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# The U.S. Shale Gas Revolution and its Implications for International Energy Policy

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## Abstract

Four years ago, gas prices in the United States approached record highs at nearly \$4 per gallon, all the while politicians argued about the causes and solutions. President Obama tried to calm the oil and financial markets, announcing on March 30, 2011 a goal that has tantalized presidents since Richard Nixon: to attain independence from foreign energy sources by reducing oil imports by more than one-third by 2025, a milestone that could reconfigure the U.S' economy, geopolitics, and more. The U.S.' dependence on foreign petroleum is widely considered a national security risk due to the volatility of oil and gas prices, supply-demand imbalances, and threats of sudden and more severe supply disruptions. For four decades, as U.S. energy consumption and imports increased, production fell, prompting the question: is rising oil and gas production in the U.S. likely to alter the four-decades-old debate surrounding energy independence in the U.S. and beyond, and if so, how and with what consequences to international energy markets? This paper evaluates the geopolitics of the U.S. shale gas revolution and its implications for international energy policy.

**Key words:** Shale Energy, Natural Gas, Unconventional Gas, Energy Policy

**JEL classification:** O32, Q410, E2, Q43, Q55

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## 1. Introduction

The shale gas revolution has fundamentally transformed energy markets domestically and abroad. Rising production has led to falling gas and oil prices in the U.S., while Europe, in contrast, is paying four to five times more for its natural gas and becoming one of the biggest importers of U.S. coal. As recently as five or six years ago this turnabout seemed improbable, with many analysts calling for rapid growth in renewable energy investment as the best means by which to wean the nation from its dependence on imported oil. Even then, such investment seemed far-fetched as the liquidity crisis worsened during the 2008-2012 global recession, forcing the federal government to institute stringent fiscal and monetary stimulus to stabilize the financial market and institutions. Taken together, the shale gas revolution represents the maturation of industry-friendly policies started under President Bush and continued during the Obama Administration. These policies supported the introduction of advanced technologies such as hydraulic fracturing, tight-oil extraction, horizontal drilling, innovative industrial software and other digital solutions, which have allowed production companies to economically extract oil and gas from previously inaccessible or financially infeasible shale rock formations with breathtaking speed. Most tantalizingly, this is a story of the triumph of a combination of economics of energy (operating by its own rules of supply and demand), the power of government-funded research and development (R&D), and getting the relationship right between the government and private sectors.

## 2. The Shale Oil and Gas Boom

In both the U.S. and abroad, rising shale gas production stands to raise the prospects for greater use of natural gas, an outcome that will exert significant influence on the structure of the global gas market. Cheap natural gas prices will help displace fuels associated with greater carbon intensity and higher air pollution, such as coal and oil. These low prices have also been an engine of growth in the U.S., stimulating local economic booms in places like Oklahoma, Texas, North Dakota, and Pennsylvania. It is now a well-established fact that increased shale gas production in the U.S. has had a ripple effect on other energy markets abroad through displacements of supplies in global trade as well as by fostering greater interest in shale resource potential, and it is expected these impacts will expand over time. According to the Energy Information Administration (EIA), in 2013, about 9.35 trillion cubic feet of dry natural gas was produced in the U.S., representing about 39% of total dry natural

gas produced directly from shale deposits.<sup>1</sup> The U.S. is well on its way to becoming self-sufficient in oil and gas, and according to the International Energy Agency (IEA), forecasts on global energy trends show it could overtake Saudi Arabia as the world's biggest supplier of hydrocarbons by 2020.<sup>2</sup>

These developments have exerted pressure on the global energy markets as evidenced by a flood of oil from the U.S., the slowing economic growth in China and Asia in general and the falling oil prices. The result is heightened discord at the Organization of the Petroleum Exporting Countries (OPEC), which has spawned competition for new markets by producers even as Middle East turmoil frays political alliances. Revelations about the existence of technically—and possibly commercially—viable shale gas resources have continued with smashing success in Europe, Argentina, China, India, Australia, and elsewhere. Together, some of these developments could, in principle, have significant geopolitical ramifications thus exerting a powerful influence on U.S. energy and foreign policy.

### **3. Growth Generators**

Indeed, a particularly attractive investment environment has facilitated the U.S. shale renaissance, and spurring this production boom are the sector's private gas producers, rather than the government, who make investment decisions. This year, intent on realizing even better performance, gas producers are particularly focused on cost reduction and economies of scale. Perhaps even more important, the well-developed open markets in the U.S. have facilitated efficient trading in shale gas to the highest bidder, conditions that are distinctly lacking in Europe and Chinese gas markets. Equally, the strong-form market efficiency that exists in the U.S. gas industry lets producers benefit from long-term contracting and its variants to hedge long-term systemic risks since they can sell their production several years in advance and use those contracts as income hedging instruments when they seek financing for their projects. In the U.S. gas industry, resources are also mostly owned by individual investors, not governments, thus keeping politics a step removed from gas market development.

These features have offered both security of supply and economic benefits to the U.S. Save for Canada, none of these growth generators that have spawned the U.S. shale gas boom are present in other countries with high technically recoverable shale resources. However, it is far

too early to assume the shale gas boom will not materialize beyond U.S. borders; there are no physical principles that prevent techniques and technologies developed in the U.S.—including enhanced oil recovery and horizontal drilling combined with hydraulic fracturing—from being applied around the world to extract technically recoverable shale.

## 4. Triumvirate Mechanisms

Geopolitical consequences of the soaring shale gas supplies for international energy policy have concentrated on the triumvirate mechanisms of the price of oil, the changing patterns of trade in the global energy market, and the integration of natural gas markets. Whether or not the shale gas boom transcends North America or is replicated in other regions of the world, these factors remain a tantalizing possibility. Here they are discussed in detail.

The first mechanism through which policymakers imagine the U.S. shale gas boom will upturn global energy markets and geopolitics is through its impact on oil prices. In January 2008, the price of oil hovered around \$90 per barrel. By the end of the year, oil prices had plunged to under \$35 per barrel but not before it peaked at \$147 per barrel that July. Six years later, in January 2015, both Brent and U.S. crude futures dropped to \$47.93 per barrel on the New York Mercantile Exchange, a 5½-year low amid continuing concerns about a global supply glut and the pace of economic growth. Oil futures concerns forced Saudi Arabia's state oil company Saudi Aramco to cut its light oil prices to the U.S. by 60 cents per barrel for the February delivery, raising the prospects of what observers consider the beginning of a price battle to regain market share lost to American shale producers. Like other members of OPEC, Saudi Arabia dislikes that kind of volatility since too low prices result in enormous financial problems for many exporting countries and their economies depend on oil trading between \$100 and \$130 per barrel. However, according to a study on modern oil prices and the impact of new technology led by James Bartis of the RAND Corporation, oil shale will become profitable at an oil price between \$80 and \$110 per barrel, with further cost decreases as the industry gains experience.<sup>3</sup>

In any case, there is no current consensus on the future price of oil because these estimates reflect different assumptions about technology, policy, demographics, lifestyles, and global economic growth, all of which result in varying future supply and demand growth projections and different prices for oil. Moreover, since oil is traded globally, prices are determined by

the total global supply and not necessarily by how much is produced by a single country. For instance, in 2008, as the price of oil went on an incredible roller-coaster ride, Saudi Arabia stepped in as the prices fell from \$115 per barrel to about \$60 in less than six months. And guess what happened? Nothing. The fact of the matter is that other members of OPEC did not follow Saudi Arabia in propping up the prices, exposing the Saudis on their inability to single-handedly control global oil prices. Additionally, though U.S. oil production was higher in 2010 than in 2009, the prices of oil were higher too. The big question is what will be the impact of U.S. shale production on the global price of oil?

While it may not be possible to adequately predict long-term implications of the U.S. shale revolution, it is already evident that increased U.S. oil output means the potential to exert downward pressure on the price of oil. Previously, when oil production rose in the U.S., oil output of many OPEC countries fell. Trevor Houser and Shashank Mohan of Rhodium Group, have analysed the economic implications of the U.S. shale oil and gas boom, and concluded that without this boom in the U.S. and Canada, the global price of oil would trade 3-11% higher from 2013 to 2035.<sup>4</sup> Given the temptation of many oil exporting countries to maximize their revenues from oil sales by restraining production and propping up prices, a sustained drop in the price of oil could have major political ramifications. As further volatility in oil prices is projected, this is likely to hammer energy stocks and currencies exposed to crude exports, as well as intensify risks to oil-dedicated sovereign wealth funds such as Saudi Arabia's Sanabil Al Saudia fund.

Second, geopolitical implications of the shale boom relate to changing patterns of trade that are and will continue to upturn global markets. The push for U.S. exports of liquefied natural gas (LNG) has been strong and is likely to increase in the coming years as the number of companies applying for permits to build terminals expands, transforming the U.S. into the number three LNG exporter after Qatar and Australia, according to IEA.<sup>5</sup> Regionally, domestic supplies expansion in both Canada and the U.S. are expected to be sufficiently robust to move them to a position of joint self-sufficiency by 2020, according to EIA.<sup>6</sup>

The long-term upside to the competitive American LNG export market, beyond the potential to shake up global markets, is the prospect to exert shifts in trade patterns as countries search for different pricing mechanisms and more market flexibility in the delivery terms. Signing up more companies for cheaper hub-priced LNG from the U.S. looks very attractive at the

current \$3.07/MMBtu price levels. Already this has created some short-term friction for suppliers from Angolan and Nigerian LNG markets, who planned to supply U.S. markets, but no longer find a ready market in the U.S. as a result of the shale boom. Besides, development of an American LNG export market could also help insulate gas importing countries in Asia and Europe from political arm twisting by suppliers in the Middle East and Russia. A scenario that would not only be good for the economies of these consuming countries as a whole, but also for U.S. foreign policy, is freeing up would-be allies to actively work with the U.S. rather than holding back for fear of political and economic retaliations. Internationally, there is a strong perception that energy trade is at the core of political relationships, and will continue to be as the American energy renaissance continues.

The final implication of the U.S. shale boom on global energy policy and geopolitics is its potential to fundamentally transform the natural gas markets. Following the 2011 events at the Daiichi nuclear power facility in Fukushima, Japan, in combination with soaring U.S. shale gas supplies and high oil prices, a significant initial widening of the gap between natural gas prices in the Americas, Europe, and Asia occurred, reaching their low point in April, 2012. The expected emergence of other regions as significant LNG supplies to the world market alongside North America, including Australia, Argentina, South Africa and parts of East Africa such as Mozambique and Tanzania could theoretically, have the opposite effect of bridging regional gas prices.

For over a decade, natural gas prices have been characterized in the U.S. by high price volatility and supply-demand imbalances. In October 2014, the Henry hub natural gas spot market was trading in the \$3.8/MMBtu to \$4/MMBtu range. Based on the Henry hub averages, natural gas spot prices averaged \$4.45/MMBtu in 2014 and it is estimated at around \$3.84/MMBtu this year, according to the EIA.<sup>7</sup> Although price differentials will remain between different regional markets because of transportation costs, it is likely that big importers targeting the shale boom such as South Korea and Japan will gain from having alternate suppliers with lower costs, a development that will continue to benefit these economies so long as the transformation in the natural gas industry endures.

Either way, signs of geopolitical transformation of the soaring U.S. shale gas supplies are already evident beyond American shores: discord in OPEC and rising imports of U.S. coal for power generation in Europe. It is also uncertain which OPEC member could effectively play

the role of “swing supplier” to guarantee less volatility of oil prices. But the shale boom is still too new for anyone to definitively make any predictions of what a stable price would mean for the global energy markets. Therefore, the breadth and depth of the geopolitical implications of the shale boom will largely depend on two factors: sustainability of U.S. shale production and its associated value chains, and the extent to which this boom can be replicated beyond U.S. borders.

## **5. The Promise of Expansion in Shale Energy**

Could oil and gas prices have fallen over the last decade as they have without rapid growth in shale? Open access implemented two decades ago through the Federal Energy Regulatory Commission (FERC) Order 436 which mandated third party access to gas transmission pipelines, stagnant coal prices, and a positive financial foundation of the gas industry helped to lower the prices, but most credit goes to the maturation of industry-friendly policies and technologies leading to shale boom. Technology is driving efficiencies, resulting in lower costs to drill each well. The evidence clearly indicates a flourishing global gas market. Fuel switching of coal for less carbon intensive natural gas in power generation has significantly grown with shale development and is likely to continue in other regional gas markets, especially in Europe and Asia. This would lead to better economical viability to undertake further extraction of the technically recoverable shale gas supplies.

Cheap gas prices compared to coal and petroleum is now a reality as daily gas volumes transported has significantly increased with the expansion in shale production. While the geopolitical premium that can accrue to the international energy markets from the shale boom in the U.S. are significant, investments in the industry, especially to support operations and efficiency improvement of the nearly 10,000 small producers, remain puny, sparse, and uncoordinated. Given the transformative potential of the shale boom for U.S foreign policy as well as its energy standing, it would be remiss for American policymakers not to turn the current energy renaissance into geopolitical heft.



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