Journal of Environmental Economics and Management 70 (2015) 92–108

Contents lists available at ScienceDirect

Journal of Environmental Economics and Management

journal homepage: www.elsevier.com/locate/jeem

Revealing climate change opinions through investment behavior: Evidence from Fukushima

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ARTICLE INFO

Article history:
Received 20 June 2014
Available online 29 January 2015

JEL Classification:
G02
G11
G14
Q4

Keywords:
Climate change
Public opinion
Event study
Financial markets
Stock returns
Fukushima

ABSTRACT

In this study we present a novel research approach to obtaining behavior-based evidence of regional climate change attitudes, using the 2011 Fukushima nuclear plant incident as a natural experiment. Our approach allows us to produce the first non-survey-based empirical evidence of a trans-Atlantic divide in public opinion on the environment and climate change that investors assign to fossil-based and renewable energy. This value is based on the perceived potential of these fuel types to substitute for nuclear generation in the aftermath of the Fukushima crisis. We carry out an event study to examine differences in abnormal returns of global coal and renewable energy companies on European and American stock exchanges. We find that investors trading on U.S. markets exhibit a significantly more favorable perception of coal stock profitability, while investors trading on European exchanges display a more favorable perception about profitability of renewable energy stocks.

Introduction

There has been an evident trans-Atlantic divide on climate policies in the United States and Europe. Europe has set an ambitious emissions reduction target under the Kyoto Protocol, implemented multiple policies and measures including cap-and-trade to achieve that target, and played an important role in post-Kyoto international negotiations. U.S. legislators, by contrast, failed to support the Kyoto Protocol, often questioned the basic science of climate change, and failed in 2010 to enact a climate bill to launch a cap-and-trade scheme to curtail carbon emissions (Carlarne, 2006; Schmidt and Haifly 2012; Skjærsethet al., 2013).

Such a trans-Atlantic divide on climate policy has been, at least in part, attributable to a reported difference in public opinion on climate change between the United States and Europe. For example, surveys conducted in 2009 by the Pew Research Center and the World Bank show that 44 percent of U.S. respondents believed at that time that global warming was a *very serious problem*. A much higher percentage of respondents in France (68 percent) and Germany (60 percent) agreed with this statement. Only 46 percent of U.S. respondents thought *climate change would harm people in their country now or within 10 years*, whereas 67 percent of respondents in France believed so (Brechin and Bhandari, 2011).[1]

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[1] The Brechin and Bhandari (2011) study only looks at relative differences in surveyed opinions that the authors compile from multiple polls. Although the authors convey that substantial differences in responses exist, they do not carry out any statistical tests to evaluate these differences.

http://dx.doi.org/10.1016/j.jeem.2015.01.004
0095-0696/

Surveys and opinion polls presently constitute the primary method of obtaining individuals' views on climate change and other environmental concerns (Brechin and Bhandari, 2011; Lachapelle et al., 2012; Lorenzoni and Pidgeon, 2006). However, the political and emotional charges that fuel the debate on climate change makes obtaining accurate and honest views on such subjects rather challenging. While useful, public opinion polls give us only a relatively simple—and often general—sense of how people feel about a certain issue. Moreover, self-reported opinions have been found to misrepresent individuals' true beliefs and corresponding actions (Podsakoff et al., 2003). For instance, survey-based studies appear to lead to a paradox that "Americans seem concerned about global warming, yet view it as less important than nearly all other national or environmental issues" (Leiserowitz, 2006).

This paper takes a novel approach to understanding individuals' true attitudes toward climate change by directly observing actions that people take when presented with a potential energy and environmental crisis—actions that reveal their perceptions of how grave environmental and climate change concerns are. Being able to observe what people do in response to a challenge, rather than what they say, provides more compelling evidence of one's understanding of said challenge, especially when observed actions are tied to monetary outcomes.

More specifically, we examine behavior of investors in U.S. and European financial markets during the unfolding of the Fukushima crisis that reflects their perceptions about future profitability of various energy assets (i.e. stocks of fossil fuels and renewable energy). Our approach exploits an intuitive link between people's attitudes toward the concept of climate change and their relative perceptions for the profitability prospects of different energy sources. Survey-based studies have found that people more concerned about climate change tend to have a more optimistic and positive evaluation of renewable energy than of fossil fuels.[2] This implies that an individual's level of environmental and climate concern likely frames his assessment of the relative future profitability of various energy types. We draw on this link to gauge potential regional differences in climate change attitudes through *actual* investing behavior of financial market participants in the United States and Europe. These participants are mostly local investors, as established by the home country bias literature.[3]

We also address an important challenge of differentiating investor perceptions of the *global* profit potential of specific energy types on one hand from investor expectations about *local* policy response to the Fukushima crisis on the other. The former would be based on global profit expectations and thus provide evidence of investor's environmental views. The latter may have nothing to do with one's environmental attitudes, but would impact investment decisions by changing the local profit potential of energy firms.

We use Japan's Fukushima nuclear power crisis of March 2011 as a natural experiment. Public support for nuclear power weakened noticeably (Gilani and Shahid, 2011) and the prospects of nuclear power worldwide dimmed as emergency workers struggled to contain the scale of the Fukushima crisis in its initial days.[4] A decline in nuclear generation without an offsetting reduction in energy demand implies a need for compensating generation from other energy sources. The anticipated shift in the global generation portfolio led investors to rebalance their energy asset holdings.

We argue that the rebalancing was done in a manner consistent with investor perceptions of how the world would respond to the nuclear crisis (that is, their expectations about which energy type would become the most likely substitute for nuclear generation). The increase in demand for the products and services of these energy companies would make them more profitable and therefore more attractive to investors.[5] Because the actions we observe have direct financial outcomes, our approach provides evidence that reflects the relative monetary value that investors assign to fossil-based and renewable energy in the immediate aftermath of the Fukushima crisis.

We apply event study methodology to stock market data from the time period encompassing this crisis.[6] Our results indicate that investment behavior does indeed reflect investors' environmental perceptions. We observe positive financial effects accruing to a portfolio of *global* coal companies traded on U.S. markets, on the order of 8.6 percent in excess returns, but not to those listed on European exchanges. By contrast, European exchange data reveal larger positive outcomes for a

[2] For example, analysis of a large British public attitude survey by Spence et al. (2010) finds that both concerns about climate change and general environmental concerns are linked with a positive evaluation of renewables.

[3] The home country bias, a result that equity portfolios of investors (including both individual and institutional investors) tend to remain heavily concentrated in their domestic stock markets, has been studied for decades and remains one of the most important puzzles in international finance. The vast majority of investors does not hold foreign securities or invests only a small portion of total assets in foreign stocks, despite a relatively low correlation between stock returns of various countries and the potential benefit from international diversification. See, for example, French and Poterba (1991), Abreuet al. (2011), and Grinblatt and Keloharju (2001).

[4] Most notably, Germany committed to phase nuclear capacity out of its energy portfolio completely by the year 2022, and China halted nuclear projects due to safety uncertainty. Many other nations followed suit with safety checks and delays of new nuclear project approvals (Joskow and Parsons, 2012). In retrospect, the negative impact of the Fukushima crisis on nuclear power may have been exaggerated. Duffy (2011) and Davis (2012) note that a global nuclear renaissance was unlikely prior to the Fukushima incident and Joskow and Parsons (2012) argue that the actual effect of Fukushima is unlikely to result in as drastic a reduction on nuclear capabilities as has been widely conceived.

[5] An investor's objective is to maximize the expected return on his investment, given some risk tolerance. Following the Fukushima nuclear crisis, an investor would rebalance her asset portfolio toward those financial assets she believes will be more profitable in the future. For energy stocks, this implies companies associated with that energy type that is most likely to make up for a reduction in nuclear generation.

[6] Event study methodology has been widely used in finance and economics literature (Fama (1965), Fama et al. (1969)). There are studies that apply the event study methodology and other empirical approaches to evaluate the effect of the Fukushima crisis on financial returns of energy firms in a single region. They find that nuclear utilities (particularly Japanese utilities in the affected area and those operating nuclear power plants) suffered a severe decline in returns and a significant increase in systematic risk (Kawashima and Takeda, 2012), while European nuclear and renewable sectors experienced short downward and upward returns adjustments, respectively (Ferstl et al. 2011).