



CMC – Demand from the Energy Sector Carboxymethyl cellulose ethers used in oil drilling

July 2016

Role of CMC in drilling and fracking

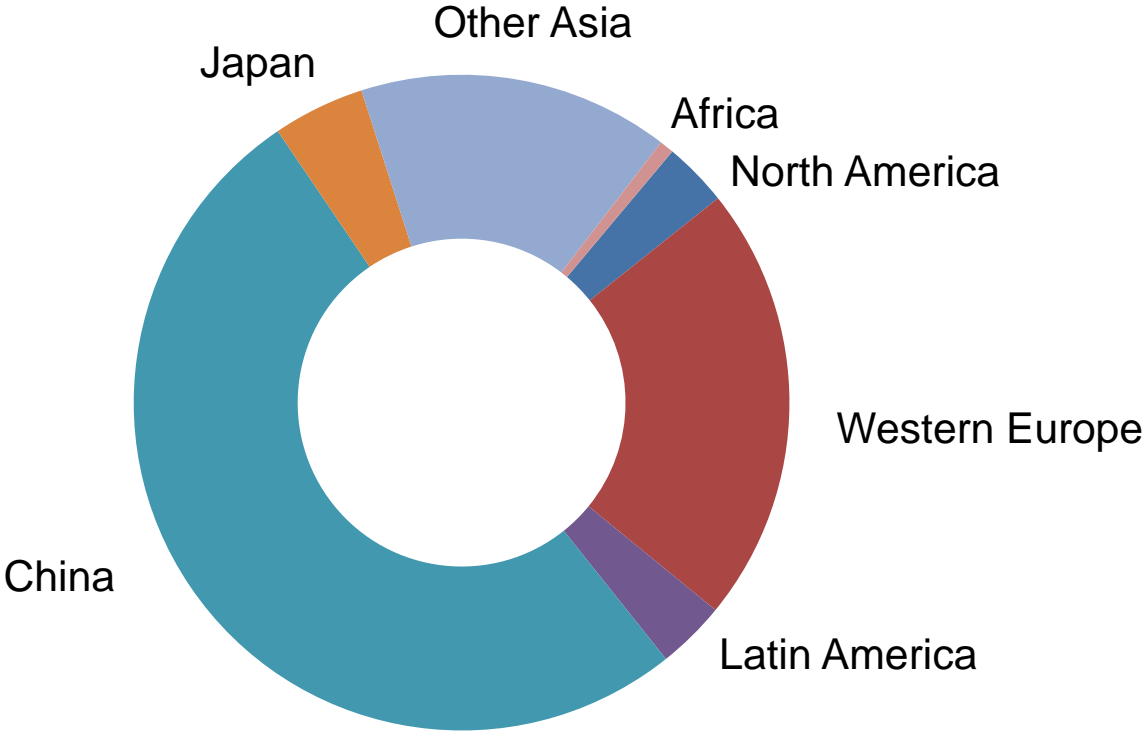
- Drilling mud is a viscous fluid used in oil and gas drilling. Its role is to (1) lubricate and cool the drill bit and (2) carry the cuttings to the surface.
- The mud can be water-based, oil-based or synthetic-based.
- CMC is used in water-based drilling mud as a thickening agent to control viscosity. Proper viscosity is needed to keep the cuttings in suspension and to prevent fluid loss during drilling.
- CMC is also used in water-based fracking fluids (hydraulic fracturing is used in new or existing wells to release oil and gas trapped in the rock formation).

CMC – Properties and uses

- CMC is one of several cellulose-based ethers (MC, HEC, EHEC, HEMC, HPC, EC, HPMC)
- It's used as a binding/water retention agent and thickening agent.
- High purity grades go into food, pharmaceuticals and some industrial applications, while technical grades go into detergents and drilling fluids, with smaller volumes going into paints and adhesives.
- In drilling, CMC competes with other gelant additives such as guar gum powder and xanthan gum.
- CMC is cheaper than other gelants but requires larger volumes and more labour to mix the mud.

CMC capacity concentrated in China + WE

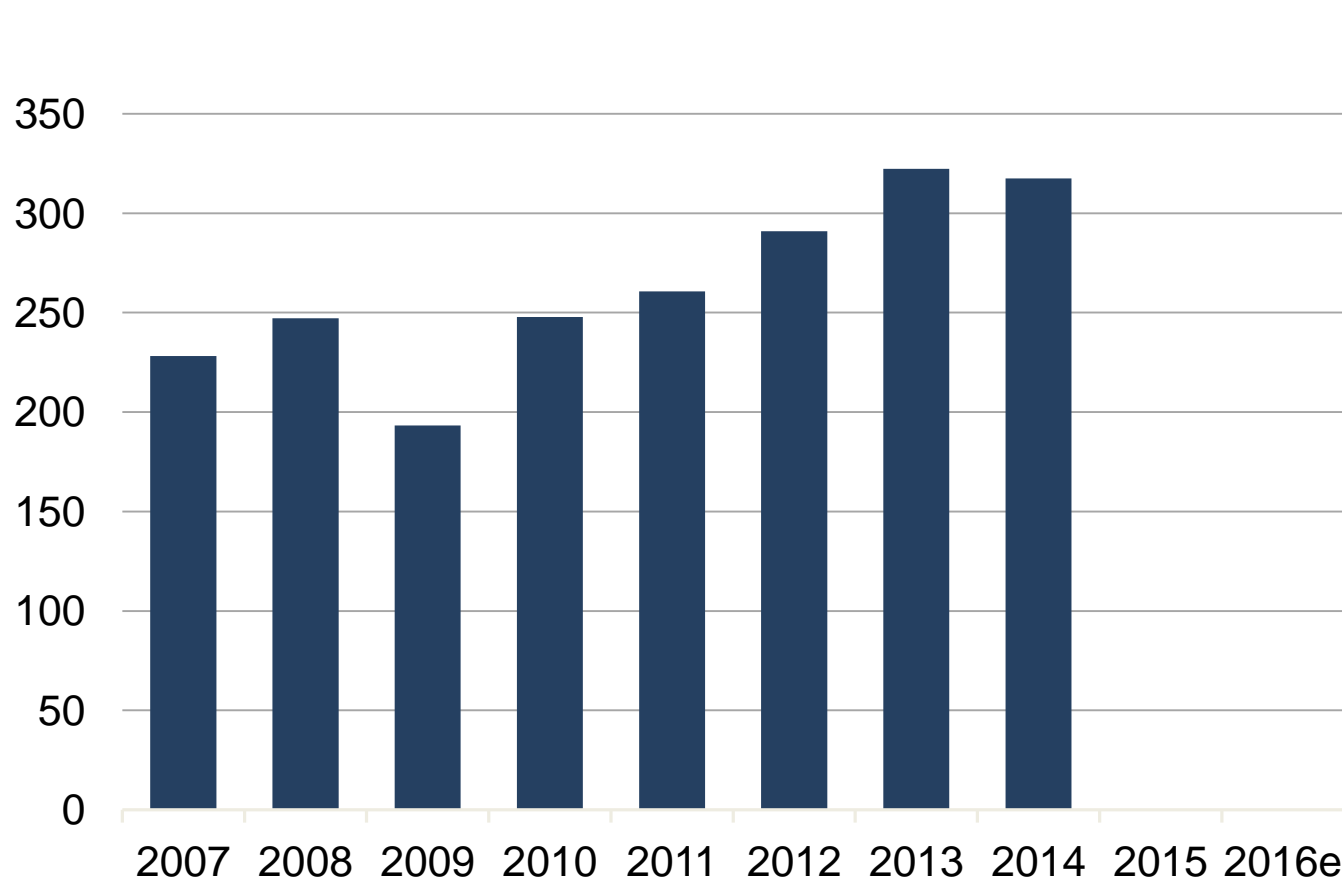
CMC capacity by region
2016



- China dominates in the technical grades.
- Western Europe dominates in the high purity segments.

Source: Numera, company reports

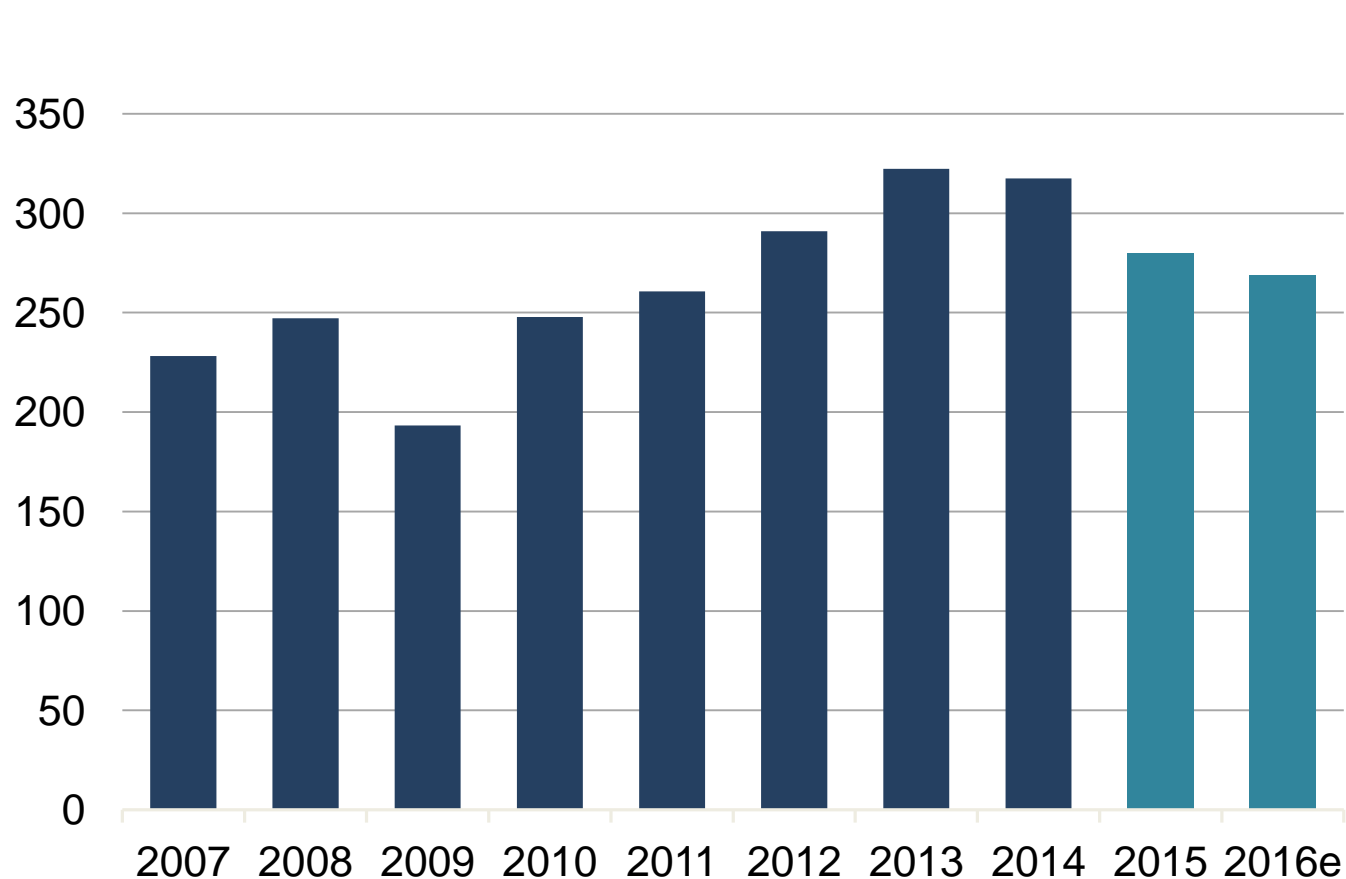
≈50% of output is traded ...



- Roughly 50% of CMC output is traded globally, making export volumes a timely indicator of global production.

Note: polyanionic cellulose (PAC) has the same CAS number as CMC, however, volumes could have been classified under another HS code (other cellulose ethers).

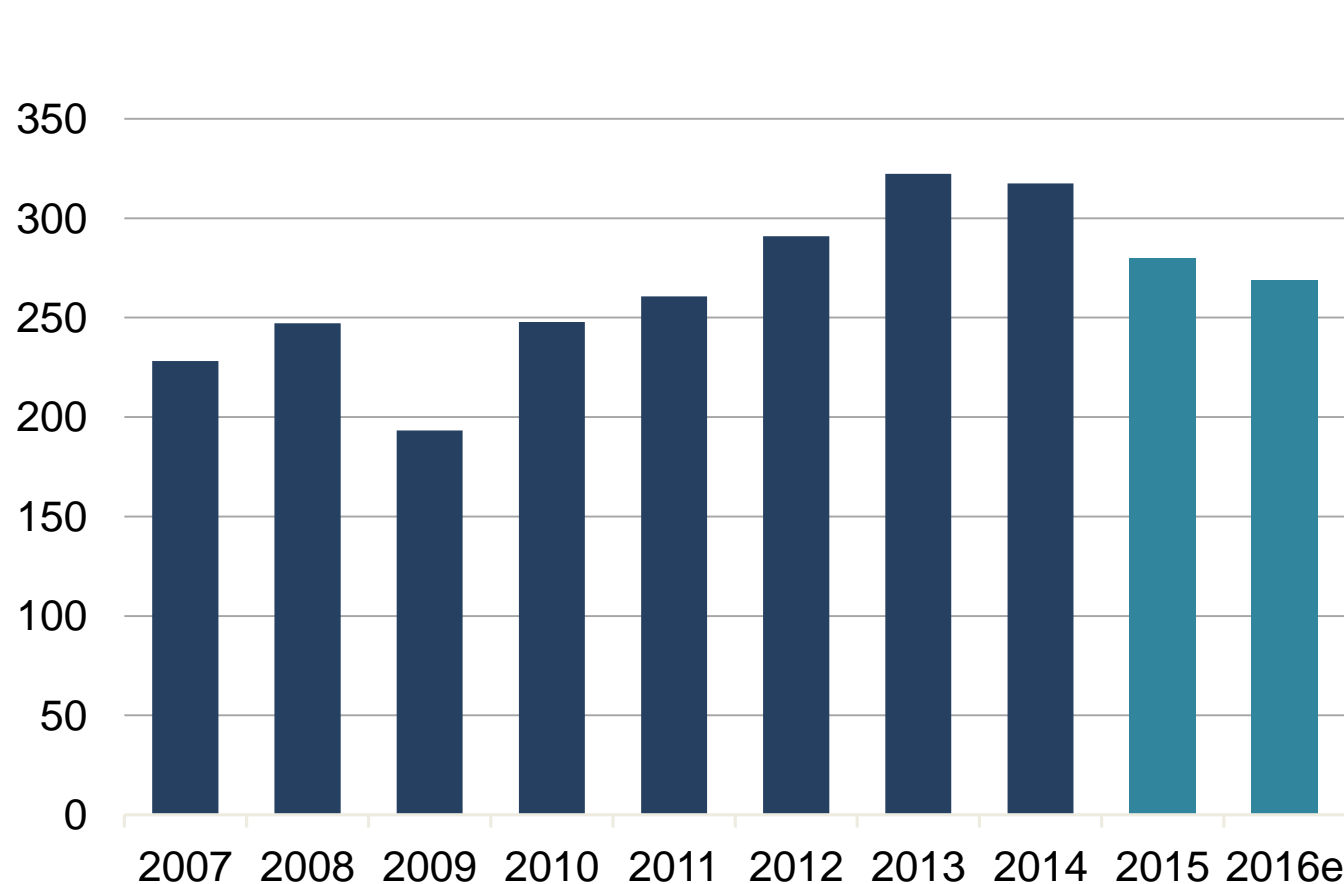
...and volumes down $\approx 20\%$ since 2013-14...



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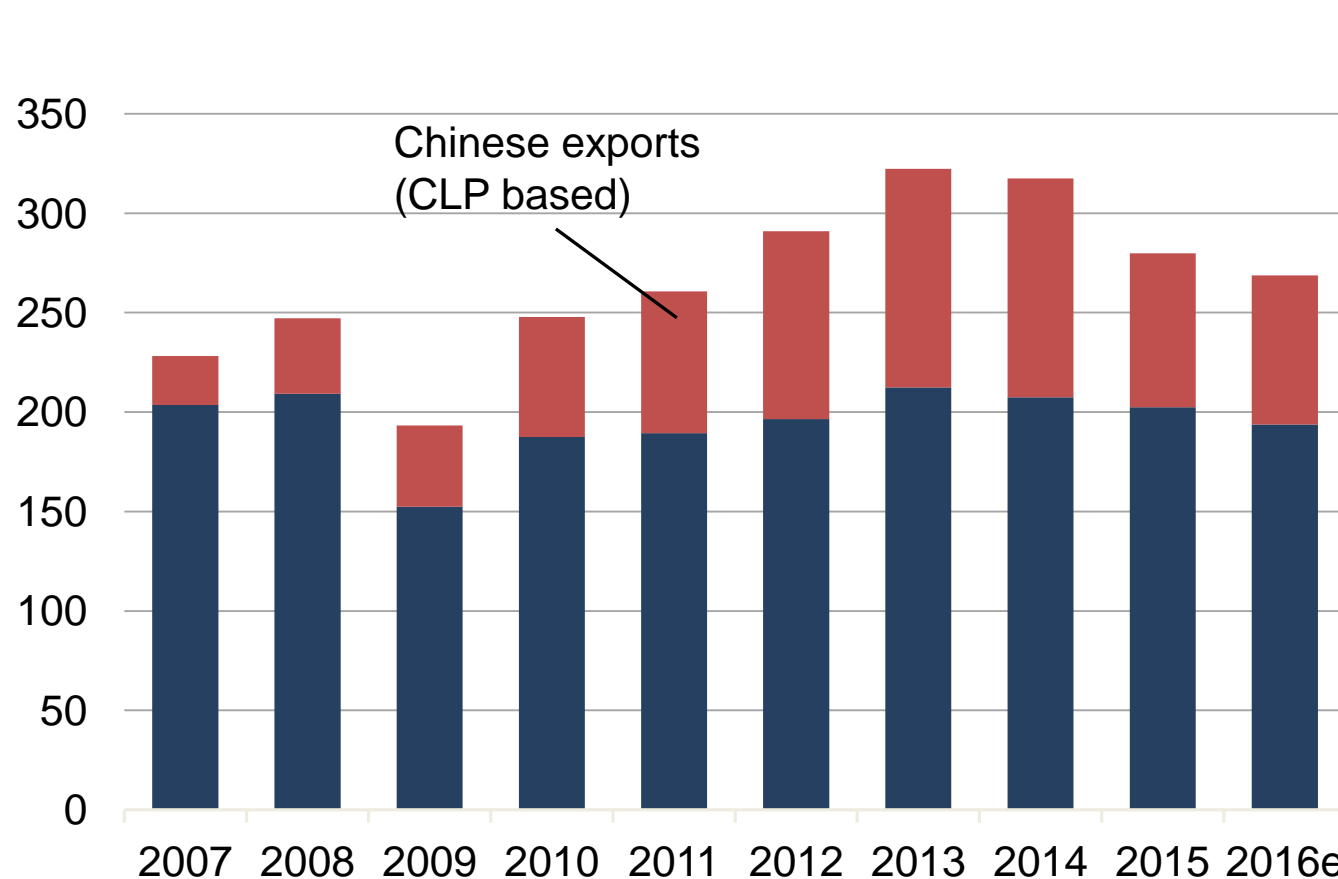
...with 80% of the drop linked to NA demand...



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- Exports are down roughly 20% from the peak.
- About 80% of the drop is due to lower demand in North America.

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... and Chinese technical grades hardest hit

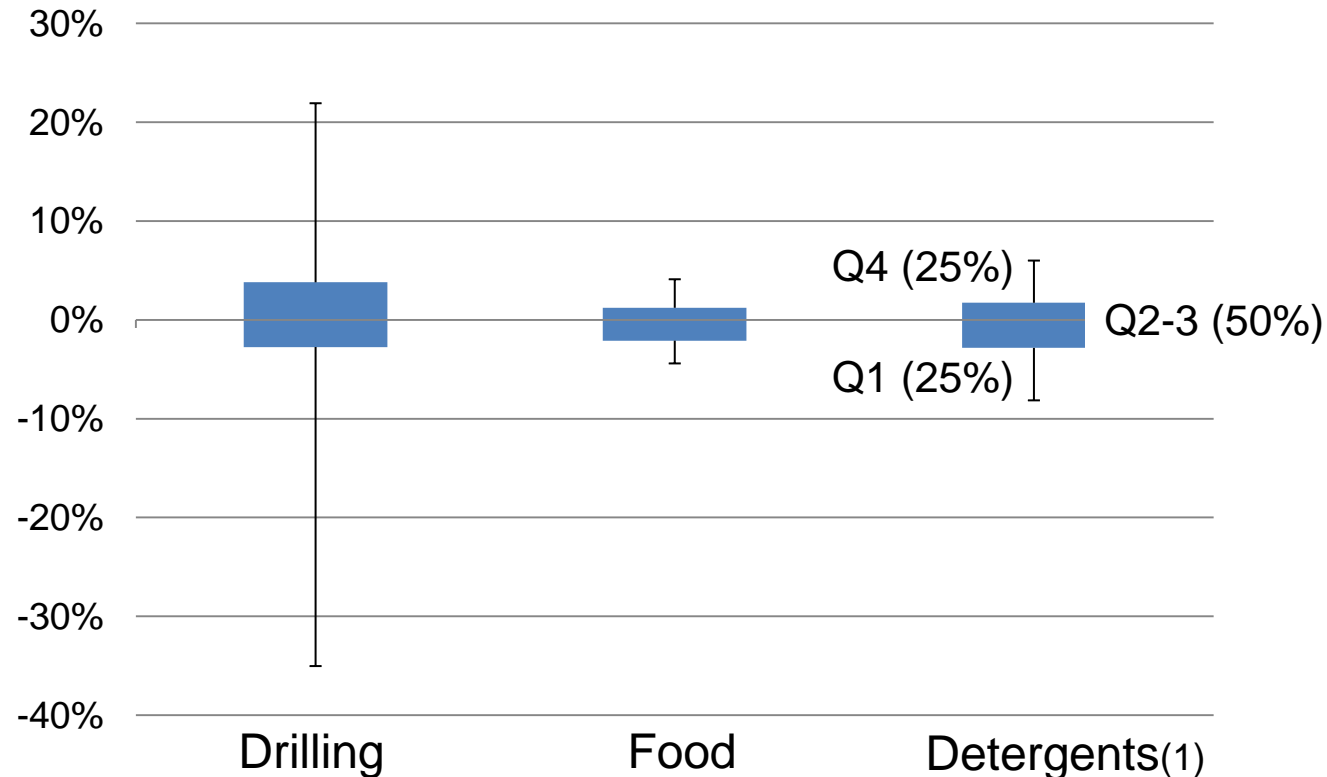


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- Exports are down roughly 20% from the peak.
- About 80% of the drop is due to lower demand in North America.
- Hardest hit have been Chinese producers of technical CMC.

Oil drilling is what drives volatility in NA CMC

Distribution of growth rates in manufacturing production
quarter-to-quarter volumes



- Of the major end-uses of CMC, food and detergent production have very low volatility.

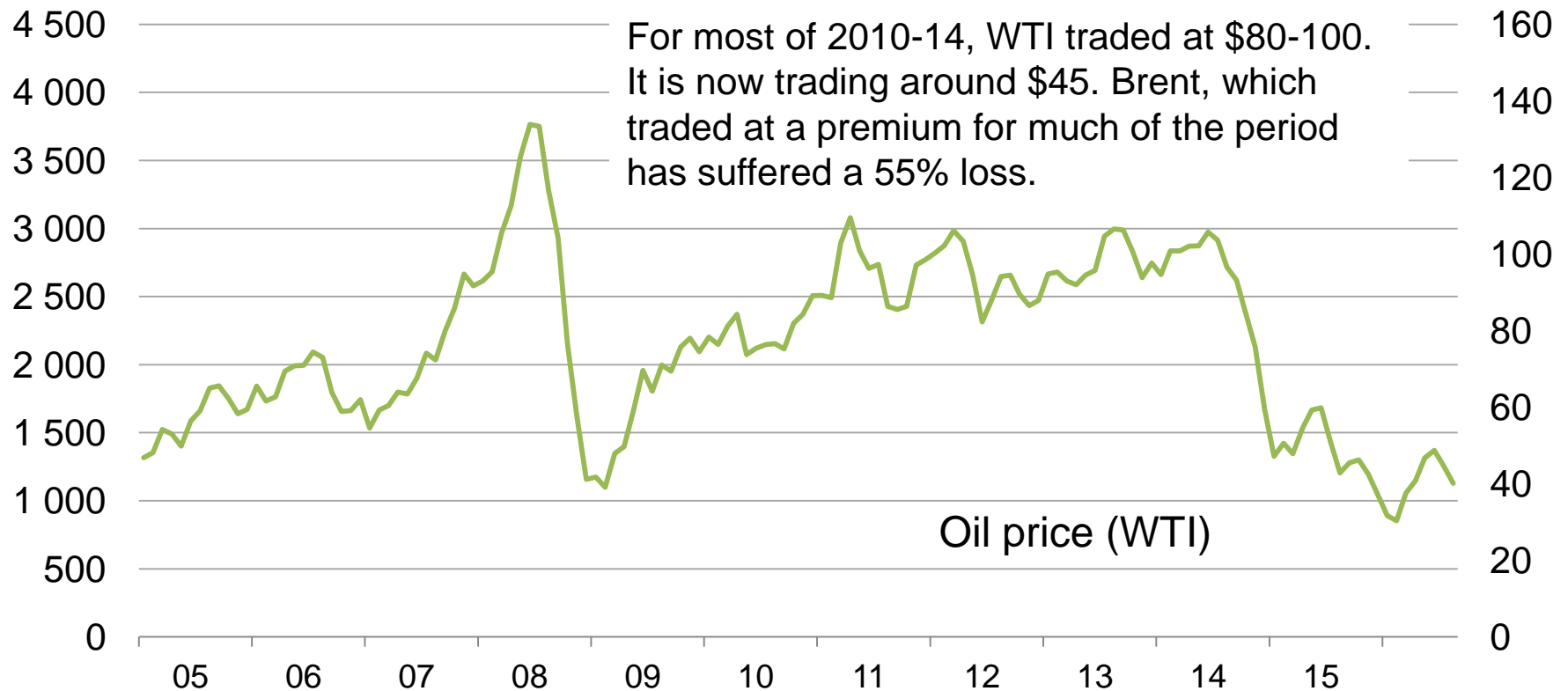
- Oil drilling, on the other hand, rises and falls sharply, exhibiting nearly 4 times the volatility of food or detergents.

(1): Soap, cleaning compound, and toilet preparation manufacturing

Oil prices are down about 50% from peak...

Global Rig Count (left)

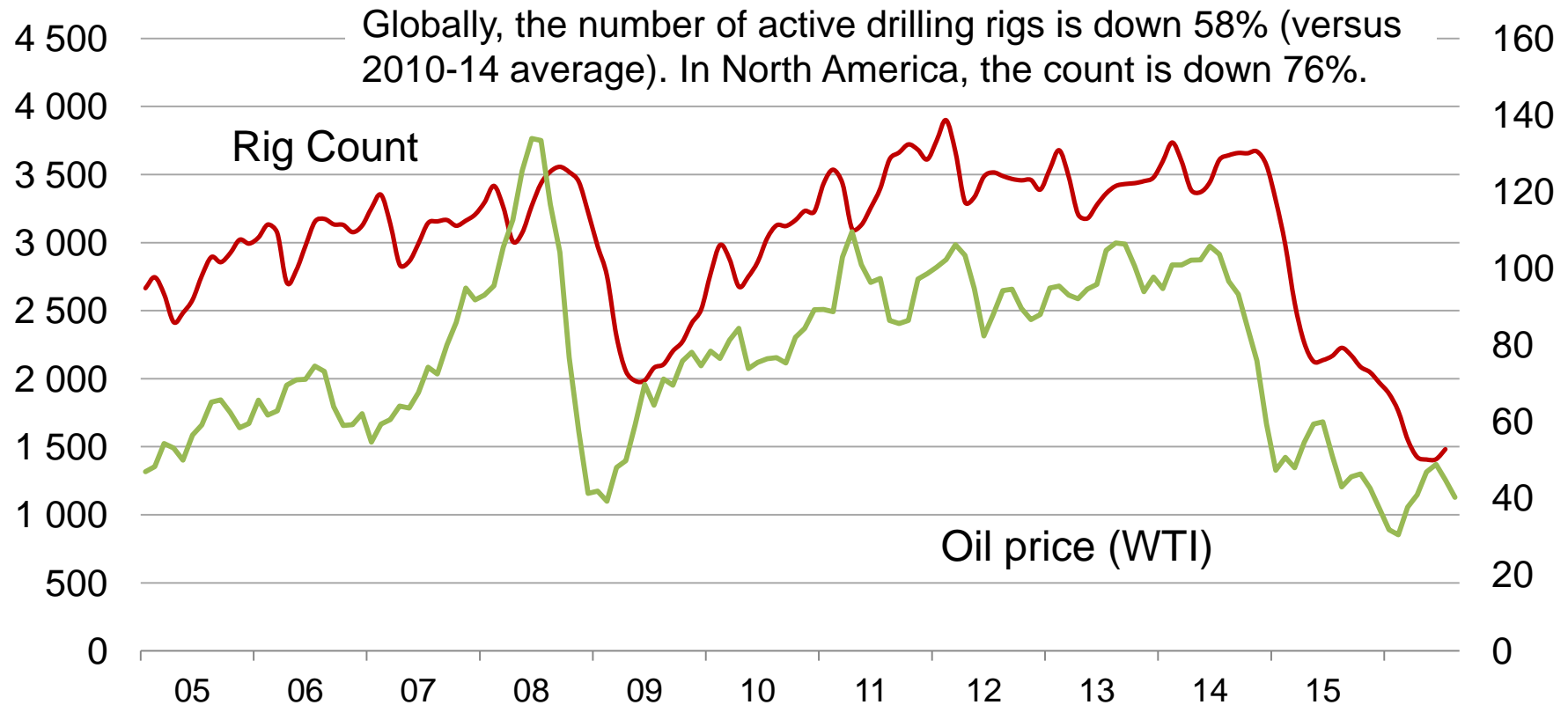
WTI USD/Barrel (right)



Source: Baker Hughes, Federal Reserve

...triggering a collapse in drilling activity...

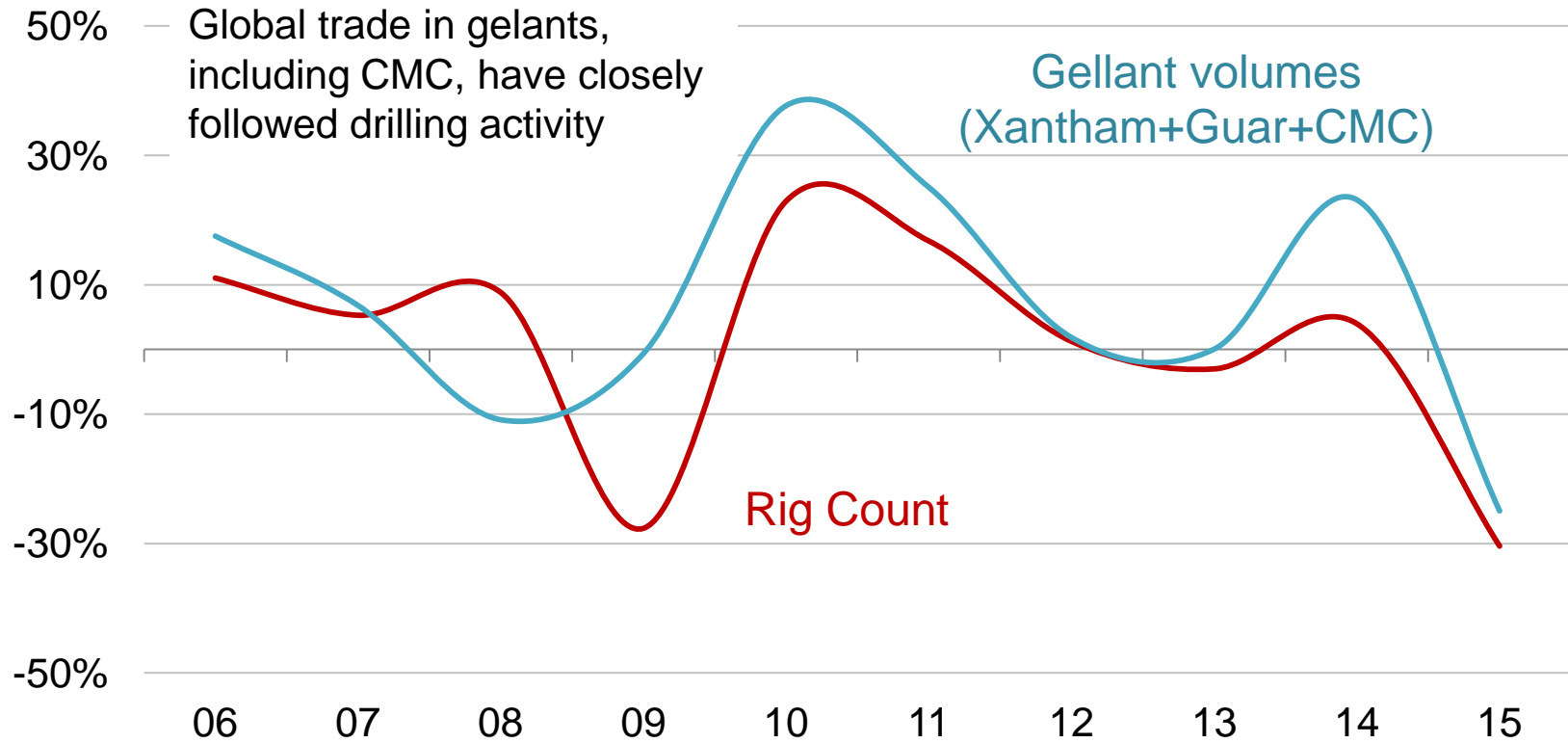
Global Rig Count (left)
WTI USD/Barrel (right)



Source: Baker Hughes, Federal Reserve

...leading to a sharp drop in gelant additives

Global trade and rig count variation
year-over-year (%)

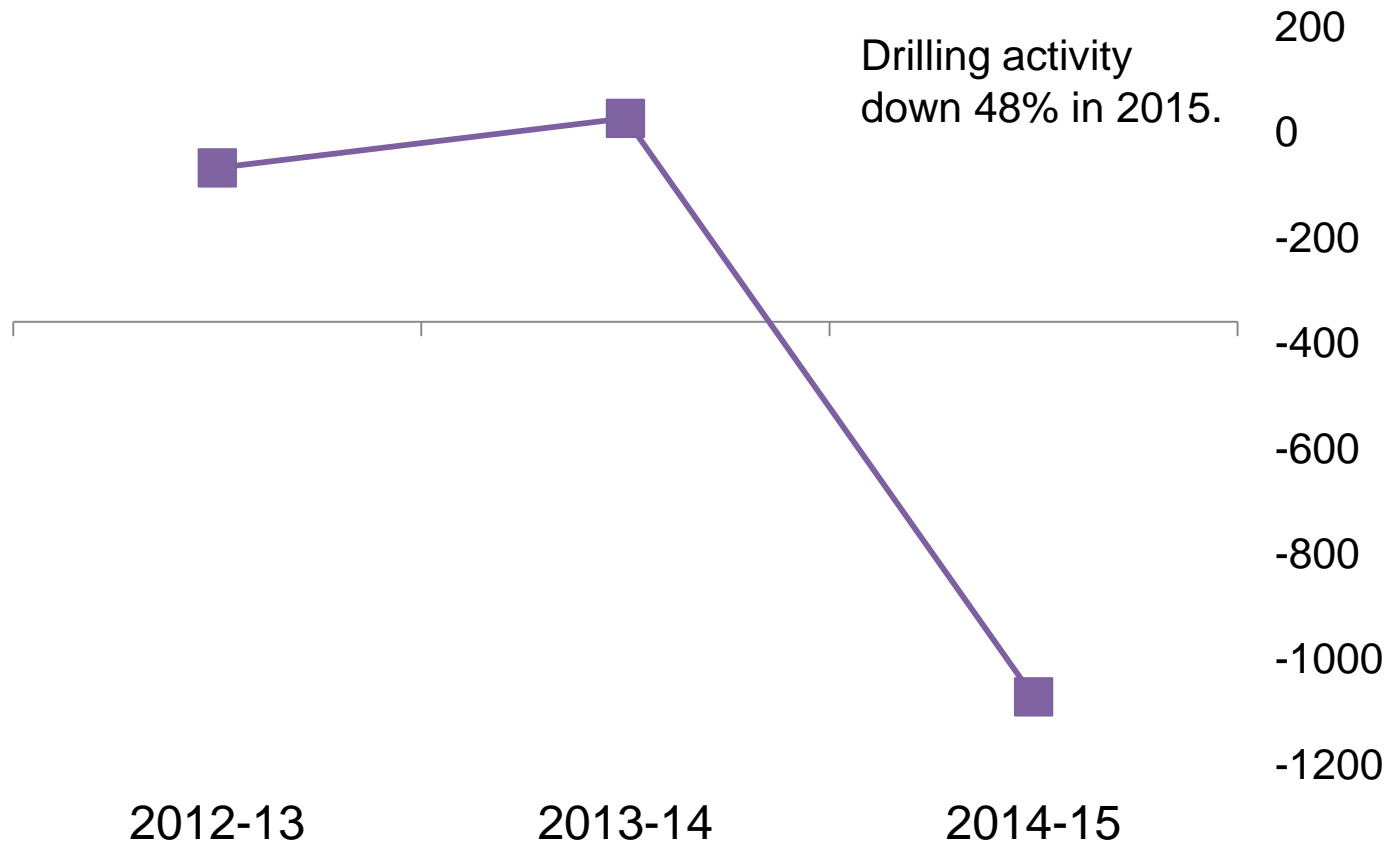


Source: Numera, Baker Hughes, customs agencies, OPEC

*In **North America** where most of the drilling is onshore and uses imported gelants, the links are very clear.*

NA drilling activity fell 48% in 2015 alone...

North American trade and rig count variations
000s tonnes (left), units (right)

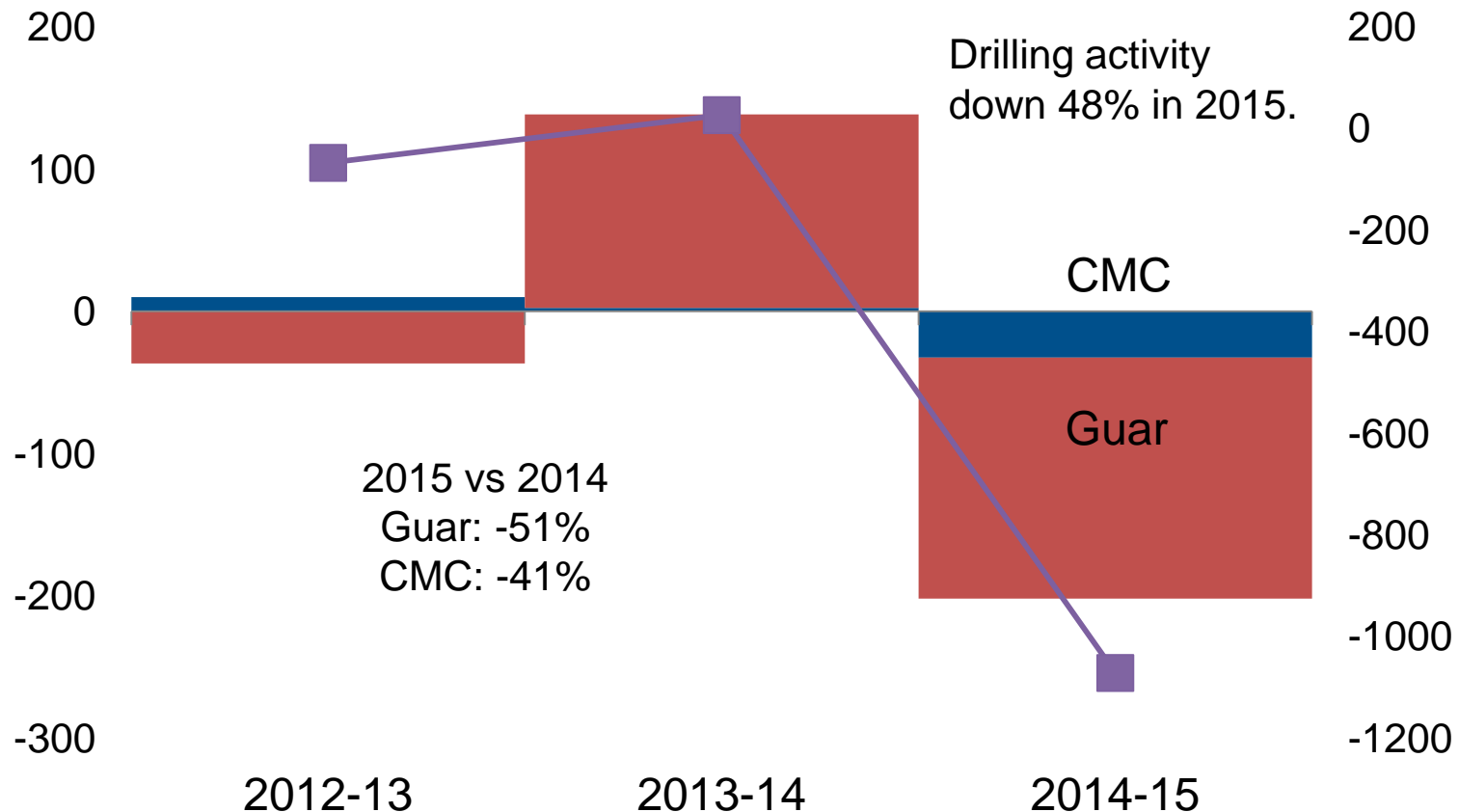


Source: Numera, Baker Hughes, customs agencies



...cutting demand for mud additives by half

North American trade and rig count variations
000s tonnes (left), units (right)



Source: Numera, Baker Hughes, customs agencies

Trends and Outlook

- Since the summer of 2014, oil prices are down about 55%. Consequently, spending on exploration and production has been cut back dramatically. Last year alone, spending was slashed 35% in North America and close to 17% in the rest of the world. The reduction continued in the first half of this year. As a result, we have seen a 58% drop in drilling activity globally versus the 2010-14 average.
- This has contributed to a sharp drop in consumption of CMC for use in drilling and hydraulic fracturing. Global trade in CMC, a good indicator of global consumption, has dropped 24% (Q1 2016 vs. Q3 2014).
- Also contributing to the losses for CMC has been increased use of other gelants, such as guar gum, which are costlier, but less labour-intensive to use. It is a secular trend that before 2014 was masked by the strong cyclical recovery in drilling and CMC consumption.

(Con't) Trends and Outlook

- When will drilling activity recover? We need to see a sustained improvement in oil pricing (above the cost of tight oil in the US). The recent rally in price has been somewhat reversed with WTI settling back around \$46. And the futures market has WTI at only \$54 three years out. So the worse may be over but a recovery does not appear imminent.
- Consequently, CMC consumption by the oil sector is expected to move sideways well into 2017.
- As oil prices do eventually rebound, so will demand for CMC, though the impact of substitution will limit the recovery.



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