Study predicts world economy unlikely to stop relying on fossil fuels

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A pumpjack in Texas. Image: Wikipedia.

On the heels of last year's historic climate agreement in Paris, a new study concludes that fossil fuel consumption is likely to grow without clear and decisive global action to put an adequate price on carbon dioxide emissions and increased clean energy technology.

"The Paris agreement laid out a dramatic new vision, but there is still much work to be done to turn that broad outline into the concrete climate policy changes around the globe that are needed to reduce fossil fuel consumption and the odds of disruptive climate change," said Prof. Michael Greenstone, a study co-author and director of the Energy Policy Institute at the University of Chicago. "But one thing is clear: Counting on the fickle finger of fate to point the way to cheaper low-carbon

energy sources, without market and policy forces pushing us there, mistakes hope for a strategy."

Writing in the *Journal of Economic Perspectives*, Greenstone and coauthors Thomas Covert of the University of Chicago and Christopher Knittel of the Massachusetts Institute of Technology found that the continued use of fossil fuels would lead to dramatic changes in the planet. In measuring their impacts on warming, the study finds that burning the fossil fuels known to us today would increase global temperatures by 10 to 15 degrees Fahrenheit. Those numbers don't account for advances in fossil fuel extraction techniques that could make resources we can't even extract today economically accessible, such as oil shale and methane hydrates, potentially adding another 1.5 to 6.2 degrees Fahrenheit of warming.

The economists explored whether market forces alone would cause a reduction in fossil fuel supply or demand. By studying the history of fossil fuel exploration and technological progress for both clean and dirty technologies, they concluded that it is unlikely that the world will stop primarily relying on fossil fuels soon. As one piece of evidence, the economists studied the amount of reserves in the ground over the last three decades compared to world consumption. For the last 30 years, reserves of oil and natural gas have grown at least as fast as consumption. As a result, the world has always had 50 years of future consumption stored as reserves in the ground. This was equally true in boom years (when prices were high) and bust years.

Technological progress, such as the development of hydraulic fracturing and the ability to extract oil from tar sands, is at least partially responsible for a long-term pattern of consistent worldwide growth in fossil fuel reserves. Looking at the average growth rate of these reserves, the study shows that both oil and natural gas grew at a steady rate of 2.7 percent. While coal reserves fell consistently through the late 1990s to

2008, they too have since taken a fairly consistent turn upward; further, there are currently roughly more than 100 years of reserves.

"As long as markets fail to account for the environmental damages from using fossil fuels, there will always be incentives to develop new techniques to more efficiently access these resources," said Thomas Covert, an assistant professor of microeconomics at the University of Chicago's Booth School of Business. "It seems unlikely that our technological abilities to recover fossil fuels should stop improving any time soon. With continually improving technology, the world will likely be awash in fossil fuels for decades and perhaps even centuries to come."

The study's authors also found that technology has improved significantly in cleaner energy sources. This is encouraging because cheaper clean technologies would reduce demand for fossil fuels. Unfortunately, the trends in clean technology progress are not yet strong enough. For example, the levelized cost of solar power fell from nearly $450/MWh in 2009 to $150/MWh in 2014. Though the downward trend continues today, the cost of natural gas-fired power is still cheaper, even when accounting for the cost of climate-related damages.

The story is similar when looking at alternatives to fossil fuels in the transportation sector: namely, battery-powered electric vehicles. At the current battery cost of $325 per kWh, the authors find that the price of oil would need to exceed $350 per barrel before an electric vehicle would have a lower cost of ownership than an equivalent gasoline powered vehicle. Unfortunately, oil traded at an average of $49 per barrel during 2015 and is currently trading below $30 per barrel. Thus, batteries need to be much cheaper before electric vehicles could cause reductions in demand for fossil fuels.

"While alternative sources of energy and energy storage technologies

have vastly improved, lowering costs, they still have a long way to go before they are cost competitive with fossil fuels," said Chris Knittel, the William Barton Rogers Professor of Energy Economics at the MIT Sloan School of Management and director of the Center for Energy and Environmental Policy Research. "To change this, governments should put a price on carbon emissions and start injecting more money towards the basic R&D that is critical to making these technologies more cost competitive."

More information: Thomas Covert et al. Will We Ever Stop Using Fossil Fuels? , *Journal of Economic Perspectives* (2016). DOI: 10.1257/jep.30.1.117

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