



Missing OPEC

The Unwelcome Return of Boom-Bust Oil Price Cycles

**Presentation to the Dallas Federal Reserve conference, “Oil and the
Economy: Adapting to a New Reality”
Houston Branch Office, November 18, 2016**

Robert McNally
The Rapidan Group

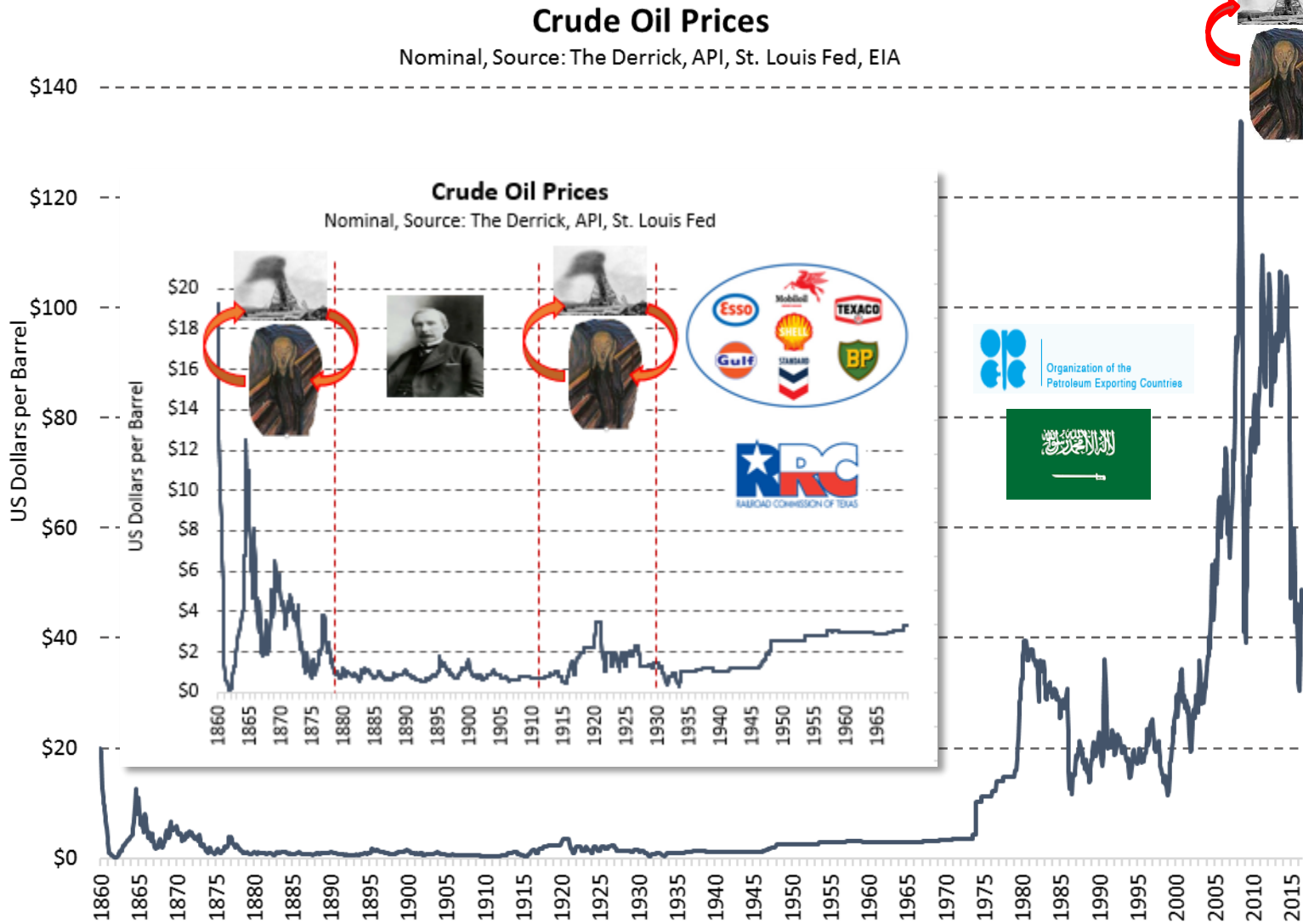
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Some Historical Perspective On Oil Price Volatility

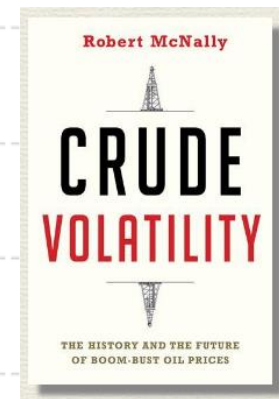
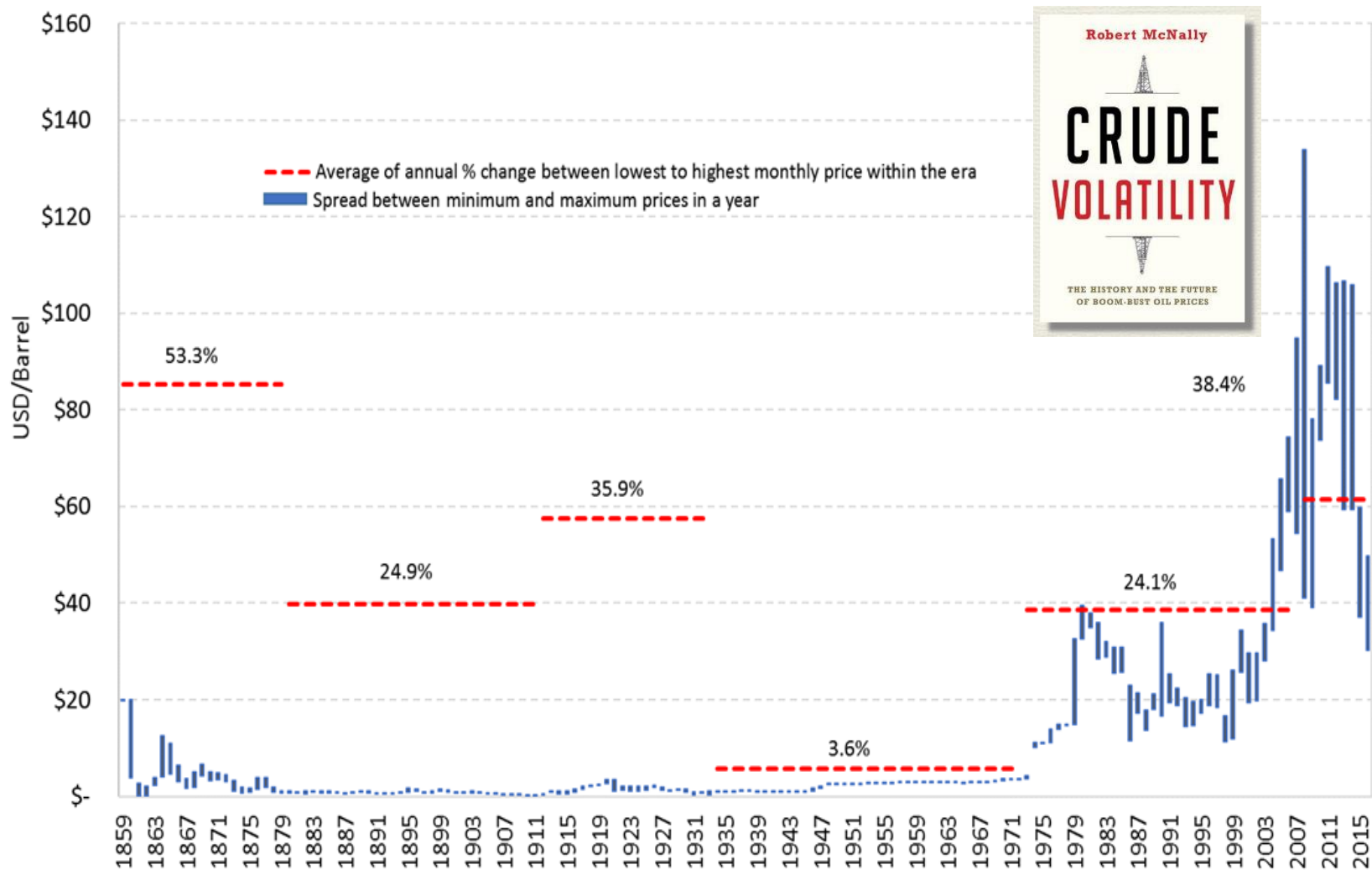
Demand & Supply Inelasticity Means Imbalances = Wild Price Swings

Standard Oil, Texas Railroad Commission, Seven Sisters, OPEC used to manage supply to stabilize prices



Since 2008 the Oil Market Has Been in a Post-OPEC, New Boom-Bust Era

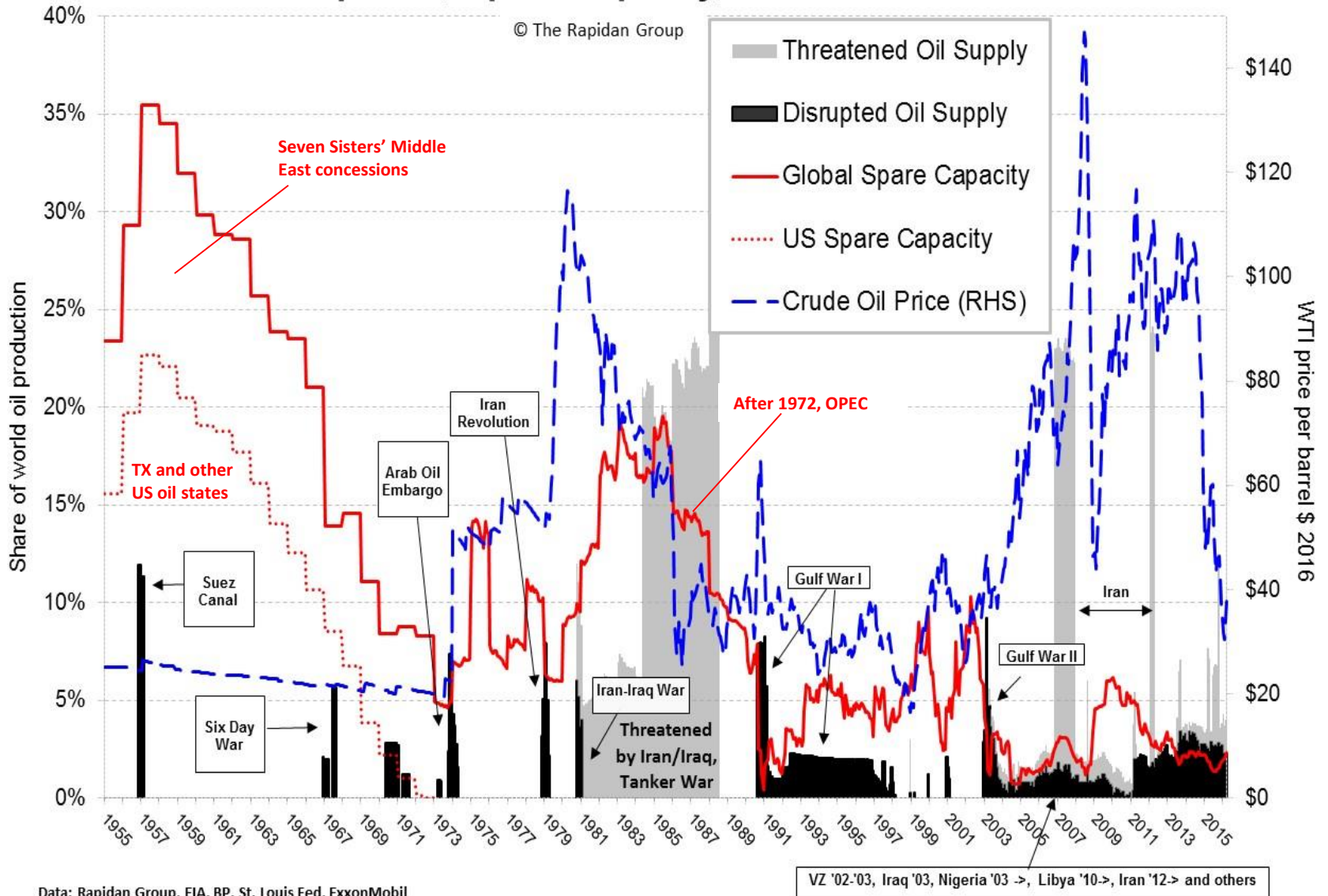
Annual Ranges of Monthly US Crude Oil Prices, 1859-2016



Data Sources: The Derrick, API, St. Louis Fed, EIA, The Rapidan Group

No Spare Capacity, No Peace

Oil Disruptions, Spare Capacity, and Crude Prices

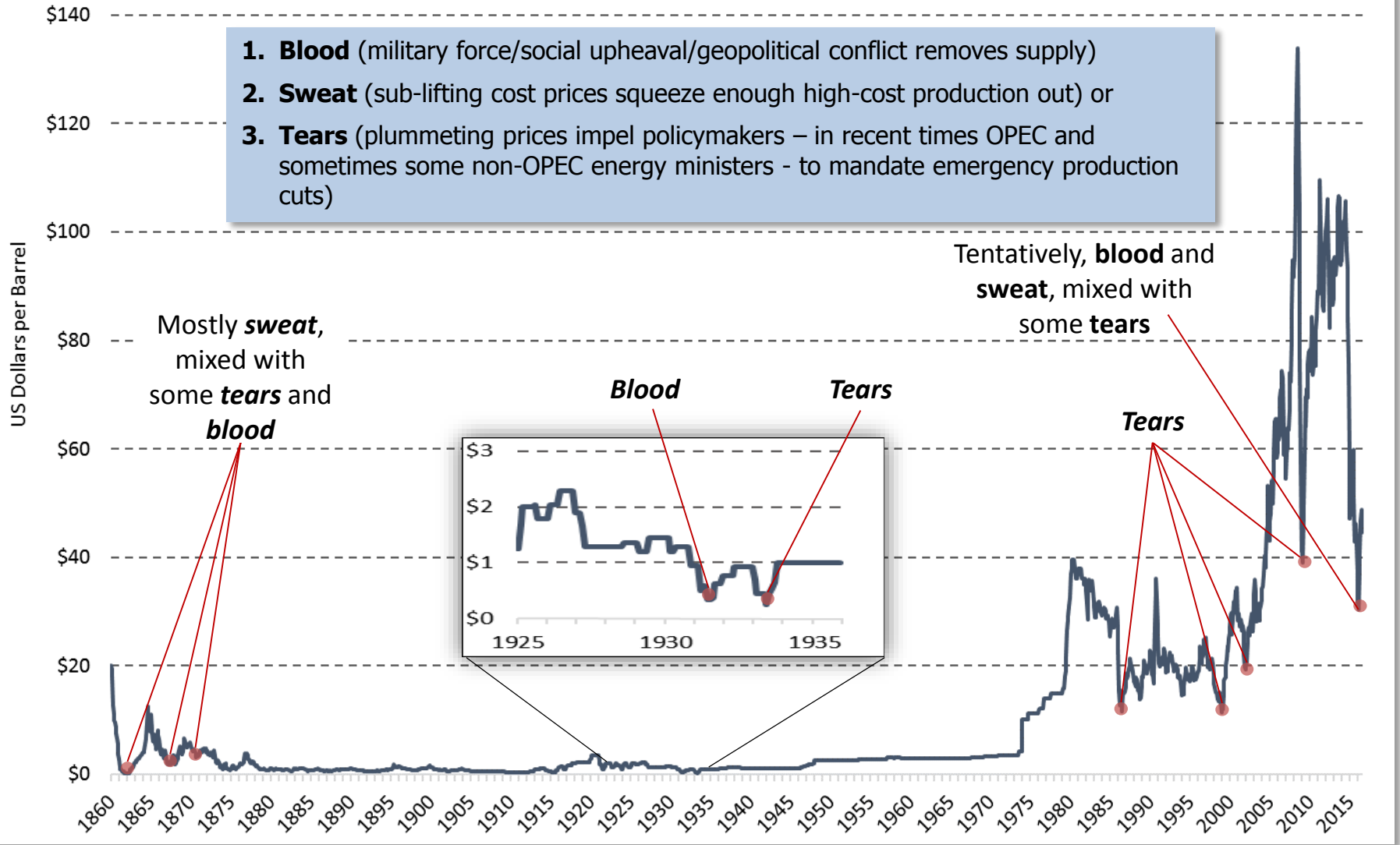


Have Crude Oil Prices Bottomed?

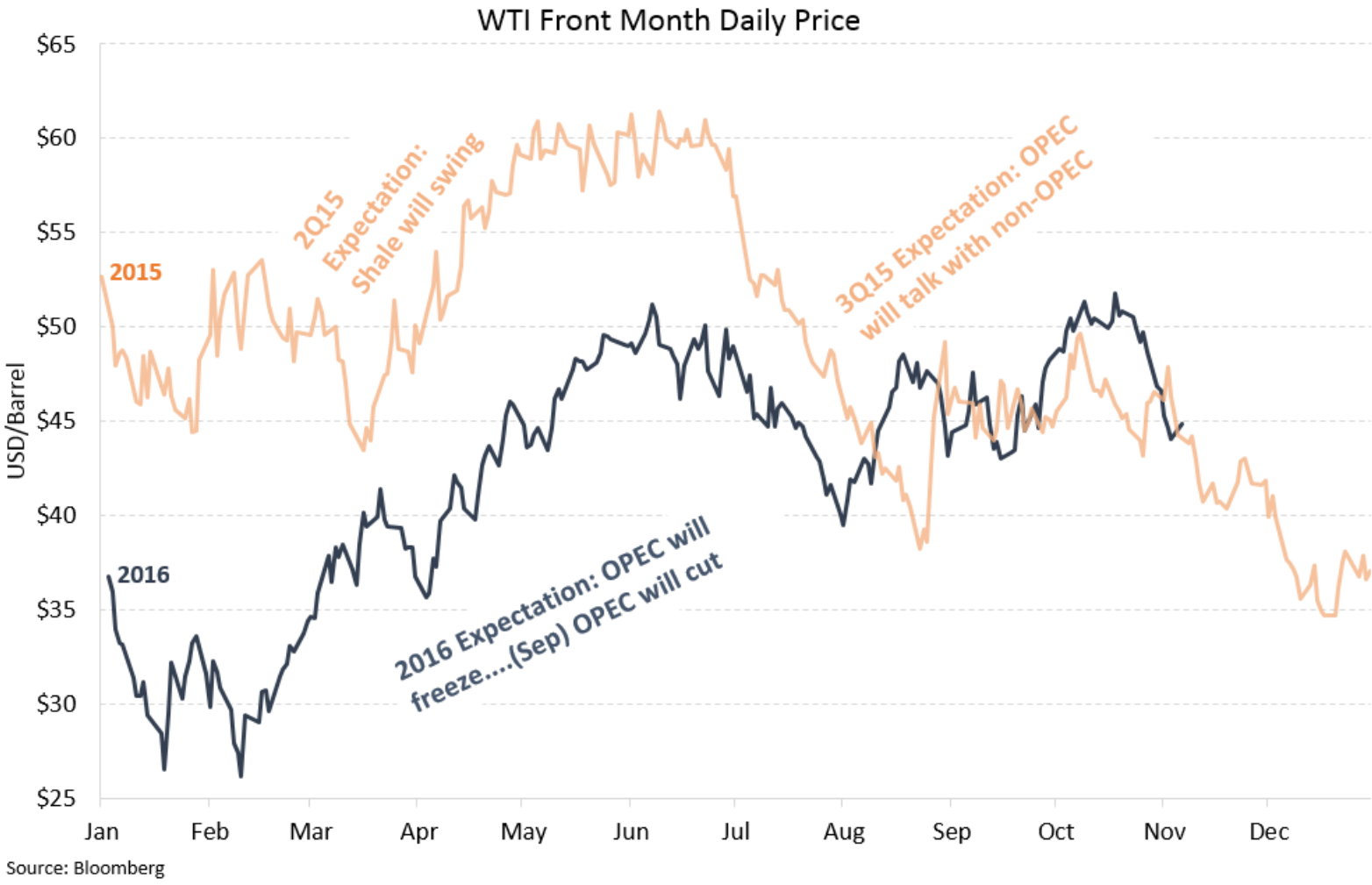
Busts Can End Three Ways

Crude Oil Prices

Nominal, Source: The Derrick, API, St. Louis Fed, EIA



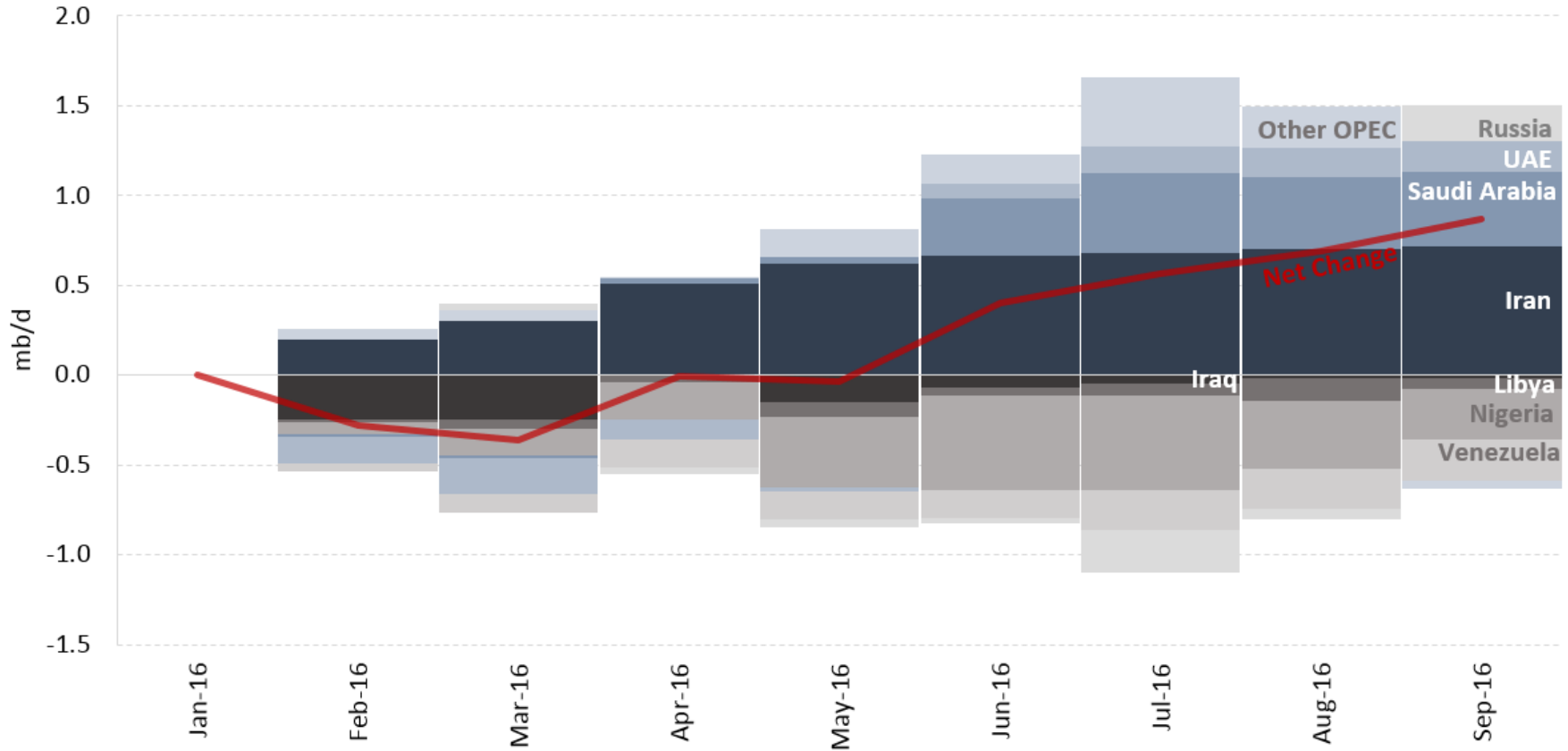
Market Eager to Pounce on Bottom Courtesy of Shale or OPEC



Source: Bloomberg

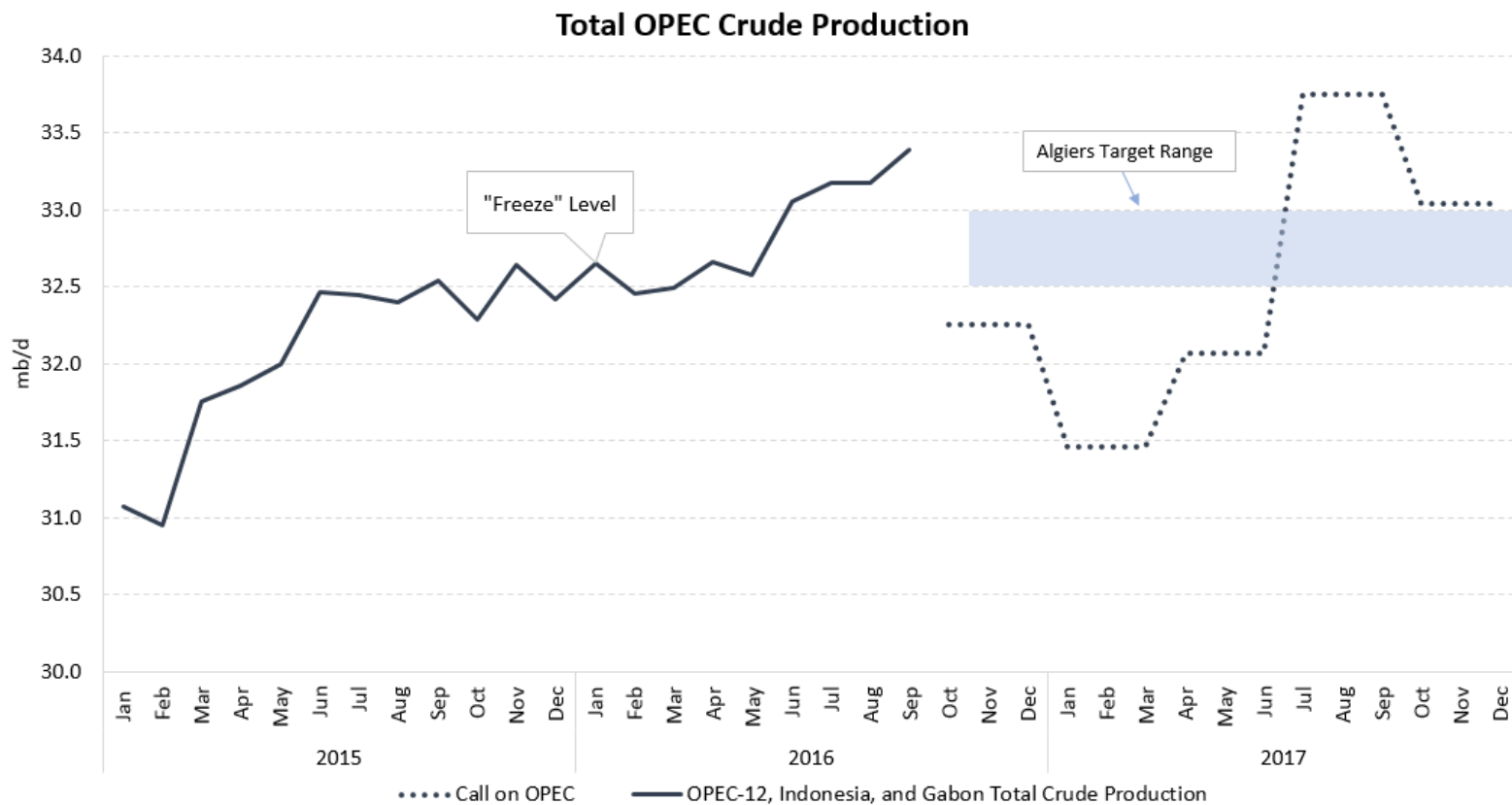
Anti-Freeze - Iran and Saudi Arabia Added an Eagle Ford Since February

Change in OPEC and Russian Crude Production from January 2016



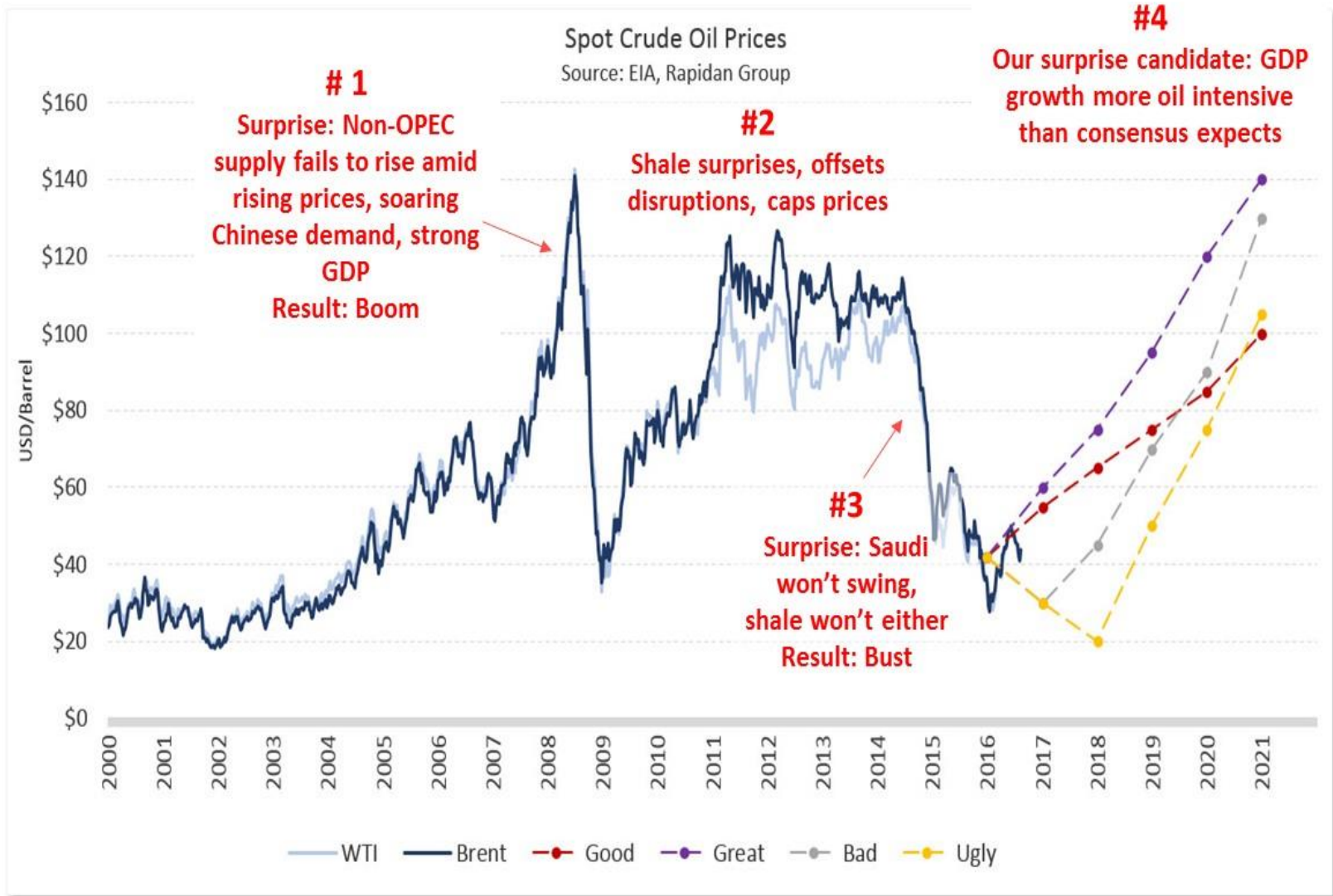
Source: OPEC, IEA, Rapidan Group

Algiers – OPEC Surprised, But With Enhanced Verbal Intervention Instead of Cuts



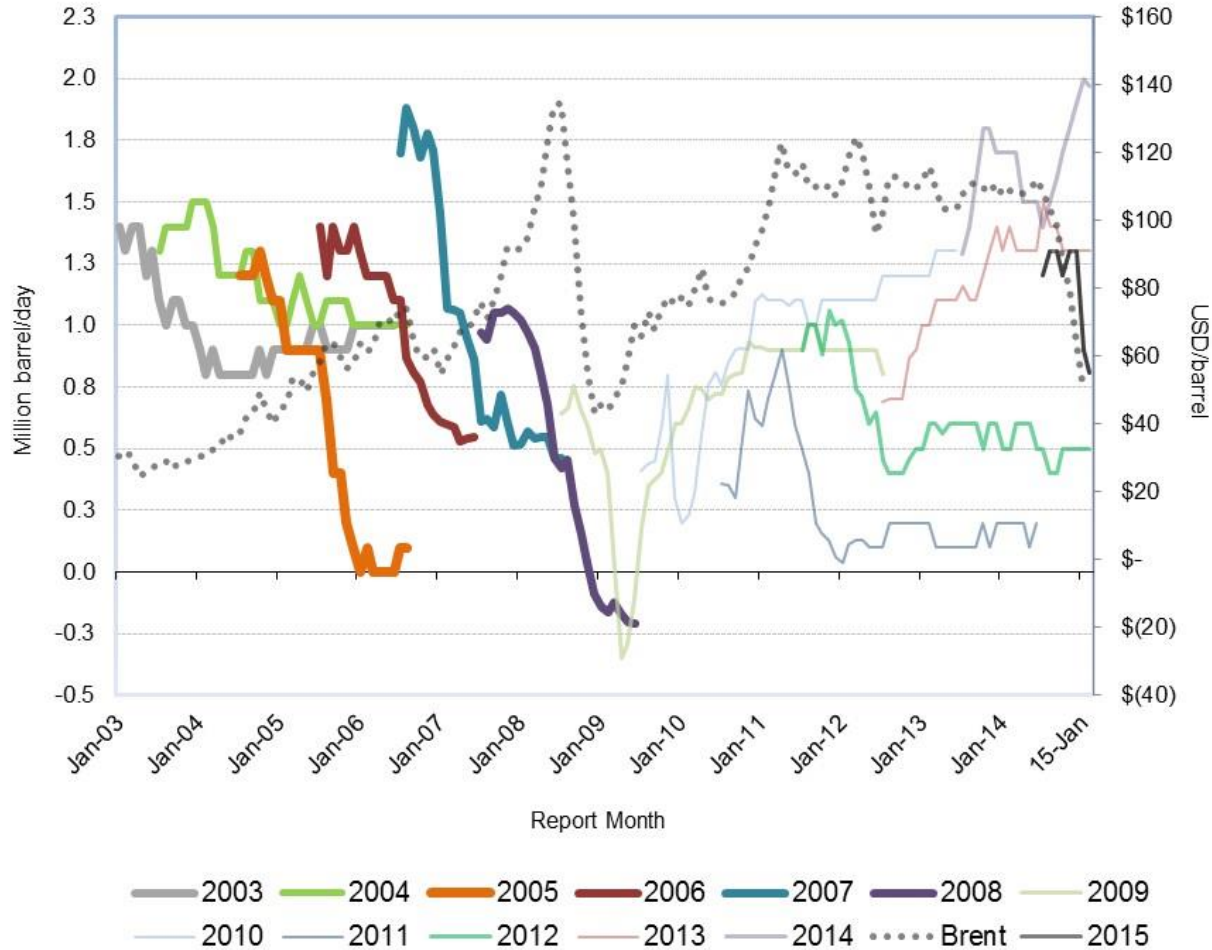
The Next Big Surprise?

Every Five Years or So, Major Surprise Develops and Hits the Market



Surprise #1 – Non-OPEC Supply Curve Steeper than Believed

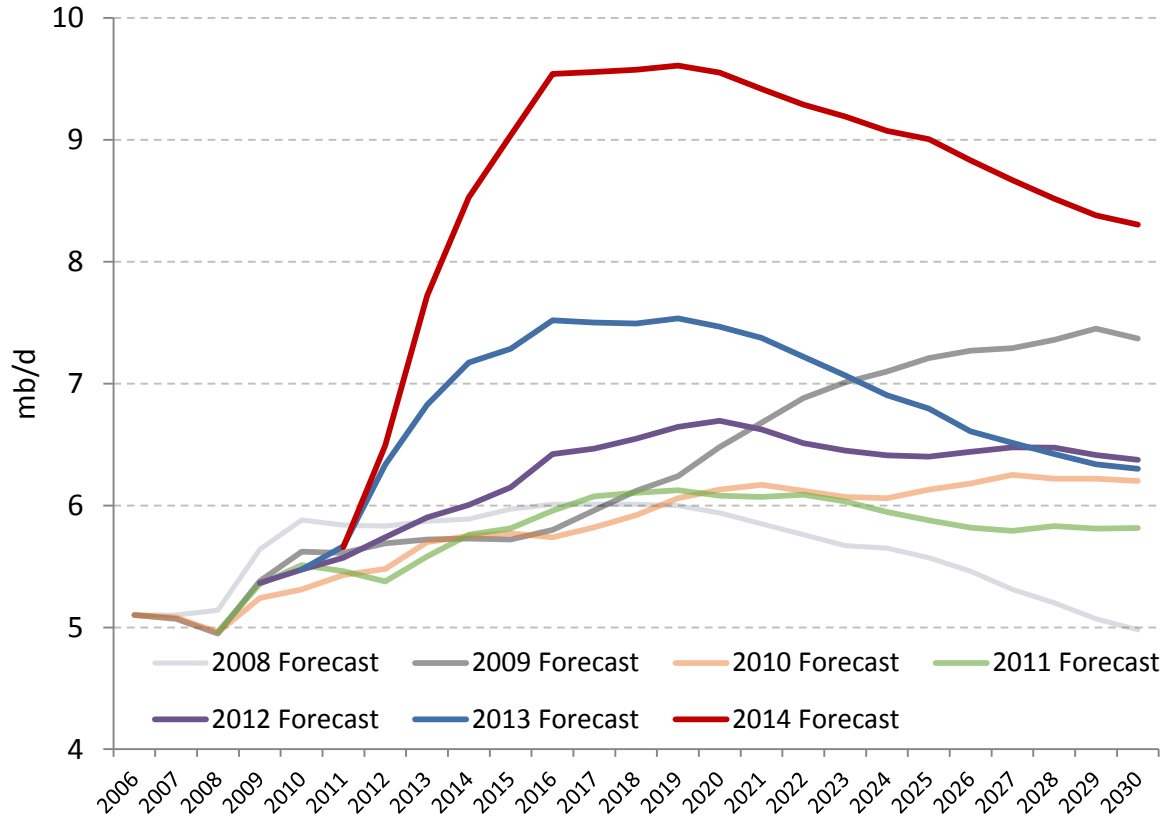
Annual Non-OPEC Production Growth and Crude Prices
IEA Projections ('07-'15 exclude Angola) Sources: IEA, EIA,



Surprise #2 – Shale Oil Bursts from Nowhere

Total US Crude Production Forecast, Reference Case

Source: EIA Annual Energy Outlook



Surprise #3 – Saudi Won't Swing

FINANCIAL TIMES

March 9, 2015 7:52 pm

The big drop: Riyadh's oil gamble

For years Saudi Arabia acted as a safety net in the market, but as prices fell the game changed, writes Anjali Raval

It was October 7, and the price of oil had been falling precipitously since June. Everybody wanted to know when Saudi Arabia would take charge and stem the plunge. "Of course you're going to cut production," declared one guest.

"What makes you think we're going to cut?" the Saudi official replied.

The throwaway remark, recounted by one of the attendees, reverberated across markets. It was the first sign that Saudi Arabia would not come to the oil market's rescue, shattering long-held assumptions about the kingdom's oil policy and shaking up a world energy order in place for decades.

By **NICOLE FRIEDMAN**
THE WALL STREET JOURNAL. Oct. 28, 2014 3:54 p.m. ET
 COMMODITIES

Why the Drop in Oil Prices Caught So Many by Surprise

Then, the widely shared assumption in the oil market that OPEC would collectively cut production to keep prices high started to look shaky. Saudi Arabia, the world's biggest oil exporter, has indicated in recent weeks that it is comfortable with a lower oil price, and prices have fallen in response to these signals.

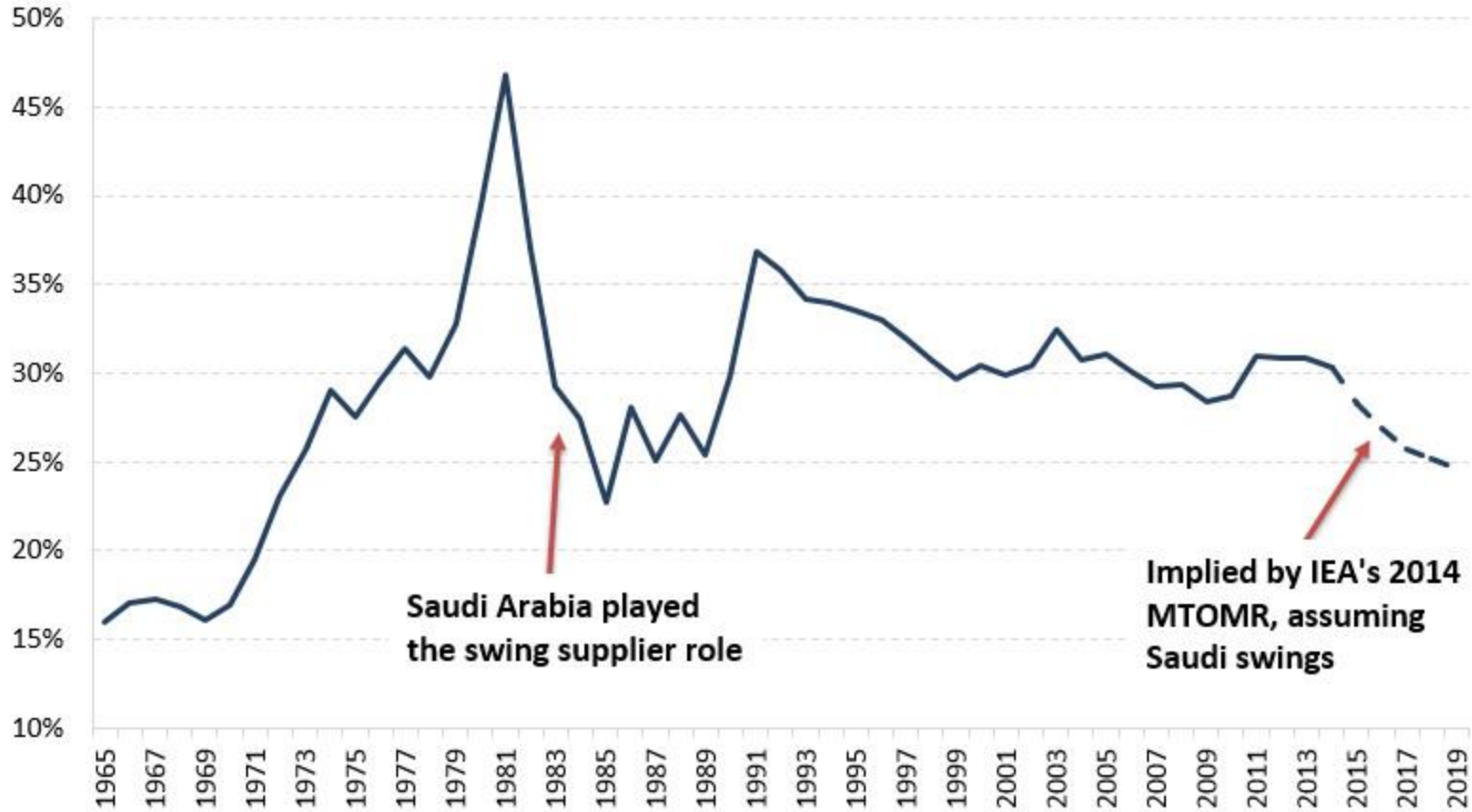
OPEC Spare Capacity



Source: IEA, BP — BP 2014 Spare capacity — 2014 MTOMR Implied Spare Capacity — 2014 MTOMR Effective Spare Capacity

Surprise #3 – Saudi Won't Swing

Saudi Share of OPEC Production



Source: TRG, BP, IEA, EIA

Surprise #4 – “Peak Demand” Predictions Fall Far Short

Opec: oil demand could peak in just over a decade
 Cartel says oil demand could peak in 2029 if signatories of Paris climate deal meet aims

Financial Times, November 8, 2016

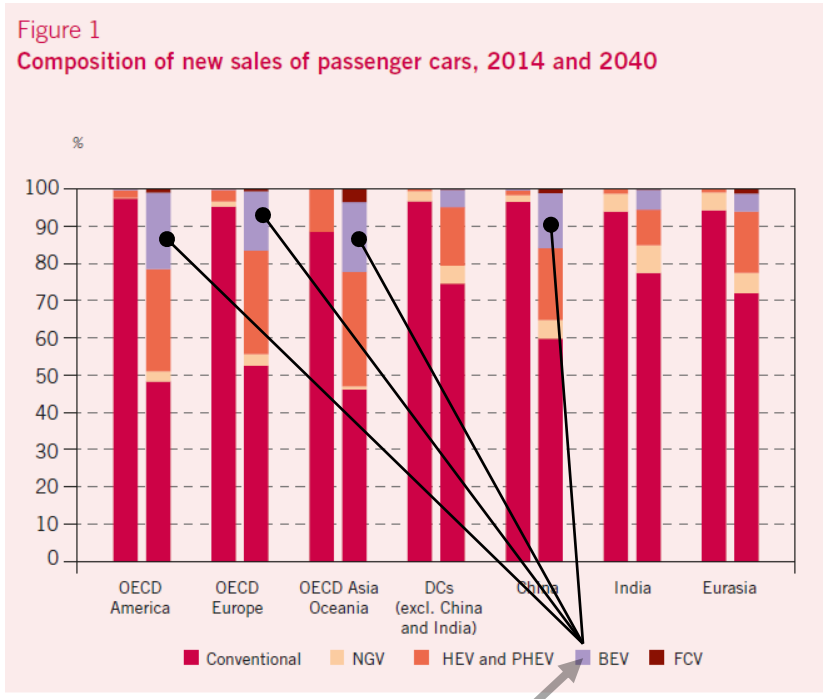
Forget 'Peak Oil': We could reach 'Peak Demand' for energy before 2030
 Anmar Frangoul | Special to CNBC.com
 Monday, 10 Oct 2016 | 8:04 AM ET

Global demand for energy will peak in 2030, says World Energy Council
 New technology and stricter policies will transform energy industry as phenomenal growth in solar and wind power continues

The Guardian, October 10, 2016

Energy Giant Shell Says Oil Demand Could Peak in Just Five Years

Bloomberg, November 2, 2016



World Oil Outlook 2016, OPEC

Battery electric vehicles

BEVs have been talked about for some time, but there remain some major drawbacks that, to a certain extent, will limit the penetration of such vehicles.

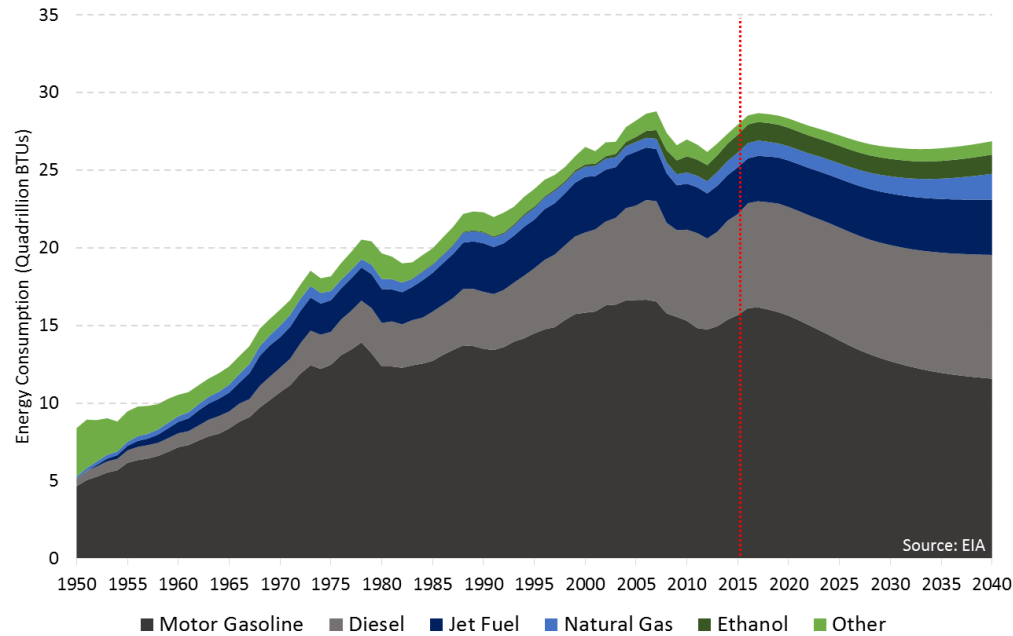
To start with, it should be noted that the drastically increased weight of BEVs over conventional ICE-powered cars causes the average power consumed at the

EIA Assumes US Oil Demand Peaks, Then Declines Because Gasoline Implodes

Unrealistic vehicle efficiency gains underpin massive decline in transportation sector gasoline demand

- Peak demand in transport sector includes massive declines in gasoline use
- Other fuels (diesel, jet fuel, electricity, etc.) grow in use while gasoline fades
- Diminished gasoline use is due to efficiency gains in light duty vehicles (see below from AEO 2016), sharp diversion from history

Energy Consumption in the U.S. Transportation Sector by Fuel 1950-2040



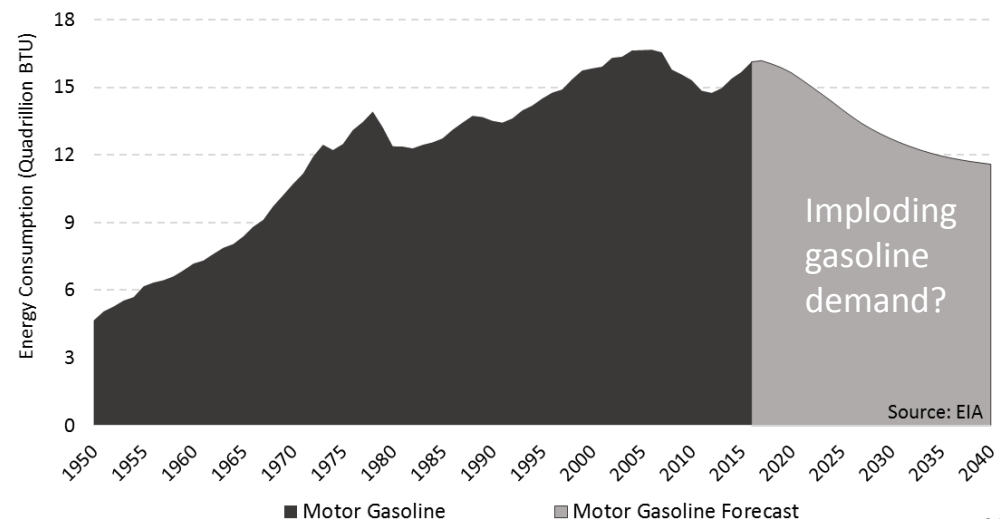
• Transportation sector total delivered energy consumption (excluding pipeline) declines over 2015-40 in the Reference case. This trend differs markedly from history, which saw 1.3% average annual growth over 1973-2007 (2007 was the peak year for consumption).

• Petroleum-based gasoline use falls 26.3% over 2015-40, driven by rising light-duty vehicle fuel economy.

• Use of all other transportation fuels grows over 2015-40, led by diesel fuel and compressed and liquefied natural

Source: EIA Annual Energy Outlook 2016

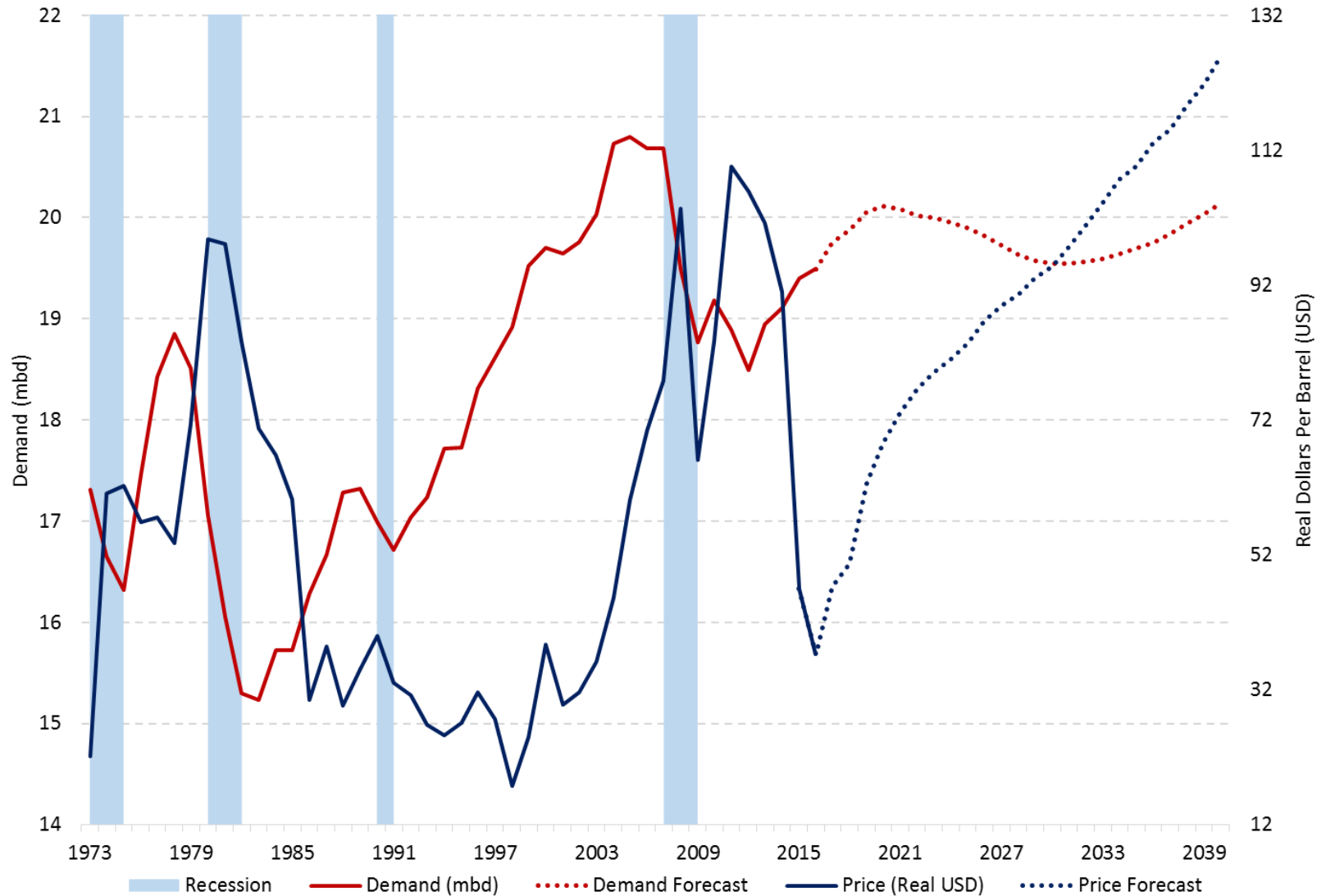
Gasoline Consumption in the U.S. Transportation Sector 1950-2040



US Demand Forecasts Show Future Decline – But Where’s the Recession?

Prices rise while demand remains flat in EIA’s base forecast

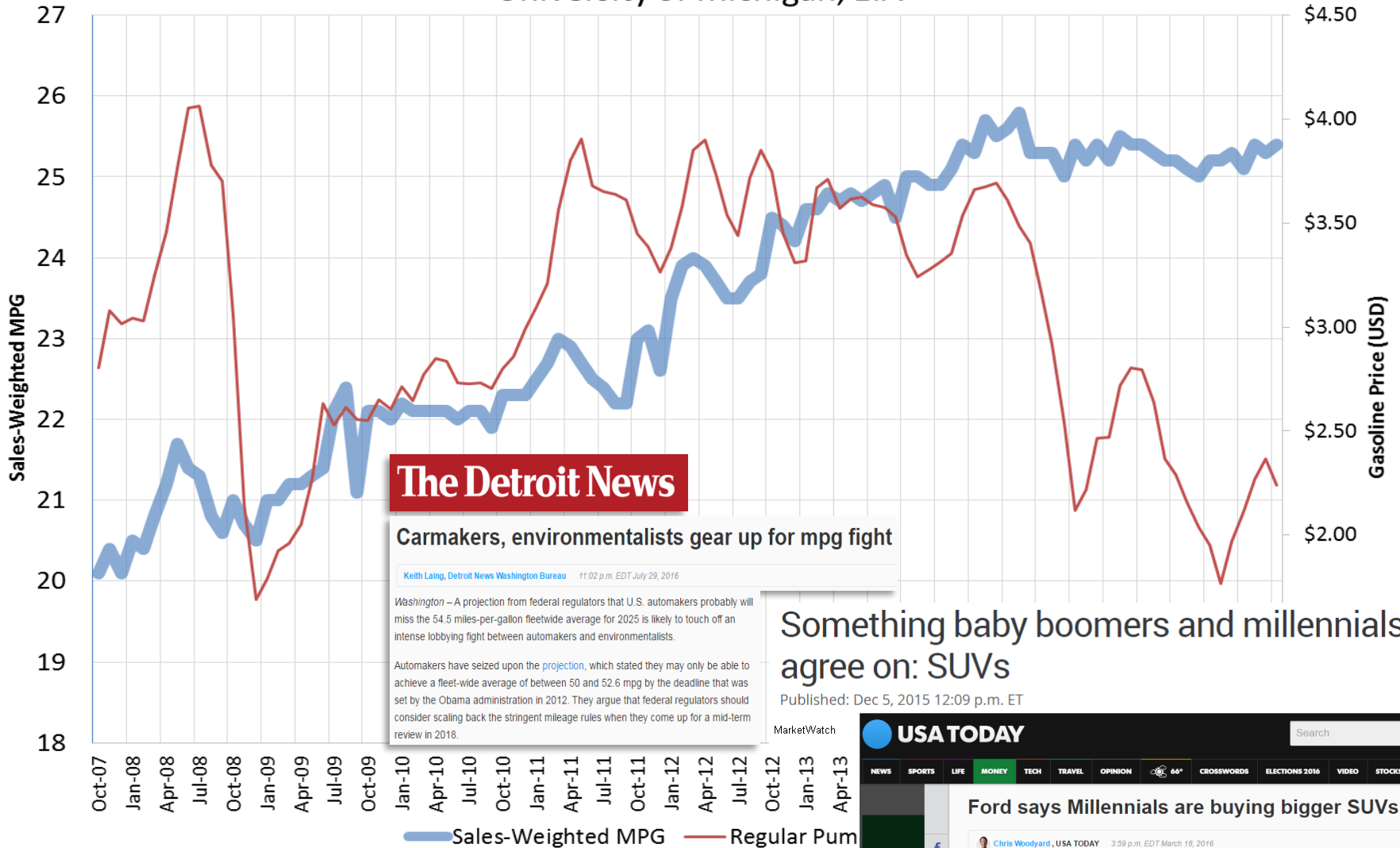
US Oil Demand and Real Crude Prices



Big Battle Shaping Up Over Fuel Economy Standards in Washington

Sales-Weighted MPG of New Car Purchases and Pump Prices

University of Michigan, EIA



The Detroit News

Carmakers, environmentalists gear up for mpg fight

Keith Laing, Detroit News Washington Bureau 11:02 p.m. EDT July 29, 2016

Washington – A projection from federal regulators that U.S. automakers probably will miss the 54.5 miles-per-gallon fleetwide average for 2025 is likely to touch off an intense lobbying fight between automakers and environmentalists.

Automakers have seized upon the projection, which stated they may only be able to achieve a fleet-wide average of between 50 and 52.6 mpg by the deadline that was set by the Obama administration in 2012. They argue that federal regulators should consider scaling back the stringent mileage rules when they come up for a mid-term review in 2018.

Something baby boomers and millennials agree on: SUVs

Published: Dec 5, 2015 12:09 p.m. ET

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Ford says Millennials are buying bigger SUVs

Chris Woodyard, USA TODAY 3:59 p.m. EDT March 18, 2016

Ford is finding that Millennials are opting to buy its

Millennials May Want to Drive as they Start Families and Jobs

Which would disappoint environmental groups

RESOURCES FOR THE FUTURE Research

BLOG POST

Complying with the CAFE Standards: Will It Be More Difficult than Predicted?

Feb 11, 2016 | K.G. Duleep

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This is the fifth of five posts in the RFF blog series, Evidence for the New CAFE Standards, examining key issues related to Fuel Economy (Wednesday Series)

The Detroit News

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Ford is finding that Millennials are opting to buy its

environment360
Reporting, Analysis, Opinion & Debate

07 APR 2016: ANALYSIS

On Fuel Economy Efforts, U.S. Faces an Elusive Target

One of President Obama's signature achievements on climate has been strict standards aimed at improving auto fuel efficiency to nearly 55 miles per gallon by 2025. But credits and loopholes, coupled with low gas prices, may mean the U.S. will fall well short of this ambitious goal.

BY MARC GUNTHER



ABOUT THE AUTHOR

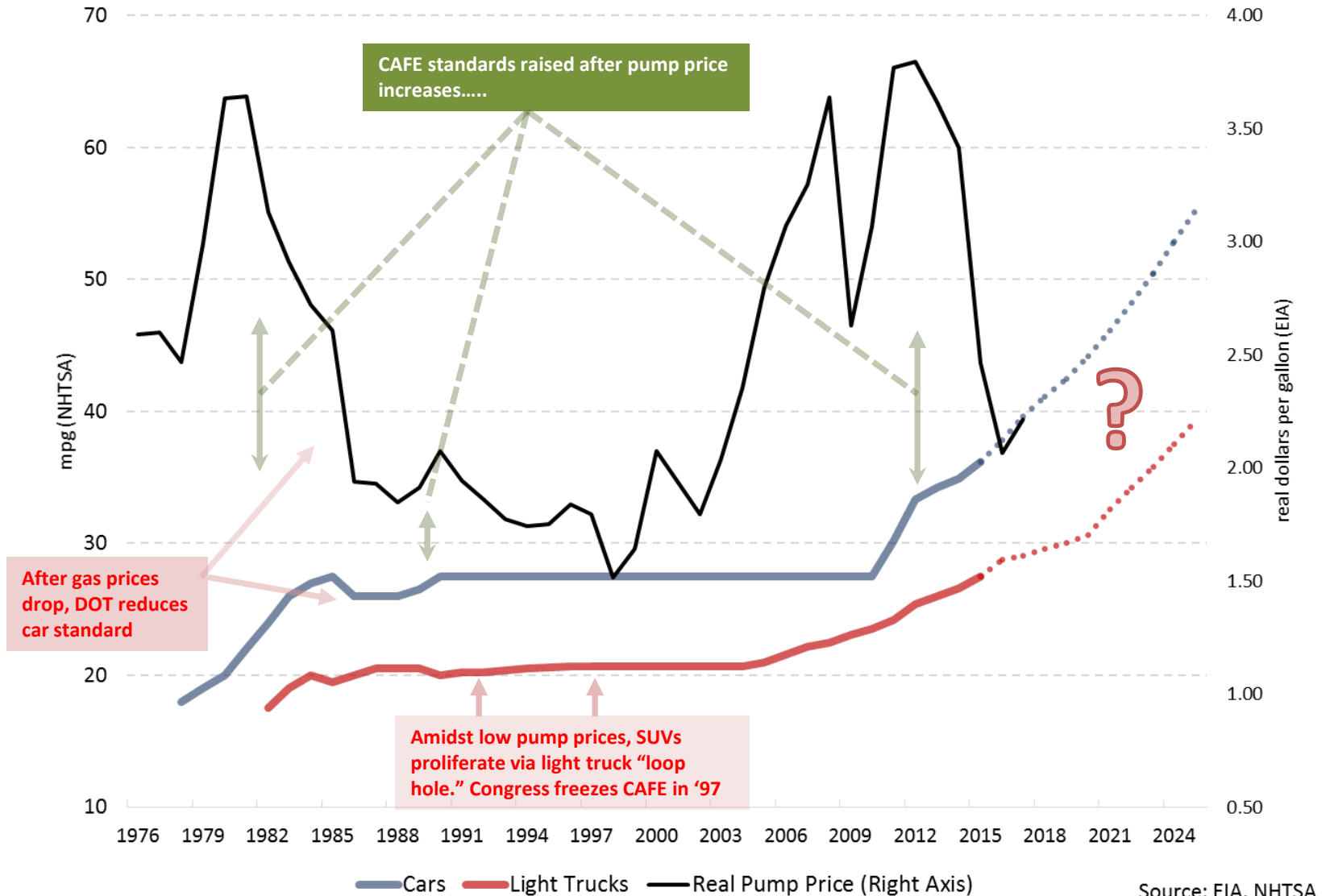
Marc Gunther has reported on business and sustainability for *Fortune*, *The Guardian*, and *GreenBiz*. He now writes about foundations, nonprofits, and global development on his blog, *Nonprofit Chronicles*. In previous articles for *Yale Environment 360*, he has reported on whether green bonds could bankroll a clean energy revolution and if large companies can lead the low-carbon revolution.

MORE BY THIS AUTHOR

Five years ago, flanked by auto industry executives at a Washington, D.C.

History Shows Washington Shirks from *Biting* Fuel Economy Standards

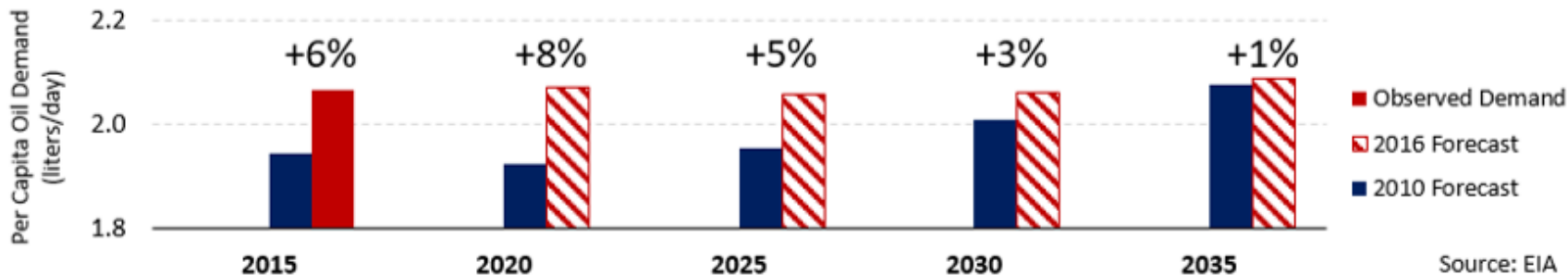
Fuel Economy Standards and Real Pump Prices



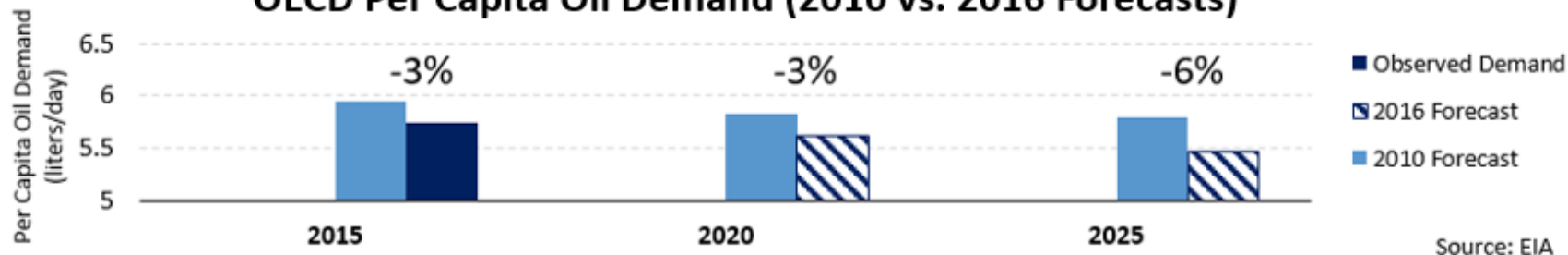
Source: EIA, NHTSA

Reality Check: Forecasters Seeing Thirstier Demand Growth

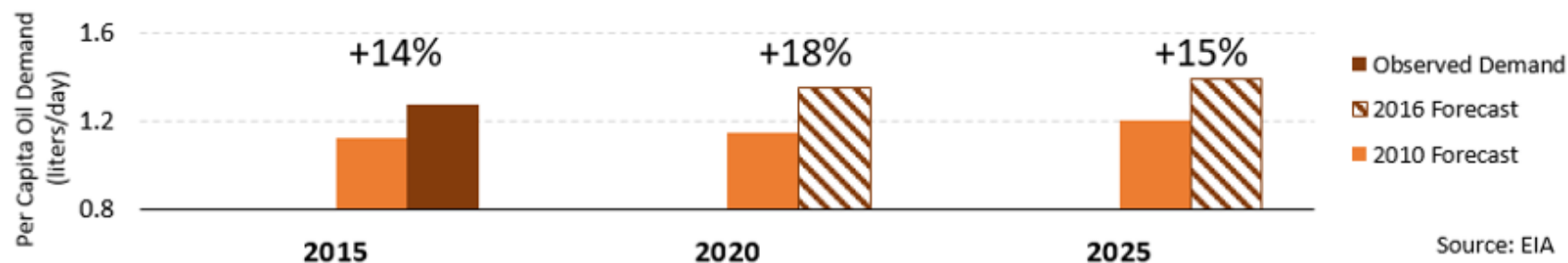
Total World Per Capita Oil Demand (2010 vs. 2016 Forecasts)



OECD Per Capita Oil Demand (2010 vs. 2016 Forecasts)



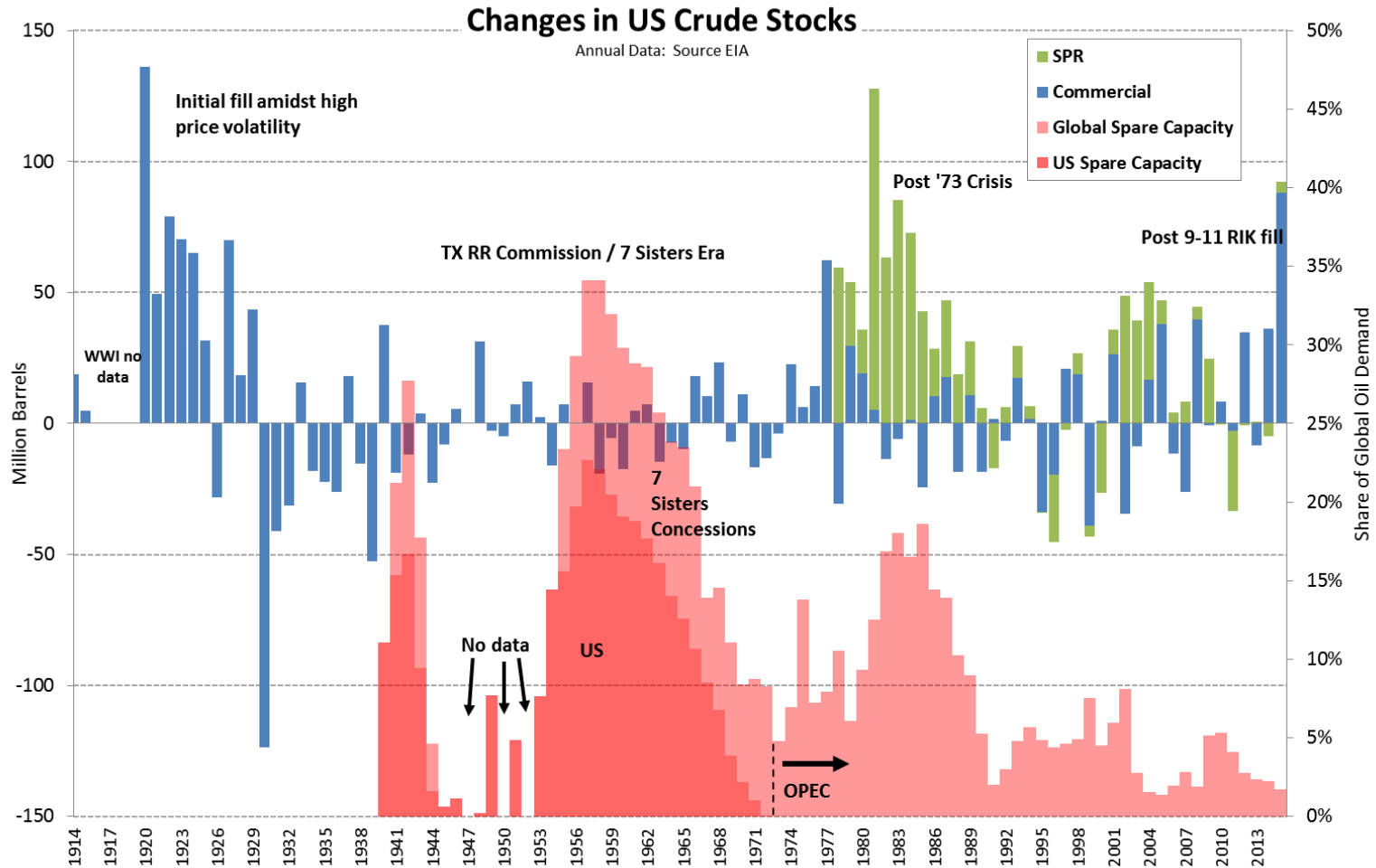
Non-OECD Per Capita Oil Demand (2010 vs. 2016 Forecasts)



Let's Not Forget About Frantic Inventory Building

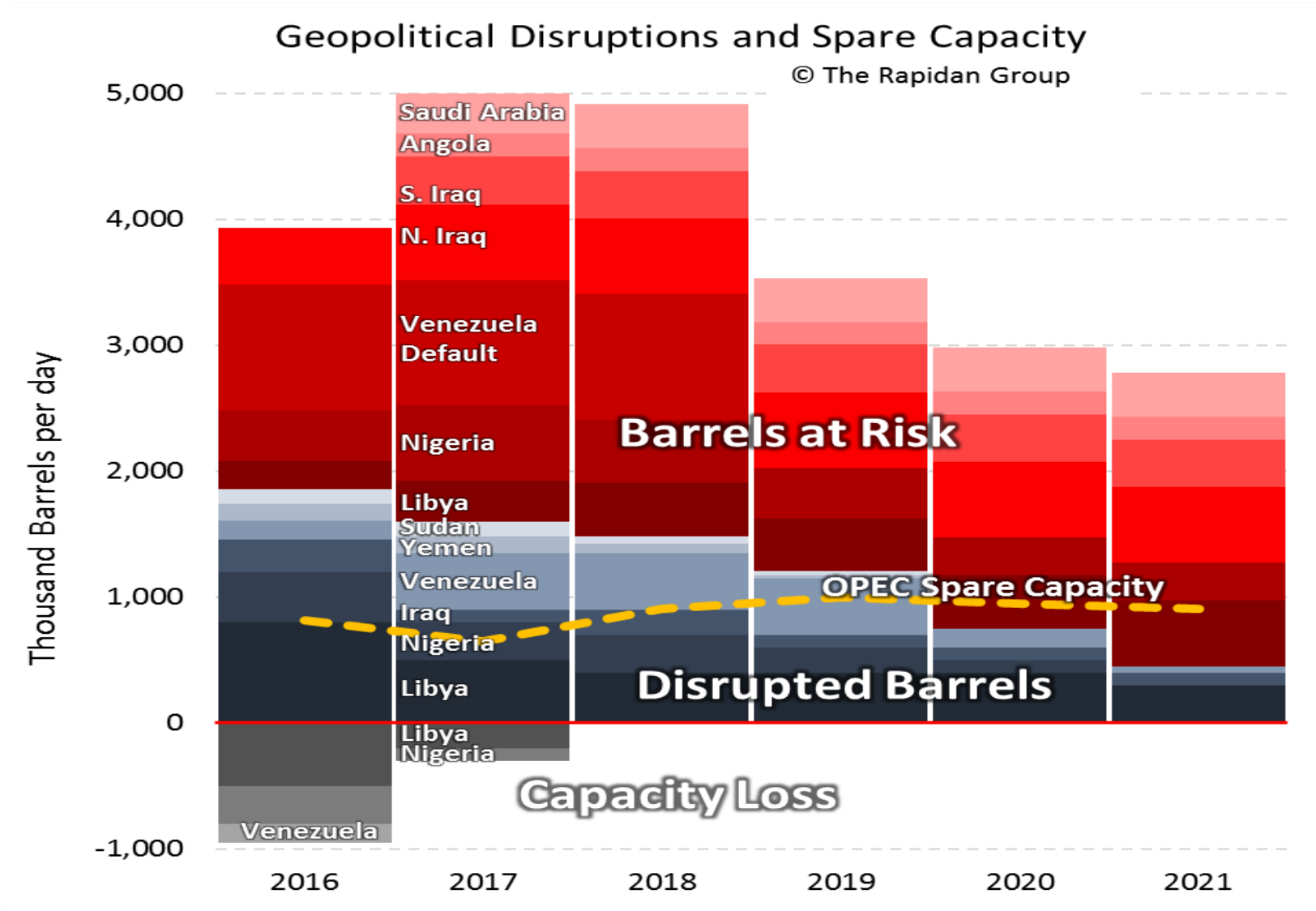
The US built inventory cover in periods of high spare capacity, but China and India will fill in a tight market

- India and China have both announced plans to acquire 90 days of import cover
- We expect China will work aggressively to import an additional 2-400 million barrels of crude in the coming years
- India will be slower to ramp up; 39 million barrels of storage will likely be filled in the next 12-18 months, but plans to fill an additional 91 million barrels by 2020 are ambitious and could be delayed



Barrels at Risk

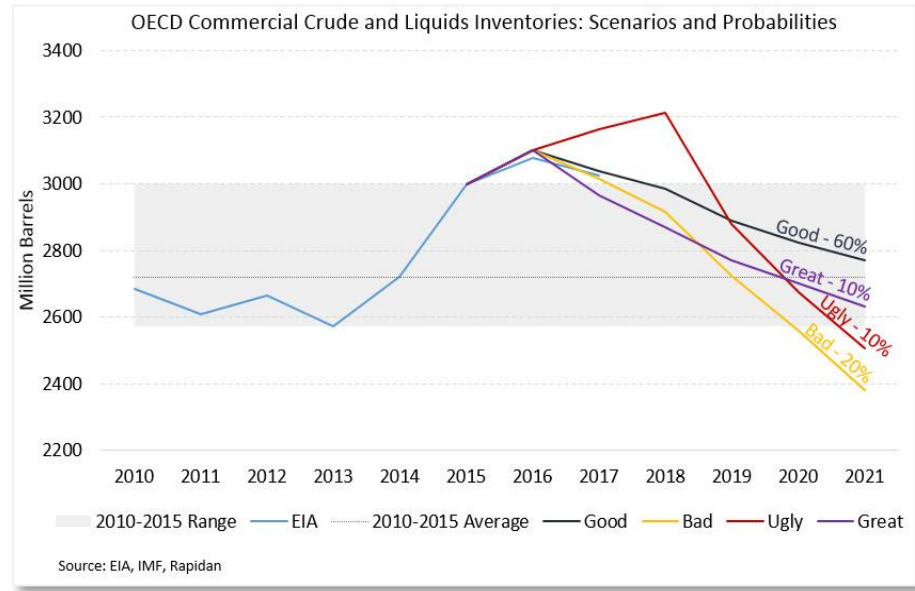
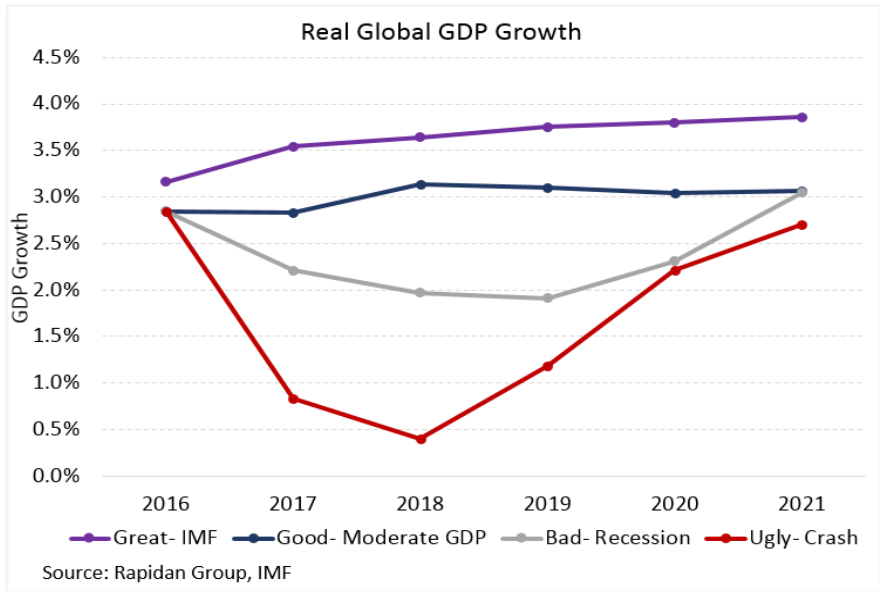
"Base Case" - Moderate GDP (60% odds): Disruptions average 1.2 mb/d through 2021; 2.6 mb/d threatened



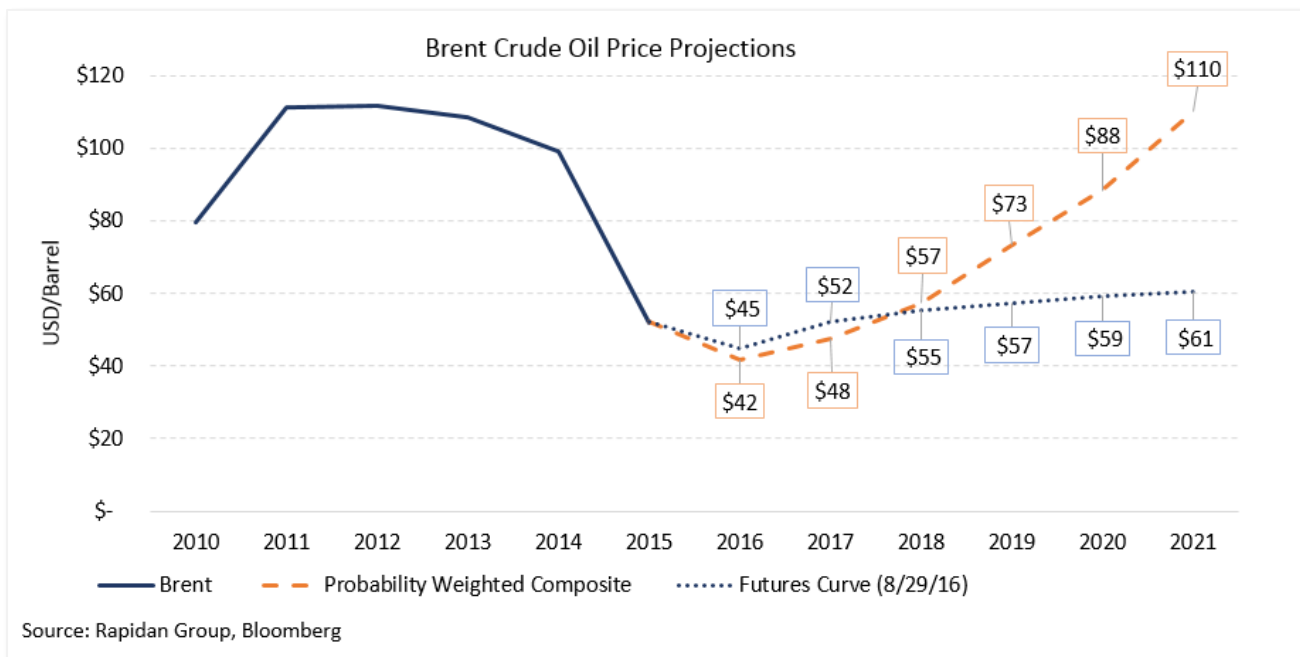
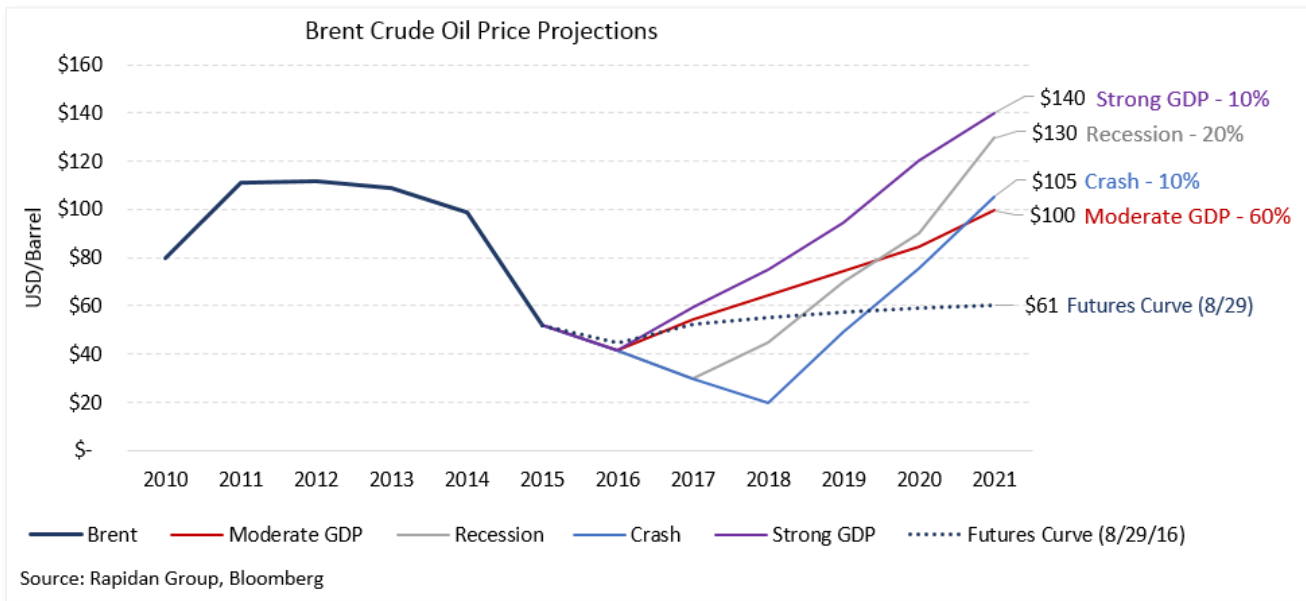
Our Price Scenarios and Probabilities



Boom To Follow Bust
Rapidan Group Five Year Oil Market Outlook
 August 2016



Our Price Scenarios and Probabilities





Thank You

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