



THE OXFORD
INSTITUTE
FOR ENERGY
STUDIES

Oil Market Dynamics: Saudi Arabia Oil Policies and US Shale Supply Response

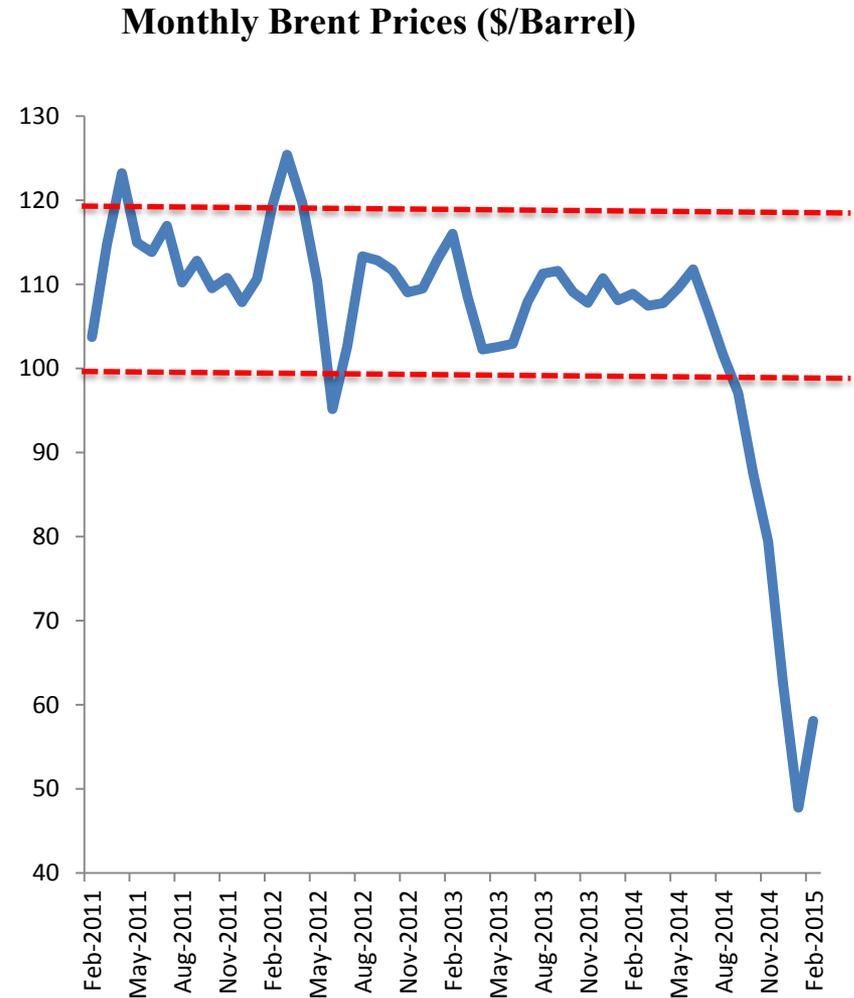
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CRUDE AND REFINED PRODUCTS MARKETS: TRANSIENT SHOCK OR SECULAR CHANGE? WORKSHOP, THE HAGUE
18 MARCH 2014

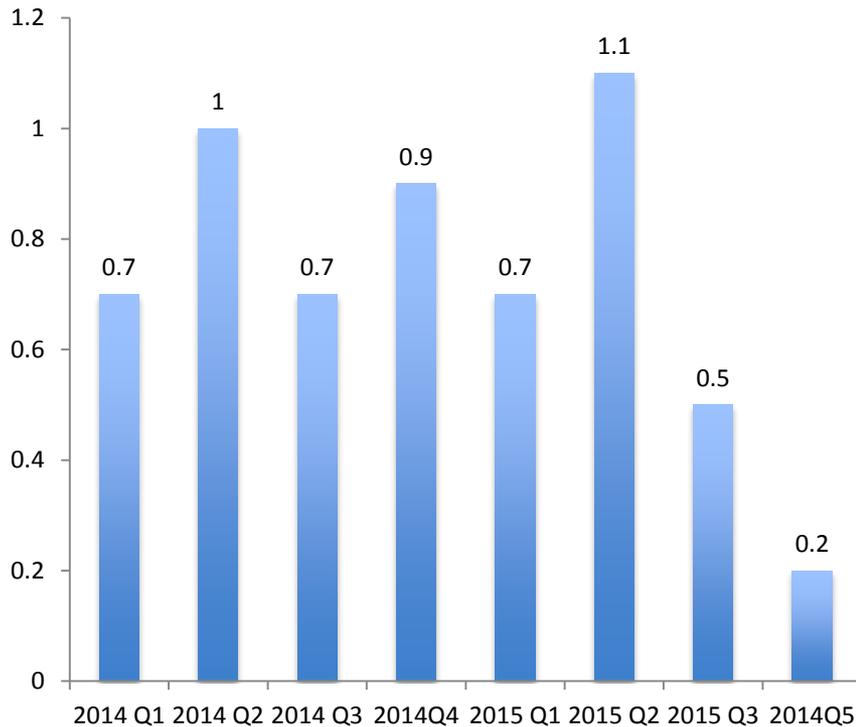
Oil Price Breaks Away from the Narrow Price Band

- Many moving parts in oil market dynamics despite the stability of the oil price between 2011 Q1 and 2014 Q2
- Ex-post analysis: Combination of factors behind the fall in the oil price
 - Demand factors (slower economic growth, China's rebalancing, etc...)
 - Supply factors (sharp increase in US oil supplies; easing of disruptions, etc...)
 - Limited impact of geopolitical events on supplies
 - OPEC (Saudi Arabia) behaving differently from what the market expected affecting market balances and changing sentiment and perception about a very important supply feedback
 - In the background, shifts in perception from oil scarcity to oil abundance and more elastic supply curve



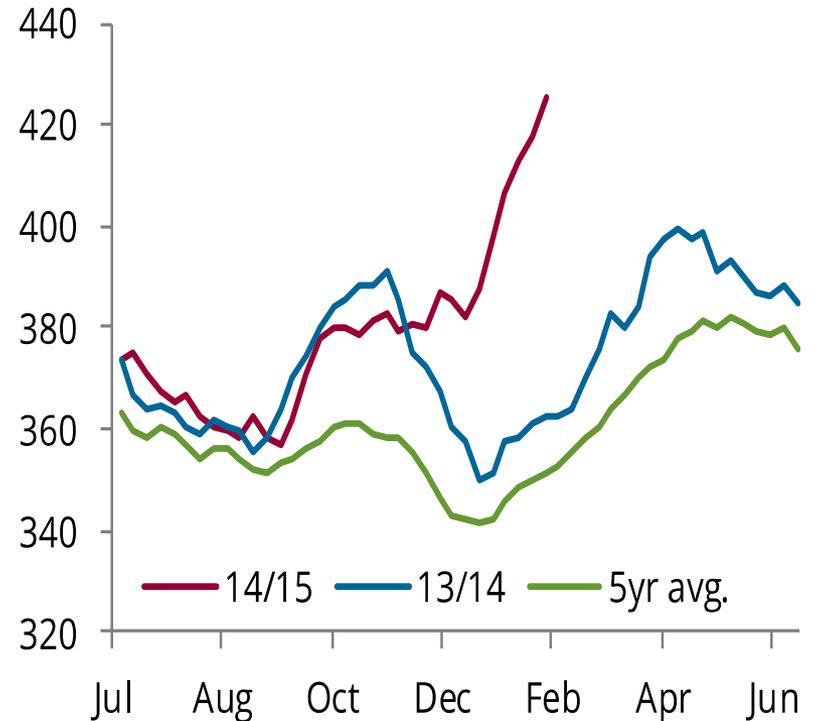
Marginal Barrel Sets the Oil Price

EIA Estimate of Stockbuilds, mb/d



Inventories continued to build well into the first half of 2015 on the back of strong stock builds in 2014

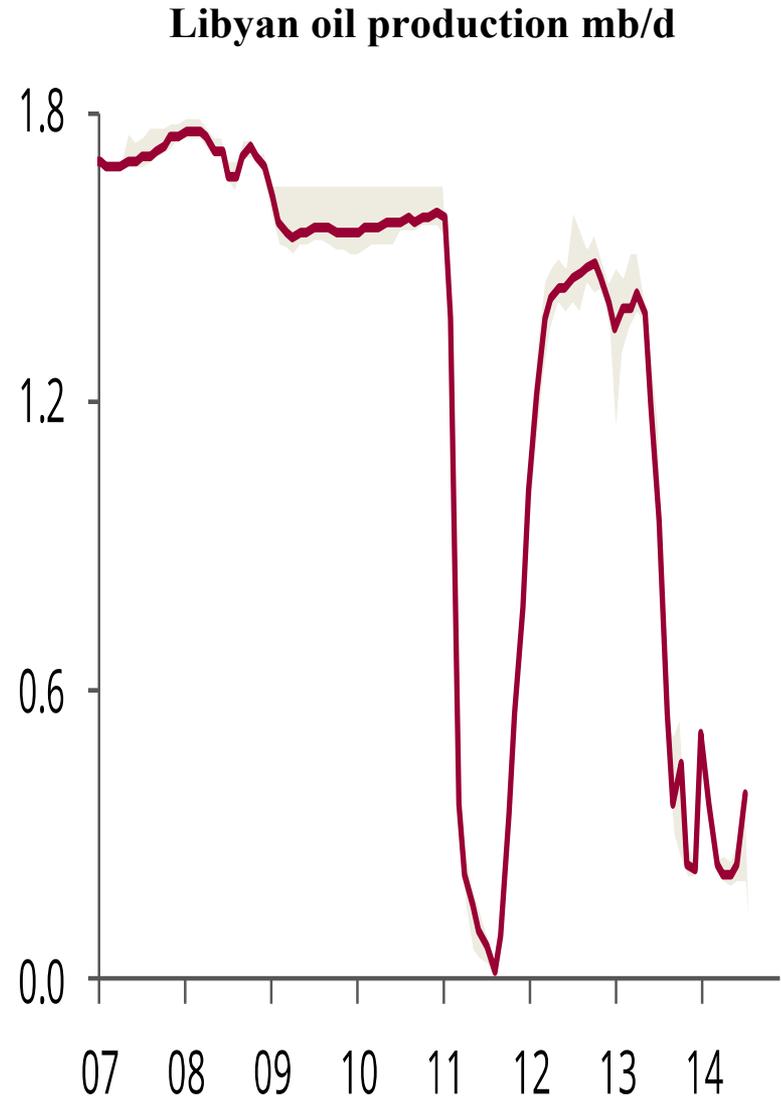
US Crude Oil Stocks, Million Barrels



Crude stocks in the US have been rising fast as one of the few places with available storage capacity

Short Term Uncertainties

- The health of global economy
- Oil demand response in a low price environment
- The return of Libyan barrels
- The return of Iranian barrels
- Oil output growth from Iraq (including Kurdistan)
- Storage capacity being filled? (not likely for now)
- **Is OPEC cut (perhaps with non-OPEC producers) completely off the table?**
- ‘Leave it to the market’ and ‘watch and see’ for now: **Supply response in a low price environment?** Uncertainty about both magnitude and timing



The Drivers of Saudi Arabia Oil Policy

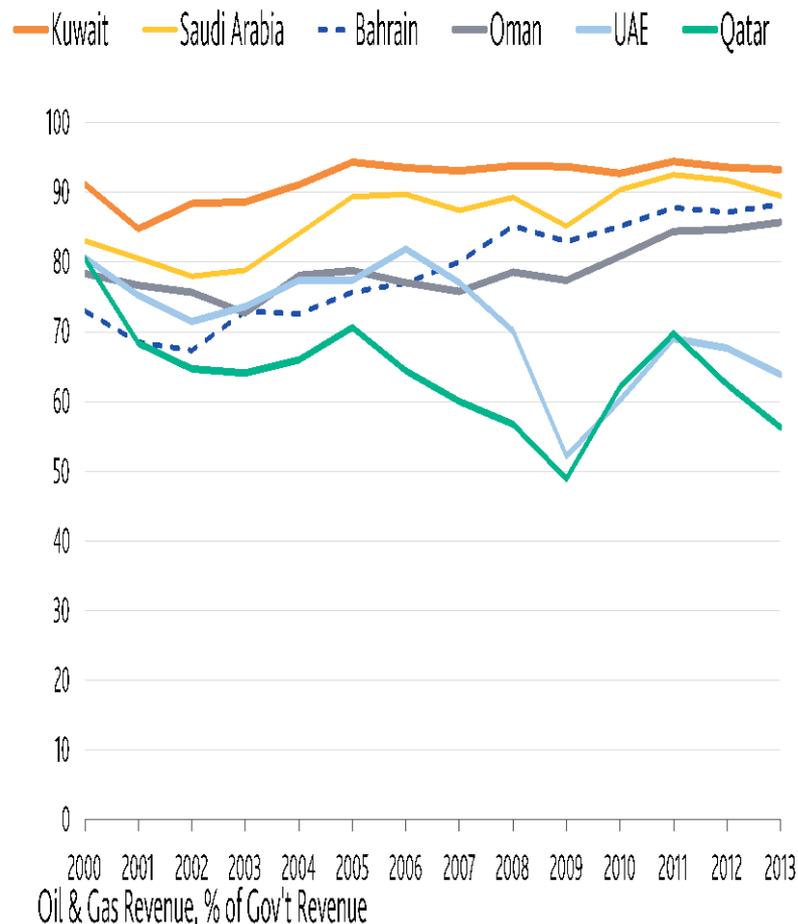
Saudi Arabia Oil Policies: Rooted in Fundamentals

- Some focus on the personal attributes of the decision maker (the oil minister)
 - Misguided approach
- Saudi oil policy is more fundamentally rooted and shaped by features of Saudi Arabia's political, economic and social systems
- Some key features that have direct influence on oil policy
 - High dependence of the country on oil revenues (means that the revenue objective will always rank high)
 - Massive oil and gas reserve base which will be exhausted over many decades (long-term demand for oil is key consideration; energy security and climate change policies aimed at reducing demand and substituting away from oil key long-term threat)
 - Saudi Arabia's dominance in oil markets and oil trade (presence in key markets and market share is paramount; revenue vs volume (market share) objectives)
 - Idle (spare) capacity (should be optimized)
 - Leading role of Saudi Arabia among oil-exporting countries (effective leadership within OPEC)
 - Challenge of long-run economic development (diversification of the economic base is a key concern)
 - Vital importance of achieving political and internal stability (affects spending decisions and pricing policies; also regional and international relations)
- **Whenever there is multiplicity in objectives and few policy tools, trade-offs will arise**

Revenue Objective Remains Key for Saudi Arabia

- Some existing explanations based on premise that SA not concerned about lower price or even favours a ‘low price’ policy
- SA does not actively ‘seeks’ a lower price
 - Dependence on oil revenues remains high
 - SA spending commitments both at domestic and regional fronts continue to rise especially in the aftermath of the Arab Spring
 - Private sector activity driven by government expenditure
- May 2014, Saudi oil minister Mr Ali Naimi: ‘One-hundred dollars is a fair price for everybody - consumers, producers, oil companies... it is a **fair price**’

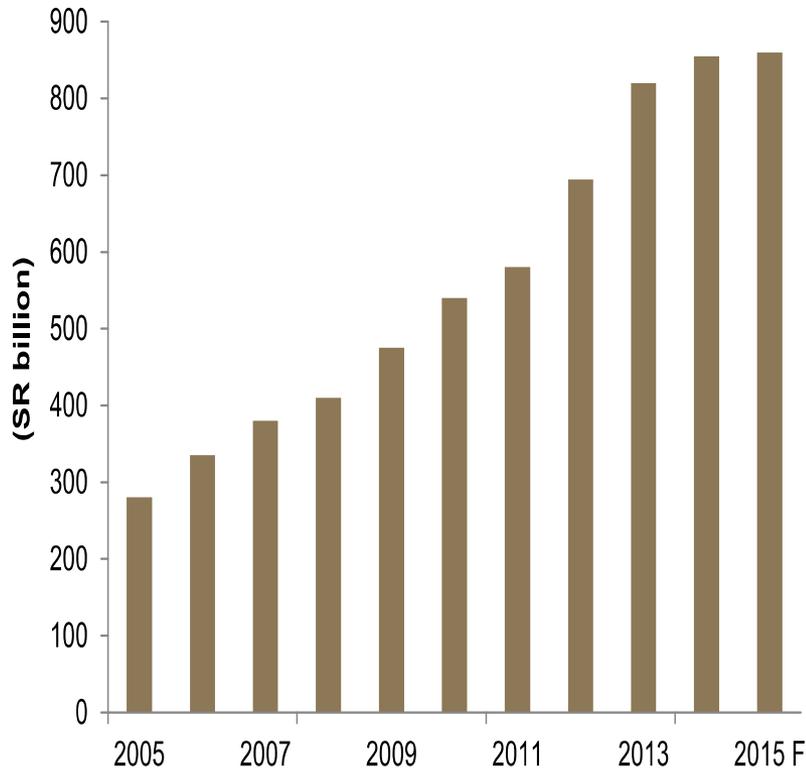
Oil & Gas Revenue as a % of Gov't Revenues



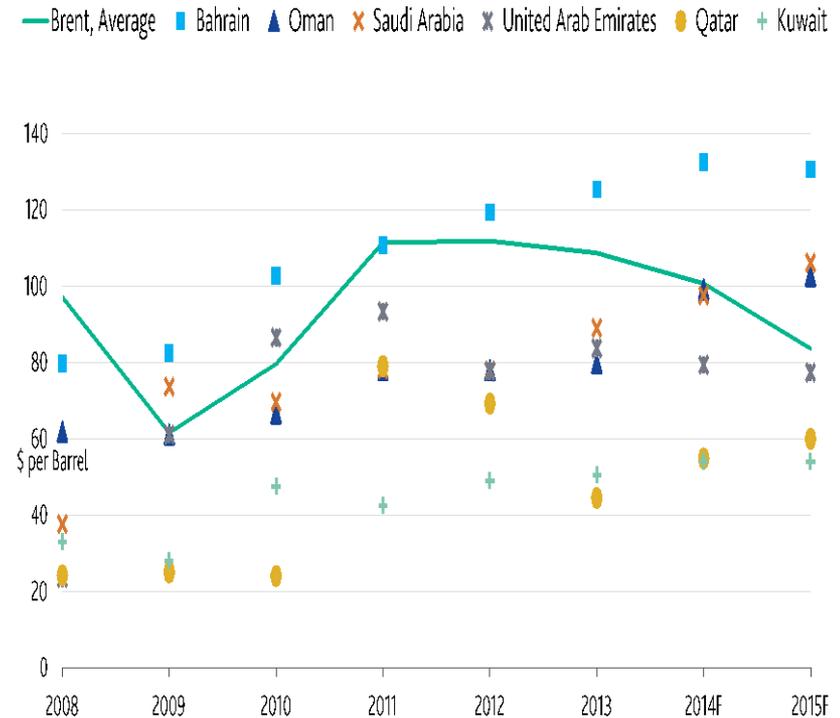
Government Expenditure has Tripled in the last decade

Increasing Fiscal Break-Even Price

Budgeted Spending (SR Billion)



Fiscal Break Even Price, \$/Barrel

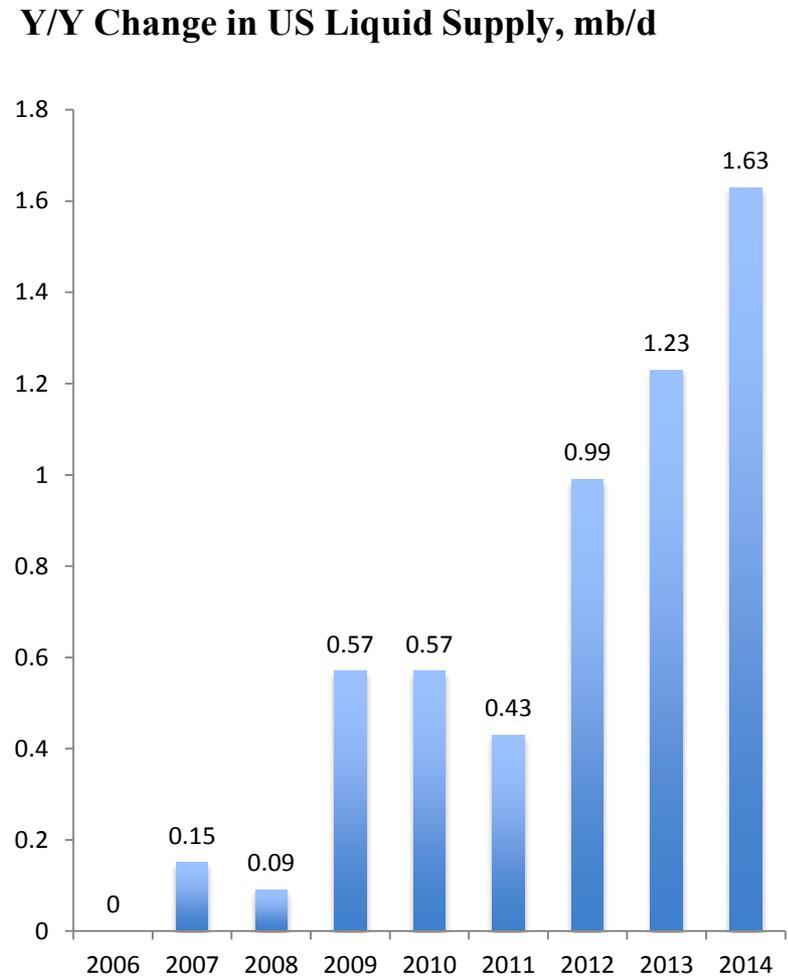


Government expenditures almost tripled in the last decade

Fiscal breakeven prices continues to rise as government expenditure increases

Could the 'Fair' price keep the supply-demand responses in check?

- Strong supply & demand responses in a high oil price environment
- No pro-active policy from SA to bring oil prices down in the last few years (validating the 100+ oil price)
- Politically difficult to bring down prices both domestically and within OPEC
- Price levels need to rise extremely high to see a Saudi response (specifically if price rise is caused by geopolitical factors)
 - In 2012 during sharp rise in the oil price as concerns about attacks on Iran intensified, Saudi Arabia adopted an active policy to try to bring prices down
- Outside OPEC and unorthodox channels to communicate their message at that time

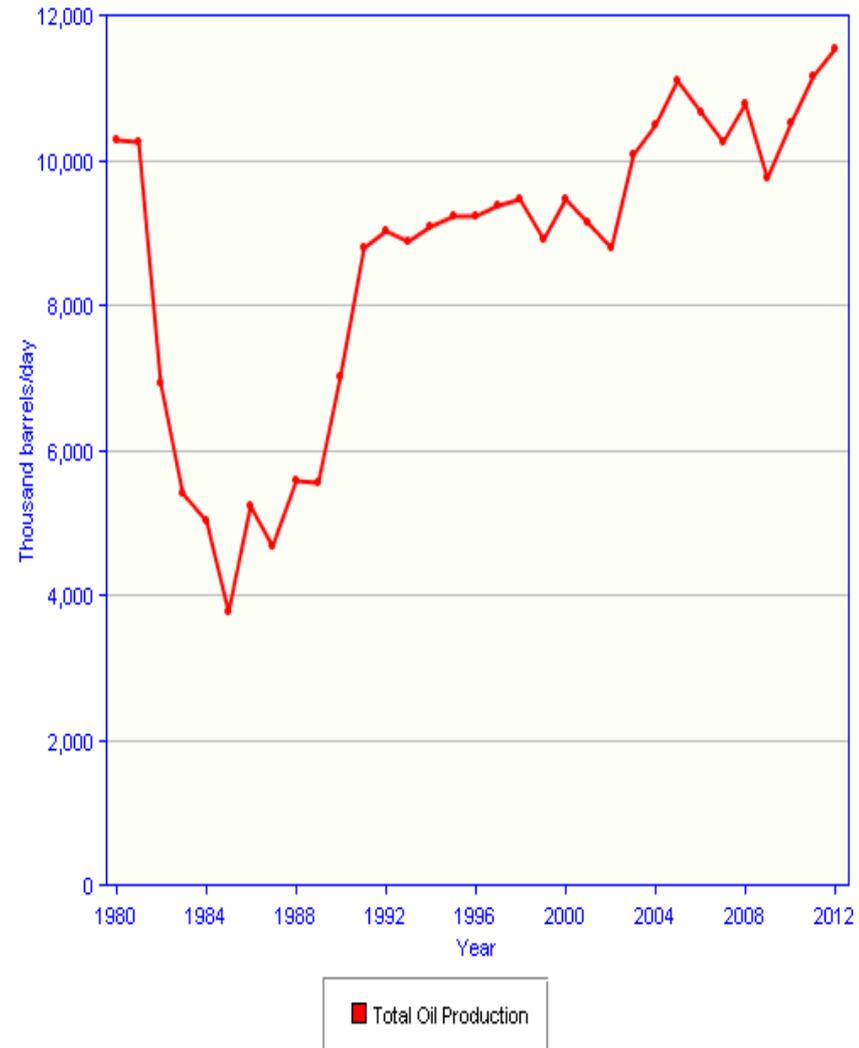


Is Saudi Arabia Opposed to Output Cuts?

Saudi Arabia Does not Oppose Cuts but Cuts Have to be Collective and Burden Shared

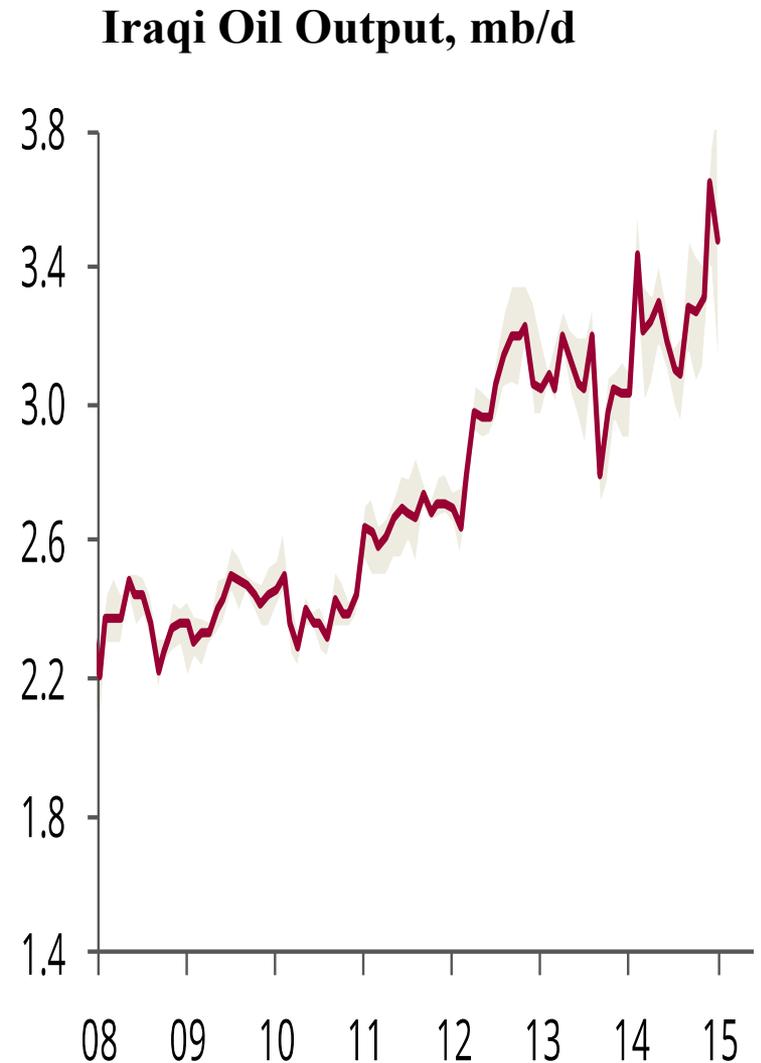
- Output cuts main tool to impact supply-demand balances and influence the oil price (in addition to signalling)
- But Saudi Arabia will not cut output unilaterally
- Before the fall in oil price, Saudi Arabia sent clear signals that it is unlikely to reduce output unilaterally and is unhappy about the quota system
 - ‘we (Saudis) have learned our lesson. Every time we go to quotas, who bears the brunt? Us. We have learned the lesson. We are no longer the swing producer. Who needs quotas?’ (MEES, Dec 6, 2013)
- Mabro (1998): ‘The point that Saudi Arabia has been making consistently since 1985, backed by its policy in 1986 which was a genuine price war, seems to have *sunk* in. Saudi Arabia's willingness to cut output on its own to influence the course of oil prices could not be taken for granted. **In fact nobody could realistically expect to see such willingness ever emerging again**’.

Saudi Arabia Oil Production



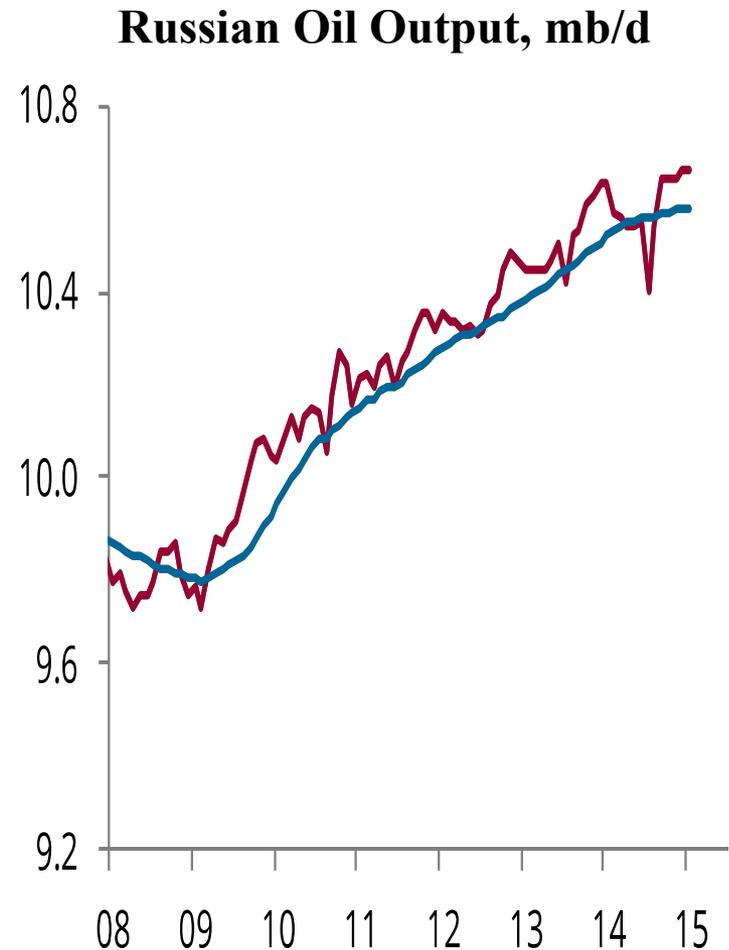
A Difficult Task which is Becoming More Difficult

- More challenging in current context: Many OPEC producers unable and unwilling to reduce their production due to their heavy reliance on oil prices for basic functioning (e.g. paying wages in Libya, buying basic amenities in Venezuela)
- Leadership role: Low price may be needed to enforce more discipline within OPEC (game theoretical approach)
- Particular concern is low cost producers such as Iran and Iraq
- Coercing OPEC discipline through pushing prices lower may not always work, especially when many OPEC members are producing below their 'perceived' maximum capacity due to various sorts of problems
- Even if a cut to OPEC quota agreed in November enforcing cuts across OPEC nations beyond the very short term at best will be difficult (Cheap Talk)



Cooperation with Non-OPEC Members

- Establishing relationship with non-OPEC a key objective for Saudi oil policy
- OPEC does not include all the relevant exporting countries and therefore only provides a partial framework for effective policy making
- Belief that other non-OPEC producers should participate as they also have interest in protecting the oil price
- Especially producers with high volumes of production such as Russia



Saudi Arabia can Implement a Unilateral Cut but at What Cost?

- Potential explanation: No point in defending oil price in face of weaker demand
 - ‘from an economics point of view, it’s much better to let prices go way down’, and that the emerging price war is ‘a war of necessity’
- But market conditions indicate current oversupply far from being out of control (for instance when compared to 2008/09)
- Before loss of Libyan production, Saudi Arabian production was around 9.1 mb/d in early 2013 below 9 mb/d in 2011
- Rebalancing supply side market would not require a journey into uncharted territory
- ***But it involves a loss of market share and results in large idle capacity***

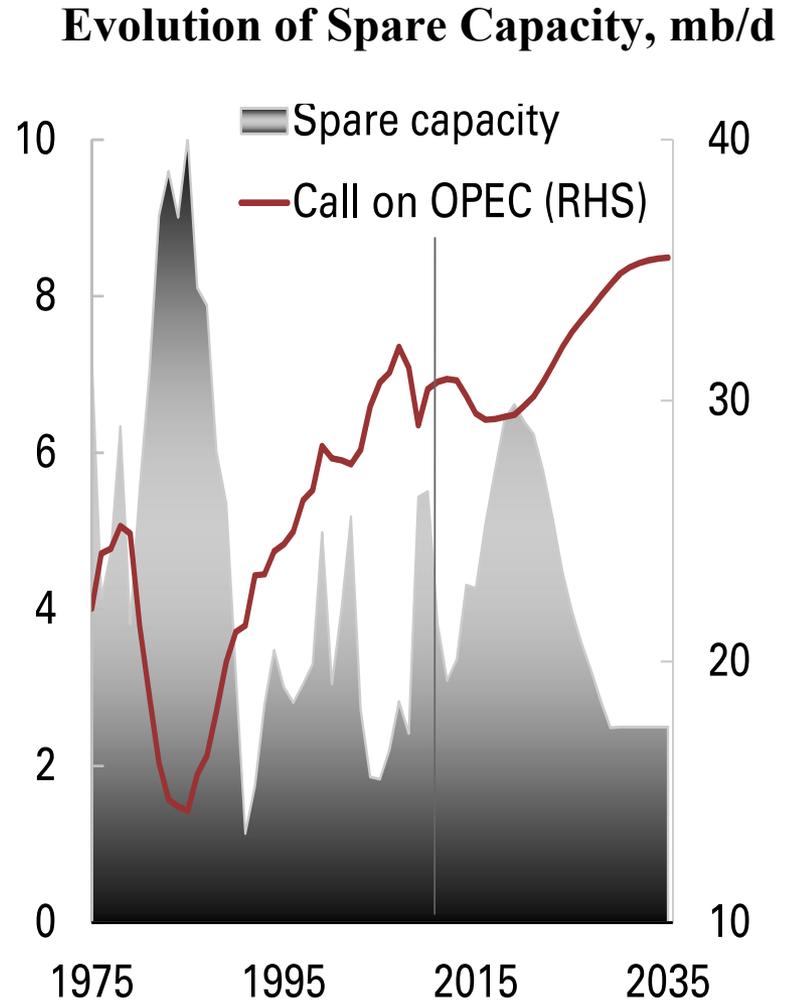
EIA Summary Balances, mb/d

	2014 Quarters					2015 Quarters					y/y change		
	2013	Q1	Q2	Q3	Q4	2014	Q1	Q2	Q3	Q4	2015	2014	2015
Demand	91.2	91.1	91.4	92.9	93.2	92.1	92.3	92.7	93.8	93.8	93.1	0.9	1.0
OECD	46.1	45.7	44.8	45.8	46.7	45.7	46.3	45.1	45.9	46.5	46.0	(0.3)	0.2
Non-OECD	45.2	45.3	46.7	47.0	46.5	46.4	46.0	47.5	47.9	47.3	47.2	1.2	0.8
Non-OPEC supply	54.4	55.3	56.3	56.8	57.3	56.4	56.5	57.2	57.6	57.8	57.3	2.1	0.8
non-OPEC excl NA	35.0	35.0	35.3	35.5	35.5	35.3	34.7	35.3	35.6	35.4	35.2	0.3	(0.1)
North America	19.3	20.4	21.0	21.4	21.8	21.1	21.7	22.0	22.1	22.4	22.0	1.8	0.9
FSU	13.8	13.9	13.9	13.9	14.0	13.9	13.8	13.8	13.8	13.8	13.8	0.1	(0.1)
OPEC NGLs/Condensates	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.5	6.5	6.4	(0.0)	0.1
Call on OPEC crude	30.5	29.4	28.7	29.7	29.4	29.3	29.4	29.0	29.7	29.6	29.4	(1.2)	0.1
OPEC crude	30.1	30.0	29.7	30.3	30.4	30.1	30.1	30.2	30.2	29.8	30.1	(0.0)	(0.1)
Stockbuild	(0.3)	0.7	1.0	0.7	0.9	0.8	0.7	1.1	0.5	0.2	0.6	-	-

Source: EIA February Short Term Energy Outlook

Managing Idle Capacity

- Oil price should be associated with a volume of production that leaves Saudi Arabia with amount of idle capacity necessary for an effective exercise of leadership
- Capacity should not be so small that it reduces ability to calm markets when prices threaten to explode (plus enforce discipline)
- Capacity should not be so large so as to affect revenue and market positions adversely
- Output volume is key consideration in conjunction with revenues (the two should not be separated) but *creates a trade-off*
- In the long term also affects investment decisions to build new capacity

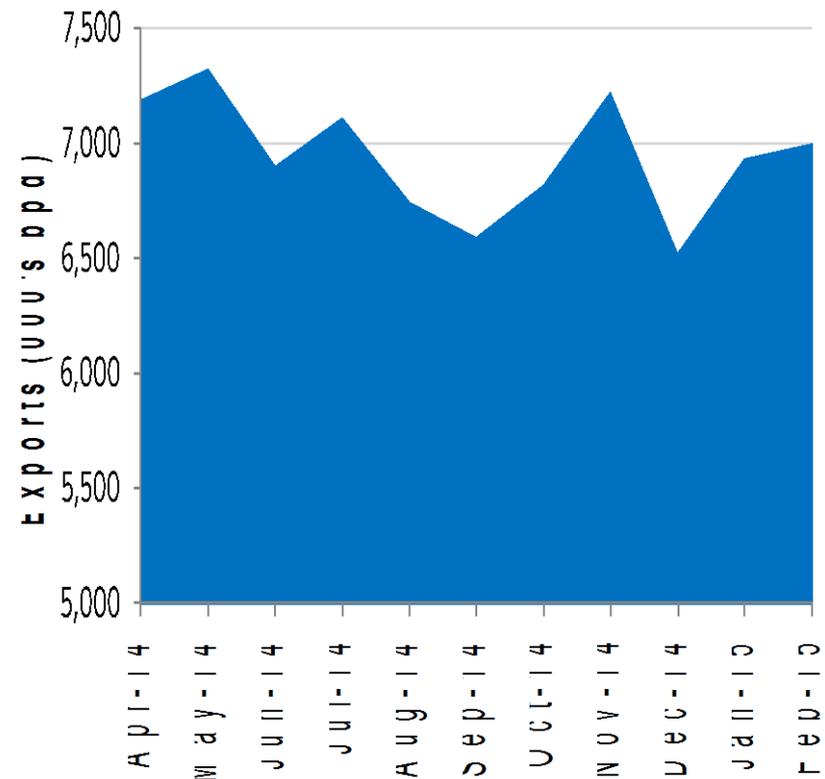


Trade off: Maintain Market Share or Maximize Revenues in a More Competitive Environment?

Volumes Matters

- Losing market share to others has never been acceptable to Saudi Arabia and this has been made most evident in this cycle
 - Naimi (Dec, 2014): *'If I reduce, what happens to my market share? The price will go up and the Russians, the Brazilians, US shale oil producers will take my share'*.
- Presence in key markets matters
- Especially as markets have become more competitive

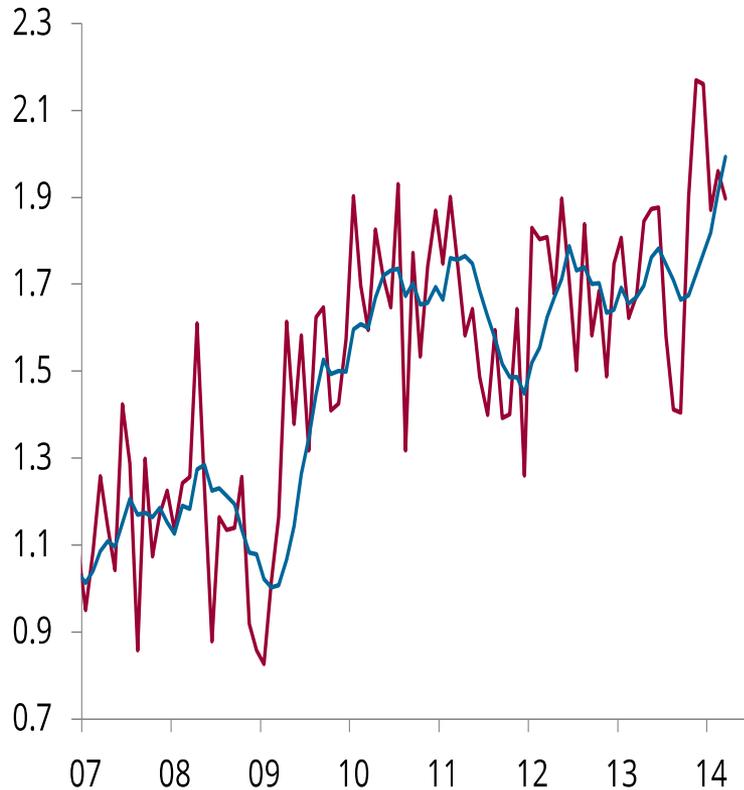
Saudi Arabia Monthly Exports, mb/d



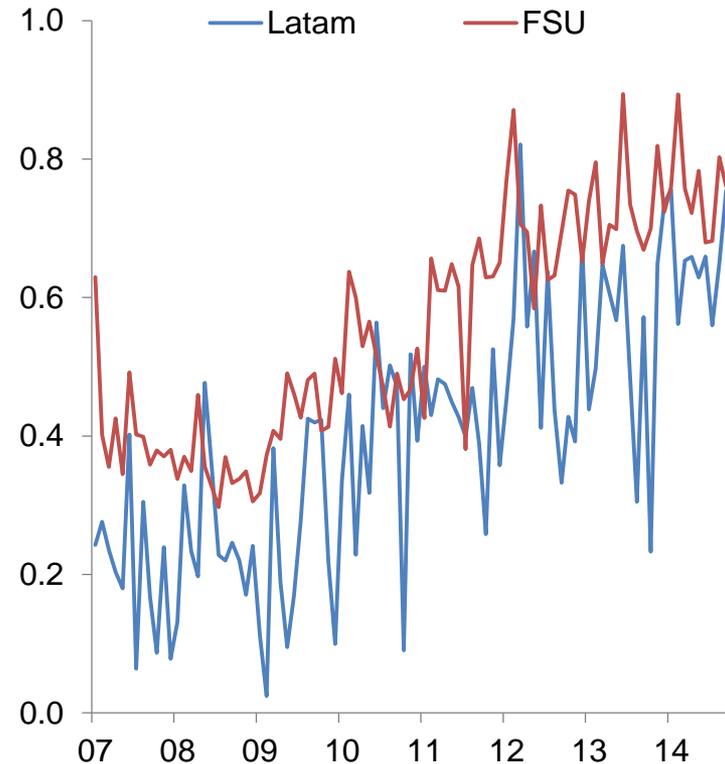
Source: Thomson Reuters Oil Research & Forecasts

Accelerated Shift of Exports to Asia

WAF Exports to Asia (mb/d)



Latin American and FSU exports to China mb/d

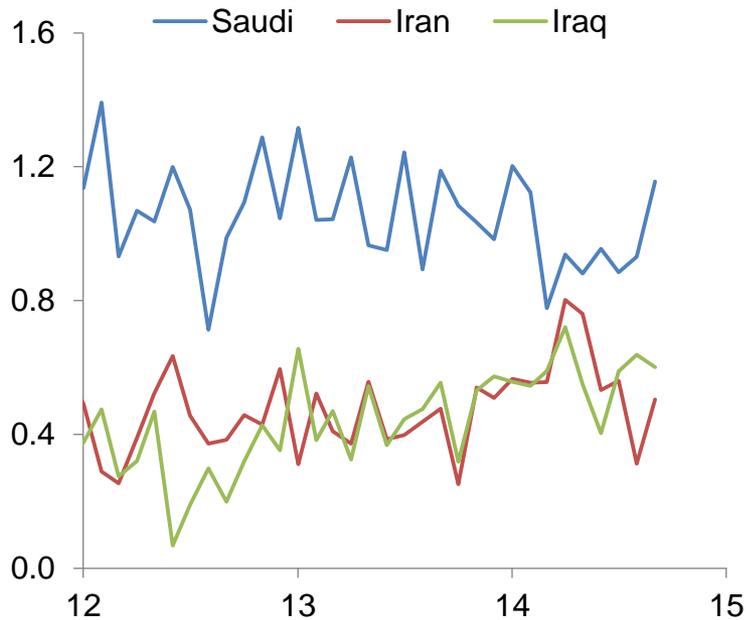


WAF producers turning to key growth market Asia to sell their cargoes

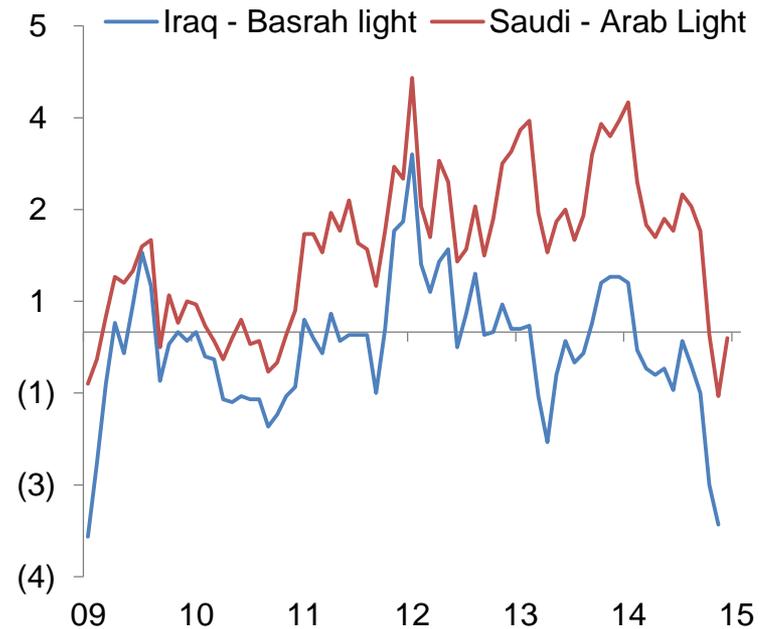
So are Latin American and FSU producers who are turning to Asia

Generating More Competitive Pressure Among Middle East Producers

Chinese imports by country
Mb/d



Iraq and Saudi OSPs to Asia
\$/barrel



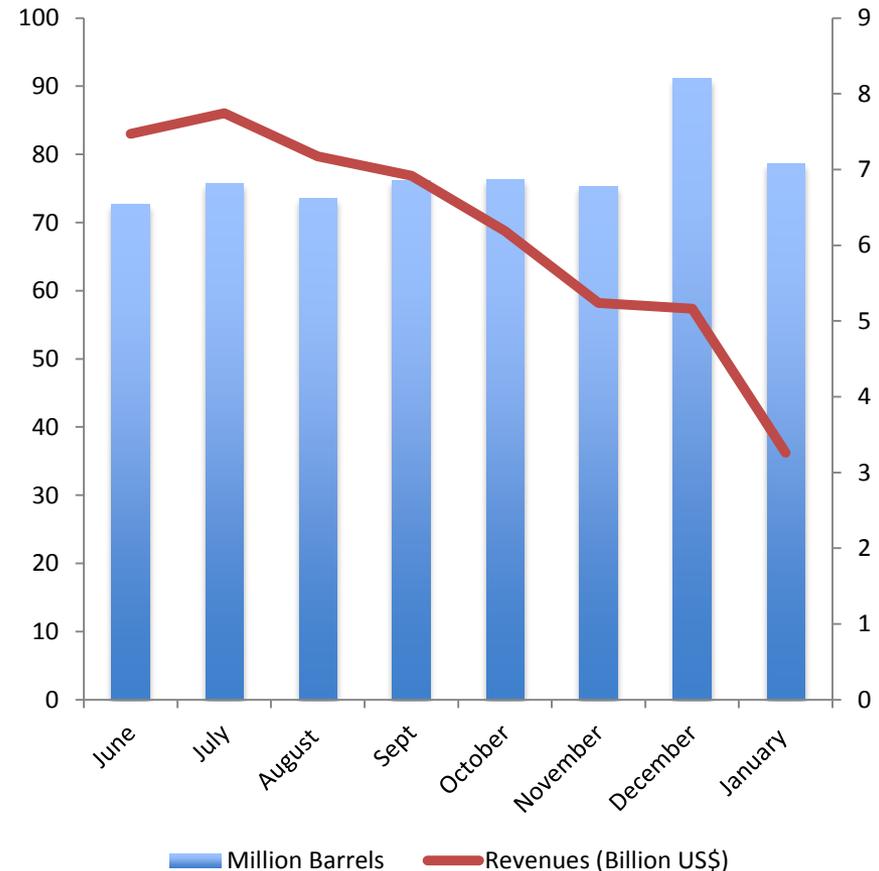
Competition intensified between Middle East producers trying to increase market share in Asia

...reflected in better terms and adjustment of price differentials

The Focus Should be on Revenues, but at Which Time Horizon?

- Short-term revenues or long-term revenues?
- Biggest fear in the short-term
 - Lower market share and lower prices
 - Producers will increase volumes in an attempt to increase revenue
- Pragmatic approach
 - 1986: Relevant trade-off in the circumstances of the time favored volume over price (after volumes went down to unacceptable levels)
 - 1998: favored price over volume given the very negative impact of abysmally low prices on revenues
- A trade-off will weigh in different directions depending on circumstances
- ***Keeping market share at whatever cost is not an 'ideological' position and could change depending on market circumstances***

Iraq Monthly Revenues and Production



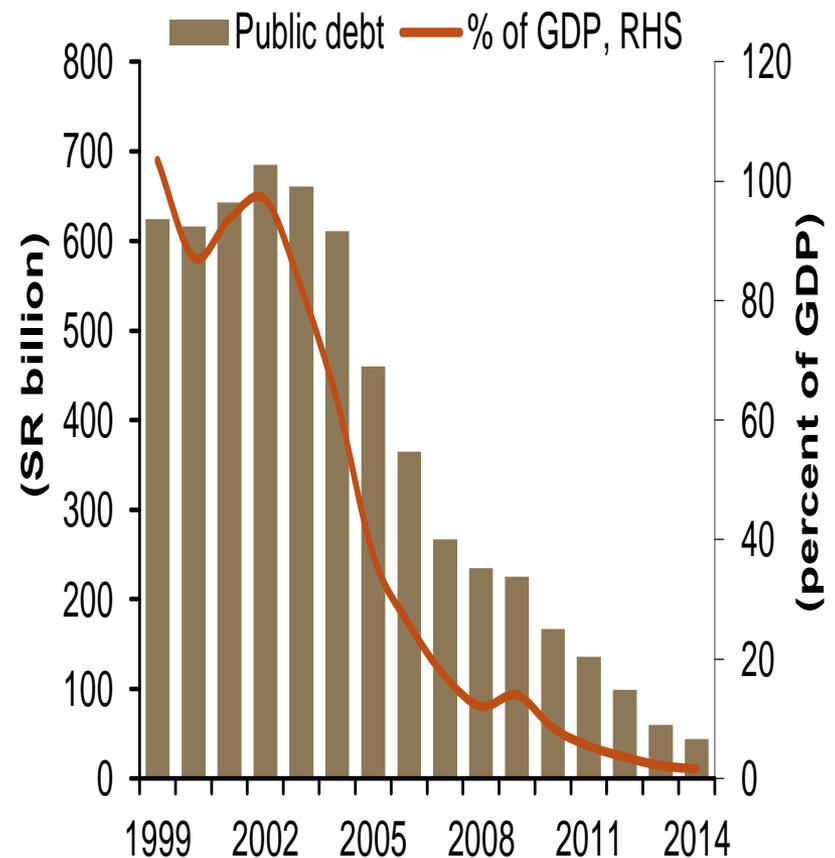
Is New Policy Shift in Paradigm?

- Does current decision to leave it to the market to find the price floor a shift in paradigm?
 - ‘The best quota is satisfy your customer’
 - *Mr Falih (CEO, Saudi Aramco) been reported to have said ‘that he does not believe producers, whether OPEC or other industry players, should try to influence oil prices, which should be market driven. Nor would Saudi Arabia consider cutting production in response to rising output from fellow OPEC producers Libya and Angola’.*
- Ultimate belief in pricing mechanism to clear excess supplies? Not really!!!
- A more pragmatic approach
 - Plan A: Try to achieve a cut including cooperation from non-OPEC (From Saudi Arabia’s perspective unilateral cuts should be avoided)
 - When not possible to achieve cut, moved to Plan B: Leave it to the price mechanism to clear excess supplies
 - This phase of cycle: Volume over price for now

Saudi Arabia can Withstand a Lower Price Environment

- Saudi Arabia is in a good position to withstand lower prices in the near term mainly as result of pro-cyclical fiscal policy
 - Accumulated large foreign assets
 - Does not need to balance its budget every year
 - Debt quite small in absolute value and relative to GDP and capacity to borrow large
 - Government expenditure an endogenous variable: Decline in revenues would result in adjustment of expenditure outlays to some extent (mainly capital expenditure)

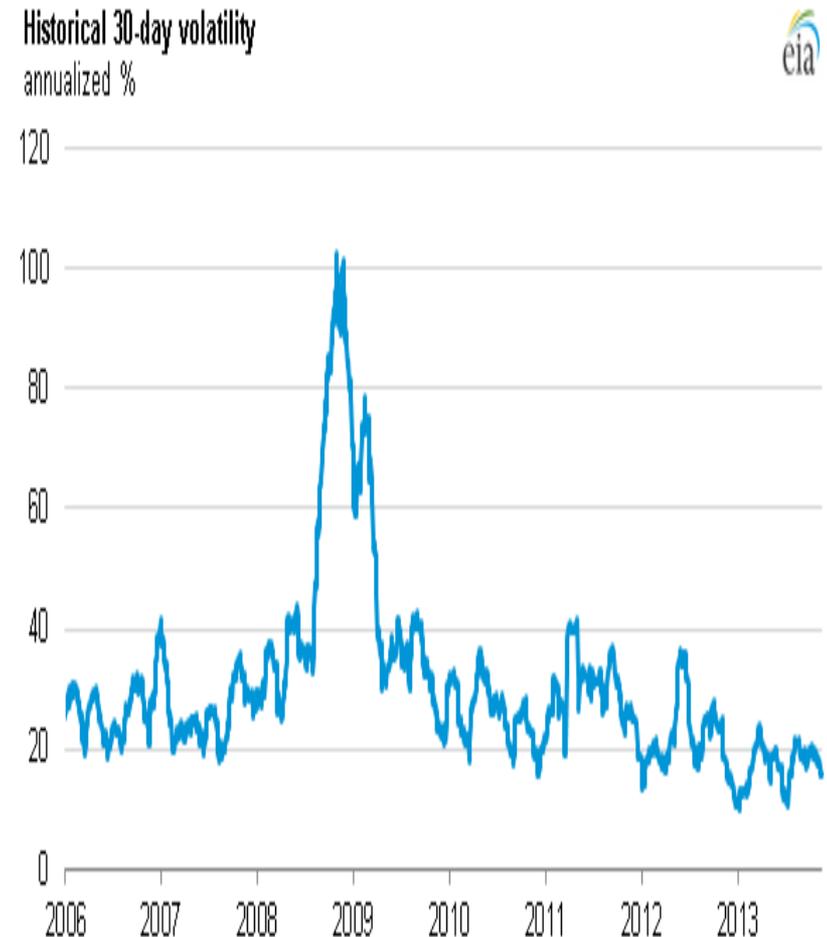
Saudi Government Debt
(% of GDP)



Implications of Saudi Arabia's Oil Policy

- For now leave it to the price mechanism to clear the market of excess supplies
- High uncertainty and comes with risks
 - Magnitude
 - Timing
- Implies that an important feedback mechanism on downside has been lost or can no longer be taken for granted
 - A higher tendency to undershoot and for prices to become more volatile
 - Era of low price volatility and price stability within a narrow range may be over
- Longer-Term implications
 - Risk premium in the oil industry increased affecting investment decisions
 - Trade off: Volatility can reduce level of investment but also affect demand

Crude Oil Price Volatility



Some Lessons

- Maximizing revenue remains key objective
- But should be balanced against the objective of volume (avoid losing market share and left with high idle capacity)
- Trade-off will be shaped by market conditions, cohesiveness of OPEC, internal conditions of the country which will determine which direction policy will take
- Oil policy is not constant and there is no desired 'oil price' (price is a moving target depending on market conditions)
- No 'ideological' belief in market mechanism to produce the desired outcome and implement cuts when conditions are 'right'
- Shale has generated a new set of challenges and uncertainties making the calculus of the trade-off more difficult and uncertain

US Shale Poses New Set of Challenges

US Shale Supply Response Far from Clear

- Key uncertainties
 - Elasticity
 - Magnitude
 - Timing
 - Linear or non-linear effects (perception of risk of shale projects)
- How elastic is the supply curve?
 - Once the oil price is above a certain level, wells will be brought back into production (switch on, switch off)?
 - Put a cap and a floor on the oil price
- Break even cost highly uneven
 - ‘Well by Well’ economics
 - Least productive wells will be shelved first affecting production at the margin
 - Productivity and efficiency improvements

North Dakota Break-Even Oil Prices		
	Price (\$/bbl)	Rigs
McKenzie	\$28	66
Dunn	\$29	28
Stark	\$36	2
Williams	\$37	43
Mountrail	\$42	31
Bottineau- Renville	\$51	4
Billings	\$53	4
McClellan	\$73	1
Bowman- Slope	\$75	0
Golden Valley	\$77	0
Burke	\$81	3
Divide	\$85	8
Average/Total	\$56	190

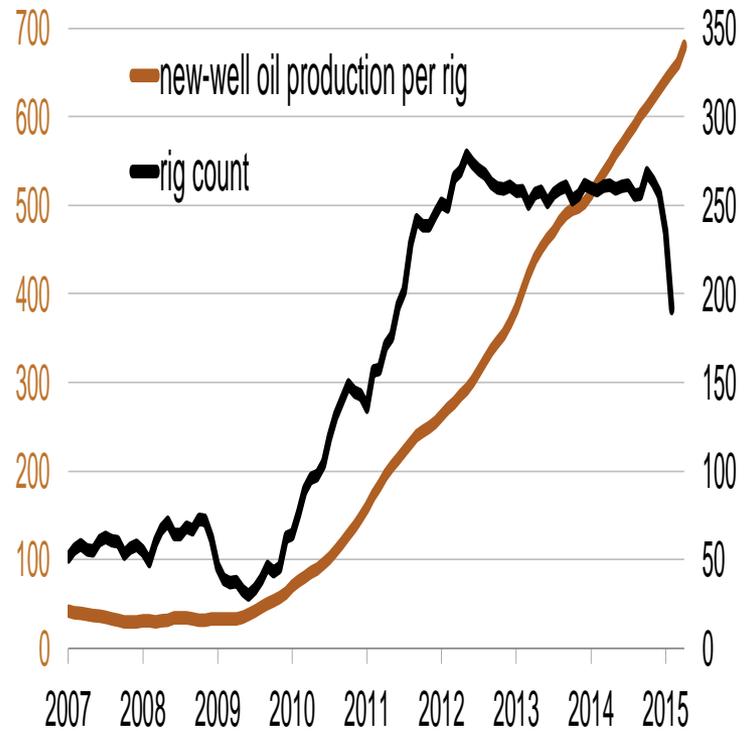
Source: North Dakota Department of Mineral Resources

Improvement in Efficiency and Productivity

Eagle Ford Region

New-well oil production per rig

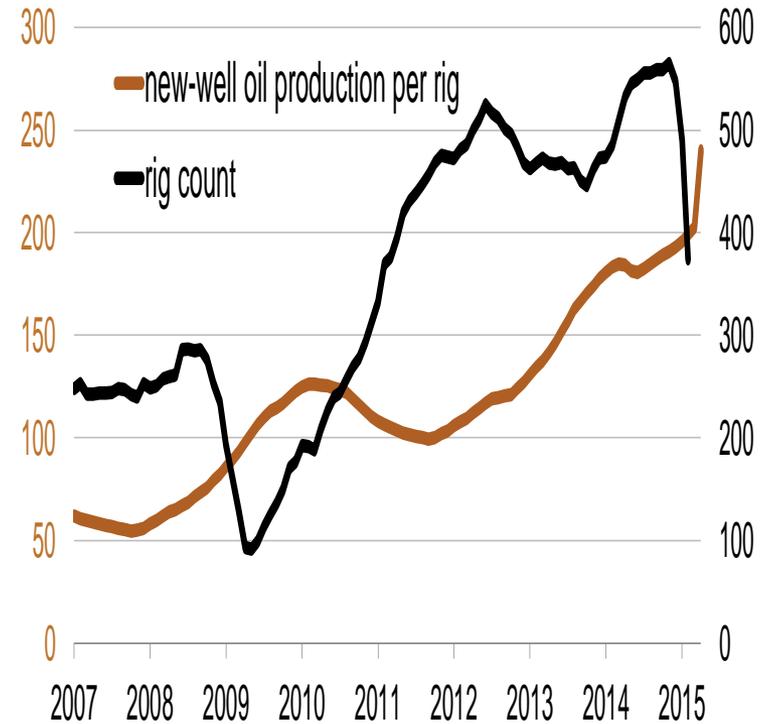
barrels/day



Permian Region

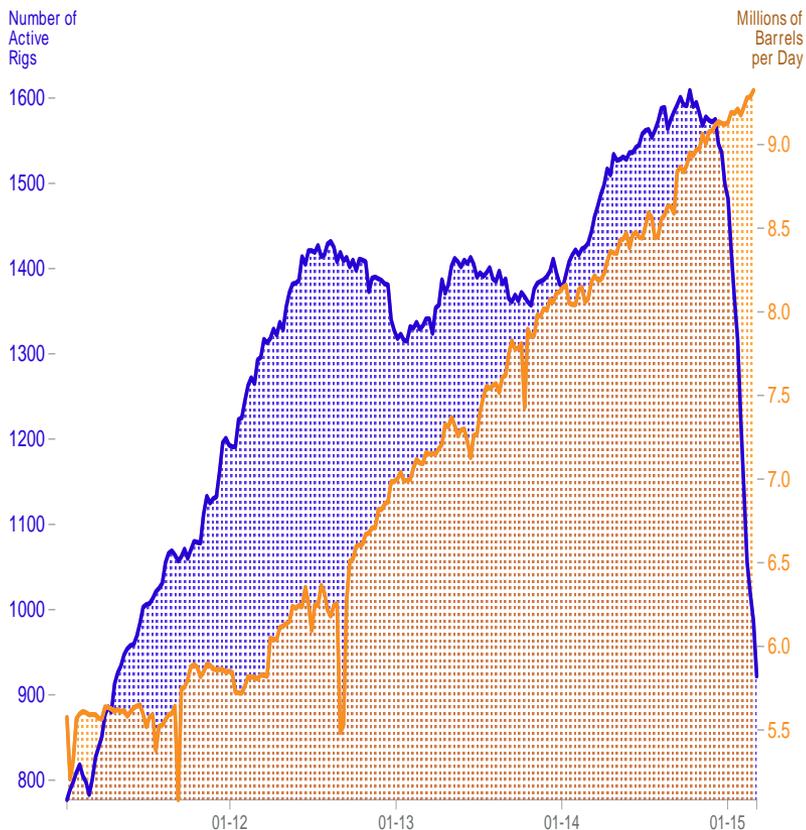
New-well oil production per rig

barrels/day



Number of Rigs Falling and Companies Cutting Capital Expenditure But How Long Are the Lags in Supply Response?

US Oil Rig Count, kb/d



Capital Expenditure Cuts by US Independents, Million US\$

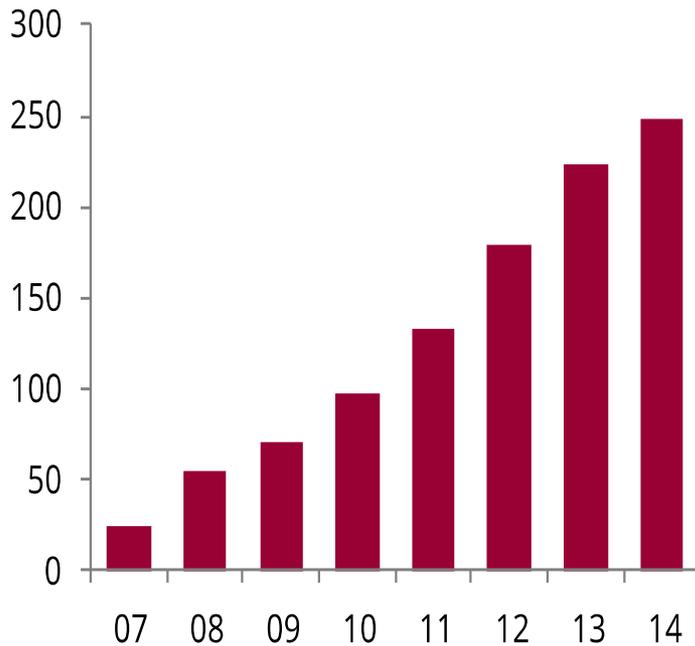
	Basin	2015E	2014	% chg.
		Capex	Capex	
Anadarko	Global	6,830	9,200	(26)%
EOG Resources	Eagle Ford / Permian	5,000	8,300	(40)%
Marathon Oil Corp	Global	4,400	5,500	(20)%
Encana Corp	Permian / Eagle Ford	2,800	2,550	10%
Continental Resources	Bakken/SCOOP	2,700	4,550	(41)%
Concho Resources	Permian	2,000	2,600	(23)%
Pioneer Natural Resources	Permian	1,850	3,364	(45)%
Oasis Petroleum	Bakken	800	1,430	(44)%
Halcon Resources	Eagle Ford / TMS	775	1,420	(45)%
Rosetta Resources	Permian / Eagle Ford	750	1,200	(38)%
Linn Energy	California / E. Texas	730	1,550	(53)%
WPX Energy	Williston / San Juan	725	1,400	(48)%
Sanchez Energy	Eagle Ford	630	870	(28)%
PDC Energy	Niobrara / Utica	560	640	(13)%
Denbury Resources	USGC / Rockies	550	1,100	(50)%
Laredo Petroleum	Permian	530	1,100	(52)%
Carrizo Oil & Gas	Eagle Ford / Niobrara	460	620	(26)%
Stone Energy	GoM / Marcellus	450	875	(49)%
Diamondback Energy	Permian	430	450	(4)%
Matador Resources	Permian / Eagle Ford	350	570	(39)%
Rex Energy Corp	Marcellus / Utica	340	670	(49)%
Chaparral Energy	Mid-Con	340	670	(49)%
Comstock Resources	Eagle Ford	310	580	(47)%
Exco Resources	Eagle Ford	275	423	(35)%
Breitbrun Energy	Permian / Mid Con	200	380	(47)%
Approach Resources	Permian	180	400	(55)%
Goodrich Petroleum	TMS	175	350	(50)%
Swift Energy	Eagle Ford	110	400	(73)%
Emerald Oil Inc	Bakken	72	225	(68)%
Abraxus Petroleum	TMS	50	190	(74)%
American Eagle Energy	Bakken	50	120	(58)%
Total		35,422	53,697	(34)%

The fall in the number of rigs has been spectacular falling from a peak of 1600 to around 1200 affecting market expectations

And companies have been slashing their capital expenditure budgets

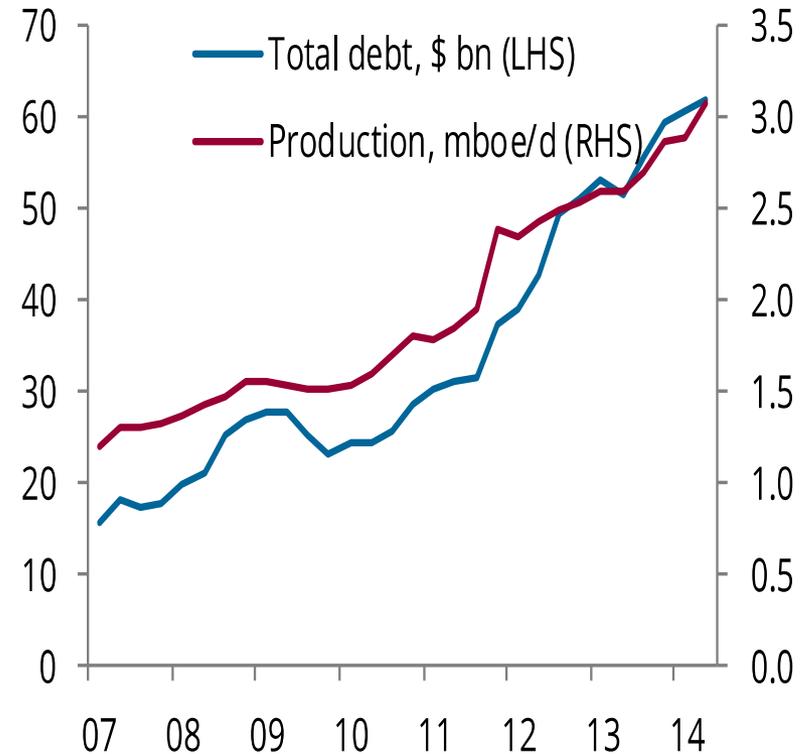
Highly Leveraged Players: Disruptive Impact Originating from Credit Markets?

Cumulative Capex since 2007 for Shale Producers, \$bn



Source: Company Reports, Energy Aspects

The only way to increase production is to drill more wells which is reflected in the large increase in capital expenditure

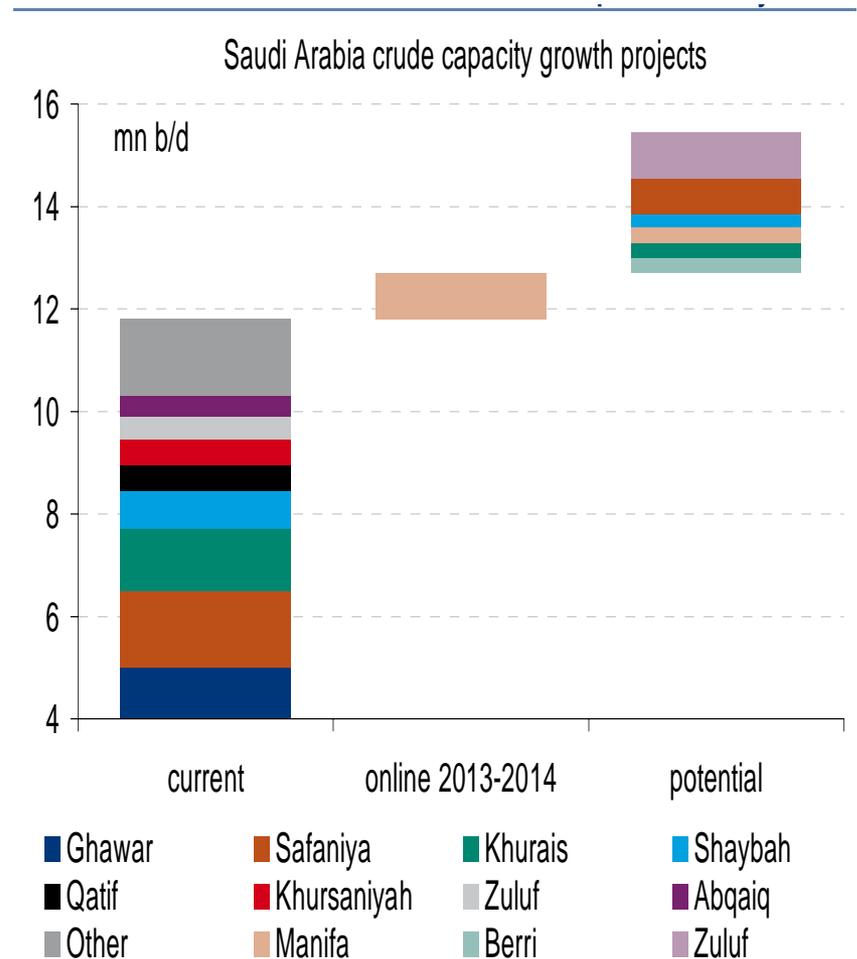


Production increases at big cost by drilling hundred of wells and accumulating large amounts of debt

Saudi Arabia Long Term Oil Policies

Incentive to Invest Under Uncertainty

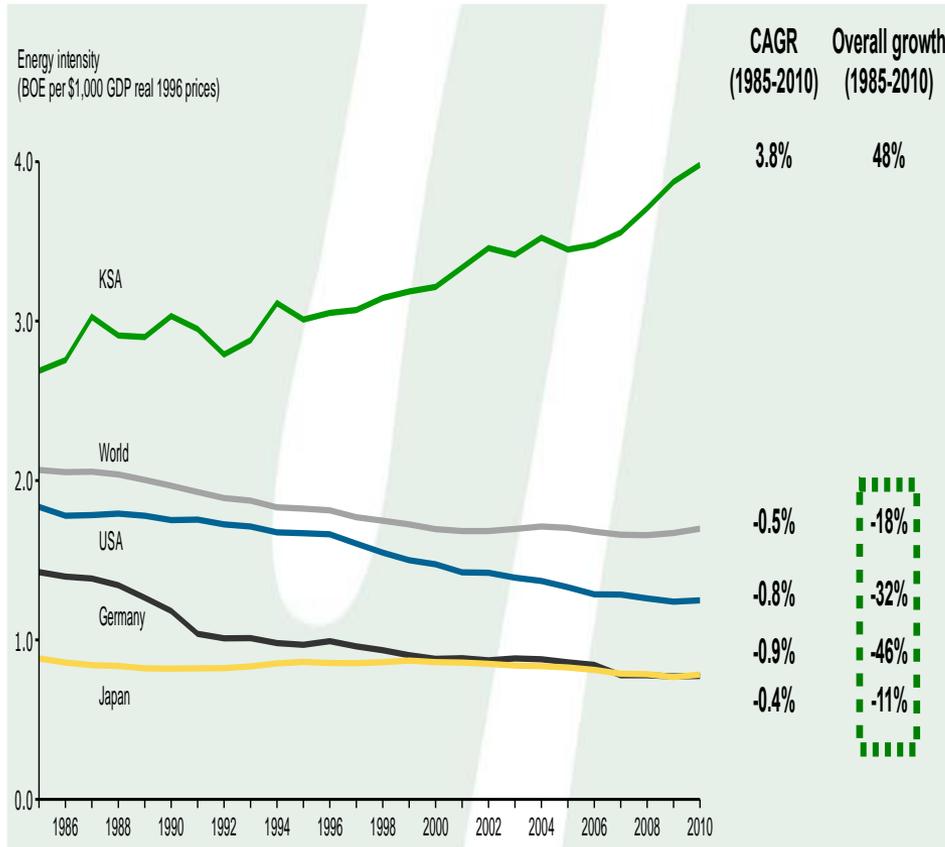
- Under uncertainty, the option to wait becomes very valuable
- No plans or incentive to increase oil productive capacity from current level
- New investment only to replace declining fields
- Focus on development of gas reserves to increase its share in domestic economy and free oil for exports
- Try to arrest the rapid growth in domestic demand to make more oil available for exports



Source: IEA, EIA, BofA Merrill Lynch Global Commodities Research

Increase in Energy Intensity

Energy Intensity in Selected Economies



Prices Paid by Power Producers in Saudi Arabia compared to International Prices in 2012 (\$/MMBTU)

Fuel	Price Paid by Power Producers	International Price
Heavy Fuel Oil	0.43	15.43
Natural Gas	0.75	9.04
Diesel	0.67	21.76
Crude Oil	0.73	19.26

Source: Electricity & Cogeneration Regulatory Authority (ECRA) Annual Report 2012

Energy intensity in Saudi Arabia keeps rising contrary to global trends

....in large part due to lack of price signals needed to rationalize energy demand growth

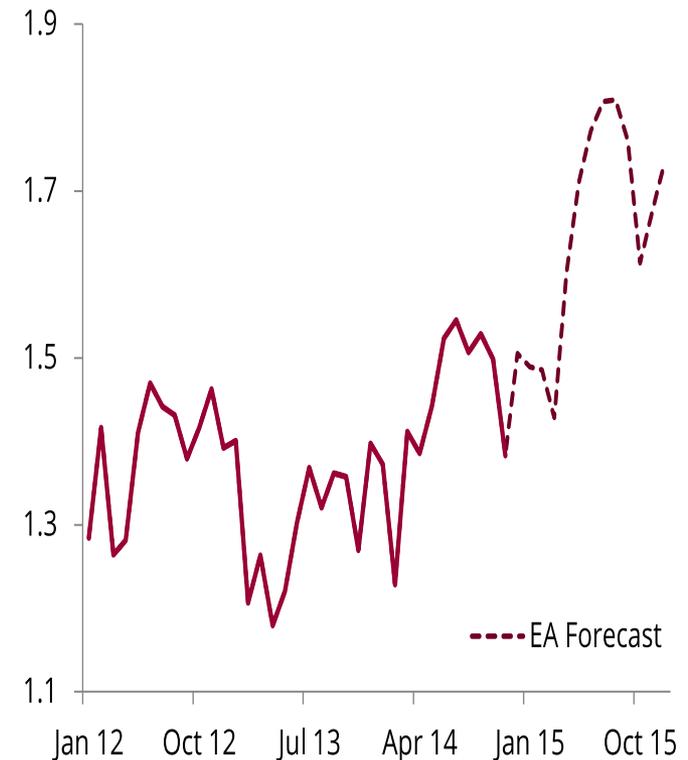
Create Value Added Through Vertical Integration: Refining

Refinery Expansion in Saudi Arabia

	Thousand b/d	Start Up	Saudi Aramco Share (%)	Partner
Satorp, Jubail	400	2013	62.5	Total
Yasref, Yanbu	400	2014	62.5	Sinopec
Jazan	400	2018	100	

Saudi Arabia refining capacity risen sharply as drive towards vertical integration and creation of more value added

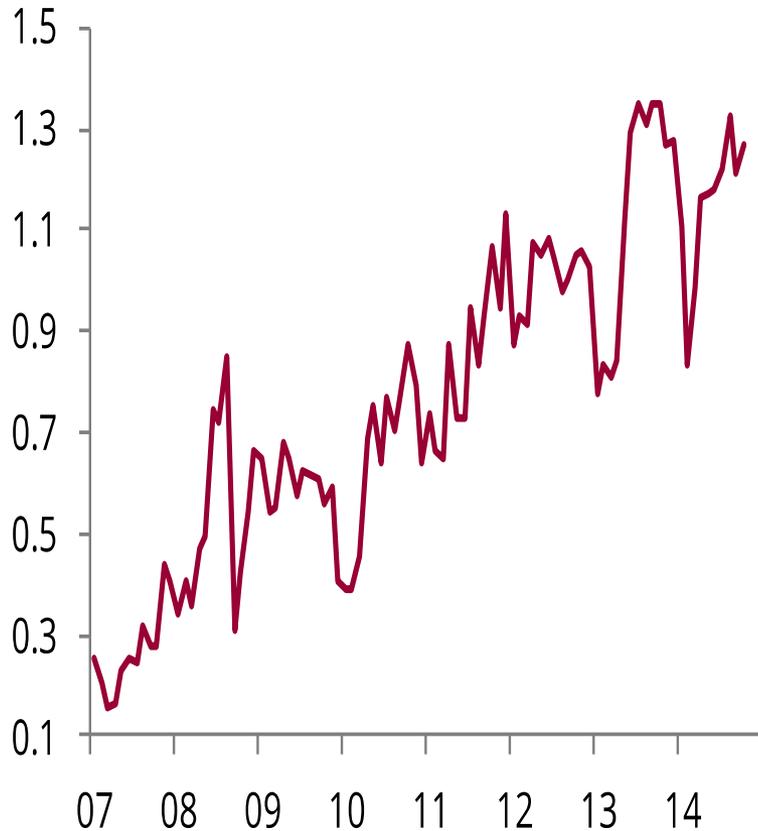
Middle East (ex-Iran) diesel output mb/d



Most of the refining capacity is geared toward the middle of the barrel (diesel and kerosene)

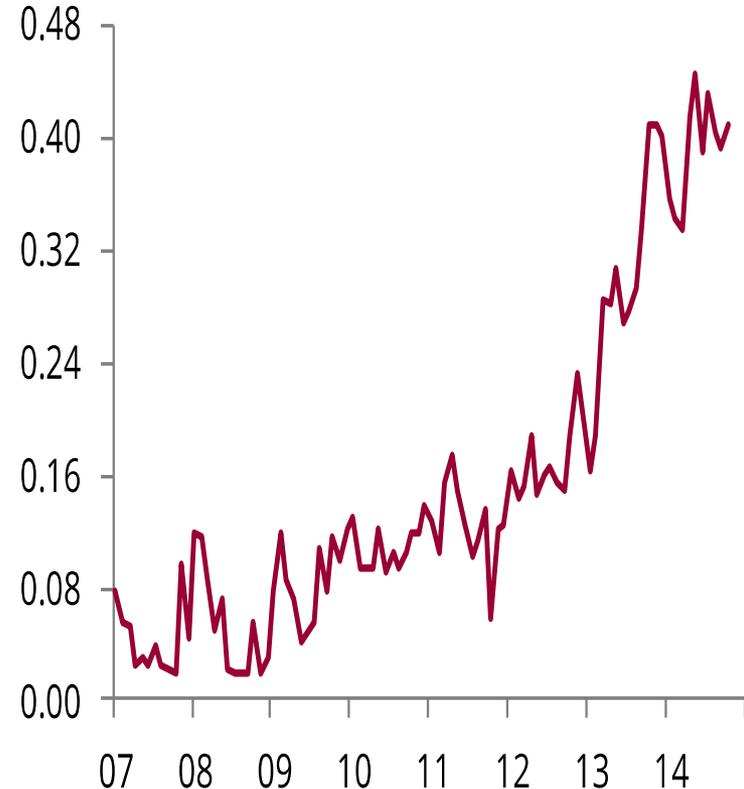
Saudi Arabia will be Competing in the Products Markets Creating Different Set of Challenges

US Distillate exports, mb/d



Shift in trade flows not only limited to crude but also products particularly diesel as US turns into world's largest exporter of diesel

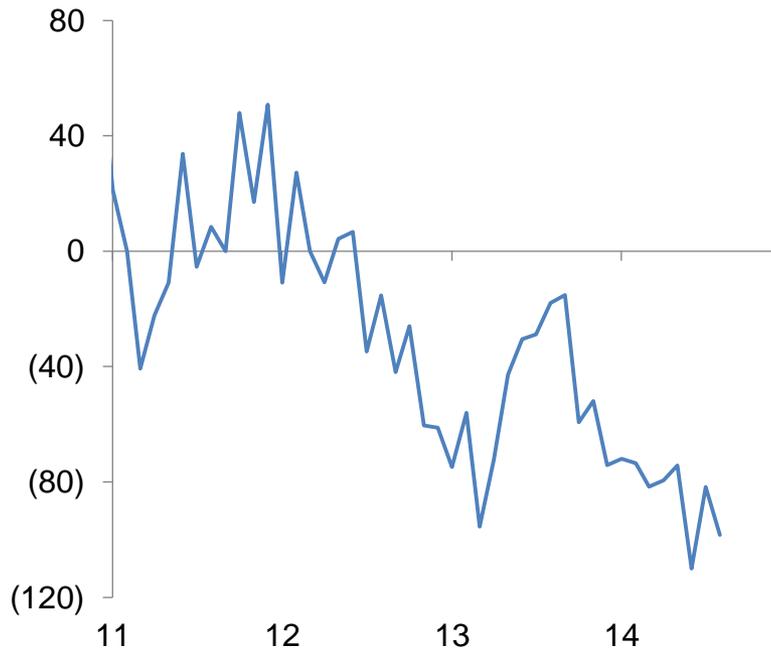
US Propane Exports, mb/d



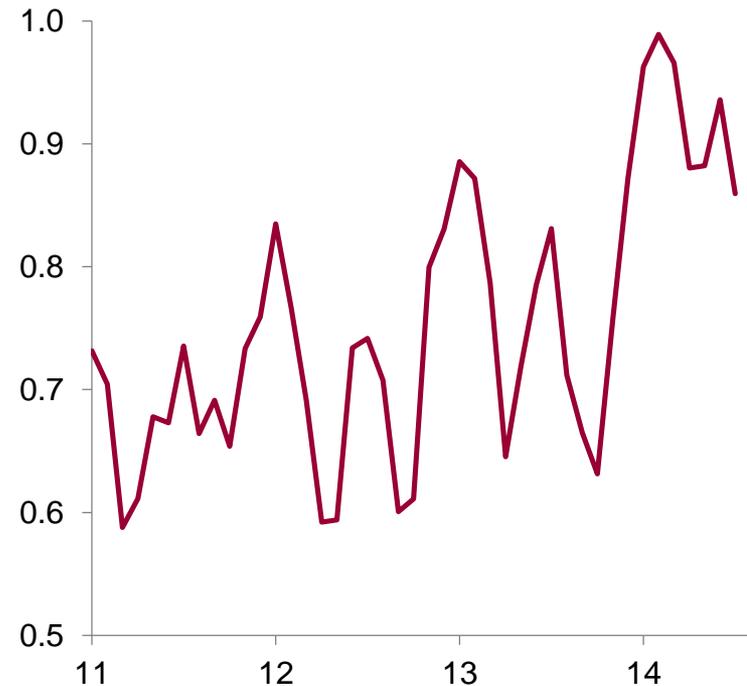
....but also other products such as propane where US propane is reaching Asian and European markets affecting petrochemical feedstock choice

Shifts in Trade Flows in Products

Chinese diesel net exports
Thousand b/d



Russian diesel exports
mb/d

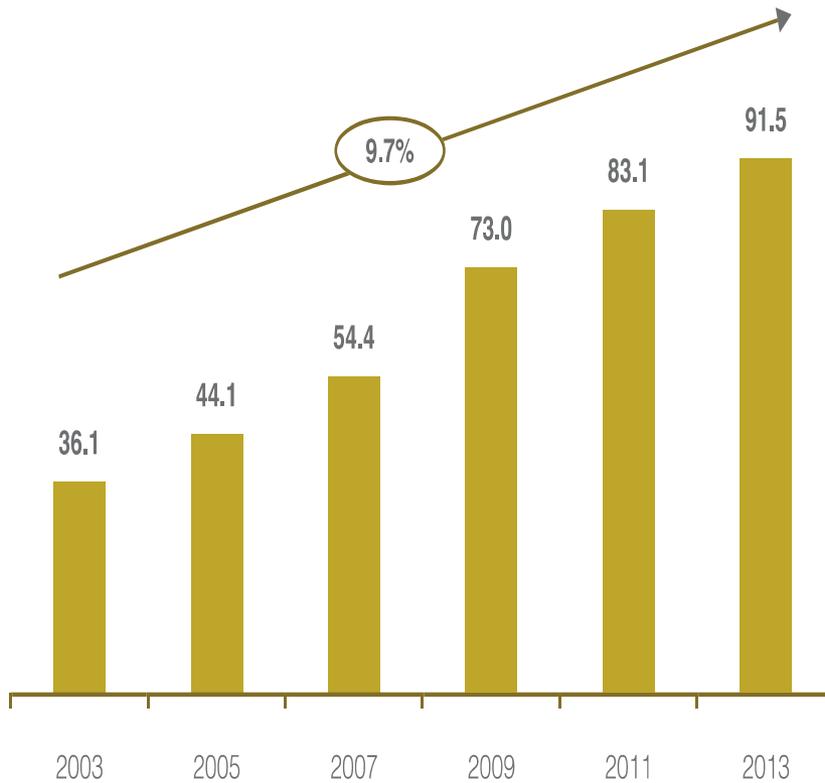


Excess refining capacity has turned net importers of diesel, such as China, into net exporters

Russian diesel exports have risen sharply with rising refinery runs and capital improvements at existing plants

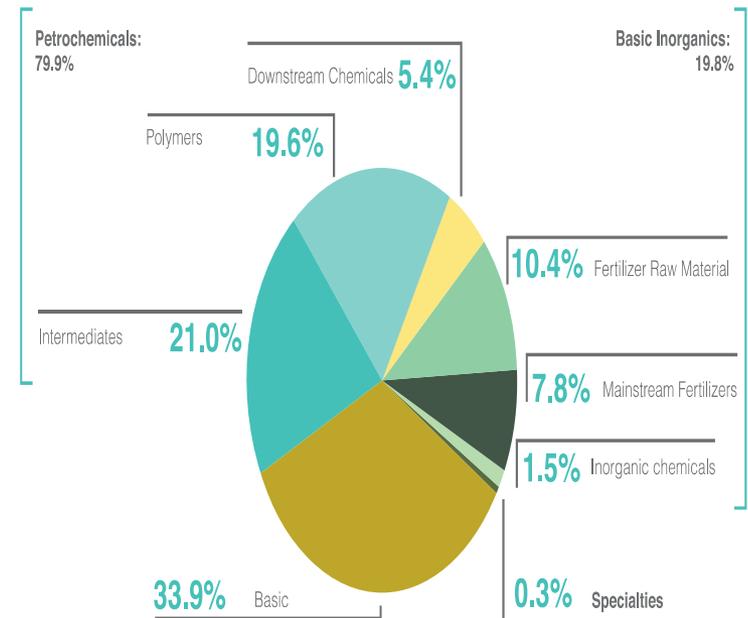
Create Value Added Through Vertical Integration: Petrochemicals

Chemicals Production Capacity in Saudi Arabia
(Million Tons)



Source: Gulf Petrochemicals and Chemicals Association (GPCA), 2014

Saudi Arabia Chemicals Capacity by Product Segment, 2013
Total: 91.5 million tons



Source: Gulf Petrochemicals and Chemicals Association (GPCA), 2014

Conclusions

- Multiple objectives and therefore tradeoffs
- No fundamental change in oil policy but market circumstances dictate trade-off
 - Saudi oil policy could be explained by key structural drivers which have not changed much over the last few decades
- Low oil price is not a policy objective per se
 - Low oil prices will destabilize the exporting country in the long term
 - Low oil prices will not necessarily discourage substitutes (price is not the only determinant of technical progress)
 - Oil substitution policies will continue regardless of the oil price
- Market share over price in the latest cycle
 - Market circumstances: Shale poses new challenges
 - Difficult in agreeing collective cuts: OPEC cohesiveness not possible
 - Greater financial resilience to deal with the decline in the low price
- Saudi Arabia stance could change (pragmatic approach) which makes it difficult to predict next steps