAE 2020). The reduction in oil consumption may be due to switching from oil consumption to other energy sources.

The rapid transformation of the energy system may pose long-term challenges to sustainable development of the Saudi Arabia's economy given the importance of oil for the economy. Therefore, it is critical for policy makers in Saudi Arabia to understand the future dynamics of oil market.

With this background, the objective of this study is to analyze the impact of renewable energy on Saudi Arabia's crude oil exports. Recent trends show that renewable energy growth is accelerating worldwide, but the share of renewable energy in total energy varies by region and country (Fattouh et al. (2019). The largest renewable energy markets roughly correspond to the areas with the greatest energy demand, such as China, the U.S., India, and the EU. The other country Brazil, Indonesia, Japan, and Canada are also important markets for renewable energy (IRENA 2018).

Therefore, to avoid an aggregation misspecification problem, the scope of the study is expanded by examining the impact of renewable energy on Saudi Arabia's crude oil exports at the regional level. Regional level is important for policy poimt of view because it can provide policymakers with a deeper understanding of the potential leverages to design oil exports policy at the regional level. To the best of our knowledge, there is no study that measure the impact of renewable energy on Saudi Arabia's crude oil exports. This study intends to be a first attempt to fill this gap by analyzing the role of renewable energy on oil exports at aggregate and regional levels. For the regional analysis, we focused on two regions, namely Asia, and Europe[[1]](#footnote-1). Saudi Arabia exports about 86% of its total crude oil exports to these countries (Saudi Central Bank 2020).

## Methods

Many economic and non-economic factors have influenced Saudi Arabia’s crude oil exports. Saudi Arabia's crude oil exports were affected by events such as the war in the Middle East, the Asian currency crisis, the global financial crisis, and the oil price collapse in 2014 among others. Therefore, we need an appropriate econometrics methodology that can consider not only economic determinants of Saudi Arabia oil exports but also other non-economic factors that might affect Saudi Arabia’s oil exports. All-important determinants must be included in the empirical model, and omitting key variables negatively affects the goodness of fit and distorts the effects of the included factors (Castle, Doornik, Hendr ,2011)

Castle et al. (2020) argue that successful selection of econometric model requires robustness against many potential problems jointly, including outliers and shifts; omitted variables; incorrect distributional shape; non-stationarity; mis specified dynamics; and non-linearity, as well as inappropriate exogeneity assumptions. Model selection by Autometrics- a cutting edge econometric tool, with tight significance levels and bias correction is a successful approach that allows to handle multiple breaks (Doornik, 2009; Doornik and Hendry, 2009)

In this study, we used state-of-the-art econometric techniques such as Autometrics, which provide a parsimonious specification and impulse indicator saturation allows many breaks to be detected. Autometrics is a new algorithm for automatic model selection within the general-to-specific framework proposed by Hendry (1999). The asymptotic theory is derived in the situation where there are no outliers or structural breaks by using empirical process techniques. Stationary processes, trend stationary autoregressions, and unit root processes are considered. This approach has acceptable performance when there are possible outliers and shifts leading to incorrect distribution shape, omitted variables, mis specified dynamics, nonlinearity, and nonstationary, as well as testing the validity of exogeneity assumptions (Castle et. al.2020)

## Results

The results show that crude oil exports from other OPEC member countries have negative and statistically significant impact on Saudi Arabia crude oil exports for full sample and European countries, whereas this coefficient is positive for Asian countries. The positive coefficients of exports from the other OPEC member countries for the Asian countries indicate that Saudi Arabia oil exports vary with the exports of other OPEC nations.

The significantly positive coefficient of income and the significantly negative coefficient of domestic oil supply reveal that income exerts a positive effect, whereas domestic oil supply exerts an inverse effect on Saudi oil exportation in all three cases. Positive and statistically significant coefficient of price for Asian countries, indicates that market share of Saudi Arabia oil exports changes with price changes. Negative and statistically significant coefficients of renewable energy for all three cases, suggest that in the Saudi Arabia oil exports may be affected by the development of alternative energy sources.

## Conclusions

The twenty-first century will be portrayed by growing share of low-cost renewable technologies and a shift away from carbon-intensive fuels. In all three estimated models, an increase in the economic activity would demand more oil from KSA whereas domestic oil production in these countries would imply the opposite. The economic growth in Asia has a strong positive impact on Saudi Arabia’s oil exports and renewable energy consumption in EU countries has strong negative impact on oil exports from Saudi Arabia. Strong economic growth and increasing population in Asia are main reasons for positive and staiticaly significant relationship between Saudi Arabia’s oil exports and economic activity in Asian countries.

In the long term, development of alternative energy sources, may create challenge for Saudi Arabia. Therefore, income diversification, may be the ultimate hedge against the energy transition. In the long term, economic diversification should be the most important strategy that can protect the Saudi economy from the effects of the energy transition. Policy makers may wish to keep aligning the country's oil exports' policy with structural or other changes in the energy market. The other policy option for Saudi Arabia to address these challenges is to save oil revenues to accumulate financial assets or invest in physical assets.

## References

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1. Selected Asian Countries: Japan, China, Korea, Rep., India, Singapore, Thailand, Pakistan, Bahrain, Malaysia, Indonesia

Selected European Countries: France, Italy, Spain, Netherlands, United Kingdom, Belgium, Germany [↑](#footnote-ref-1)