Measuring Climate Policy Uncertainty

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Abstract

This study presents a new measure of uncertainty related to climate policy, based on news from major US newspapers. The Climate Policy Uncertainty (CPU) index spikes near important events related to climate policy, such as new emissions legislation, global strikes about climate change and President's statements about climate policy, among other developments. Our findings suggest that climate policy uncertainty has a strong and negative effect on CO_2 emissions.

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1. Introduction

Policies aiming to tackle climate change have been at the forefront for quite a few decades now, in an effort of countries around the world to reduce greenhouse gas emissions towards a more sustainable future. Despite this fact, there can be substantial uncertainty around the implementation path of such policies. A recent example is the withdrawal of the US from the Paris Accord in 2017 (only to re-join after three years under President's Biden administration).

Uncertainty in general might lead firms to delay investments through the real options channel (Bloom, 2009). This could translate into less investment in new equipment and R&D. However, uncertainty related to climate policy specifically might have an opposite effect. For instance, Lopez et al. (2017) using survey data from a sample of 250 European firms report that uncertainty induced by climate policy regulation is positively related to a firm's decision to invest in reducing their ecological footprint. Having said that, besides survey data, aggregate measures of climate policy uncertainty are scarce in the literature.

This paper presents a new index of climate policy uncertainty (CPU). Using the scaled frequency of articles in eight major newspapers in the US, our index captures important events related to climate policy. When we test the effect of climate policy uncertainty on a timely global issue, such as CO_2 emissions, our findings indicate that CPU has a strong and negative effect on emissions, both at the aggregate and sector level.

Our work is mostly related to that of Engle et al. (2020), which applies textual analysis on articles from the Wall Street Journal (WSJ) and construct a climate change news index. Our measure differentiates from theirs in two ways. First, we use eight major newspapers instead of one, which allows for greater news coverage. Second, we focus exclusively in news discussing climate policy that may induce uncertainty, while the authors include all news related to climate change (e.g. natural disasters). In fact, the correlation coefficient between our index and their WSJ climate change news index is quite low (0.41). Our study is also related to the concurrent work of Faccini et al. (2021) which uses the Latent Dirichlet Allocation (LDA) method on news from Reuters; instead of constructing an index, the authors construct climate risk factors and examine the cross-section of US stock returns.

This study contributes to two strands of the literature. First, it contributes to the literature using textual analysis on newspapers to extract uncertainty on a wide area of topics, such as economic policy, monetary policy, trade policy and geopolitical risk (Baker et al., 2016; Caldara & Iacoviello, 2017). Our study shows that such technique can also yield another proxy for uncertainty related to climate policy. Secondly, our study contributes to the growing literature on climate/environmental economics and finance, which study the determinants of CO_2 emissions and how climate risk affects firms' investment decisions (Le et al., 2020; Engle et al., 2020). In this aspect, the CPU index can be utilised as an additional tool to capture climate policy uncertainty at the macro level.

The rest of the paper is organized as follows. Section 2 presents the methodology for constructing the index; Section 3 presents the results from an empirical exercise using the CPU index; Section 4 concludes the study.

2. Methodology

In order to construct the CPU index, we follow the established methodology of Baker et al. (2016) and their EPU index. Specifically, we search for articles in eight leading US newspapers containing the terms {"uncertainty" or "uncertain"} and {"carbon dioxide" or "climate" or "climate risk" or "greenhouse gas emissions" or "greenhouse" or "CO_2" or "emissions" or "global warming" or "climate change" or "green energy" or "renewable energy" or "environmental"} and ("regulation" or "legislation" or "White House" or "Congress" or "EPA" or "law" or "policy"} (including variants such as "uncertainties", "regulatory", "policies", etc.) from January 2000 till March 2021. The eight newspapers are: *Boston Globe, Chicago Tribune, Los Angeles Times, Miami Herald, New York Times, Tampa Bay Times, USA Today and the Wall Street Journal*. For each newspaper, we scale the number of relevant articles per month with the total number of articles during the same month. Next, we standardize these eight series to have a unit standard deviation and then average these across each month. Finally, we normalize the averaged series to have a mean value of 100 for the whole period.

Figure 1 presents the evolution of the index for the period 2000:M1 to 2021:M3. As shown in the figure, there is quite a number of spikes over the sample period around important events regarding climate policy. For example, the index spikes on June 2001 (President Bush's statement about global climate change reiterating his Kyoto Protocol rejection), December 2007 (EPA's new energy legislation about vehicle greenhouse gas emissions and the decision to decline the right of 17 states to set strictest rules on car emission standards), January 2017 (Volkswagen pleads guilty on the emissions scandal), June 2017 (Trump announces US withdrawal from the Paris Accord), September 2019 (Global strikes ahead of the UN Climate Action Summit, 24 States sue Trump administration on revoking their right to set emission standards, Trump administration plans to scrap Obama's Clean Water Act reform), April 2020 (Trump administration rejects new emissions rule) and December 2020 (EPA new greenhouse gas emission standards for aircrafts), among other events.

[FIGURE 1 HERE]

3. Results

In this section, we conduct an empirical exercise with our index. Climate policy uncertainty is particularly relevant for researching areas with direct climate outcomes, such as CO_2 emissions. To examine the impact of climate policy uncertainty on the CO_2 emissions, we use monthly data from 2000:M1 till 2020:M12 and fit a VAR model with a Cholesky decomposition and the following order: the CPU index, the log of industrial production (as a proxy for growth), the log of energy consumption and the log of CO_2 emissions. Monthly data on US CO_2 emissions (both at the aggregate and sector level) and energy consumption are from the *EIA* (Energy Information Administration), while data on industrial production are from *Refinitiv*. The series of CO2 emissions and energy consumption are seasonally adjusted using the Census X-13 method and the choice of lags in our VAR models are based on the Schwarz information criterion. Figure 3 depicts the impulse response functions of CO_2 emissions to one standard deviation shocks from CPU, using 90 percent confidence levels. At the aggregate level, our results indicate a quite large impact of CPU on CO_2 emissions. Specifically, a one standard deviation shock from CPU leads to a drop by more than 0.5% on CO_2 emissions one month after the shock, before this starts to dissipate and becomes insignificant after ten months.

[FIGURE 2 HERE]

At the sector level, the maximum drop in CO_2 emissions lies within the residential and commercial sectors. On the former, this is approximately -0.8% at the first month, while thereafter becomes insignificant; hence, this is a very short-lived effect. On the latter, this is again approximately -0.8%, yet the effect lasts up until five months. Moving to the industrial sector, there is a 0.6% drop within one month from the shock, and the effect lasts up until ten months after the shock. The transportation sector experiences the most instant effect on a shock from CPU. Specifically, it has an immediate drop of 0.7%, while this effect lasts up until 13 months from the shock. Finally, a one standard deviation shock from CPU causes an approximate drop of 0.4% on CO2 emissions sourced from electrical power one month after the shock, yet this effect is not significant.[1]

[1] In light of recent evidence linking EPU and CO_2 emissions (Jiang et al., 2019; Syed & Bouri, 2021), we re-run our models by including the EPU index. Results remain qualitatively similar and are available upon request.

Overall, CPU seems to have a strong effect on CO_2 emissions, both at the aggregate and sector level. There is one potential channel which may explain our findings; more specifically, high uncertainty in respect to climate policy or climate risk may discourage energy consumption and non-essential transportation by firms and individuals. At the same time, shocks in climate policy uncertainty may encourage renewable energy consumption, increase R&D innovations on climate-friendly innovations, thus leading to lower CO_2 emissions.

4. Conclusion

This study presents a new index of climate policy uncertainty (CPU) for the US, based on the volume of articles published in eight major newspapers. The CPU index appears to capture major events related to climate policy and events. When we employ the index to examine the relationship between climate policy uncertainty and CO_2 emissions, our findings suggest that shocks to climate policy uncertainty are associated with lower emissions, both at the aggregate level and the majority of sectors examined.

This new measure of climate policy uncertainty, which will be publicly available, is of particular interest to practitioners and researchers. Specifically, traders in the carbon market should factor climate policy uncertainty in their decision making process, as this can affect the demand for carbon emission rights. In addition, future academic research could employ the CPU index in a wide area of topics, such as examining the role of climate policy uncertainty on energy demand and greenhouse gas emissions. Finally, another potential area of research would be examining the role of climate policy uncertainty on firm-level investment, especially for firms in climate-sensitive industries (e.g. transportation, mining and energy).

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Figures

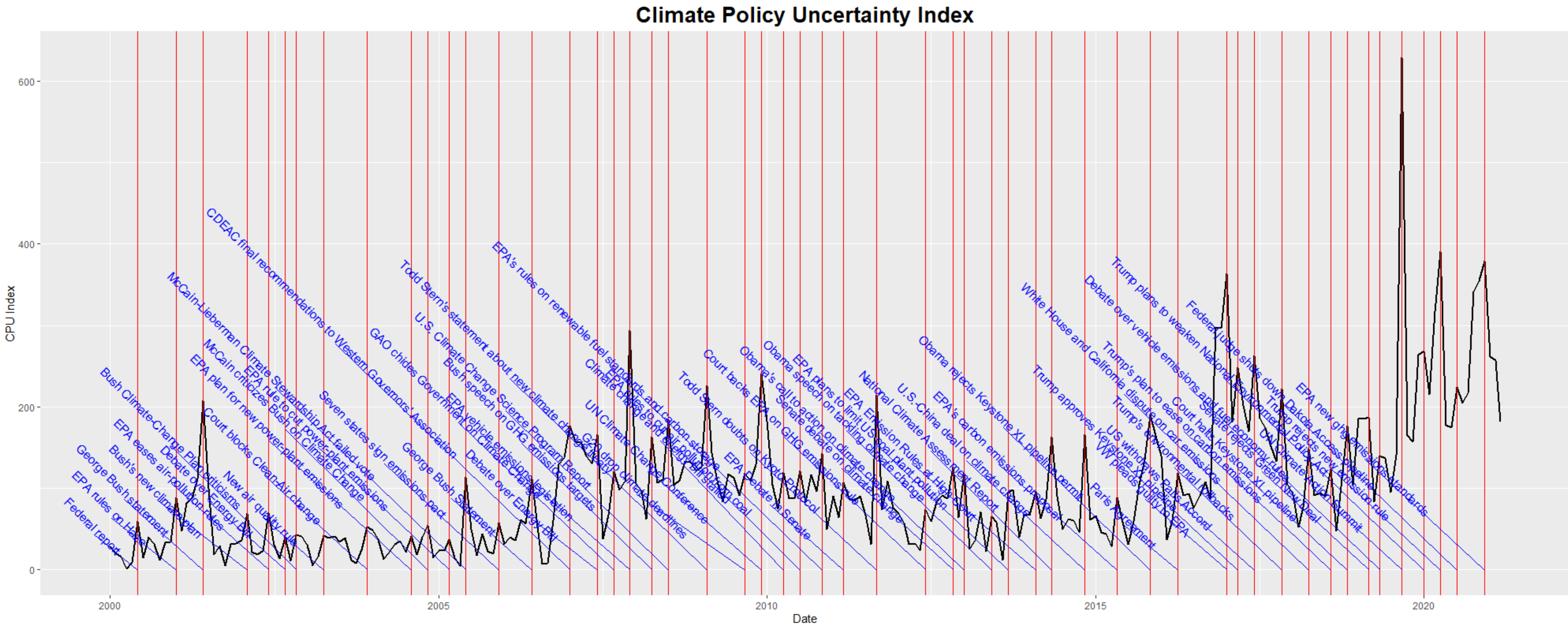

Figure 1 – The Climate Policy Uncertainty Index for the United States (2000:M1-2021:M3)

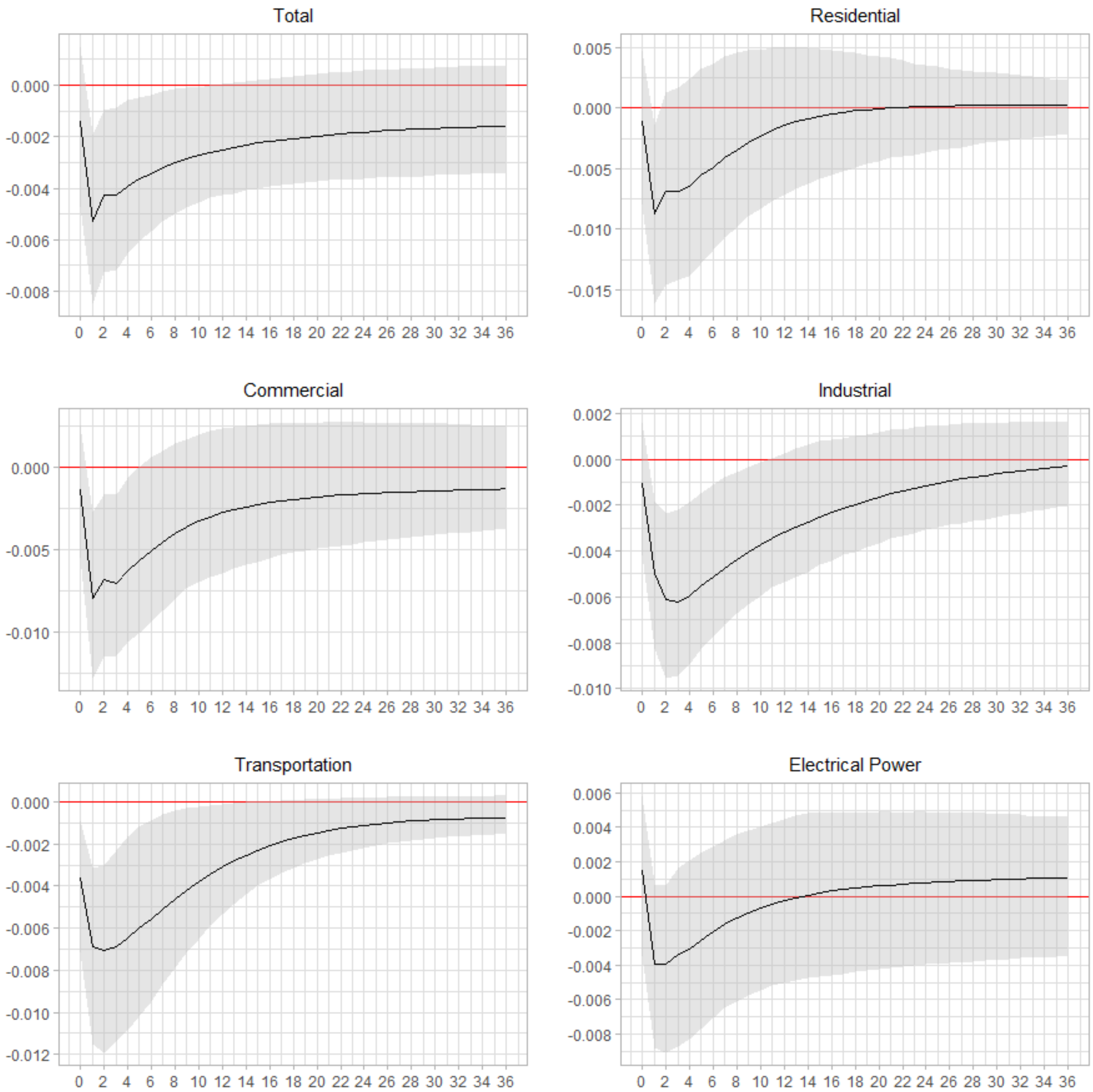

Figure 2 – Impulse response functions for CO_2 emissions to a shock from CPU. Months in x-axes.