News-based Environmental Policy Uncertainty and Clean Innovation

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This study aims to investigate how perceptions about policy uncertainty, i.e. frequent and unpredictable changes in environmental and climate regulations, relate to clean innovation investments. To limit global temperature rise below 2 degrees Celsius, the world will need to massively invest in clean technologies over the next decades. Meeting this objective necessarily requires commitments from governments to implement long-term stable policy support for clean innovation investments. Given the irreversible nature of innovation activities, firms typically want to know which policy assumptions will be valid for their projects over the next decades and, when faced with a policy framework characterised by high uncertainty, they may prefer to postpone or withdraw their investments.

The economic literature has mainly investigated environmental policy uncertainty in the context of optimal timing of investments in power plants in a real-option framework using theoretical models calibrated on plants' operating costs (Chronopoulos et al. 2016). Recent work by Dorsey (2018) has also looked at legal challenges to the Clean Air Insterstate Rule to investigate how policy uncertainty affects coal-fired plants investments and emissions. Much less attention has been devoted to the impact of policy uncertainty on energy R&D investments, mainly due to the lack of good indicators of environmental policy uncertainty suited for applied research. Existing indices are often qualitative subjective measures (such as the perception of experts), with little variation over time and potentially subject to reverse causality (Kalamova et al., 2013).

This study improves on existing literature by developing a newspaper-based index of perceived uncertainty about U.S. environmental policy and examining its evolution over the last three decades. Following a similar approach as Baker et al. (2016) for macroeconomic policy uncertainty, we count the frequency of articles referring to uncertainty about climate and environmental regulations in ten leading U.S. newspapers.[1] The underlying assumption, validated by the work of Baker et al (2016), is that newspaper articles are a good proxy to measure policy risks and shocks as perceived by contemporary observers. To accurately identify articles

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[1]New York Times, Washington Post, Wall Street Journal, Houston Chronicle, Dallas Morning News, San Francisco Chronicle, Boston Herald, Tampa Bay Times, San Jose Mercury News and San Diego Union Tribune - since 1979 for the earliest archive.

describing environmental policy uncertainty, we first extracted a set of 500'000 articles from our set of newspapers based on a very large set of keywords related to environmental and climate regulations. We then conducted a large-scale manual screening of relevant articles referring to uncertainty in the context of environmental and climate regulations. This set of articles is used as an input to train a support-vector machine (SVM) learning algorithm – a supervised approach to text-mining – to identify the most relevant articles (Tobback et al., 2018). The SVM algorithm constructs a rule that predicts whether an article is relevant and apply it to our whole universe of newspaper articles. At this stage, the algorithm produced promising results using the subset of New York Times articles and we are currently studying the performance of the classifier on the larger set of newspapers. Articles referring to uncertainty in environmental policy typically refer to policies being rolled back, to whether specific regulations will be adopted, to indecisiveness of governments, etc. The algorithm will allow to identify spikes in uncertainty around major environmental policy debates, such as for instance the breakdown of the Waxman-Markey Bill in 2009 and uncertainty about government subsidy cuts after the financial crisis of 2009.

In the second part of the analysis, we will test how meaningful our indicator is. Since using newspaper-based measures of environmental policy uncertainty raises several issues about accuracy and potential bias, we will compare our index with other measures of environmental policy uncertainty, such as volatility in energy governmental R&D expenditures (Kalamova et al, 2013). Finally, we aim to investigate how environmental policy uncertainty relates to clean technology investments by looking at how our news-based index is associated with firm-level patenting activities in renewable and fossil-fuel energy (Noailly and Smeets, 2015), recent venture capital investment data using the Crunchbase database and stock returns of clean energy and technology companies using various clean energy indices (WilderHill Clean Energy Index, S&P Global Clean Energy Index).

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