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North America Oil & Gas Exploration & Production

**Sixth Joint IEA-IEF-OPEC Workshop on the Interactions between Physical
and Financial Energy Markets**

Developments in Oil Market Financing

Bob Brackett, Ph.D. • Senior Analyst • +1-212-756-4656 • bob.brackett@bernstein.com

Andrew Pizzi • Senior Research Associate • +1-212-407-5813 • andrew.pizzi@bernstein.com

Zhenhao Li • Research Associate • +1-212-756-4007 • zhenhao.li@bernstein.com

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North American Oil & Gas Exploration & Production team

Bob Brackett, Ph.D. (Senior Analyst)

Bob Brackett is the Senior Research Analyst covering **North American Oil & Gas Exploration & Production**. He is currently recognized as All-American #1 by Institutional Investor (for the 5th year in a row) and #1 by Greenwich buy-side surveys. Previously, Bob was Director of E&P Planning and also Director of Corporate Strategy for Hess Corporation. Before Hess, Bob was an Engagement Manager with McKinsey & Company's Petroleum Practice, serving the majority of the world's largest oil companies across five continents and 30 countries throughout the petroleum value chain. Bob began his career with ExxonMobil, spending eight years in positions in Exploration, Business Development, Development and Research. As a NASA Space Grant Fellow, Bob received his PhD in Earth & Planetary Sciences from Washington University – St. Louis. He received his MBA from Rice University in Houston. He also holds a BS in Geophysics and a BA in Astronomy from the University of Texas.

Andrew Pizzi (Senior Associate)

Andrew Pizzi is the Senior Research Associate on the **North American Oil and Gas Exploration & Production** team. Previously, Andrew was the Senior Market Analyst at Bloom Energy, a manufacturer of natural gas generators based on fuel cell technology. Prior to Bloom Energy, Andrew spent four years with NERA Economic Consulting analyzing oil, gas, and power markets and regulation. Andrew received an MBA from Wharton and holds a Bachelor's degree in Economics from Williams College.

Zhenhao Li (Associate)

Zhenhao (Zen) Li is the Research Associate on the **North American Oil and Gas Exploration & Production** and **Natural Gas & MLPs** team. Previously, Zhenhao has interned at UBS' investment banking division in their industrials team and at KKR in their internal auditing team. He holds a Bachelor's degree in Economics with concentrations in Finance and Accounting from the Wharton School.

Key points

Developments in oil market financing

Quick answer – E&Ps don't need it.

How do E&Ps think about funding

Cash in ~ cash out (except when greedy or scared)

Goldilocks example – E&Ps at top / bottom / mid cycle

How E&Ps won the shale war

What do E&Ps do with funding

E&P mentality towards balance sheet

Role of de-levering

Capex takes lion's share

Why the “predator prey” model is so important

oil production is a function of price

today's price means too much production

Lotka-Volterra equation

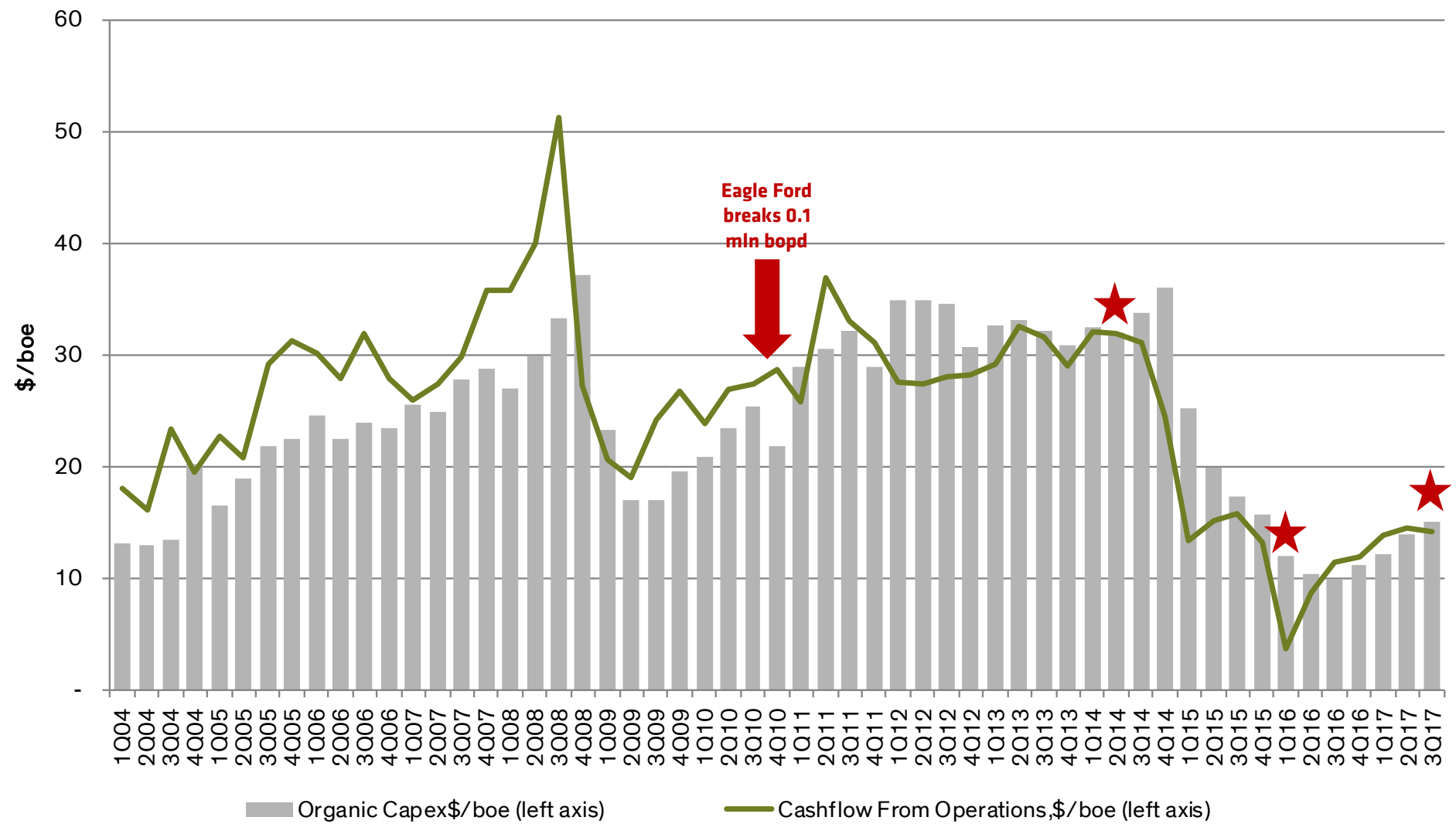
How to stop the shale “predators”

Financing, fiscal terms, inflation, dis-efficiencies, lack of inventory, ... or culling

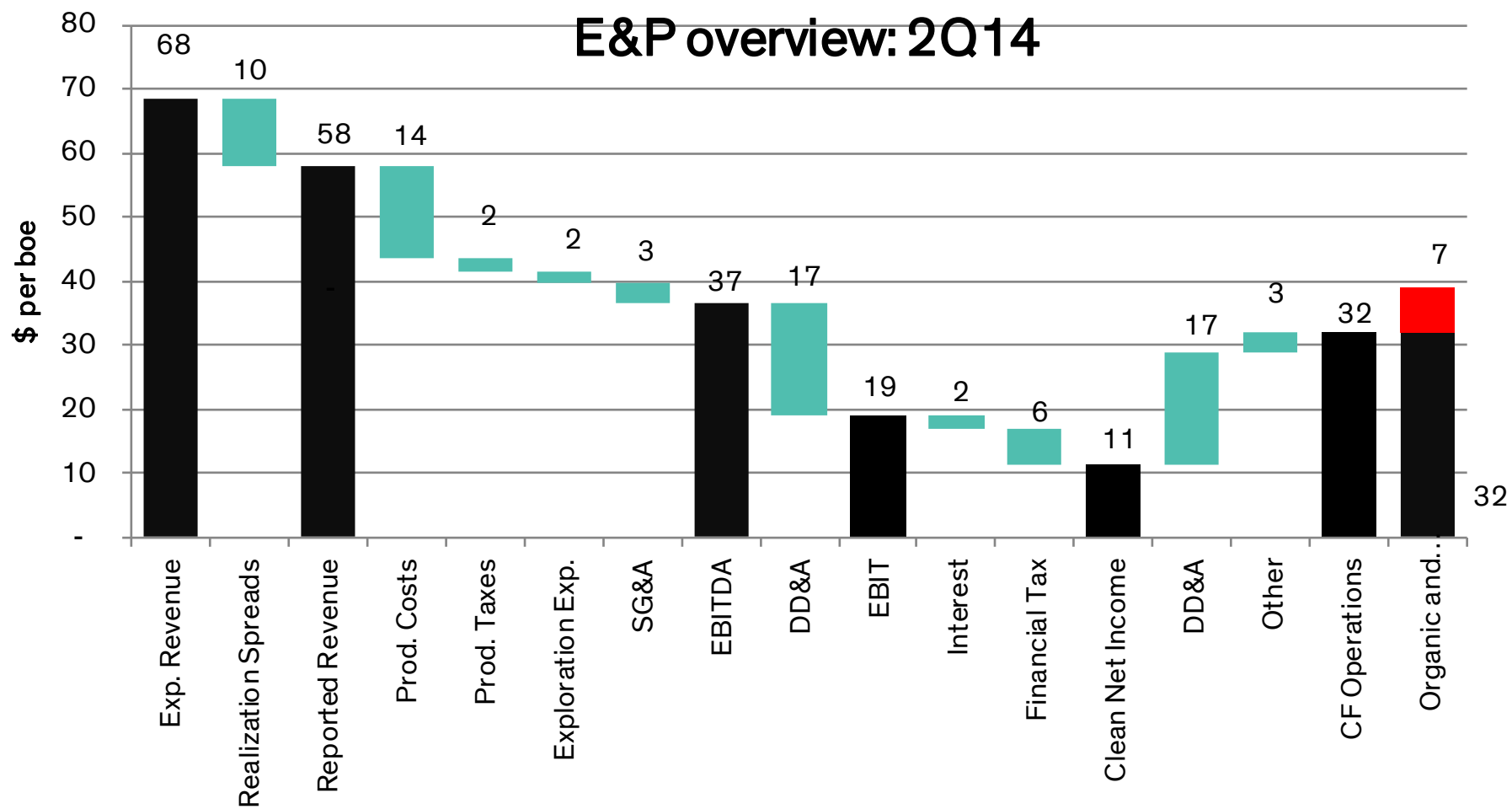
“Culling” – a collapse in oil price – has a strong negative nonlinear reaction – reduces supply & CFO & future growth

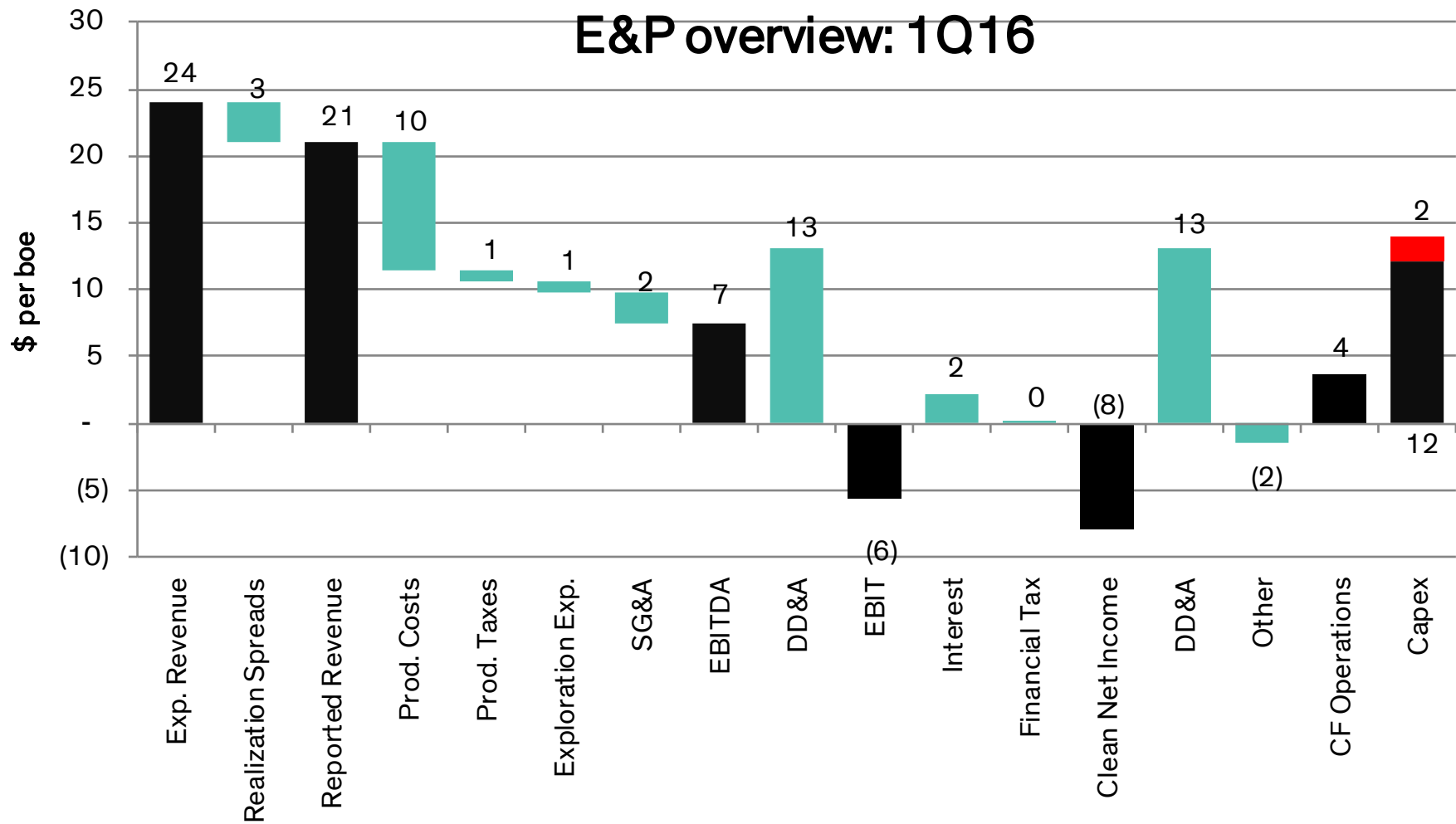
Shale Era Business Model: Cash In ~ Cash Out (except when greedy or scared...)

E&P Sector CFO compared to "organic" capex (capital spent drilling & completing existing acreage) i.e., productive capex

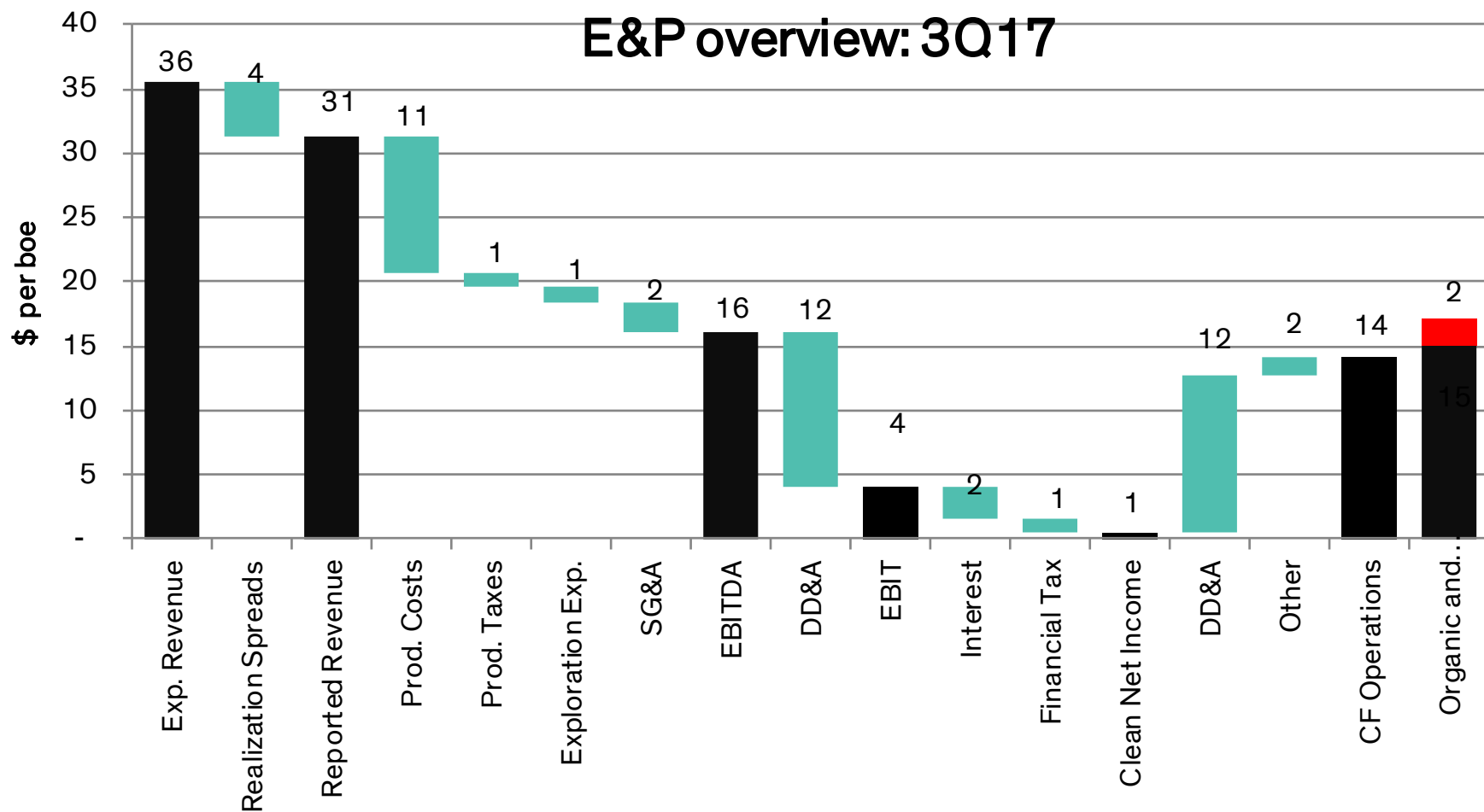


E&P overview: 2Q14





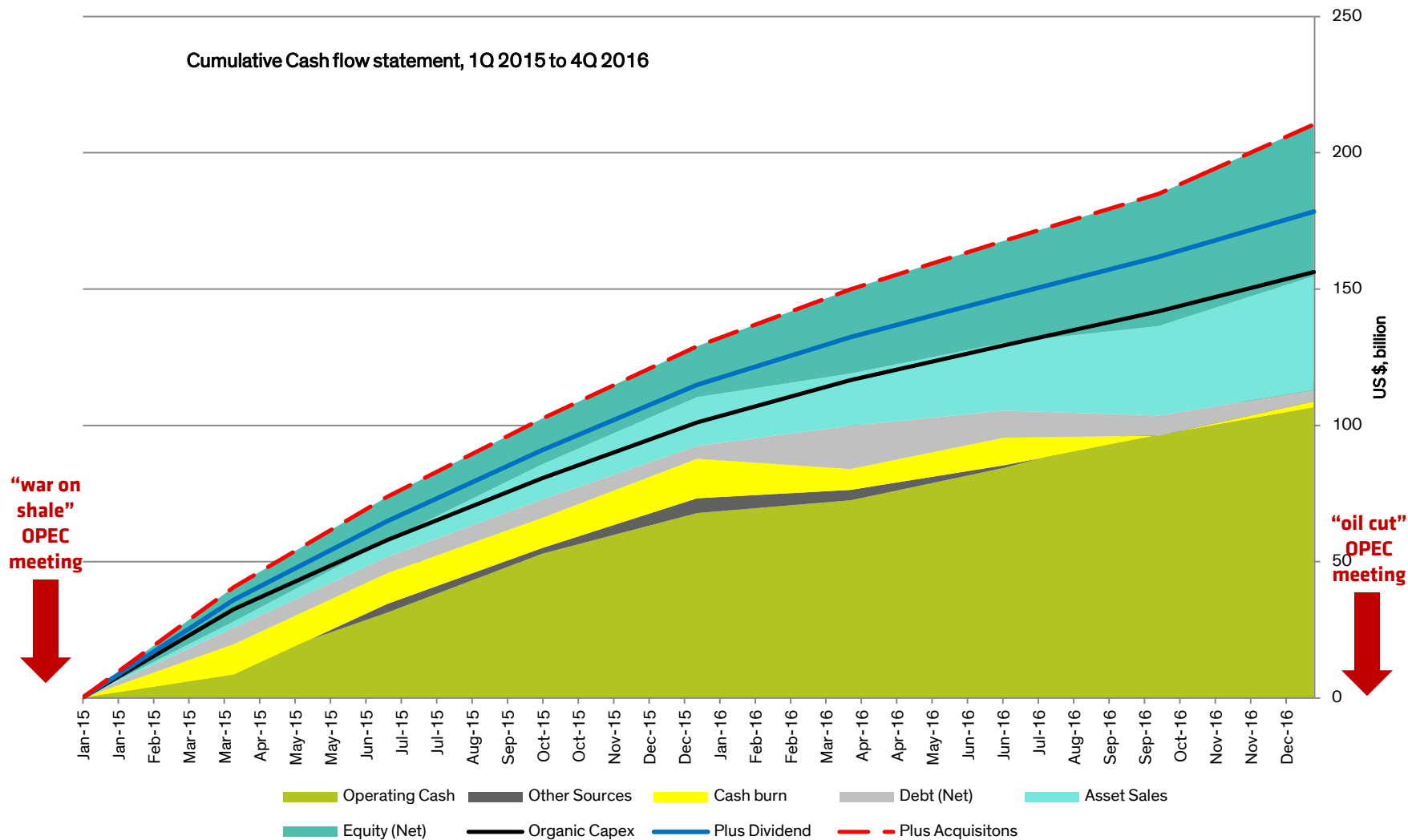
E&P overview: 3Q17



How E&Ps won the shale war...

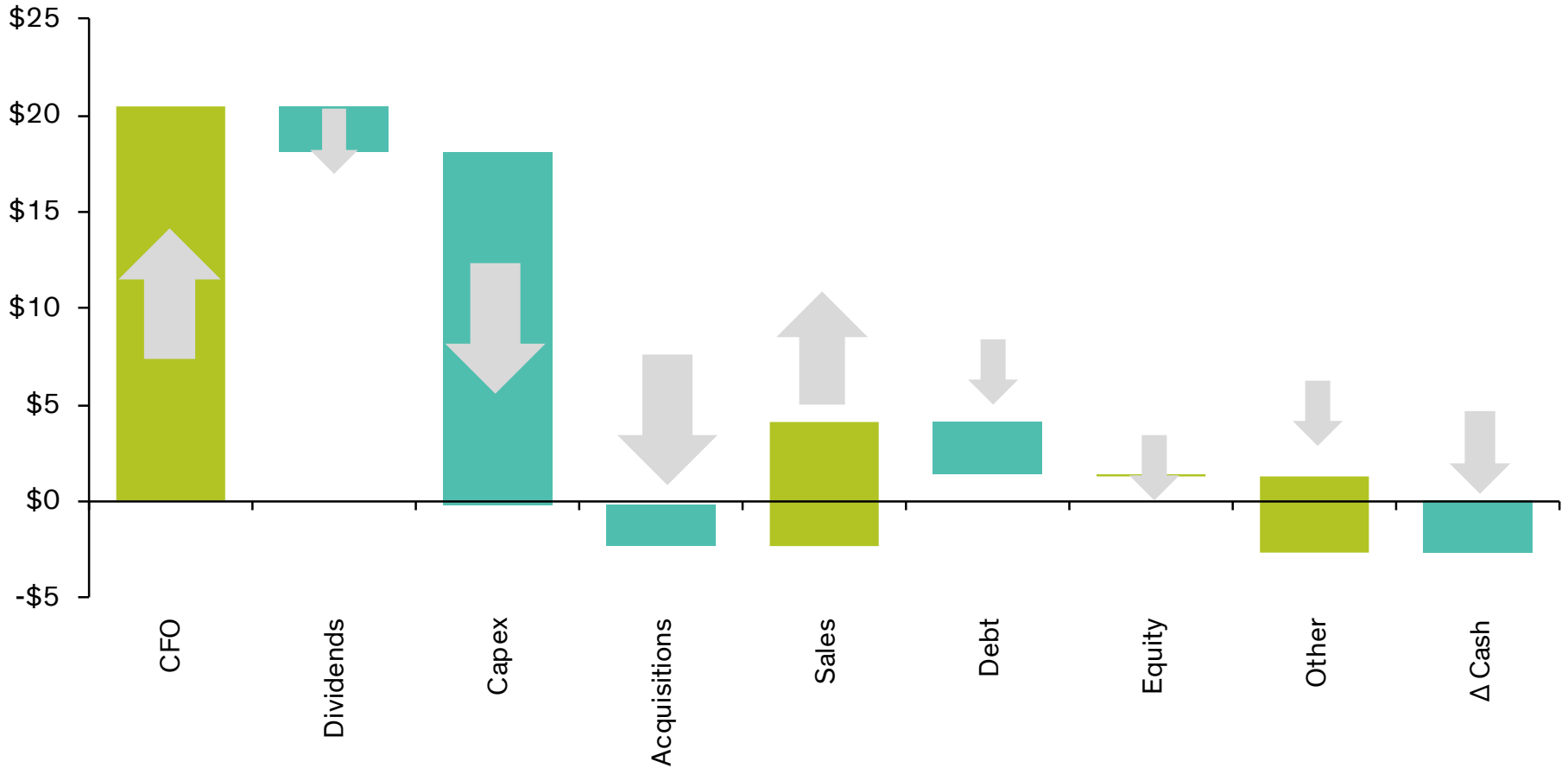
...same way we won the revolutionary war...with help

Cumulative Cash flow statement, 1Q 2015 to 4Q 2016

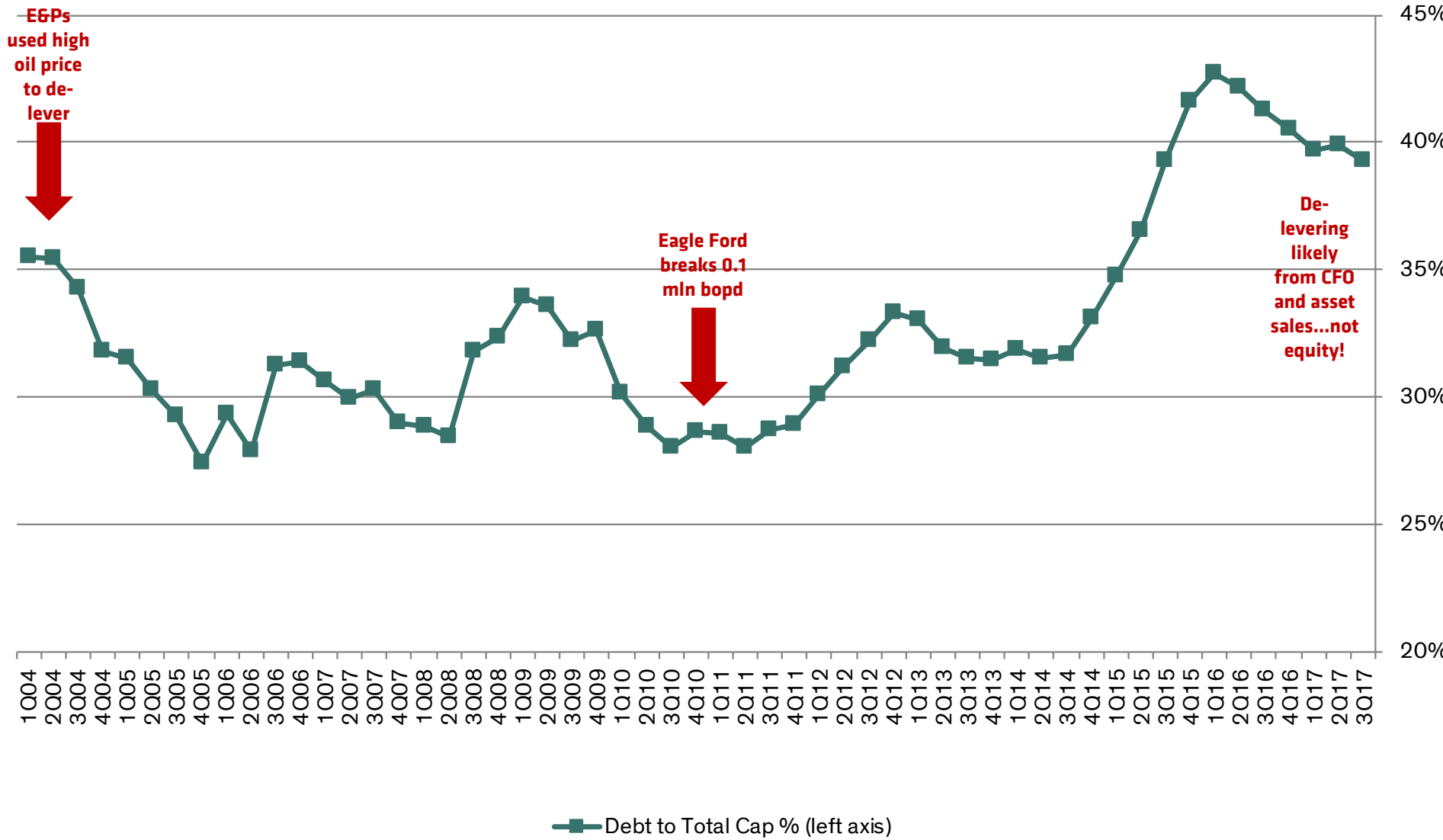


E&P mentality today – CFO covers capex & dividends; rest of balance sheet balances

E&P Sources & Uses of Cash: 3Q 2017 (\$ billion)

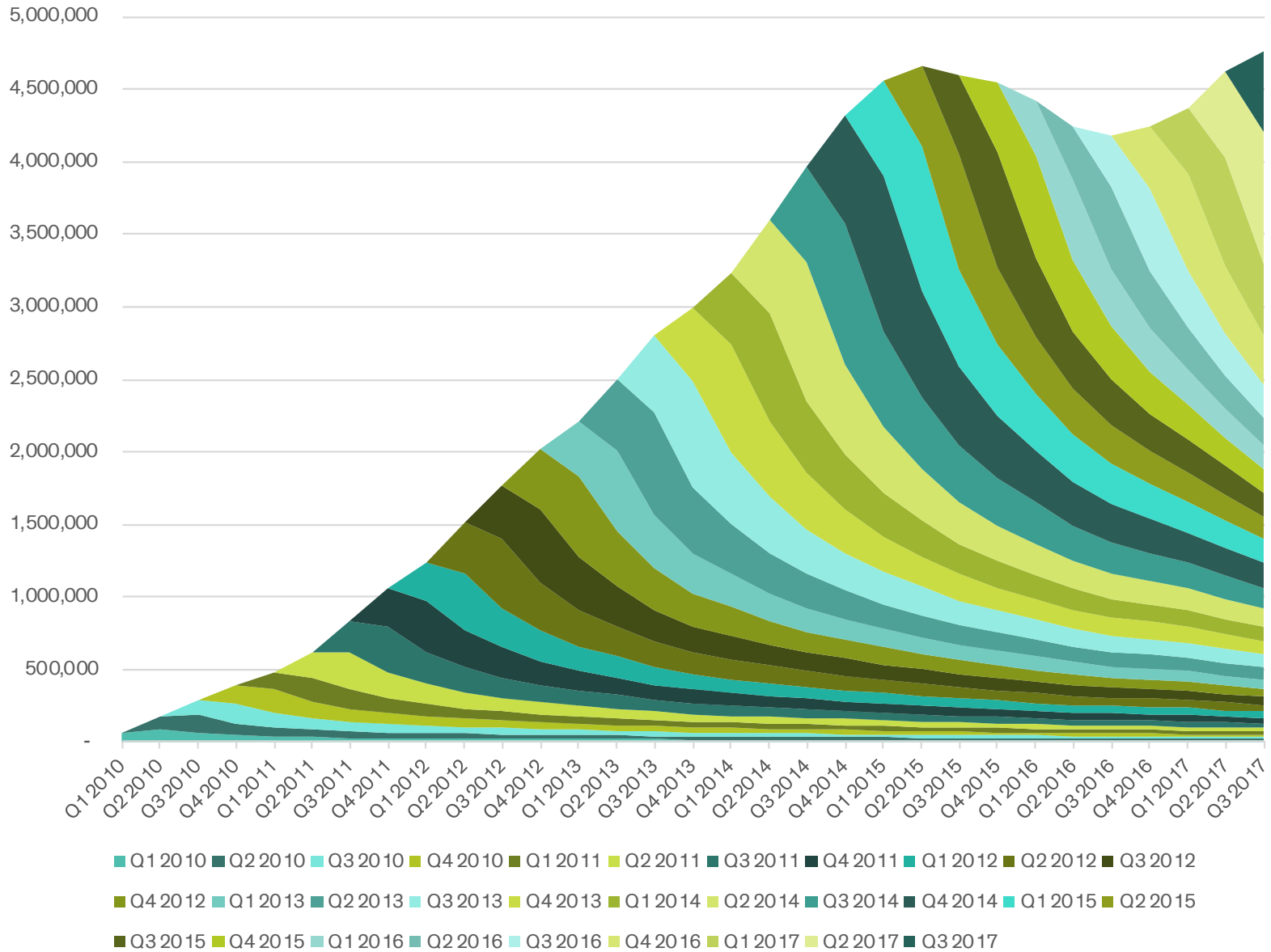


E&Ps are de-levering but still debt is too high versus history

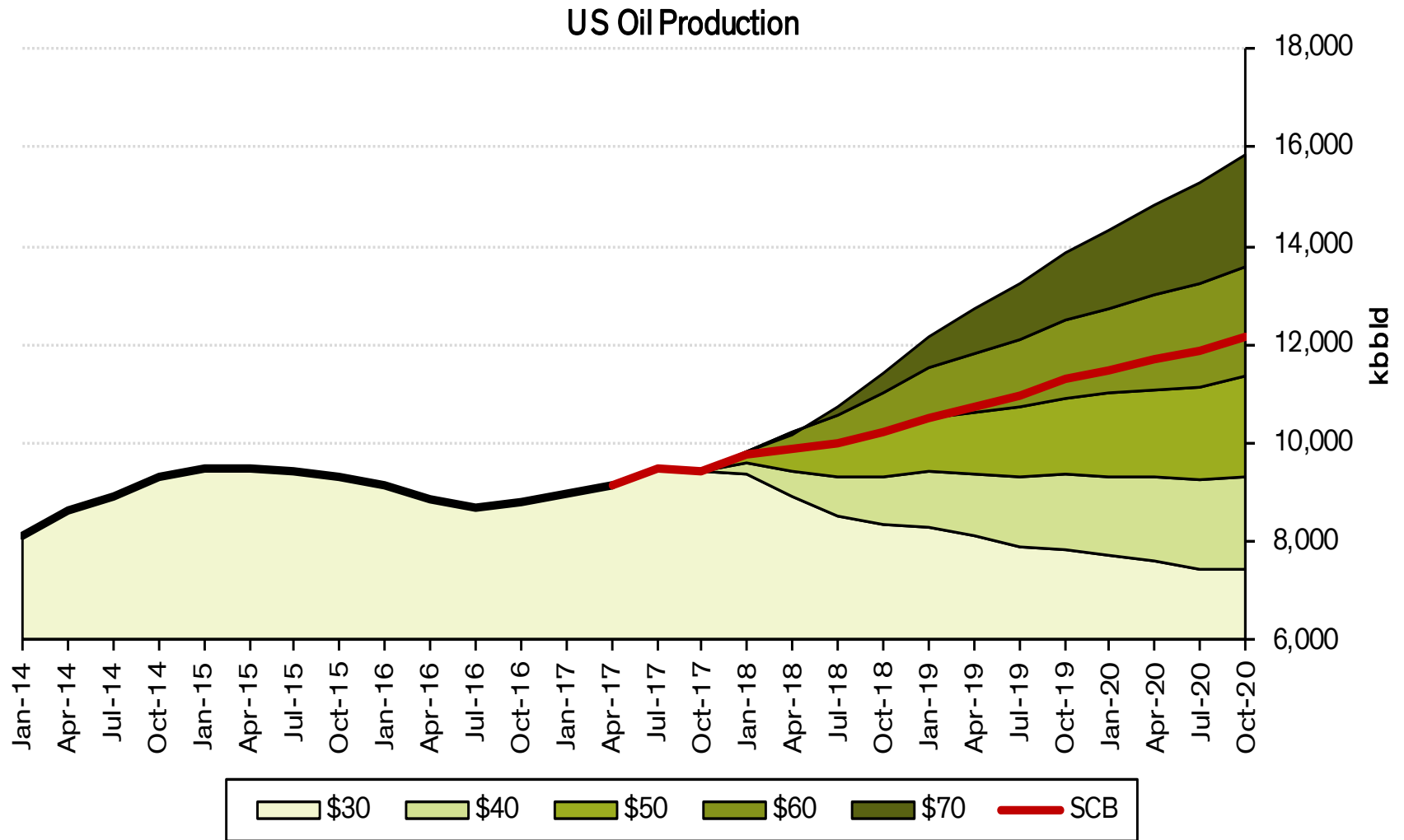


Lion's share of CFO goes to capex...

Shale Contribution by Quarter (bopd)



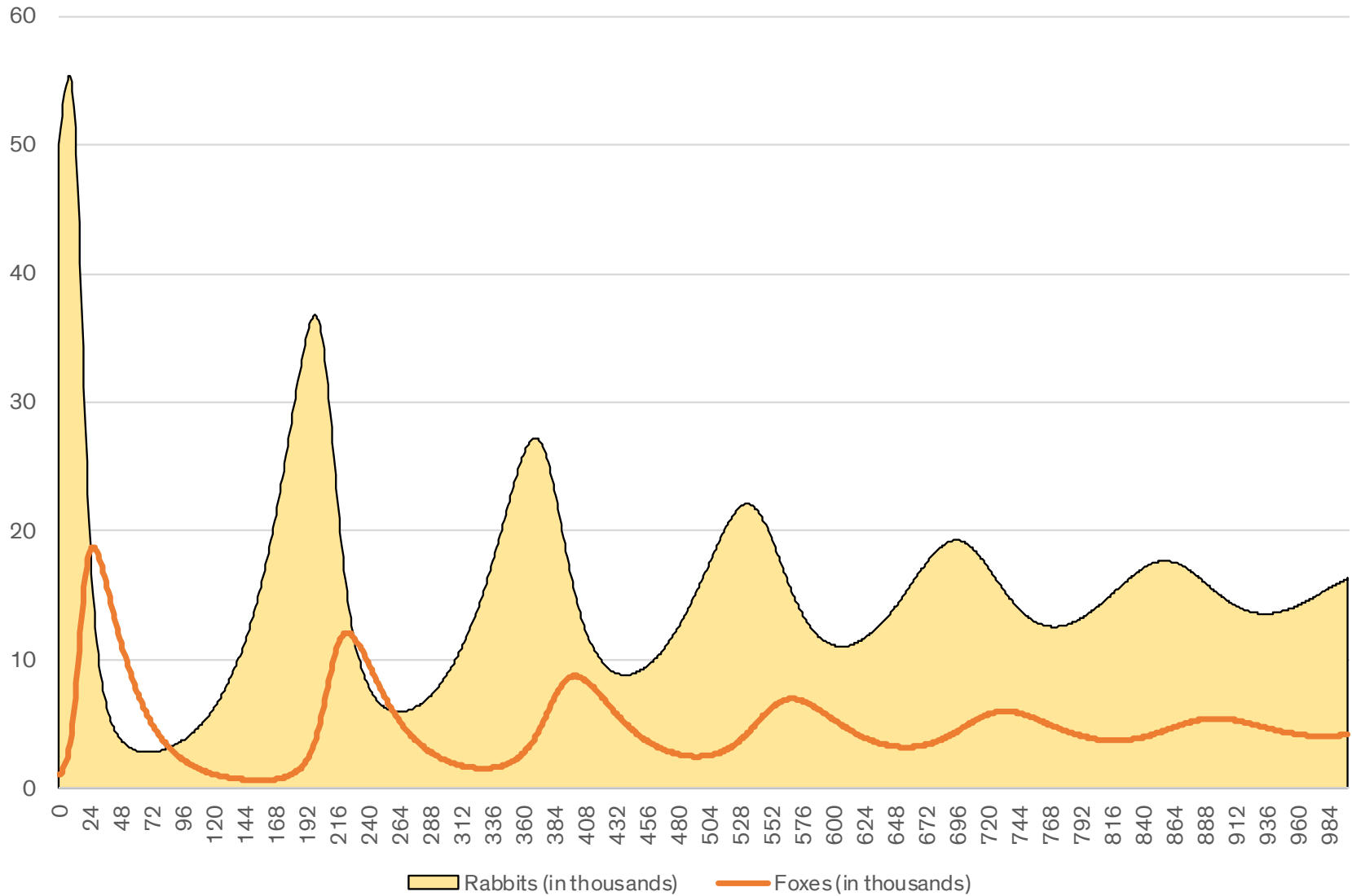
Oil production is a function of price...



Growth dominated by (a) financing, (b) inflation, and (c) efficiencies

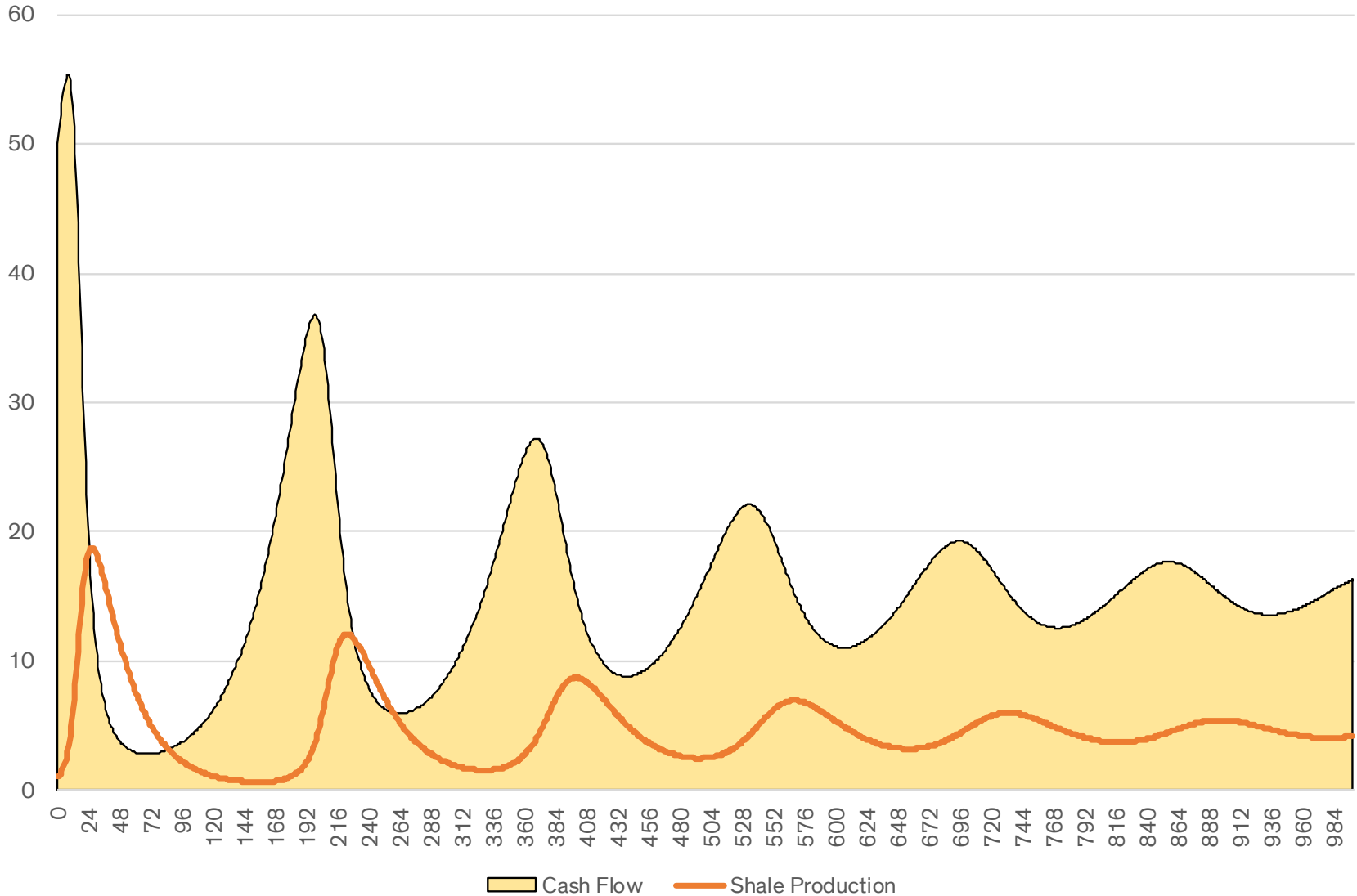
Lotka-Volterra (1st order nonlinear differential equations describing biologic systems)

Predator-Prey Model (Lotka-Volterra)



Shale is not a thermostat - it induces waves (and needs culling!)

Predator-Prey Model (Lotka-Volterra)



... "equilibrium price" is lower than where we are today

How to stop the shale “predators”

Financing

Investor-imposed financial discipline appears to be coming

Fiscal terms

U.S. tax reform a modest net positive

Inflation

runs at about ½ the beta of the commodity price...dampens impacts a bit

Dis-efficiencies

not any time soon

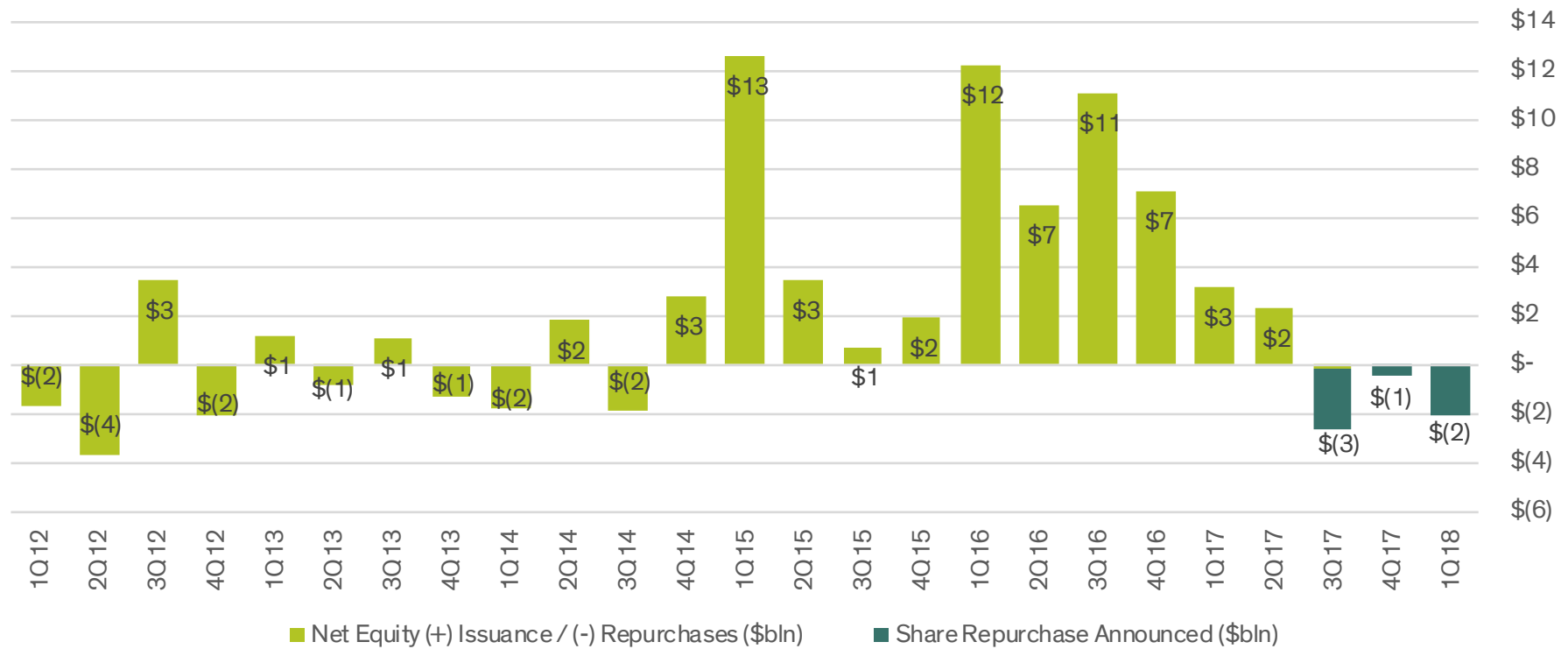
Lack of inventory

not any time soon




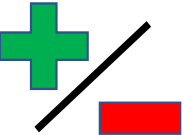


Culling

coming soon?

How to stop shale "predators"? Financial discipline...but need a lot!

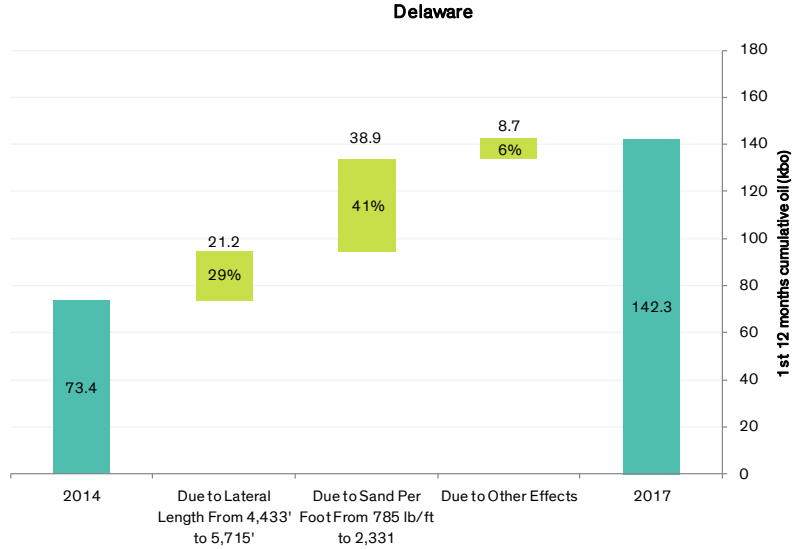


Tax reform impact on E&Ps unlikely to help – overall a mild to medium positive

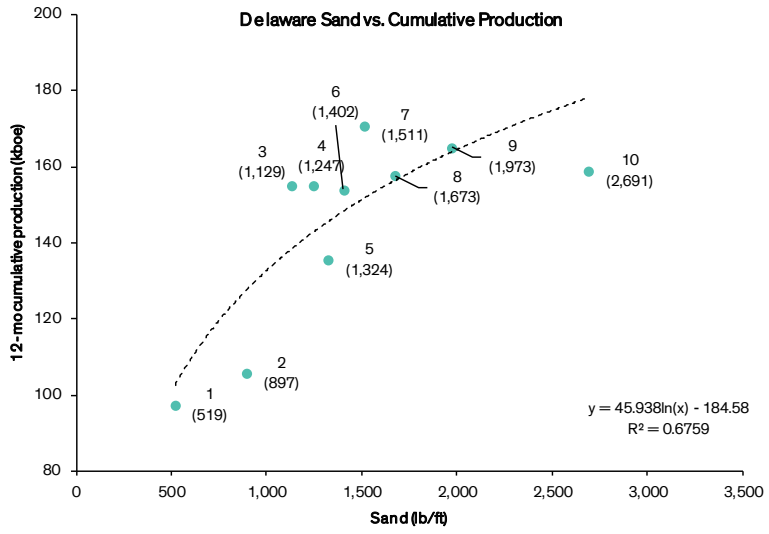
Policy Change	Positive or Negative	Impact Relative to S&P	Comments
Change in Corporate Tax Rate		Low	The corporate tax rate was reduced from 35% to 21%. E&Ps benefit far less than other sectors due to their very low cash tax burden.
Repeal of Corporate AMT		Med-High	E&Ps can deduct a large proportion of their (also large) capital budgets every year through intangible drilling credits - and now 100% bonus depreciation. This frequently led to minimal tax bills under the tax code and the imposition of the Corporate AMT. Repeal of the AMT will immediately benefit companies with significant AMT credits (EOG, COG, SWN) and those that might have otherwise faced AMT in the future (many others). Tax credits are refunded on a 50%, 25%, 12.5%, 12.5% schedule over the next 4 years.
Bonus Depreciation		Med-Low	E&Ps already deduct ~70% of well cost in year 1 through IDCs, but E&P is a capital intensive sector and bonus depreciation will be helpful on the ~30% of the capital budget not already eligible to be deducted.
Foreign Earnings Changes		Medium	Accumulated foreign earnings are repatriated at 8% (profits) or 15.5% (cash). This will create a one-time tax hit for firms with profitable foreign operations. However, going forward, foreign earnings from upstream operations will only be taxed locally.
Interest Deduction Limitation		Low	E&Ps with high leverage could run into the interest deduction limitation (30% of adjusted taxable income), but are unlikely to present a large taxable income base in any event due to the deductibility of their capital spending.
NOL Changes		Low	Net Operating Losses can only offset 80% of taxable income, can't be carried backward, but can be carried forward indefinitely. This will tend to extend the period over which NOLs get used to offset tax bills. E&Ps produce lots of NOLs but already have a low cash tax burden which makes the loss of these NOL provisions less impactful.

Efficiencies are decelerating (but not worsening!)

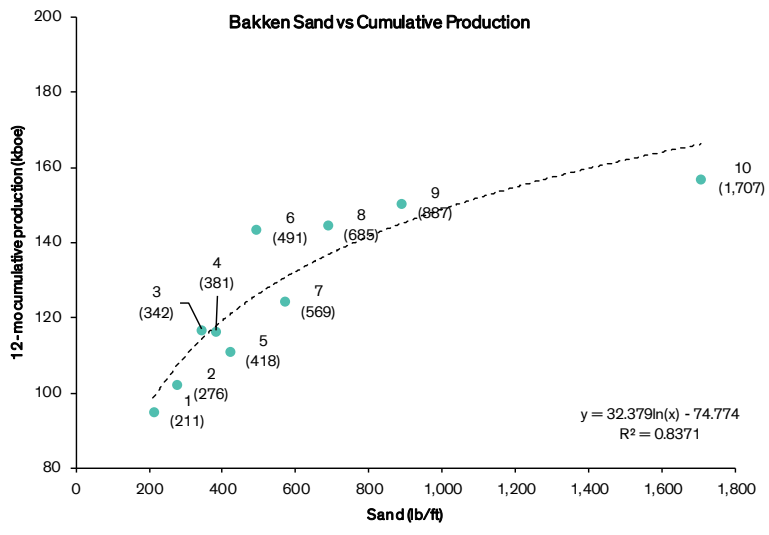
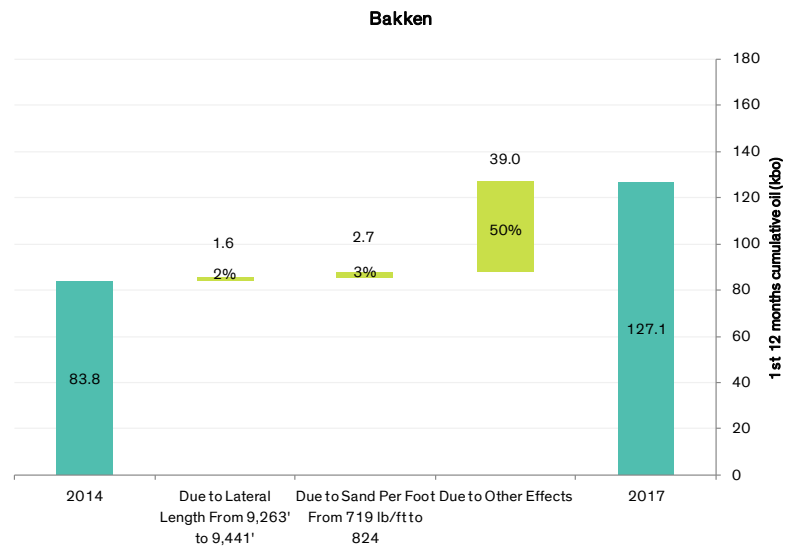
Productivity has increased in the Delaware largely due to lateral length and sand/ft increases but at diminishing rates



Correlation between proppant use and productivity - points represent the decile of sand usage

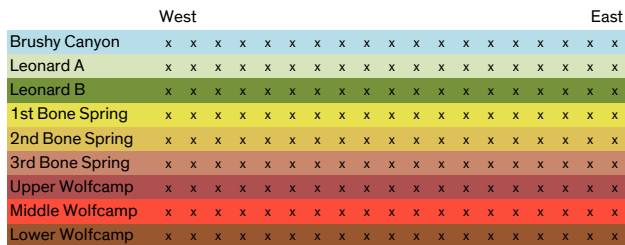


Productivity increases in the Bakken were nearly independent of lateral length and sand/ft increases - we suspect improvements from high-grading or geology

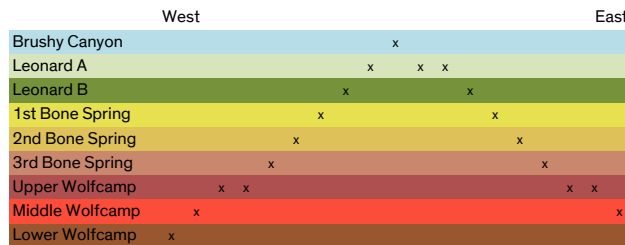


...and Permian supports sufficient inventory

On one extreme, every layer works at every point in the basin

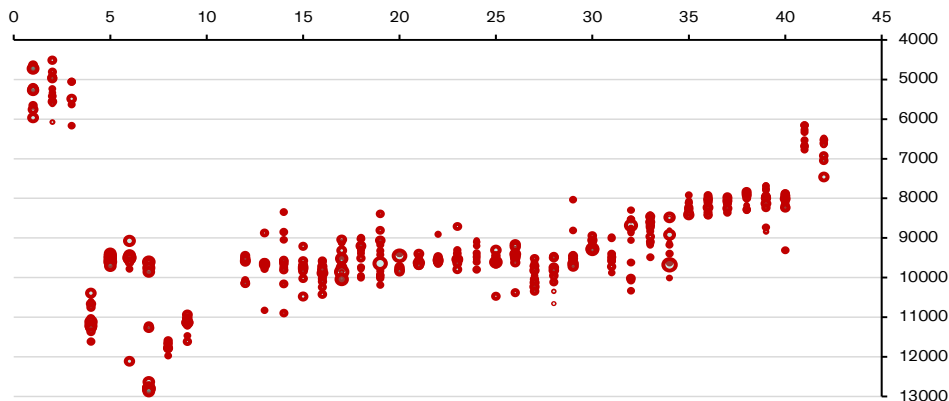


On another extreme, every layer works at one point in the basin



When we examine the depth of wells drilled over the play, we find 1000'-3000' that work over most of the play

Box # (from West to East across entire Permian) and Well Rate by Depth

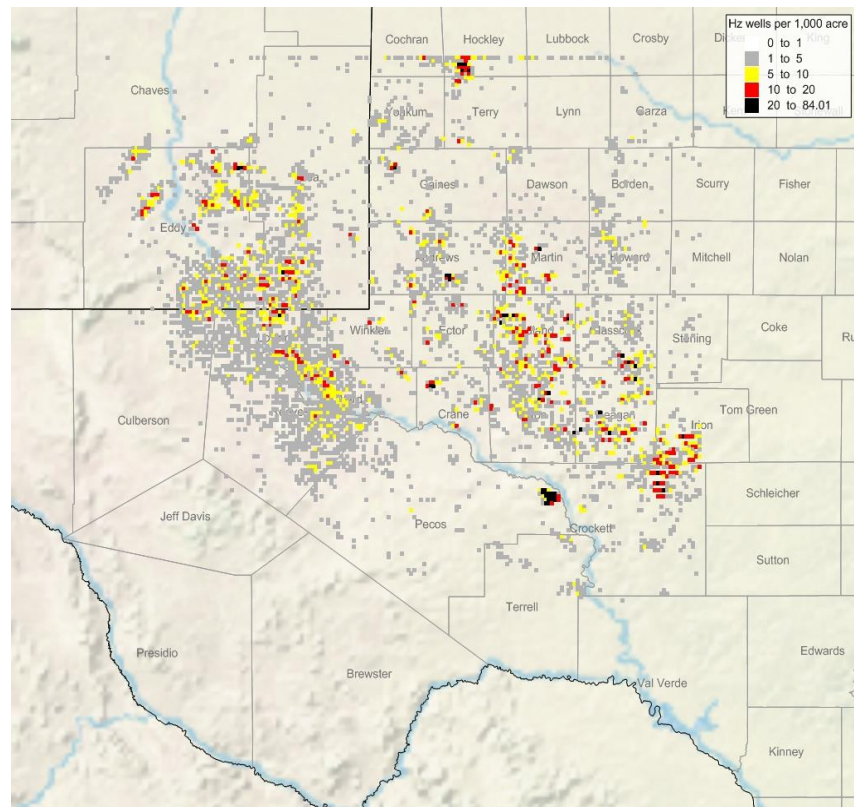


5-10% recovery factors seem reasonable

EUR per 5,000' well (min BO)	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
1	0%	1%	1%	1%	2%	2%	2%	3%	3%	3%
2	1%	1%	2%	3%	3%	4%	5%	5%	6%	7%
3	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
4	1%	3%	4%	5%	7%	8%	9%	11%	12%	13%
5	2%	3%	5%	7%	8%	10%	12%	13%	15%	17%
6	2%	4%	6%	8%	10%	12%	14%	16%	18%	20%
7	2%	5%	7%	9%	12%	14%	16%	19%	21%	23%
8	3%	5%	8%	11%	13%	16%	19%	21%	24%	27%

Recovery Factor (with 5-10% RF highlighted)

The vast majority of the play has <5 wells drilled per 1000 acre section



Source: Di Desktop, IHS Energy, Bernstein analysis and estimates

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