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# *The Petroleum Economics Monthly*

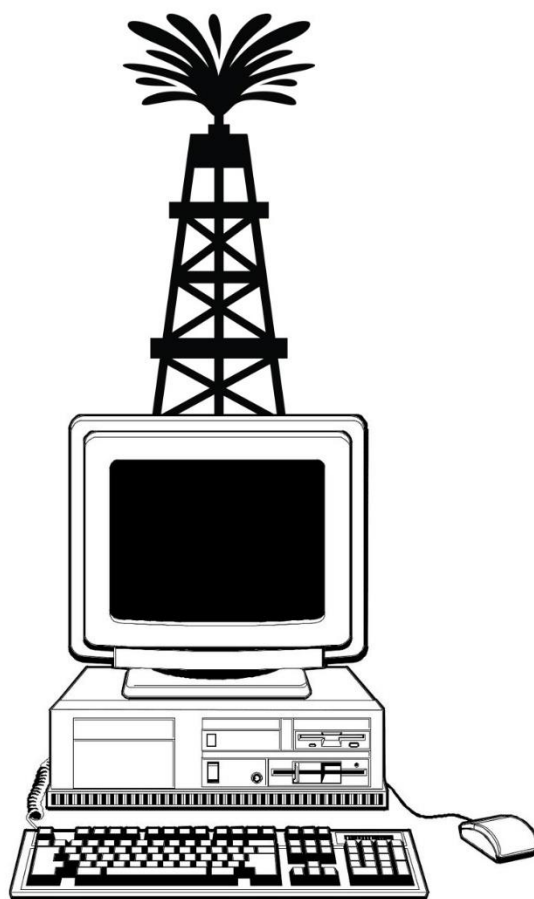
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## **A Lesson in Disruption: The New Economics of Global Oil and Gas**



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**A Lesson in Disruption:  
The New Economics of Global Oil and Gas**

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**SUMMARY**

This issue of *The Petroleum Economics Monthly* updates the November 2014 *PEM* titled “ManuFRACturing Fossil Fuels: Implications for Oil Prices.” That report chronicled the development of fracking as a source of incremental natural gas and crude oil supply. The discussion focused on fracking as a disruptive technology. The report also introduced the term “manufracturing.”

Historically, hydrocarbon production by the oil and gas industry involved a process of exploration, discovery, development, and production. Reserves were discovered. Then funds were expended to develop the fields. Production followed over a period of years.

While this was going on, a mythology developed within the industry regarding finding reserves. According to the received wisdom, easily found, easily accessible resources were developed first. Then, as these low-cost reserves were exhausted and global demand for hydrocarbons rose, firms would move to more difficult, more expensive fields. According to the prevailing doctrine, costs would increase over time as the industry had to spend ever-larger amounts to bring in new fields.

This escalating cost expectation dominated thinking for decades. Chief executive officers of firms such as Amoco, Arco, Fina, and Mobil allowed themselves to be purchased by larger companies, believing they were too small to exist in a business where development costs for new prospects were rising from billions to tens of billions.

The Kashagan field in Kazakhstan is a monument to this thinking. The field holds vast reserves but to date, even after a consortium of large companies poured more than \$50 billion into it, output is just two hundred thousand barrels per day.

The myth that costs must rise inexorably has finally been broken by nerds from Silicon Valley. These nerds developed and applied a revolutionary production technique—fracking—to the United States’ vast shale reserves. Indeed, fracking is a disruptive technology of the type described by Clayton Christensen and Joshua Gans.<sup>1</sup> More specifically, fracking has introduced two types of disruptions to the oil and gas industries.

First, fracking is inexpensive compared to developing giant fields. This allows small independent firms to compete on an equal basis with or even gain a competitive edge over the large integrated oil companies and the oil-exporting states.

Second, entrepreneurs have open access to fracking technology, making the entry of new firms formed by experienced oil and gas professionals easy.

As noted in the November 2014 *PEM*, fracking is the sort of innovation that accelerates an industry’s commoditization. Six years ago, IBM celebrated its centennial with a multi-page spread in *The Wall Street Journal*.<sup>2</sup> In it, the firm asked this question: “How does a company confront relentless commoditization?” Its answer was “you have to keep moving to the future” and it gave this example:

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<sup>1</sup> See Clayton M. Christiansen, *The Innovator’s Dilemma: When New Technologies Cause Great Firms to Fail* (New York: HarperBusiness, 2000) [<http://goo.gl/Ijqt4s>], and Joshua Gans, *The Disruption Dilemma* (Cambridge, MA: MIT Press, 2016) [<https://goo.gl/W4NswL>].

<sup>2</sup> “Nearly All the Companies Our Grandparents Admired Have Disappeared,” *The Wall Street Journal*, June 16, 2011 [<https://goo.gl/xZNsXB>].

Consider the IBM Personal Computer. This wasn't just a breakthrough invention and successful IBM business. It was a product that spawned a whole new sector of our industry. But several years ago, it became clear that the PC was not central to our future—or the future of computing. So we got out—a move that scratched almost \$11 billion in annual revenues from our books. This was just one of several similar moves over the past 10 years. All part of the perpetual motion of building higher-value businesses.

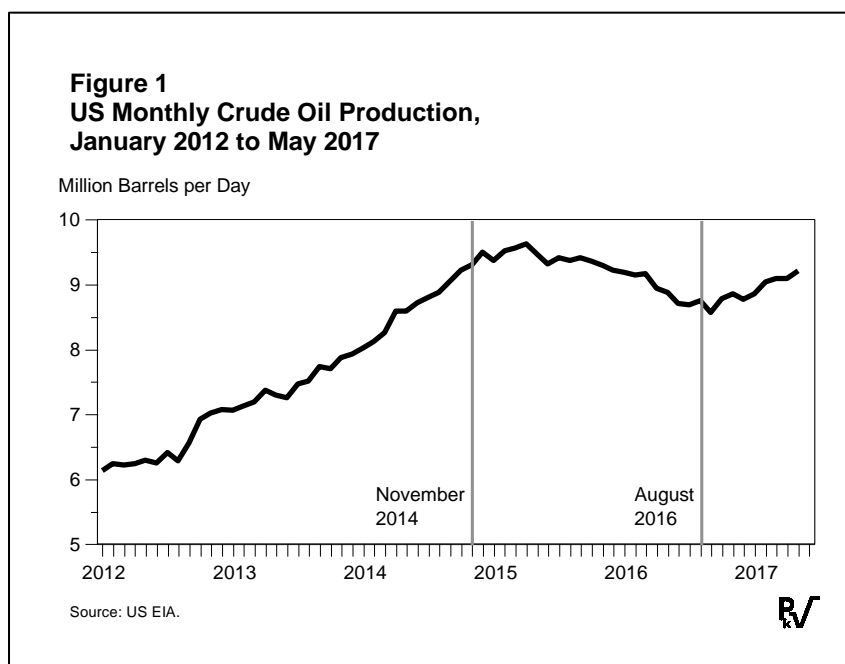
In much the same way as PCs commoditized the computer business, fracking has commoditized oil production.

In November 2014, the leading oil-exporting countries acted to slow fracking's progress. The Saudi oil minister at the time, Ali Naimi, recognized the threat posed by fracking and declined to make unilateral cuts in production.<sup>3</sup> Other countries also refused to act. Crude oil prices collapsed.

The collapse depressed US drilling and production. However, the price recovery did not occur as quickly as anticipated. Less than two years later, Saudi Arabia and other oil-exporting nations reversed course, agreeing to a joint production cut aimed at increasing prices. The effort was led by Saudi Arabia. The Saudi action was taken as part of the nation's plan to build on its Vision 2030, an ambitious plan to reform its economy.

The most immediate impact of Vision 2030, though, appeared in the production of US crude. As Figure 1 shows, US oil production immediately reversed after al-Falih's statement in August 2016. Output began to rise more and more quickly. Two years of low prices had prompted US producers to cut costs aggressively while seeking new methods to boost productivity. Shale production surged, protected first by the price protection created by oil-exporting countries and then by the election of Donald Trump as president.

In less than a year, US output reached the previous peak of 9.43 million barrels per day. Furthermore, forecasts by the US Energy Information Administration anticipated production would increase another million barrels per day by the end of 2018. As noted below, based on prior underestimates of the shale boom's impact, the increase will likely be two million barrels per day, meaning that the cutbacks by oil-exporting countries will need to increase significantly to prevent further price declines.



<sup>3</sup> See Ali Naimi, *Out of the Desert* (New York: Penguin Random House, 2016), pp. 279-80.



Here we suggest that the current surge in US oil production will be even larger than the prior one. Furthermore, the current expansion of Manufacturing appears far less vulnerable to low prices than the earlier rise for these reasons.

First, aided by investors from Silicon Valley, US producers have boosted productivity rapidly, driving costs down.

Second, the new technologies are leading to substantial increases in estimates of recoverable reserves in the United States, reserves that have been long known but previously considered uneconomic.

Third, US producers have found a rich market for light sweet crude in Asia, where buyers seem interested in reducing their dependence on Middle Eastern crude.

Fourth, new pipelines and port facilities are cutting the cost of moving US supplies to the global market.

Fifth, the historical model, where drilling activity was determined by cash flows from activities, may have been replaced by the expectations model, which drives investment in new technologies, a model most obvious in the case of Tesla.

Finally, US investors and operators know they can operate with impunity regarding the actions of OPEC and other international producers because they expect their activities to benefit from the protectionist policies of the Trump administration.

In the end, we attribute the expected surge in US output discussed here to an industrial phenomenon described in detail by Gans and Christensen, which we will call “Disruptive Economics.” Gans explains it well in a single sentence:

*The phenomenon of disruption occurs when successful firms fail because they continue to make the same choices that drove their success.*

It is our expectation that the disruptive influence of manufacturing, augmented by activist rather than passive investors, the contributions from Silicon Valley, falling costs for renewable energy supplies, and protectionist economic policies will doom the weaker oil-exporting countries as well as large multinational companies to the fate predicted by Professor Gans. This issue of *The Petroleum Economics Monthly* describes the essentially unstoppable pressure from fracking on traditional oil producers.