The Phases of Saudi Oil Policy
Phase 1: Cut Output in Face of Temporary Demand Shock

Following the collapse in oil demand in the aftermath of the 2008 financial crisis, OPEC implemented one of the biggest cuts in its history with Saudi Arabia accounting for the bulk of the output cut.

Saudi Arabia also sent a strong signal about its preferred price of $75/B and the market stabilized at that price for the second half of 2009 and for most of 2010 before starting to rise towards the end of 2010.

Source: EIA
Phase 2: Increase Output in Face of Exogenous Supply Shock

The market witnessed some serious supply disruptions following the Arab Spring and imposition of sanctions on Iran. Saudi oil output closely mirrored the supply disruptions: First surge in Saudi output in 2011 following the Libyan disruption; Second surge in output following the sanctions on Iran. As disruptions eased towards the end of 2014, Saudi Arabia’s output fell but remained at above 9.5 mb/d.

Source: EIA, Energy Aspects
Al Naimi: ‘$100 is a fair price for everybody – consumers, producers, oil companies’, but also ‘high international oil prices are bad news. Bad for Europe, bad for the US, bad for emerging economies and bad for the world’s poorest nations and that Saudi Arabia will act to lower soaring oil price’.

At $100 price, both demand and supply responses were very strong and visible, especially the response from US shale which added more than 1 mb/d in 2013 and exceeded 1.8 mb/d in 2014 Q2.

Source: EIA, Energy Aspects
Phase 3: Maintain Market Share

- Saudi Arabia was reacting to an imbalance caused by economic forces unleashed by high oil prices (reactive rather than pro-active policy)

- In face of imbalance, two options: Cut output or leave it to the price mechanism to clear the market

- Factors shaping Saudi Arabia’s decision in favor of the second option:
  - Size of market imbalance in Q4 2014 was relatively large
  - Unwillingness to act unilaterally to balance the market; fundamental principle shaped by 1980s experience
  - Difficulty of reaching an agreement within OPEC and with non-OPEC producers as the pain of lower oil revenues was not widely felt (and hence willingness to act was also low) and many OPEC countries had ambitious plans to increase productive capacity
  - Saudi Arabia built strong fiscal buffers during the boom years and perhaps belief that Saudi Arabia can withstand a lower oil price for longer
  - US shale introduced a new set of structural uncertainties (unlike the 2008 temporary shock)
    - Uncertainty about price elasticity of shale oil and more generally about the nature of the shock

Source: Fattouh, Poudineh, and Sen (2016)
(1) Large Market Imbalance

Estimates of Implied Stock Change, mb/d

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Q1 14</th>
<th>Q2 14</th>
<th>Q3 14</th>
<th>Q4 14</th>
<th>Q1 15</th>
<th>Q2 15</th>
<th>Q3 15</th>
<th>Q4 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1 14</td>
<td>1.00</td>
<td>1.02</td>
<td>1.31</td>
<td>1.66</td>
<td>1.78</td>
<td>2.23</td>
<td>1.58</td>
<td>1.53</td>
</tr>
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</table>

OECD Stocks relative to 5yr avg., mb

- Crude
- Products

In 2014 and 2015, the market imbalance was very large which meant that Saudi Arabia would have had to make a big cut to balance the market.

The stock-build has not only been limited to crude but extended to products which are well above the five-year average.

Source: IEA, Energy Aspects
(2) Fundamental Principle: Saudi Arabia will Not Balance the Market Unilaterally

Saudi Arabia Oil Production, mb/d

Saudi Arabia production vs Quota (kb/d)

Saudi Arabia not willing to cut output unilaterally; shaped by the mid 1980s events when its attempt to protect the price resulted in loss of large volumes of production and market share and did not increase price (and hence lower revenues).

Source: BP, OPEC

In response to Venezuela’s increase in output in the mid 1990s, Saudi Arabia increased its output beyond its quota contributing to the oil price collapse in 1997 and 1998.
(3) Difficult to Bring Producers with Ambitious Plans to Increase Capacity under the Quota System

Despite a deteriorating political situation, Iraq managed to increase its output substantially benefiting from opening its oil sector to foreign players.

Source: Energy Aspects

So did Russian oil output, which continued to increase benefiting from a more favourable tax system and large investment programme in its oilfields.

Source: Energy Aspects
Saudi Arabia’s foreign assets have risen over the boom years helping the country to build fiscal buffers to shield itself against temporary shock.

Debt ratios fallen sharply as government paid off its domestic and foreign debt during the boom years.

Source: SAMA

<table>
<thead>
<tr>
<th>Short run elasticity</th>
<th>Definition</th>
<th>Implications for trade-off</th>
</tr>
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<tbody>
<tr>
<td>Relatively elastic</td>
<td>Proportionate change in shale oil supply is <em>higher</em> than proportionate change in oil prices.</td>
<td>An output cut by SA is not likely to influence the oil price as the Kingdom cut will be substituted by shale oil.</td>
</tr>
<tr>
<td>Relatively inelastic</td>
<td>Proportionate change in shale oil supply is <em>lower</em> than proportionate change in oil prices.</td>
<td>An output cut by SA is likely to influence the oil price as it will not be substituted.</td>
</tr>
<tr>
<td>Asymmetric elasticity (1)</td>
<td>Shale oil is relatively <em>elastic when oil price goes down</em> and relatively <em>inelastic when oil price increases.</em></td>
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</tr>
<tr>
<td>Asymmetric elasticity (2)</td>
<td>Shale oil is relatively <em>inelastic when oil price goes down</em> and relatively <em>elastic when oil price increases.</em></td>
<td>An output cut by SA is not likely to influence the oil price as the Kingdom’s cut will be substituted by shale oil.</td>
</tr>
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</table>

Source: Fattouh, Poudineh, and Sen (2016)
At time of decision there is no information available to the players regarding the elasticity of shale oil supply; whether Saudi Arabia is in Game 1 (Elastic US Shale) or in Game 2 (Inelastic US Shale) will only be revealed after the players have implemented their strategy. Under uncertainty about US shale response, Saudi Arabia is better-off to assume that shale supply curve is elastic and not to cut production.

Source: Fattouh, Poudineh, and Sen (2016)
In 2015, Saudi Arabia was one of the main contributors to output growth adding more than 400,000 b/d; in 2016, Saudi output reached a historical record of close to 10.8 mb/d.

Saudi exports remain elevated and it seems there is implicit policy of maintaining crude exports above the 7 mb/d mark to maintain revenues.

Source: JODI, MEES, Energy Aspects
Saudi Arabia also competing in products markets.

Exports of products (particularly diesel) have been on the rise and Saudi Arabia is also competing in the products market.

Source: JODI
Costs and Uncertainties in Market Share Strategy

• The increase in output does not compensate for the decline in the oil price and hence oil revenues fall (In 2015, Saudi Arabia’s revenues fell by almost 50% from the previous year)
• Long-term market share strategy could result in higher revenues if existing sources of supply exit the market or potential suppliers are deterred from entering
• For an oil dependent economy to maintain such a strategy it must have financial resilience
  – Rely on its fiscal buffers (erode quickly)
  – Adjust its economy to the low oil price environment (painful)
  – Reduce reliance on oil revenues by diversifying the economy (long-term)
• Added complexity because of official policy to maintain spare capacity
  – Higher output means lower spare capacity and hence need to continue to invest if spare capacity to be maintained
• Timing of market share benefits will also depend on adjustment of other producers
  – High cost producers can reduce their cost structure through efficiency, high-grading, and cost deflation in the supply chain
  – Long leads of capital intensive projects mean that the response is not immediate even for high cost producers
  – Low-cost oil producers response to price signals may take a long time
Non-OPEC Supply, Particularly US Shale Has Fallen Sharply

Non-OPEC Supply Ex US Supply, y/y change, thousand b/d

US Supply, y/y change, thousand b/d

After robust growth in the environment of high oil prices, the y/y change in non-OPEC supply has turned negative in almost every part of the world but with some surprises on the upside.

Source: EIA, Energy Aspects

Despite efficiency gains, US shale has been leading the way and has been the fastest to respond to the decline in the oil price with y/y growth turning negative in 2016.
So Did Output in Some Key OPEC Countries

Attacks on oil infrastructure in the Niger Delta intensifies as government’s ability to pay-off militants weakened.

Poor planning, lack of investment, fall in number of rigs, equipment theft, and payment delays to service companies impacting Venezuela’s output.

Source: Energy Aspects
But Supply Continued to Increase in Key Producing Countries Particularly within OPEC

Y/Y Change in Oil Production in Selected OPEC Countries, thousand, b/d

Y/Y Change in Oil Production in Brazil and Russia, thousand, b/d

In low cost producers with large reserve base, output continued to grow, especially for low-cost Middle East suppliers.

In countries like Russia, devaluation of Ruble, change in taxation, projects coming online commissioned in high oil price era meant that output continued to grow even in a low price environment.

Source: Energy Aspects
Many Projects Sanctioned in Period of High Oil Price Started Come online

Non-OPEC Upstream Oil Projects Pipeline, kb/d

More than 2 mb/d of new projects coming online in 2016 sanctioned during the period of $100 + environment. The pipeline of new projects will slow down as investment is cut.

Source: Energy Aspects
Phase 4: Purse an Agreement to Cut Output

Deadlock in Doha over freeze on oil output

Opec should ‘steward the market’ – Saudi Arabia

Saudi energy minister hints at effort to rebalance oil market

INTERVIEW-Saudi energy minister tempers expectations for production freeze

Saudi Arabia doesn't target specific level of oil output: Falih

Saudi minister says OPEC moving to common position on oil output changes

Saudi Arabia showed willingness to freeze output & cooperate with other producers following sharp fall in oil price in beginning of 2016, but signal was not always clear and position shifted from freeze to cut over the year.

It took a long time to reach an agreement; in the meanwhile Saudi Arabia increased its output in 2016 reaching a record level in August; Can’t be explained only by rise in domestic demand during summer.
Explaining the OPEC Output Cut Decision

• Cut output but not at any cost; Key conditions
  – Output cut must be collective (OPEC and non-OPEC)
  – Burden of cut should be shared equitably
  – Agreement should be transparent so it can be monitored
  – Agreement should be credible (i.e. influence the oil price and boost revenues)

• Potential explanations of this shift in strategy
  (1) Producers showing more willingness to cooperate as oil revenues collapsed
  (2) Market resolved a key uncertainty regarding US shale response
  (3) The market already rebalancing so the benefit of cut is positive and cost of obtaining information about shale response on the upside is low
      • Current market conditions do not reveal useful information; OPEC needs to test US shale response on the upside
      • Obtaining information from the market in 2014 was very costly because market was slack as opposed to the current ‘relatively’ tighter market
  (4) The cost of pursuing the market share strategy has exceeded the benefits
      • Mabro (1998): ‘Prices have to fall a long way and price expectations have to remain depressed for a long time for a significant improvement of the market share of those who launch an oil price war. No oil-exporting country has the financial resources which enable it to sustain such a policy.’

Source: Fattouh and Sen (2016)
Explaining the OPEC Output Cut Decision (2)

• Explanation (1) is a possibility but can be thought more of an enabling factor to reach a deal

• Explanation (2) is less convincing as there is no evidence that uncertainty regarding US shale in the market has been resolved especially regarding US shale supply response in a rising price environment

• Explanation (3) is a possibility but it is unlikely to be the main reason for output cut by OPEC
  – Obtaining information can be a side benefit of output cut but not the main cause of it
  – But it is also true that the benefits from an output cut are higher in a tighter market

• Explanation (4) is the most plausible one
  – Exporting countries including Saudi Arabia have been hit hard by low oil prices

The rig count in the US has reversed sharply in the last few months as prices increased.

Source: Energy Aspects

Would some of the plays such as Eagle Ford reverse the output losses at the current price range of $50-$55 and increase output sharply, especially as some cost inflation starts appearing in the supply chain?

Source: Energy Aspects
The market imbalance in 2016 has become smaller and hence the cut needed to balance the market is also smaller.

OPEC: ‘the market rebalancing is underway, but the Conference stressed that OECD and non-OECD inventories still stand well above the five-year average. The Conference said it was vital that stock levels were drawn down to normal levels’.

Size of Imbalance is Smaller but Level of Stocks Still High

Estimates of Implied Stock Change, mb/d

OECD Stocks relative to 5-year average, mb

OPEC: ‘the market rebalancing is underway, but the Conference stressed that OECD and non-OECD inventories still stand well above the five-year average. The Conference said it was vital that stock levels were drawn down to normal levels’.
The growth in the private and non-oil sector has stalled putting at risk Vision 2030 which relies heavily on a vibrant private sector.

Source: SAMA

The fiscal buffers have eroded at a faster rate than originally expected.
Despite Adjustment Measures, the Fiscal Challenge Persists

• Adjustment to a low price environment
  – Drawn down on foreign reserves
  – Increase domestic lending
  – Tap international debt markets
  – Increase domestic energy prices
  – Reduce capital spending
  – Reduce current spending
  – Boost non-oil revenues
  – Devaluation (Not on the table so far)

• Measures have not been enough to address fiscal challenge
  – Massive increase in expenditure during boom years + some unexpected expenditure (Yemen war)

• Mid to long-term structural reforms
  – Vision 2030, National transformation programme, diversification

• But dilemma: Diversify from the sector which remains the engine of growth of the economy and the main source of revenues needed to shift the economy into more sustainable path and mitigate the impact of reform on Saudi nationals
The Game in a Dynamic Setting

- In a dynamic setting, the game we introduced in Fattouh et al. (2016) can lead to shift from market share to revenue maximisation strategy.

- To see this lest assume that $w(t)$ is the net payoff of market share in period $t$, $b(t)$ is gross benefit and $c(t)$ is the cost of market share in the same period

  $$w(t)=b(t)−c(t)$$

- The output cut will bring revenue of $s(t)$ to the countries with probability $p(t)$. 
Maintaining Market Share has become Costly

- If we assume that the producers are risk neutral we can write:

  (i) If \( w(t) = b(t) - c(t) > p(t)s(t) \) market strategy net benefit outweighs the expected benefit from output cut

  (ii) If \( w(t) = b(t) - c(t) = p(t)s(t) \) the country is indifferent between a market strategy and output cut

  (iii) If \( w(t) = b(t) - c(t) < p(t)s(t) \) the expected benefit of output cut is higher than maintaining market share

- Given that uncertainty has not been resolved yet (i.e., \( p \) is still the same as at the beginning of price fall) and the benefits of maintaining market share \( b \) has not increased and the gain from output cut \( s \) has not changed, the only way that \( b(t) - c(t) < p(t)s(t) \) is the cost to increase considerably.
Potential Explanations Based on Cost

- The cost has become so high in the period when the decision to cut was made such that the net gain from market share strategy has become very small.

- In repeated games, costs can accumulate over time exceeding the payoffs
  - Cumulative cost since November 2014 has grown faster than cumulative benefits wiping out the net gain from market share strategy.

- When the game was first played, Saudi Arabia may have overestimated its tolerance to the costs associated with adopting a market share strategy.

- When the game was first played, Saudi Arabia may have underestimated the cost of adopting a market share strategy as not all information was available at the time of the decision.
Possibilities about other Parameters

• The gain from the output cut may have increased at the time of decision as the market has become tighter
  – The cut in a tight market will have bigger impact on price and hence revenues
  – The timing of the cut matters

• The benefit of maintaining market share may have declined over time
  – After sharp declines in non-OPEC output, the pace of declines would have slowed down as players adjust to lower price environment and hence the marginal benefits from maintaining market share are small

• Although uncertainty regarding US shale response on the upside has not been resolved yet, Saudi Arabia may have updated its belief about the range of probabilities that shale oil may respond to their output cut
  – In the new range or probability, the output cut may have higher expected gain
Without the OPEC Cut Agreement, the Oil Price would have been Lower

Without OPEC signaling a change in behavior, the oil price would have been much lower. But this means that the upside potential from here is very limited as the information about the agreement has been incorporated in the price to a large extent.

Source: Economou et al (Forthcoming)
Most Visible Impact Likely to be Seen in Differentials in 2017

As stocks decline, the shape of the curve will flip into backwardation. Will US shale producers have the incentive to hedge in a backwardated market?

The light-heavy is another differential to monitor closely as cuts will be more concentrated on the heavy side.

Source: Energy Aspects
What Could Come Next? Potential Scenarios

- If there is no adherence to the agreement by other countries, then most likely outcome is a shift in Saudi policy towards increasing output.

- If US shale response is big and fast and substitutes for OPEC output cut, Saudi Arabia most likely to shift back to increasing production
  - Current decision to cut output would result in loss of market share without any durable impact on prices and hence lower revenues
  - But looks unlikely for US shale output to increase sharply if prices remain at these levels

- If US shale response is moderate and does not substitute for output cut, then most likely outcome is extension of the agreement
  - Put a floor on the oil price
  - Accelerate withdrawal of stocks which is the key objective of the current OPEC agreement
  - Shift the curve into backwardation

- If the market tightens for instance due to a supply disruption, would Saudi Arabia attempt to put a cap on the oil price by increasing output or let stocks draw faster?

- **OPEC decision to cut output in 2016 resolves key market uncertainties about the shock hitting the market and Saudi Arabia’s behaviour in a more uncertain world**
Conclusions

• Saudi oil policy is constantly changing and has passed through various phases in the last few years

• Saudi oil policy shaped by multiple factors
  – Domestic factors: Durability of fiscal buffers, financial resilience, fiscal sustainability, impact of lower revenues on the domestic economy
  – OPEC dynamics: Ability to reach a credible agreement with other producers and implement it
  – Market conditions: Nature of the shock
    • 2008: Temporary demand shock
    • 2011-2012: Exogenous (temporary) supply shock
    • 2014-onwards: US shale introduced new set of uncertainties

• As these factors change and/or as new information becomes available, Saudi oil policy will also change

• OPEC cut important for resolving some key market uncertainties

• As in 2016, OPEC behavior will be the key factor shaping market dynamics in 2017
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