Stumbling to a New Equ'oil'ibrium: Understanding the Current Upheaval in the Global Crude Oil Market

By Daniel Huppmann and David Livingston*

The precipitous decline in crude oil prices over the past year has sparked a renewed discussion around the drivers of the oil market and the role of OPEC (Huppmann and Holz, 2015; The Economist, 2014). The decision by OPEC ministers in November 2014 not to reduce their quota (OPEC, 2014) can be interpreted in multiple ways: was OPEC deliberately driving out U.S. shale oil producers by depressing the price? Or were OPEC members instead overtaken by market forces beyond their control?

The Economics of Oil – A Crudely Dismal Science?

The tools with which analysts have availed themselves in considering such questions are many, but all are incomplete. Only a select few in Riyadh, and perhaps Vienna, can answer with some degree of certainty which reasoning the oil ministers were following. The rest are left to, at worse, simply fit events to the contours of their respective world views, tilting at speculative windmills. At best, oil market watchers can seek to distinguish between different market structures and identify strategic behaviour using econometrics and empirical methods.

Smith (2005) illustrates that most observable patterns of suppliers reacting to shocks are in fact consistent with multiple alternative theories of market structure: cartel, oligopoly, and perfect competition; this makes econometric tests ambiguous at best. Numerical simulations based on bottom-up assessments (e.g., Huppmann and Holz, 2012) also only offer indications of the underlying fundamentals and the market structure. Furthermore, identifying whether changes in supply are driven by available capacity, fluctuations in demand, changes in expectations, or strategic considerations by individual players is virtually impossible due to the lack of readily available and reliable data. "Cheating" by individual OPEC members (i.e., oversupplying their quota) further adds to the opaqueness of the market, just as OPEC's reliance on using stated reserves as the basis of quota calculations created an incentive for each member to overstate its reserves, obscuring an accurate picture of the cartel's true economically recoverable volumes.

As a consequence, academics and policy analysts trying to make sense of current events in the crude oil markets are left with anecdotal evidence, stylized theoretical considerations, and a great deal of guesswork and speculation. Conventional wisdom holds that OPEC exerts market power via two channels: a long-term under-investment in production capacity, which creates a permanent scarcity; and, at the same time, a short-term withholding of available production capacity, whereby OPEC members and Saudi Arabia in particular use their swing producer role to dominate the market. The spare capacity held by Saudi Arabia also serves as an important deterrent to substantial investment by fringe suppliers, as a decision by the Kingdom to open its taps could quickly undermine the profitability of any new or planned project on the upper end of the cost curve.

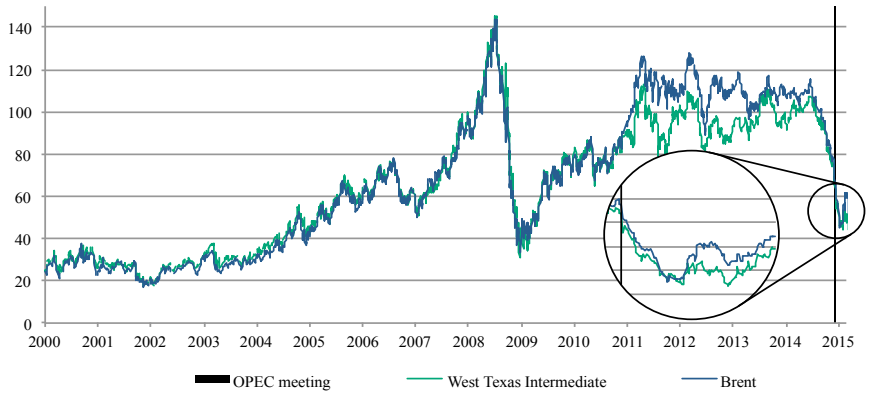

Figure 1: Daily crude oil price until May 4, 2015, West Texas Intermediate (WTI) and Brent, in nominal USD/bbl; the OPEC meeting on Nov 27, 2014, is marked for illustration.

Source: EIA, http://www.eia.gov/dnav/pet/pet_pri_spt_s1_d.htm, accessed May 11, 2015.

Is Saudi Arabia Losing its Swing?

We believe that this duality of short- and long-term market power exertion is not quite valid any more: By 2018, Saudi Arabia's refining capacity will have increased by almost 60 percent, to 5.7 million barrels per day (mmb/d) from 3.3 mmb/d in 2013 (Saudi Aramco, 2013). This build-up of domestic refining capacity addresses a number of sectoral and societal challenges: a desire to mus-

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cle its way up the global petroleum value chain in order to appropriate a larger share of the rents; increased competition from Canada and others to supply the strategic U.S. Gulf Coast refining market with heavy and medium sour crude; and a broad desire to catalyse further domestic industrial development and job creation (Livingston, 2015).

The push also portends a shifting role for Saudi Arabia in global oil markets, as the Kingdom relinquishes its status as the world's swing producer. The country's crude oil consumption has been rising by six percent per annum, driven by growing petrol and diesel demand as well as increased electricity generation from crude oil. Comparatively rare elsewhere in the world, crude-burning power plants continue to be built in Saudi Arabia. More than 60 percent of Saudi Arabia's power generation in 2013 came from crude oil or crude-derived products (diesel or heavy fuel oil). Total domestic crude burnt for power generation accounts for 0.8 mmb/d at present, and is on track to reach 1 mmb/d within five years (Krane, 2015). In addition, approximately 1.4 mmb/d of crude production that was available for export prior to 2013 will be needed to feed new domestic refineries that have come online or will be completed in the next several years.

Taken together, these factors point to Saudi Arabia's crude oil export capacity possibly declining to less than 5 mmb/d by 2020, despite the country recently registering record production capacity of 10.3 mmb/d (OPEC, 2015). This would also portend the elimination of the country's spare capacity, a key feature of the market that has been called upon in recent years to help balance supply and demand when prices suddenly spiked.

Even if Saudi Arabia wishes to maintain flexibility in its export volumes in pursuit of continued influence within OPEC and the broader market, this will be complicated by the growing role of foreign players in its refining sector. Saudi Aramco's 2014 refining capacity plans are shared among three refineries. These include the 0.4 mmb/d "Satorp" joint venture with Total in Jubail and the 0.4 mmb/d "Yasref" joint venture with Sinopec at Yanbu, coming fully online through 2015, as well as a 0.4 mmb/d wholly-owned refinery at Jazan scheduled for completion in 2018. These are in addition to joint ventures with Sumitomo Chemical, ExxonMobil, and Shell at existing refineries (EIA, 2014). To the degree that joint venture partners seek to maximize profits and throughput at these refineries, it will impinge upon Riyadh's scope to ramp up and down production swiftly, as the swing producer has been expected to do in the past (or at least prior to the November 2014 OPEC meeting).

A Gulf Apart

Concurrently, the shifting fortunes of other key producers previously relegated to the sidelines threatens to dramatically re-shape intra-OPEC dynamics. The IEA estimates Iran's total production capacity at 3.6 mmb/d and, largely as the result of Western sanctions tied to the dispute over the country's nuclear program, spare capacity is estimated at around 0.76 mmb/d (IEA, 2015). While new production capacity could take some time to materialize and the long-term damage done by previous shut-ins is not completely known, the vast majority of this spare capacity (0.65 – 0.7 mmb/d) could be ready to enter the market within six months of any nuclear deal and subsequent lifting of sanctions.

Moreover, the country is believed to hold approximately 30 million barrels of oil in floating storage, enough to sustain an additional export level of approximately 0.18 mmb/d over a six-month period. It is not inconceivable that Iran, along with Iraq – the second largest producer within OPEC despite ISIS-instigated violence and an ongoing dispute with the Kurdish government – could together exceed Saudi Arabia's production capacity by 2020. As OPEC grows increasingly multipolar, with various players pursuing different price targets and strategies based upon their particular fiscal situation, the trajectory of the cartel towards the end of this decade becomes more uncertain.

How to Interpret the Price Precipice?

To return to the question posed at the outset, what was the driving force behind OPEC's failure to cut supply in November 2014? Was it a demonstration of strength meant to humble U.S. unconventional production, or a tacit recognition that shale is the new swing supplier in the market?

There is a third interpretation between these two extremes, and one which likely maps more closely to the pragmatic nature of Saudi-led OPEC: the primary strategy is one of triggering industry consolidation, as well as eliciting valuable information, from the drop in oil prices. There has been substantial speculation regarding the price level required for U.S. shale producers to operate at a profit and continue investing at a rate sufficient to stay on the "treadmill" of production growth amidst exponential decline curves in shale wells. Anecdotal evidence initially suggested prices around 80 USD per barrel were necessary for shale oil producers, but more recent information suggests that the break-even price has already

decreased considerably due to further technological progress, reduction in input costs, and movement of rigs away from marginal zones to focus on more productive zones, both within and among individual shale plays (Wood Mackenzie, 2015).

Nevertheless, rig counts have begun to fall in the U.S. shale patch, and the financial sustainability of small shale players, pressured by credit rating downgrades and shrinking oil-price linked revolving credit facilities, will likely be under continued scrutiny over the course of 2015 (Livingston, 2014a). From the middle of 2015 onwards, the global market will have a clearer indication of OPEC's commitment to the current strategy following the June 2015 meeting, along with a sense of the true impact upon shale production as previous hedges booked by shale companies when prices where higher begin to expire.

Should OPEC hold firm, all of the anticipated results – from consolidation in the shale industry, to further information on the response of non-OPEC producers to various price levels, to the liquidity and price stability in the oil market introduced by growing global crude oil stores – in one way or another benefit Saudi Arabia. The country is sacrificing higher profits by allowing prices to dip, but it is also reasserting – in an increasingly visible way – its dominance in the market even as its spare capacity slips away.

There is another possible contributor to the price decline that has not received enough attention in public discussion: the potential presence of multiple market equilibria. These are mostly ignored in standard economics, but can occur if the aggregate demand function is convex (Wirl, 2008), or if the supply functions of individual suppliers are not monotonically increasing. The latter effect can be rationalized in the form of "backward-bending supply curves" due to target revenue behaviour by individual suppliers (Alhajji and Huettner, 2000). According to this model of supplier behaviour, a small country can only reasonably re-invest a certain level of oil revenue. As a consequence, these suppliers do not seek to maximize profits – instead, they cut back production when prices are high and expand production when prices are low. This is not in line with textbook economics, but may make sense for small countries fearing Dutch-disease style repercussions or large swings of their budgets.

Given that crude oil demand is very inelastic in the short run, even a few countries slightly expanding their production in response to the shale oil glut last summer may have exacerbated the price-depressing effects; after a while, other suppliers such as Russia and Venezuela, highly dependent on oil revenues to finance their state budgets, followed suit, even when they are aware that this would put further downward pressure on prices.

Following this logic, the recent price decline can be interpreted as a switch from a high-price equilibrium to a low-price equilibrium. Absent an effective mechanism to coordinate and enforce production cuts or an unanticipated shock to rattle markets, this new equilibrium may prove surprisingly durable. For example, even if many shale oil suppliers cease operations in this low-price environment, the technology, the expertise and the infrastructure is in place to quickly ramp up production should prices creep upwards again. Added to this are growing volumes of crude oil storage, in addition to shale oil wells that are being drilled but not completed, that together act as a sort of growing, implicit "spare capacity" on the part of the United States. These factors will likely combine to mitigate price spikes, if not general volatility, over the near to medium future.

The Prospects for Oil in a Climate-conscious World

There is no scarcity of crude oil over the coming years – indeed, quite the opposite. For a 2°C warming target to be realistic, about a third of crude oil reserves will have to remain in the ground (McGlade and Ekins, 2015). Rather than the "peak oil" phenomenon that drove both public perception and public policy over the past several decades, the challenge going forward will be one of deliberating over how to reconcile reserves with global climate targets. A paradigm shift regarding the role of oil in the global economy has been the subject of growing discussion following the notion of a "carbon budget" introduced by climate scientists and energy analysts in the academic community (e.g., McKinnon, 2015).

Importantly, the growth in unconventional crude oil including tar sands and pre-salt reservoirs has meant that the lifecycle climate impacts of oil products are becoming more varied, depending on physical characteristics, processes employed, and the slate of products ultimately produced (Gordon et al., 2015). This is in sharp contrast to the very stylized representation of the emissions from fossil fuel combustion currently used in large-scale Integrated Assessment Models (IAM), and highlights the need to integrate these insights into global economy-energy-environment-climate models.

While there are clearly choices to be made between different global oils on the basis of climate considerations, policymakers and the market have thus far treated petroleum as a single homogenous commodity. This, however, is quickly beginning to change. The government Sweden recently submitted

formal inquiries to Canada within the UN climate negotiation process, asking for further details on its plans for managing the GHG emissions associated with the Alberta oil sands, and how the latter's growth would be reconciled with Canada's economy-wide climate targets (Government of Sweden, 2015). Elsewhere, California and the European Union have begun to implement emission intensity standards that, though recently watered down, provide a foundation for creating a market differentiation between crude oil products (and other fuels) of varying lifecycle GHG emissions (Livingston, 2014b).

Finally, powerful institutional investors and shareholder groups are beginning to put new pressure on publicly-traded oil companies to disclose more information on the GHG intensity of their fossil fuel portfolios and their general approaches to climate risk. Both BP and Shell have recently been subject to successful shareholder resolutions along these lines, and have – significantly – officially endorsed the resolutions in a move that heralds a new era of engagement on these issues.

Saudi Arabia, along with many of the Gulf OPEC members, likely possesses some of the least GHG-intensive oils worldwide given the ease with which they are extracted. This would bode well for these producers in a future where climate regulations distinguish between various crudes, creating premiums for high performers and penalties for laggards. It implies fascinating possible future directions for Saudi strategy, along with that of many other producers at various positions along the GHG spectrum. However, this scenario remains far too uncertain and speculative to be anything but a distant consideration, if that, in corporate boardrooms and government ministries.

For now, whether by force or by choice, the cartel is moving to capture market share on the back of falling prices, without the help of any regulation, divestment, or other climate consideration. The latter will only add, over time, to the complexity of an already-confounding market. So too, will the possible new swing producer role of U.S. tight oil supplies, not to mention the prospect of an OPEC with growing market share but deteriorating internal cohesion. It is tempting to seek iron-clad certitude in the oil market's structure and direction, but never has this been more dangerous. The market is like the sand in the Saudi desert: the less tightly we seek to grip it, the more parts of it we can hold at once.

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