# *EFFECTS OF SAUDI ARABIA'S ECONOMIC REFORMS: INSIGHTS FROM A NEW DSGE MODEL*

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## Overview

Saudi Arabia's economy is heavily dependent on oil exports. In 2016, they accounted for nearly 75 percent of total Saudi export value in 2016 and about 60 percent of government revenues. Real gross domestic product (GDP) growth is also heavily dependent on oil. In 2016, Saudi Arabia's oil-driven growth significantly slowed and oil revenues fell dramatically as a result of the decrease in crude oil prices since mid-2014, notwithstanding the increase in oil output.

On April 25, 2016, the government of Saudi Arabia announced Saudi Vision 2030, its plan to diversify its economy, reduce its dependence on oil, and develop public service sectors. One of Vision 2030's 'executive programs,' the Fiscal Balance Program (FBP) will scrutinize government finances and encourage increased budgetary efficiency. The FBP will help to enhance the government's effectiveness. This paper analyzes some of the key economic policy reforms envisaged by the FBP using a newly developed dynamic stochastic general equilibrium model for the Saudi Arabian economy. It will run simulations to assess the economic impact of the policy changes under the Vision 2030 plan.

## Methods

We have developed the KAPSARC dynamic stochastic general equilibrium model (K-DSGE) for Saudi Arabia, designed to analyze the impacts of key economic reforms that form part of Saudi Vision 2030. We model the Saudi economy as an oil-rich small open economy. There are two representative households – Saudi and non-Saudi - and four representative firms producing a tradable and non-tradable final good, along with energy services and electricity. There is a distinction in the labor force between Saudi nationals and expatriates. The model includes three energy sources – oil, gas and renewable energy. The model features a tax system with sales taxes and taxes on labor and capital. While maintaining a balanced budget, the government collects tax revenues and provides public services and income transfers, employs Saudi nationals, and invests in oil, natural gas, and renewable energy production capacity. The economy exchanges a final good with the rest of the world, exports fossil fuels, and acquires foreign bonds. The domestic currency is pegged to the United States dollar within a fixed exchange rate regime. The model includes an oil price reaction function to capture the potential impact of Saudi oil exports in the international oil market and the effects of oil export revenues on the Saudi economy.

Using K-DSGE calibrated to the Saudi Arabian economy we simulate the following policy experiments:

a) **Introduction of a 5 percent value-added tax (VAT).** In the first period we implement a 5 percent increase in the tax (from 0 percent in the reference case) on the value of tradable goods and non-tradable goods and of energy services consumed by households, keeping it at this level for all future periods.
b) **Deregulation of the domestic prices of oil and gas.** We simulate the Vision 2030 energy pricing reform by allowing a gradual increase in the domestic prices of oil and gas from the current level to the international price level in the first five periods, keeping prices at that level for all periods thereafter.
c) **Increase in the share of renewable energy for power generation.** To reduce the dependency of Saudi Arabia's economy on oil, Vision 2030 has set a target to deploy 27.3 gigawatts (GW) of renewables by 2024. We simulate an increase in investment in renewables, starting from the current share of 0 percent of renewables in electricity generation, gradually rising to 13.75 percent in the first five periods of the simulation.
d) We then simulate all the three policies simultaneously.

## Results

For each scenario, we considered two ways in which government revenues might be recycled back to the economy: a) lump-sum transfer to Saudi households; and b) government provision of public services to Saudi households.

The 5 percent VAT applied to Saudi and expatriate private consumption increases government revenue which, if not recycled, decreases Saudi households' welfare by over 5 percent. This loss is reduced if the revenue is transferred as a lump-sum to Saudi households, boosting their private consumption and increasing their welfare by 4.2 percent annually. When government revenue is recycled entirely through government spending, annual welfare increases by about 3 percent. We also find that the larger the negative effect of the VAT, the larger the increase of oil and gas exports and the greater the government's revenues, which ultimately drives the economy's real GDP.

In the fuel price deregulation experiment where domestic oil and gas prices are increased to international price levels (significantly higher than domestic levels), both Saudi and expatriates households' consumption of energy services is significantly reduced. Oil and gas exports also generate significant revenue. When this increase in government revenue is not recycled, Saudi households suffer a net welfare loss of about 16 percent, whereas welfare increases by over 21 percent when the government revenue is recycled through government expenditure. If government revenue is entirely recycled through transfers, Saudi households welfare is increased by over 29 percent.

An increase in the share of renewable energy in power generation requires the government investment which impacts the public budget. However, there is not significant growth in oil and gas export revenue. The results of the simulation show that when government revenue is recycled either through government consumption or lump-sum transfers, welfare of the Saudi household decreases by about 3 percent.

A joint policy scenario combining the three scenarios yields an increase in Saudi households' welfare by over 28 percent if the government revenue is recycled into the economy through lump-sum transfer to the Saudi households. If the revenue is recycled into the economy through government spending then the welfare of the Saudi households increase by about 20 percent.

## Conclusions

As the Saudi economy is heavily dependent on oil exports, the magnitude of the impact on it of structural economic reforms depends upon how the reforms affect oil export revenues. Because domestic energy consumption is high due to low administrated energy prices, the welfare of Saudi citizens depends on energy prices and their disposable income. Reforms which reduce domestic energy consumption lead to increased oil exports. Therefore, the impact of economic reforms on the Saudi economy depends upon how they impact the government's budget and on how revenues from taxes or oil exports are recycled back into the economy.

We employ a DSGE model calibrated to the Saudi economy to analyze key economic reforms in the Kingdom within the general framework of Vision 2030. We simulate three policy scenarios – the introduction of VAT, an increase in the share of renewables used in power generation and the deregulation of fuel prices. We also run an experiment in which all three policy changes are simulated at once.

The preliminary results show that the VAT and fuel price deregulation policies result in surplus fiscal revenue. If the revenue is recycled to the economy through government spending or lump-sum transfers, Saudi households' welfare improves. The increase in the share of renewables in power generation requires government investment which costs the government budget. Thus, the investment policy has a negative welfare effect to the Saudi households. The joint policy that combines the three policies shows a significant positive welfare effect to the Saudi households.