(1) What sustained high price over 2005-2013?

(2) Why did price collapse since 2014?
World field production of crude oil (1000 b/d)

Excludes natural gas liquids, refinery process gains, and biofuels
(1) What sustained high price over 2005-2013?

Answer: Production barely increased May 2005 to May 2013 despite strong growth in demand from emerging market economies.
(2) Why did price collapse since 2014?

Answer:
Fracking, China, and the geopolitics of oil
1. Fracking

U.S. field production of crude oil (1000 b/d)
Number of drilling rigs active in U.S. shale oil counties
Oil produced from newly drilled wells divided by number of active rigs in shale oil counties
• How did productivity improve so much?
• Finishing wells faster
• Higher average production per well
Multiple wellheads from single pad

Source: http://www.eia.gov/todayinenergy/detail.cfm?id=7910
Better technology for moving rigs quickly

Source: http://www.eia.gov/todayinenergy/detail.cfm?id=7910
Average Bakken well decline rates by year (production from the well after $n$ months)

Source: Decker, Flaaen, and Tito (2016) http://dx.doi.org/10.17016/2380-7172.1736
Survey-based estimates of long-run break-even oil price for Niobrara shale

Source: Decker, Flaaen, and Tito (2016) http://dx.doi.org/10.17016/2380-7172.1736
2015 operating income for 5 major shale oil producers

<table>
<thead>
<tr>
<th>Company</th>
<th>2014 production (1000 b/d)</th>
<th>2015 profit ($M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EOG</td>
<td>288</td>
<td>-6,686</td>
</tr>
<tr>
<td>Pioneer</td>
<td>182</td>
<td>-1,917</td>
</tr>
<tr>
<td>Devon</td>
<td>130</td>
<td>-20,727</td>
</tr>
<tr>
<td>Whiting</td>
<td>130</td>
<td>-2,836</td>
</tr>
<tr>
<td>Continental</td>
<td>127</td>
<td>-224</td>
</tr>
<tr>
<td><strong>Sum</strong></td>
<td><strong>857</strong></td>
<td><strong>-32,390</strong></td>
</tr>
</tbody>
</table>
Fracking: Conclusion

• Improving productivity can help replace some of the lost production from less drilling
• But status quo not sustainable at $40/barrel
### 2. Geopolitics

<table>
<thead>
<tr>
<th>Change in field production of crude, Jan 2015 to Nov 2015 (1000 b/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>U.S.</strong></td>
</tr>
<tr>
<td><strong>World</strong></td>
</tr>
<tr>
<td><strong>Iraq</strong></td>
</tr>
<tr>
<td><strong>Saudi Arabia</strong></td>
</tr>
</tbody>
</table>
Saudi production within range of last 3 years
Iraq production up dramatically despite ISIS
Geopolitics: conclusion

• There is potential for significant near-term increases from Iran
• (Relative) geopolitical stability, not OPEC price manipulation, is main story
• But there is also real possibility of significant geopolitical disruptions (Iraq, Libya, Iran, Nigeria, ...)

3. China
Oil price decline is part of a bigger story
That bigger story seems to dominate week-to-week movements in oil prices.
How much of oil price decline can be explained by factors other than oil supply?

- Regression of weekly change in crude oil price on weekly change in copper price, bond yield, and value of dollar (estimated April 2007 to June 2014):

\[
\Delta p_{oil, t} = 0.363 \Delta p_{copper, t} - 1.253 \Delta p_{dollar, t} + 9.442 \Delta r_{10y, t} + \hat{e}_t \quad R^2 = 0.33
\]

- Would predict a decline in price of WTI from $105 in June 2014 to $69 today on basis of change since June in copper price, value of dollar, and interest rate.

- Suggests concerns about weakening global demand also contributed to falling oil prices.
Conclusion

• Will oil production continue to increase from Middle East and North Africa despite geopolitical turmoil?

• ???

• Will China experience a significant economic downturn?

• ???
Conclusion

• But whatever the answers, U.S. tight oil will remain the marginal producer (U.S. production will rise with excess demand, fall with excess supply)

• Fall in U.S. production is underway now and will continue

• Current price of $40/barrel not sustainable