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Rethinking the oil market in the aftermath of the 2014-16 price slump

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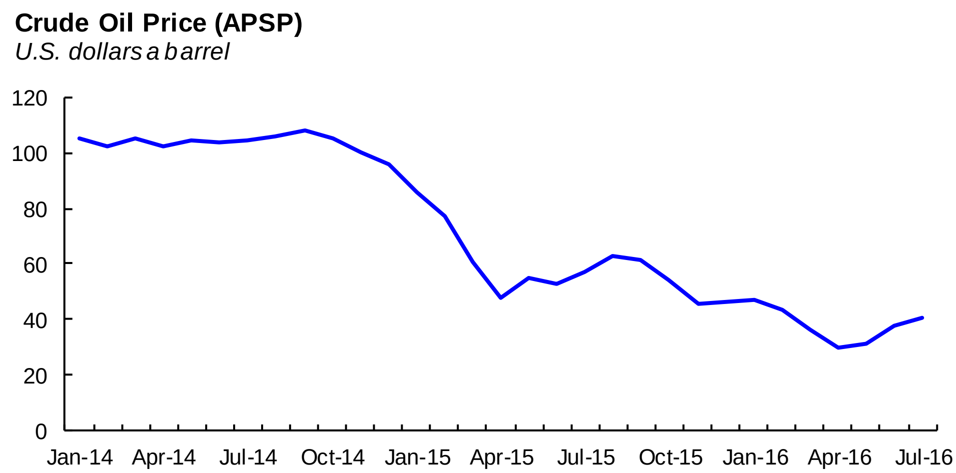
Oil prices have decreased by about 65 percent compared to their recent peak in June 2014 (see Chart). These dramatic (and largely unexpected) developments have sparked intense debates over the causes and consequences of the collapse in prices. Arguably, the oil market has changed structurally and the dynamic adjustment to lower oil prices is now quite different from the past.

Specifically, the advent of hydraulic fracturing combined with horizontal drilling has led to the advent of so-called "shale oil" that changed the dynamic of the oil market. Indeed, shale oil will lead to shorter and more limited oil-price cycles. The rapid increase in the production of shale oil—to the tune of 5 million barrels a day (mbd) in a market of 94 mbd—has also arguably contributed to the oil supply glut that led to the collapse in oil prices that started in June 2014 (Arezki and Blanchard, 2014).

Although the price collapse led to a massive cut in oil investment, production was slow to respond, keeping supply in excess. The resilience of shale production to lower prices surprised market participants, leading to even lower prices in 2015. Shale drillers significantly cut costs by improving efficiency, allowing major players to avoid bankruptcy. Shale oil production and the uncertainty surrounding its potential and resilience will define the dynamics of the oil market for years to come.

In the long run, a broader energy perspective is needed to comprehend the future of oil. The manner in which falling oil prices affect the global economy has also changed importantly. This paper provides brief answers to seven questions about the oil market in the global economy.



Source: IMF, Primary Commodity Price System.
Note: APSP = average petroleum spot price—average of U.K. Brent, Dubai, and West Texas Intermediate, equally weighted.

Question 1. Is the Slump Attributable to a "Supply Glut" or to "Peak Demand"?

The evidence suggests that supply factors have been more potent than demand ones in explaining the initial collapse in oil prices in 2014. A host of factors are involved including the rapid increase in shale production in the United States, the change in strategy on the part of Saudi Arabia, the largest member of Organization of Petroleum Exporting Countries (OPEC), and the higher than expected output in some locals in spite of ongoing conflicts (e.g. Libya and Iraq), the return of Iranian oil to international markets, the US removal of the oil export ban… (Arezki and Blanchard, 2014). These factors have persisted. The dynamic adjustment of investment in the oil sector to lower prices is and will continue to shape the speed and extent of any market recovery (IMF, 2015).

Demand factors have also played an important role (Baumeister and Hamilton, 2015). Oil demand has however grown unabated since 2011, the starting date of the emerging market growth slowdown. Of course, changes in expectations about future oil demand may also explain the delayed market response. Specifically, the realization that the emerging market slowdown is structural as opposed to cyclical has been gradual. Several episodes of market scare when oil prices further collapsed before rebounding—end of August 2015 and January to February, 2016— suggest that financial factors are also relevant (see Arezki and Matsumoto, 2015a).

Question 2. Does OPEC (still) matter?

In theory, the effectiveness of a cartel and its compact depend on the strength of demand and supply outside the cartel. The 2000 era has been characterized by strong demand and a relatively strong OPEC that in turn enticed investment and production in high cost locals (e.g. oil sand in Canada and ultra-deep water oil in Brazil). Considering the delay between investment and production for (conventional) oil, production in non-OPEC locals peaked about the same time when emerging markets started to slowdown and when expectations about future demand started to falter.

These circumstances sparked a change in strategy on the part of OPEC dominant producer and also lowest cost producer. In the past, Saudi Arabia would stabilize prices by cutting production whenever prices fell by too much or raised production when prices rose too high relative to a stated price target. In 1986, Saudi Arabia attempted to cut production by an unprecedented margin when non-OPEC production also rose rapidly. That cut in production intended to help support oil prices was unsuccessful. Perhaps learning from that 1986 episode, Saudi Arabia did not attempt this time around to cut production. It instead announced it would go ahead and step up production effectively crowding out high cost producers.

While observers had expected the initial change in strategy to last in order for it to be successful, on November 30 OPEC agreed to reduce crude oil output to 32.5 million barrels per day (mbd), effective January 2017 and for a duration of six months (extendable for another six months). That deal implies a cut in production by 1.2 mbd from its current production level. While Saudi Arabia, Iraq, United Arab Emirates and Kuwait will bear the brunt of the cuts, other member countries such as Iran, Nigeria, and Libya have been exempted. Indonesia's membership that accounted for 0.75 mbd of production has been suspended. At OPEC and non-OPEC meeting on December 10 in Vienna, additional cuts amounting to about 0.60 mbd have been agreed upon. Russia, a non-OPEC member, has committed to reducing production by 0.3 mbd, other ten non-OPEC will contribute the remainder.[1] Following the agreement, Saudi Arabia has indicated it could cut production beyond its initial commitment in a bid to further support the rally in oil prices.

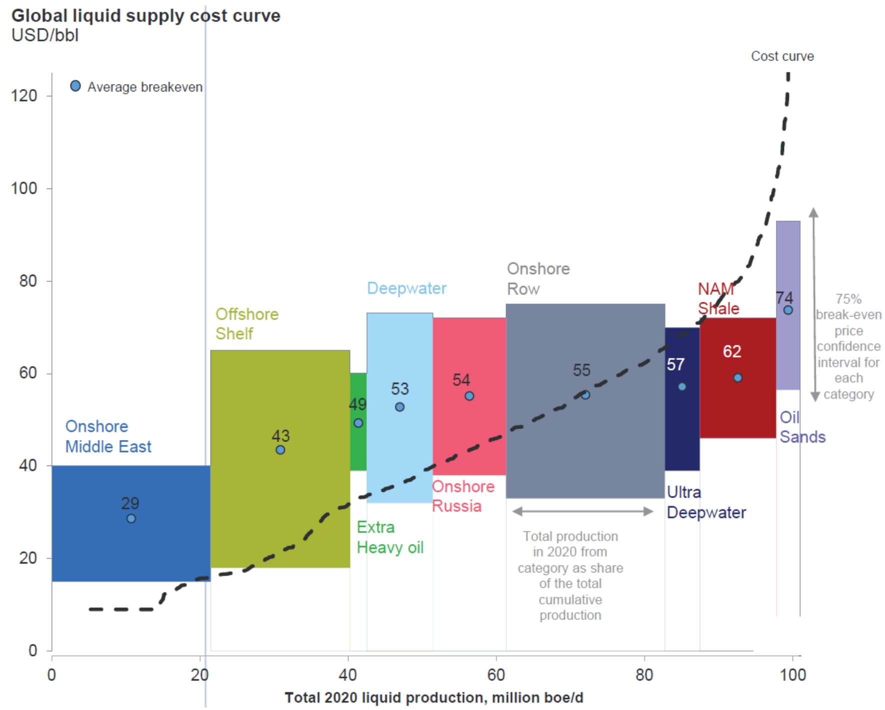
Oil prices have rallied since the starts of talks about an OPEC cut. Combined the recent OPEC deal and massive investment decrease since the start of the collapse in oil prices will lead to

[1] The list of non-OPEC countries involved in the OPEC non-OPEC agreement consists in Azerbaijan, Bahrain, Brunei, Equatorial Guinea, Kazakhstan, Malaysia, Mexico, Oman, Russia, Sudan and South Sudan.

reduce excess supply next year although U.S. investment in oil extraction has rebounded already. High inventory levels and a rapid response from U.S. shale producers should limit the scope for a sharp rise in prices in the near future. In addition, the credibility of the OPEC deal may be put into question considering the history of non-compliance with OPEC quotas.

Question 3. Is the shift in cost structure permanent or temporary?

The short answer is the shift is temporary. An important fact about the slump in prices is the significant downward shift in the cost structure associated with oil production. A commonly held belief is that the cost structure that is often proxied by breakeven prices—the price at which it is economical to produce a barrel of oil—is constant and driven by immutable factors such as the nature of the oil extracted and associated geology (see Chart). In practice, the cost structure depends on a host of factors including technological improvements and the extent of learning by doing. In instances such as the recent dramatic drop in prices, break-even prices have moved downward in sync with oil prices. That shift is explained by the operational efficiency gains stemming from the service industry's significant reduction in margins to support the upstream sector. In the specific case of shale oil, its extraordinary resilience to the drop in prices can be explained by important efficiency gains compounded by the fact that shale was at the onset of the investment cycle where learning by doing is important. Going forward, it is likely that shale cost structure will shift back up somewhat as some of the efficiency gains cannot be sustained and cost of capital is high.



Source: Rystad Energy research and analysis.

Question 4. Do futures market (truly) reflect market sentiments?

Futures have not helped predict market "breakdown". The change in market expectations about the trajectory of oil prices, as captured by longer term futures (only), got reflected after the OPEC meeting in late November 2014. The evidence suggests that futures markets appear to "learn" only gradually (Leduc et al. 2013). While oil futures curves gradually ratcheted up throughout the 2000 era until reaching a peak, they have abruptly ratcheted down at the end of 2014.

The limitations associated with futures are at least two-fold. First, while they are large in absolute size they are in fact relatively thin after 12-18 months when considering the volume traded relative to the volume actually consumed. Futures are thus not necessarily reflective of volume traded over the counter. Second, as in other commodities it is subject to the imbalance between longs and shorts. In other words, there is a higher demand for short term hedging say by oil producers than long term hedging by say manufacturers. The former are typically willing to accept relatively lower prices to hedge price risks since they can't easily pass on the price change to consumer contrary to oil and gas intensive manufacturers attempting to protect their cost structure even if oil is relatively small relative to their overall cost base.

Question 5. Why didn't low oil prices (yet) deliver a boost to the global economy?

While a drop in oil prices amounts to a transfer from exporters to importers, the expected net plus stems from the higher propensity to save of the former. Also, it is important to distinguish between supply driven oil price shocks relative to demand driven ones as the former should lead to a net plus to the global economy while the latter is symptomatic of a slowing global economy (Hussain et al. 2015).

There are several reasons behind the limited effects associated with lower oil prices on the global economy (see Obstfeld, Milesi-Ferretti, and Arezki 2016). Higher than expected fall in capital expenditure in the oil sector especially in North America has been a drag on the economy. Oil exporters have experienced higher than expected reduction in (government) expenditures. This has led to a reduction in energy subsidies, social services, infrastructure investment, and in turn imports from advanced and emerging markets. Pressures to draw down on sovereign wealth funds' assets has also risen with potential consequences on financial markets against the background of concern about market liquidity (Arezki, Mazarei and Prasad, 2015). In advanced economies, a large share of the reduction in the net oil import bill seems to have been saved by consumers. In emerging markets, limited pass-through from international to domestic prices led to the windfall not being spent albeit it led to improvement in the balance sheet of governments. The dollar appreciation has somewhat limited the reduction in domestic currency oil prices. Importantly, interest rate policies are constrained by the zero lower bound environment.

Question 6. What to make of a (two-way) relationship between the energy transition and oil prices?

The energy transition consists in the shift toward lower carbon or carbon free energies such as renewables. The expected lower for longer oil price environment will likely delay the transition (Arezki and Obstfeld, 2015). In addition to the latter, the transition faces a host of challenges that will likely take decades to overcome (Arezki and Matsumoto, 2015b). The future of oil will depend on the complex interplay between demography, technology and public policy affecting both the supply and demand for oil. In thinking about the future of the oil market one should think more broadly about energy.

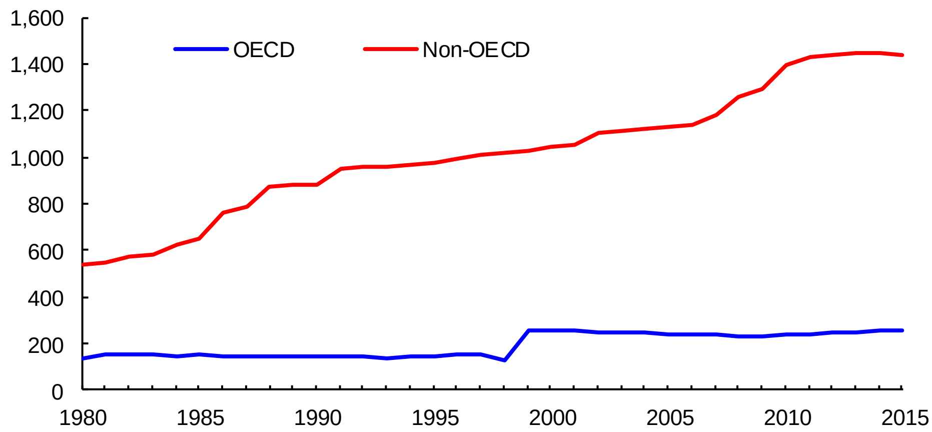
On the supply side, oil will increasingly face competition from other sources of energy such as natural gas and renewables. Oil is for the most part used for transportation in the form of oil product such as gasoline, diesel, and jet fuel. As energy using technology continues to evolve in the transportation sector in the form of the hybrid and electric car, the compartmentalization between transport and electricity sector is bound to disappear. That trend will likely further displace oil to the benefit of natural gas first and then renewables (IMF, 2016).

On the demand side, there are countervailing forces. On the one hand, the fast urbanization and growing middle class in emerging markets especially in Asia will tend to push up demand for transportation and hence demand for oil . On the other hand, the expected slower growth in emerging markets and public policies geared toward reducing emissions will improve oil efficiency and reduce oil demand.

Question 7. Is it the End of Peak-Oil?

The peak oil hypothesis posited that oil supply will reach a peak in the mid-2000s. That was precisely the same time when the so-called shale revolution started to take off. In many respects, the shale revolution can be viewed as an endogenous supply response to a period of high prices in the 2000s hence challenging the overly pessimistic that geological factors were to limit supply (Arezki, Laxton, Nurbekyan, and Wang, 2015). Also, on the energy-producing technology front the expected 'lower-for-longer' oil price environment could delay the transition (Arezki and Obstfeld 2015). Indeed, Aghion et al. (2016) provide evidence that firms in the auto industry tend to innovate more in "clean" (and "less" in dirty) technologies when they face higher fuel prices.

Oil Proved Reserves
Thousand million barrels



Source: BP Statistical Review of World Energy June 2016.

Beyond the response of technology to oil prices, the resource base (what is known about geology as opposed to true geology) depends on exploration efforts. Existing evidence suggests that discoveries of oil (as well as other commodities) have occurred mostly in developing countries including Latin America and Sub-Saharan Africa that were subject to no material exploration until they became more friendly to such activities (see Chart).[2] That increase in discoveries in the South is likely to continue to support supply in spite of depletion in the North and low prices (Arezki, van der Ploeg, and Toscani, forthcoming).

That said, the risks associated with fossil fuel assets becoming stranded are likely to expose many countries to vulnerabilities (van der Ploeg, 2016 and Venables, 2016). The historical COP21 agreement to keep global warming below 2 degrees Celsius and the innovation affecting energy producing and consuming technologies (declining cost of producing renewables; hybrid and electric cars) have further boosted the energy transition away from

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[2] These discoveries may have important macroeconomic consequences (Arezki, Ramey, and Sheng, forthcoming; Eastwood and Venables, 1982).

fossil fuels (IMF, 2016). That means that giga tons of reserves will have to stay underground unexploited. To keep mean global surface temperature below 2 degrees Celsius, only 300 to 400 giga tonnes of carbon can still be burnt but reserves of private oil and gas majors only are at least three times as high.

To abide by international commitments to limit global warming a third of oil, half of gas, and 80 percent of coal reserves should be kept in the ground forever (e.g., McGlade and Ekins, 2015). This would mean keeping unburned one third of oil reserves in Canada and the Arctic, 50 percent of gas and 80 percent of coal (mainly China, Russia, US). In the Middle East, reserves are three times larger than their "carbon budget". In other words, 260 billion barrels of oil in Middle East cannot be burnt. In addition to stranded reserves, the structures and capital used in extraction and in exploitation of fossil fuel could become stranded.

One implication of the spectre of stranded asset is that it could lead to a race to burn the last ton of carbon. That could in turn lead to the so-called green paradox whereby regulation aiming to limit carbon emissions end up raising the latter at least in the short run. Some commentators have argued the collapse in oil prices and deliberate attempt on the part of major oil exporters with low marginal cost of production crowd out higher marginal cost producers but also to delay the energy transition (Arezki and Obstfeld, 2015; Aghion and al. 2016).

While the risk of stranded assets for fossil fuel exporters appear to be remote, it does pose an existential threat that authorities cannot afford to ignore. The research will further attempt to quantify the phenomena using novel sources of data on natural capital and quantification methods. As mentioned above, it will also explore the extent to which financial markets can inform us about the risk of stranded assets and if not, why.

The energy transition also present opportunities including for the countries exposed to the risk of stranded assets. Solar power concentration is highest in the Middle East and Africa and parts of Asia and the United States, according to the U.S. National Aeronautics and Space Administration. The United Arab Emirates has endorsed an ambitious target to draw 24 percent of its primary energy consumption from renewable sources by 2021. Interestingly, Morocco, the host of the United Nations Conference on Climate Change (COP22), has unveiled the first phase of a massive solar power plant in the Sahara Desert that is expected to have a combined capacity of two gigawatts by 2020, making it the single largest solar power production facility in the world. The research will also rethink the quantification of the natural capital in particular resulting from the advent of renewable resources as growing source of energy. It will also explore the complementarities between these resources and other forms of capital such as infrastructure, human capital and soft capital/institutions (Collier and Venables, 2012).

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