The Macroeconomic Effects of Climate Policy Uncertainty*

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Abstract

Recent years have seen a lot of uncertainty about the future path of climate policy. How does this uncertainty affect the economy and the environment? In this paper, we construct a new measure of climate policy uncertainty based on newspaper coverage. Our index spikes near important events related to climate policy, such as major developments in emissions legislation, President's statements about climate policy or global strikes about climate change, among other developments. We find that climate policy uncertainty has significant macroeconomic effects: increased uncertainty leads to a significant fall in industrial production and thus emissions and an increase in unemployment. Importantly, it also causes an increase in commodity and consumer prices. Thus, climate policy uncertainty shocks transmit to the economy as supply shocks. This stands in stark contrast to other uncertainty shocks, which have been found to propagate as aggregate demand shocks.

JEL classification: D80, E66, H23, L50, Q58

Keywords: Climate policy, uncertainty, newspaper coverage. macroeconomic effects

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1. Introduction

Climate change is one of the most pressing challenges of our time, with potentially severe environmental, economic, and social consequences. Fighting climate change, however, has proved very difficult because of its global nature and the pervasive externalities involved. While governments around the world have started to discuss and implement policies to address the climate challenge, the future path of climate policy remains very uncertain. Of particular concern are the economic costs associated with the climate transition. But uncertainty about climate policy can have adverse economic effects itself and these effects may be potentially even larger than the short-term impacts of climate policies. However, the effects of an unclear and unpredictable climate policy are not yet well understood.

This paper studies the macroeconomic effects of climate policy uncertainty. We define climate policy uncertainty as the lack of clarity or predictability surrounding government actions to address climate change. It can arise from a variety of sources, including political debate around proposed policy changes, legal challenges about them, or the complexity of climate policy more generally. Measuring climate policy uncertainty is challenging, however. We construct a novel measure of climate policy uncertainty based on newspaper coverage of topics related to uncertainty about the path of climate policy. Our index spikes near important events related to climate policy, such as major developments in emissions legislation, statements about climate policy by the President or global strikes about climate change, among other developments. While our climate policy uncertainty index correlates with broader economic policy uncertainty, it is largely uncorrelated with other sources of uncertainty such as financial or geopolitical risks. Climate policy uncertainty has been particularly elevated in recent years, surrounding the Paris agreement and during the Trump presidency.

Equipped with this new climate policy uncertainty measure, we map out the economic consequences of increased uncertainty in the climate policy realm. Our identifying assumption is that climate policy uncertainty is predetermined to the US economy, after controlling for broader economic policy uncertainty. Our analysis focuses on the US, where anecdotally climate policy uncertainty has been of particular concern but our approach can be easily employed for other countries as well.

We find that an increase in climate policy uncertainty leads to a significant fall in industrial production and an increase in unemployment. A shock normalized to increase in climate policy uncertainty from the level of climate policy uncertainty during the last years of the Obama administration to the level of uncertainty during the Trump presidency leads to a decrease in industrial production of about 1.5 percent and an increase in the unemployment rate of about 0.4 percentage points. These adverse effects can be explained by the policy uncertainty weighing down on spending, investment and employment. Interestingly, commodity and consumer prices also increase significantly, reflecting the fact that producers incorporate the risk of higher production costs associated with climate policy in their product prices. Thus, climate policy uncertainty shocks appear to transmit to the economy as supply shocks. This stands in stark contrast to economic policy uncertainty shocks, which have been found to propagate through the economy as aggregate demand shocks, having a symmetric impact on output and prices.

This finding has important consequences for the conduct of monetary policy as well. Following climate policy uncertainty shocks, interest rates do not change significantly. This is consistent with the fact that the fall in activity coupled with rising inflation creates a trade-off for the monetary authority. The situation is very different for economic policy uncertainty shocks, where the central bank eases the policy rate significantly in response to the fall in output and prices. This in turn helps to stabilize the economy and the ensuing effects on activity are less pronounced than for a climate policy uncertainty shock of comparable magnitude. This illustrates the importance of accounting for the particular source of policy uncertainty.

We also do not find any evidence of a 'green paradox', i.e. the notion that the threat of future regulation increases near-term emissions by accelerating the rate at which fossil fuels are extracted today. In contrast, we find that emissions do not change significantly on impact but then decrease, following the fall in economic activity. Thus, albeit uncertainty about future environmental regulations lead to emission reductions, this comes at a substantial economic cost.

A comprehensive series of sensitivity checks indicate that our results are robust along a number of dimensions, including the construction of the climate policy uncertainty indicator, our identification strategy, the estimation technique, the model specification and the sample period. Importantly, our results are robust to purging the climate policy uncertainty measure from anticipated economic developments due to past news and other economic disturbances. This suggests our climate policy measure is relatively free from endogenous variation. Furthermore, using a climate news instead of an uncertainty index produces responses that are much attenuated, confirming that our measure captures indeed policy uncertainty and not merely news about climate policy.

Related literature. A growing literature studies the effects of climate policy actions. There is growing evidence that national climate policies are effective at reducing emissions (see e.g. Andersson, 2019; Martin, De Preux, and Wagner, 2014). A number of studies have also analyzed the macroeconomic impacts of carbon prices. For European and Canadian carbon taxes, there is little evidence that they have significant economic effects (Bernard and Kichian, 2021; Konradt and Weder, 2021; Metcalf, 2019; Metcalf and Stock, forthcoming). Känzig (2021) finds more significant effects for the European carbon market but shows that the economic costs depend crucially on how carbon revenues are distributed.

But in many countries and in the US particular, there have not been that many successful climate policy initiatives, at least at the national level. However, there has been substantial uncertainty about the future path of climate policy. Consequently, there has been growing interest recently in the economic impacts of climate policy uncertainty. Gavriilidis (2021), whose analysis this paper supersedes, was – to the best of our knowledge – the first to construct a news-based measure of climate policy uncertainty. Basaglia et al. (2021) use a similar approach but focus on the impact on firms' and investors' behavior. Noailly, Nowzohour, and van den Heuvel (2022) construct a measure of environmental policy uncertainty using a supervised machine learning approach but focus on the impact on green investment at the firm level. To the best of our knowledge, our paper is the first to empirically study the macroeconomic impacts of climate policy uncertainty. Overall, our results illustrate that a clear and predictable path for climate policy is crucial to minimize economic costs during the transition to a greener, more sustainable economy.

Fried, Novan, and Peterman (2021) study the impacts of climate policy uncertainty from a theoretical perspective. They show that uncertainty about future climate policy leads to a decrease in carbon emissions by causing investment to become relatively cleaner and output to fall, in line with our empirical findings. Furthermore, they show that a carbon tax could achieve the same reduction in emissions at much lower cost.

Our paper is also related to an influential literature studying the role of uncertainty for economic and financial fluctuations (see Bloom, 2014 for a survey). A key insight from this literature is that measuring uncertainty is not trivial. Methodologically, we build on a number of studies that take a news-based approach and proxy uncertainty by the coverage frequency of uncertainty related topics in newspapers. This approach was developed in the context of economic policy uncertainty (Baker, Bloom, and Davis, 2016) and was later also applied in the context of geopolitical risk (Caldara and Iacoviello, 2022) and trade policy uncertainty (Caldara et al., 2020). Engle et al. (2020) rely on a similar approach to create an index of climate news that can be used to build climate change hedge portfolios. Sautner et al. (2020) construct measures of climate change exposure at the firm-level by analyzing firms' earnings conference calls. We contribute to this literature by constructing a new measure of climate policy uncertainty and study its impact on the macroeconomy.[1]

Outline. The remainder of this paper is organized as follows. Section 2 covers our approach to measure climate policy uncertainty based on newspaper coverage and presents and validates our index. In Section 3, we discuss our econometric framework, in particular our identifying assumptions and the estimation of dynamic causal effects. In Section 4, we present our results. Section 5 performs a comprehensive series of sensitivity checks, in particular with regards to our identification scheme. Section 6 concludes.

2. Measuring climate policy uncertainty

Measuring uncertainty is a difficult task. Different approaches have been proposed in the literature, ranging from measures based on financial instruments (Bloom, 2009) to uncertainty in economic forecasts (Jurado, Ludvigson, and Ng, 2015). To measure policy-related uncertainty, the information contained in newspapers has been shown to be particularly useful (Baker, Bloom, and Davis, 2016). We build on this approach to construct an uncertainty index specific to climate policy. The basic idea is to proxy climate policy uncertainty by the frequency at which topics related to uncertainties about climate policy are covered in the press. Our approach captures uncertainty about the relevant actors in the climate policy realm, climate policy actions that may be undertaken or not, the timeline of policy changes as well as the economic effects of climate action (or inaction).

[1] Our climate policy uncertainty index is available at policyuncertainty.com/climate_uncertainty and will be updated on a continuous basis.

Our sample is the text contained in about 15 million news articles published in the print version of leading American newspapers from the mid-1980s, when climate policy became relevant, through the present. Our selection of newspapers includes eight of the leading papers across the country: the *Boston Globe*, the *Chicago Tribune*, the *Los Angeles Times*, the *New York Times*, the *Tampa Bay Times*, *USA Today*, *the Wall Street Journal,* and the *Washington Post*. The index counts, each month, the number of articles discussing uncertainty about climate policy, divided by the total number of published articles. This takes care of the fact that the overall volume of articles varies across newspapers and time.

To identify articles that cover climate policy uncertainty, we use a dictionary-based method, following Baker, Bloom, and Davis (2016). This amounts to specify a dictionary of words whose occurrence in newspaper articles is associated with coverage of topics related to climate policy uncertainty. This is a simple and transparent way to proxy the coverage of climate policy uncertainty.[2]

Table 1: Dictionaries for the climate policy uncertainty index

Dictionaries	Terms
Single dictionaries	
Climate	carbon dioxide, CO2, climate, climate change, emission(s), environment, environmental, greenhouse gas, GHG, global warming, green energy, renewable energy, renewables
Policy	regulation, regulatory, legislation, legislative, white house, congress, policy, policies, law, laws, subsidy, subsidies
Uncertainty	uncertain, uncertainty, uncertainties
Joint dictionaries	
Climate policy	carbon tax, tax on carbon, carbon market, market for carbon, carbon pricing, carbon price, price on carbon, cap and trade, ETS, emissions trading, energy policy, energy tax, environmental law, environmental protection agency, EPA
Policy uncertainty	transition risk
Climate uncertainty	climate risk
Exclusion words	
	business climate, economic climate, general climate, financial climate, political climate

Notes: This table summarizes the terms in the dictionaries used to construct the climate policy uncertainty index. Articles are classified as covering climate policy uncertainty if they contain a term from each of the single dictionary or a term of a joint dictionary and the corresponding single dictionary or two joint dictionaries. We exclude articles that contain words from the exclusion list.

[2] An alternative would be to use supervised or unsupervised classification algorithms. However, this is less applicable to our case as the outcome of interest is not directly observed and there are no readily available data to train a supervised model.

In particular, we specify three dictionaries: a dictionary of words meant to capture climate change, a dictionary of terms related to policy and a dictionary of words capturing uncertainty. For the policy and uncertainty dictionaries, we closely follow Baker, Bloom, and Davis (2016), who have validated the use of these terms extensively. Our main contribution is the specification of a climate dictionary, which we validate separately. This dictionary contains words such as “climate change”, “greenhouse gas”, or “renewable energy”. We then identify articles that contain terms from all three dictionaries. Furthermore, we also specify dictionaries that account for terms that fall in two of our categories. Specifically, we develop a dictionary for climate policy terms. This dictionary includes terms such as “carbon tax” or “emissions trading”. In this case, we identify articles that contain a term from this joint dictionary as well as a term from the remaining dictionary. Finally, we also define a set of exclusion words. Our initial audits revealed that these words tend to be associated with false positives. To keep the false positives at a minimum, we thus exclude articles that contain a word from this list. Table 1 describes the dictionaries that we use to construct the climate policy uncertainty index in detail.

To construct the index, we count for each newspaper i the number of climate policy uncertainty articles in each month, scaled by the total number of articles in that period. We standardize each monthly newspaper-level series to unit standard deviation and then construct an average across the all the newspaper by month. Finally, we normalize the averaged series to have a mean value of 100 for the whole period.

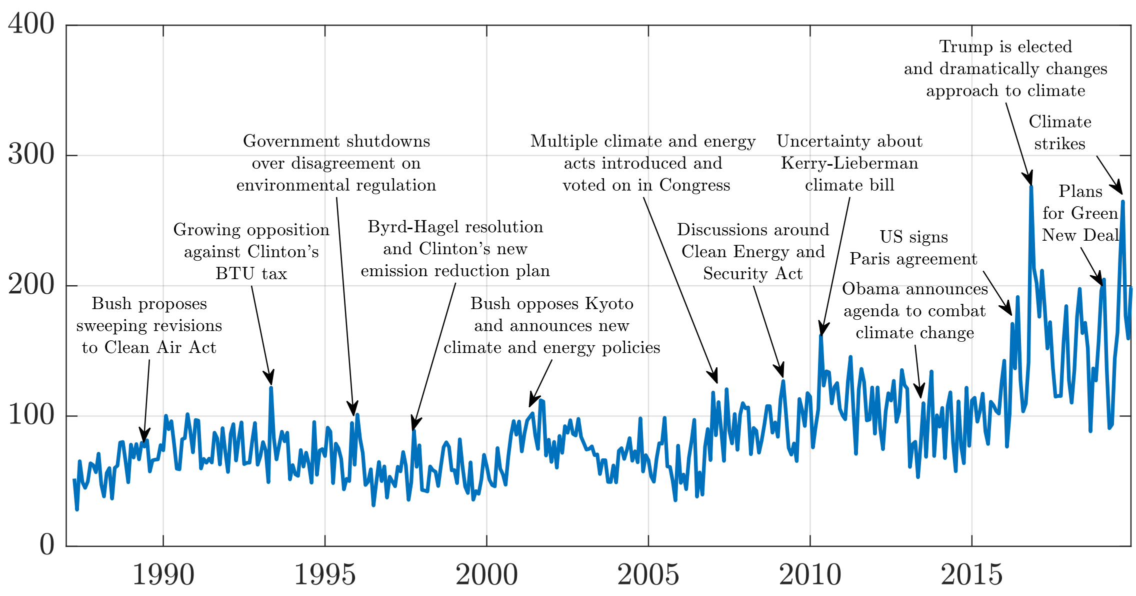

Figure 1: The climate policy uncertainty index

Figure 1 presents the resulting climate policy uncertainty index. We can see that the index displays a slight upward trend, reflecting the fact that climate policy became more uncertain in recent years. Historically, uncertainty around climate policy started to increase in the late 1980s, when the US ratified the Montreal protocol and remained elevated until the early to mid-1990s, when the US amended the clean air act and passed the first energy policy act. There are also some notable spikes, for instance in early 1993 when there was growing opposition against Clinton's proposed BTU tax, which ultimately led the President to back away from the proposal. At the end of 1995, disagreement over cuts in environmental regulations led to a series of government shutdowns, as Republicans after gaining control of both chambers blocked new rules on health, safety and the environment. Afterwards, climate policy uncertainty remained subdued until the early 2000s, when President Bush abandoned the Kyoto protocol and proposed a set of alternative climate and energy policies. In the late 2000s, climate policy uncertainty increased sharply amid several climate and energy bills and in particular the political process around the Waxman-Markey act. In the spring 2010, there was another big spike in uncertainty associated with the introduction and eventual failure of a comprehensive tripartisan climate bill sponsored by John Kerry, Joe Lieberman and, initially, Lindsay Graham. Subsequently, climate policy uncertainty decreased slightly until summer 2013, when Obama announced to use his executive powers to regulate carbon emissions after having warned congress to act on climate change. Starting in late 2015, when the Paris agreement was made, there is a historically unprecedented increase in the index. In April 2016, there is a notable spike in uncertainty when the agreement was open for signature. In November 2016, when Trump won the elections, climate policy uncertainty peaks. In the first months of the Trump presidency, climate policy uncertainty remained at historically high levels as the President dramatically changed the US approach to climate change and announced to withdraw from the Paris agreement. In early 2019, Alexandria Ocasio-Cortez Ed Markey introduced the Green New Deal, which led to another spike in climate policy uncertainty. In fall 2019, climate policy uncertainty increased again to historically high levels amid a global wave of climate strikes.

Validation. To validate the series, we perform a number of validation exercises. First, we confirm that periods of historically high climate policy uncertainty indeed show up as spikes in our climate policy uncertainty index. Second, we performed a human audit of the identified articles covering climate policy uncertainty. A particular concern are false-positives. Our audit revealed that based on our dictionaries, only a share of XX percent are false-positives. Finally, we analyze the sensitivity of our results with respect to the classification of climate policy uncertainty articles. In particular, we have experimented with a larger climate dictionary, which contains a wider selection of climate-related terms. As an additional check, we require that the terms occur in a certain proximity to each other. The results turn out to be remarkably robust.

Finally, we compare our climate policy uncertainty index to other climate news as well as other uncertainty indices from the literature. Interestingly, our climate policy uncertainty index is only weakly correlated (≈ 0.3) with the climate news index by Engle et al. (2020). Partly, this is related to the fact that they use a different approach to identify climate-related articles but more importantly, their index covers news coverage about climate change more broadly and not specific to policy uncertainty. However, our climate policy uncertainty index turns out to be quite strongly correlated (≈ 0.7) with the economic policy uncertainty index by Baker, Bloom, and Davis (2016). This is not too surprising given that our index is basically a subset of economic policy uncertainty and certain periods of elevated climate policy uncertainty, for instance the Trump years, were also associated with high uncertainty in other policy realms. Therefore, it will be crucial to control for changes in general economic policy uncertainty in our empirical analysis. Finally, our climate policy uncertainty index turns out to be basically uncorrelated with measures of financial uncertainty or geopolitical risk.

3. Econometric approach

A challenge in estimating the economic effects of policy uncertainty is that the level of uncertainty may depend on the state of the economy. This may give rise to a reverse causality problem, for instance if policy uncertainty tends to be high in times of economic distress. While climate policy is arguably more long-term in nature and thus less susceptible to these concerns than other economic policies, the political debate around climate change does also take economic considerations into account. Indeed, concerns about the economic impacts of climate policies are often cited as arguments against binding climate action (give an example).

3.1. Identification

To study the economic effects of an increase in climate policy uncertainty we rely on the following identifying assumptions. First, we assume that climate policy uncertainty is predetermined to the US economy. This implies that climate policy uncertainty responds to developments in the economy only with a lag. This assumption is not implausible given the inertia in the political process, especially at the monthly frequency. Second, we assume that a climate policy uncertainty shock only affects economic policy uncertainty with a lag. In this way, we capture policy uncertainty that originates in the climate realm, which however may lead to elevated economic policy uncertainty after, for instance due to the economic repercussions of climate policy uncertainty itself. Under these assumptions, we are able to recover the dynamic causal effects of a climate policy uncertainty shock. Because some of our identifying assumption may seem potentially restrictive, we perform a comprehensive evaluation of the robustness of our results with respect to the identification scheme in Section 5. In particular, our results turn out to be robust to the selection of macro indicators as well as how we control for economic policy uncertainty more broadly.

3.2. Econometric framework and specification

To estimate the dynamic causal effects of climate policy uncertainty shocks, we rely on two complementary approaches. Our first approach estimates these effects based on a structural VAR model. The reduced-form VAR writes

$$\mathbf{y}_t = \mathbf{b} + \mathbf{B}_1\mathbf{y}_{t-1} + \cdots + \mathbf{B}_p\mathbf{y}_{t-p} + \mathbf{u}_t,$$

where p is the lag order, $\mathbf{y}_t$ is a $n \times 1$ vector of endogenous variables, $\mathbf{u}_t$ is a n×1 vector of reduced-form innovations with $\mathrm{Var}(\mathbf{u}_t) = \mathbf{\Sigma}$. Assuming that the model is invertible, we have that $\mathbf{u}_t = \mathbf{S}\boldsymbol{\epsilon}_t$, where $\boldsymbol{\epsilon}_t$ is a n×1 vector of structural shocks and $\mathbf{S}$ is the structural impact matrix. Our identifying assumptions can be implemented by ordering the economic policy uncertainty index first, the climate policy uncertainty index second, and the macroeconomic variables after, and choosing $\mathbf{S} = \text{chol}(\mathbf{\Sigma})$. The dynamic causal effects are then estimated as the impulse response function to the climate policy uncertainty shock, $\epsilon_{2,t}$.

However, apart from the identifying restrictions discussed above, the VAR approach relies on a number of other important assumptions, in particular invertibility and the adequacy of the dynamic VAR structure. Therefore, we also estimate the dynamic causal effects using local projections. Importantly, this approach allows us to estimate the dynamic effects directly and does not rely on the invertibility requirement. For each variable of interest, $\mathrm{y}_{j,t}$, we estimate

$$\mathrm{y}_{j,t+h} = \mu_h^j + \psi_h^j \mathrm{CPU}_t + \gamma_h^j \mathrm{EPU}_t + \boldsymbol{\beta}_h^{j\prime}\, \mathbf{x}_{t-1} + \xi_{i,t,h},$$

where h is the impulse horizon, $\mathbf{x}_{t-1}$ is a vector of controls that potentially includes multiple lags of the variables and $\xi_{i,t,h}$ is a potentially serially correlated error term. ψ_h^j is the dynamic causal effect of the climate policy uncertainty shock on variable j at horizon h.

Our baseline specification includes eight variables. It consists of a policy uncertainty block, which includes the economic policy uncertainty index by Baker, Bloom, and Davis (2016) and our climate policy uncertainty index, and a block of macro controls. In this block, we include US industrial production, the unemployment rate, CO2 emissions, the PCE price index, a commodity price index and the 3-month Treasury bill rate. A potential concern is whether and to what extent our estimated effects reflect climate policy actions rather than policy uncertainty shocks. Controlling for forward-looking variables such as commodity prices should help in this respect, as they incorporate many sources of information. In Section 5, we also alternatively control for asset prices or consumer sentiment. The results turn out to be robust.

The data is monthly and our sample spans the period from 1987 when our climate policy uncertainty index becomes available and we stop the sample in 2019, before the outbreak of the Covid-19 pandemic.[3] The policy uncertainty indices as well as the unemployment rate and the Treasury bill rate enter the model in levels, all other series enter the in log-levels. We include six lags of controls and in terms of deterministics only a constant term is included. However, the results turn out the be robust with respect to all of these choices, see Section 5.

4. Results

4.1. The effects of climate policy uncertainty

We now study the dynamic effects of a positive shock in climate policy uncertainty. Because our uncertainty indices have an arbitrary scale, we normalize the shock to the increase in

[3] Total CO2 emissions are unfortunately only available at the annual level. Therefore, we compute a monthly, interpolated version using the Chow-Lin method with industrial production, commodity prices as well as consumer energy prices as high-frequency indicators.

climate policy uncertainty that we observed in the years during the Trump presidency, compared to the last couple of years under the Obama administration. Over this timeframe, climate policy uncertainty increased by about 50 points.

Figure 2 shows the dynamic causal effects to 50-point climate policy uncertainty shock. Panel A shows the responses estimated from the VAR model. We can see that climate policy uncertainty increases and remains elevated for about a year. This has consequences for the US economy. Industrial production falls and stands at about -1.5 percent after two years and the unemployment rate increases by close to 0.4 percentage points. Commodity prices increase by around 2 percent at its peak and. this also transmits to consumer prices, with the PCE price index increasing by about 0.4 percent. Importantly, the price impacts appear to materialize much quicker than the impact on activity, with the responses reaching their peak after about one year. The fact that prices and activity evolve in different directions creates a trade-off for monetary policy. In fact, interest rates tend to increase slightly after the shock, consistent with the ensuing inflationary pressures, but then get eased as the economy starts to contract. As we will see, this is a defining feature of climate policy uncertainty, which makes it very different from other sources of uncertainty.

Economic policy uncertainty also tends to increase slightly, albeit with a lag. This is consistent with the notion that economic policy uncertainty increases in times of economic distress. Some of the climate policy uncertainty will also be picked up by the economic policy uncertainty indicator, as is also reflected in the positive correlation between the two variables. Importantly, however, our results are robust if we do not restrict the response of economic policy uncertainty or do not control for economic policy uncertainty altogether (see Section 5 for more information).

Climate policy uncertainty also leads to a significant fall in emissions. However, the reduction in emissions seems to be largely driven by the fall in activity and not by improvements in the emissions intensity in production, as the emissions response mirrors the response of industrial production quite closely.[4] This result is consistent with the findings in Fried, Novan, and Peterman (2021). While the fall in emissions is certainly positive from an environmental perspective, it does come at a significant economic cost. Indeed, the existing empirical evidence suggests that climate policies such as carbon taxes or cap-and-trade systems can deliver emissions reductions at substantially lower cost (see e.g. Känzig, 2021; Metcalf and Stock, forthcoming).

We also do not find evidence for the green paradox (see e.g. Sinn, 2008). According to this literature, uncertainty about future climate policy would drive up current emissions by increasing incentives to extract fossil fuel, leading to an expansion in current supply. In contrast, our results suggest that the economic consequences associated with climate policy uncertainty are severe enough to weigh down on emissions.

[4] Note that this is not a mere consequence of the fact that we use industrial production, among other high-frequency indicators, to interpolate the annual emissions data. In fact, there is monthly data available on emissions from energy consumption and using this alternative emissions variable produces very similar results, see Appendix B.

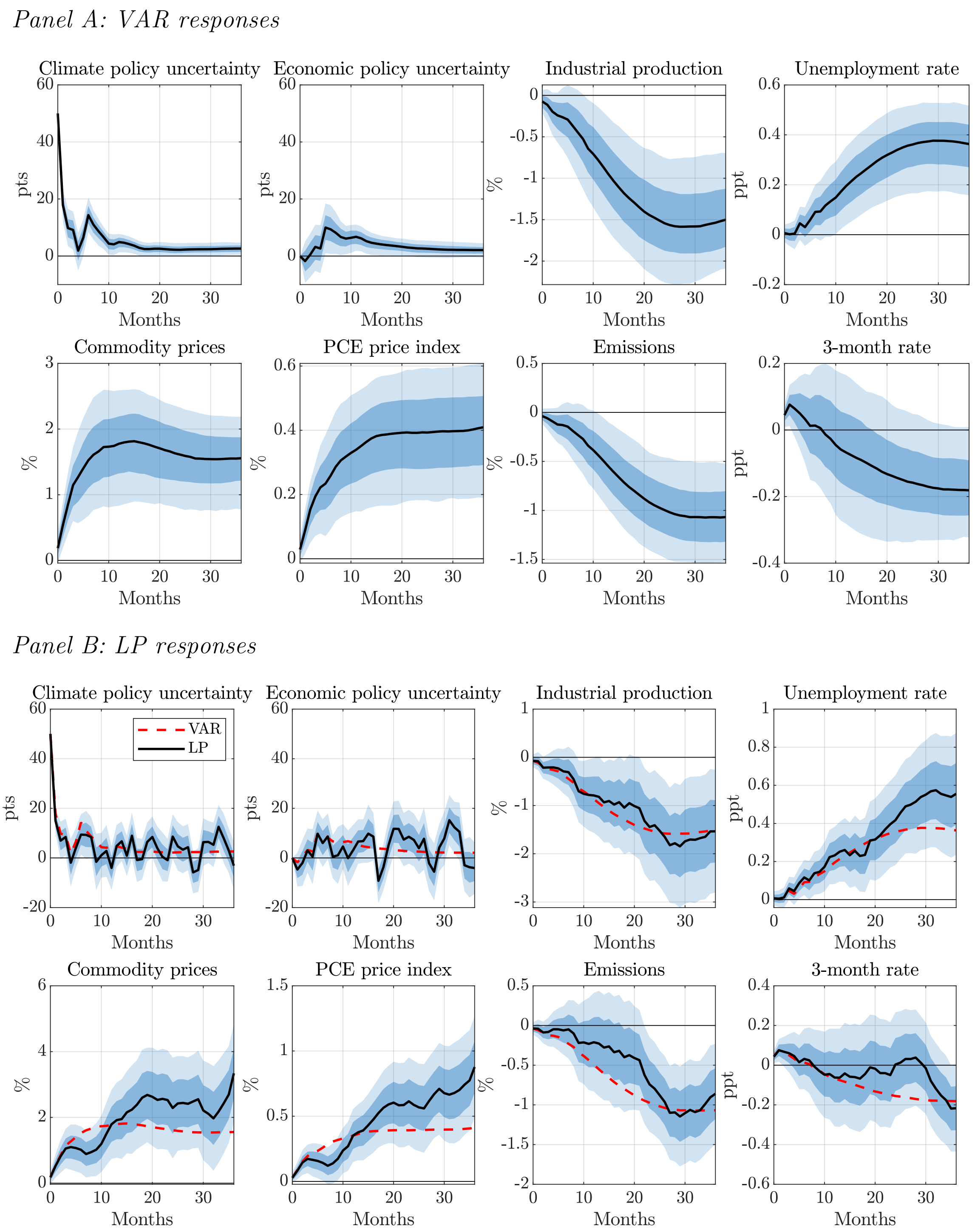

Figure 2: The impact of climate policy uncertainty

Notes: The dynamic causal effects to a 50-point increase in climate policy uncertainty. The black solid line depicts the point estimate. The dark and light shaded bands represent the 68 and 95 percent confidence bands, respectively

In Panel B, we present the responses estimated using local projections. Overall, the responses are very similar both in terms of shape and magnitude. Importantly, we confirm that climate policy uncertainty leads to a fall in activity, an increase in commodity and consumer prices, and a largely insignificant monetary policy response. The economic impacts turn out to be even a bit more pronounced, even though the responses are also somewhat less precisely estimated. These results suggest that the invertibility assumption and the dynamic VAR restrictions do not seem to be particularly restrictive in the present application.

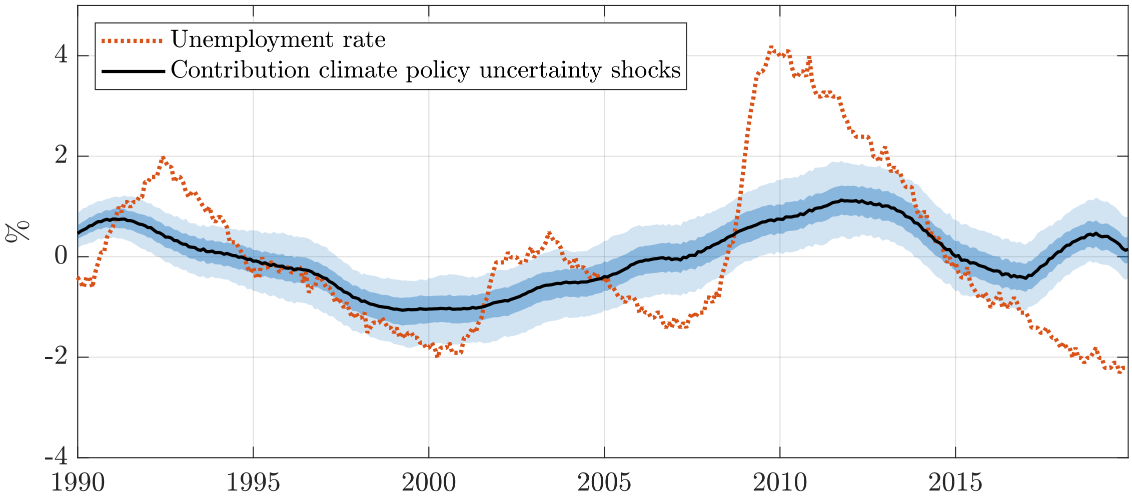

Figure 3: Historical contribution of climate policy uncertainty shocks

Notes: The historical decomposition of the unemployment rate. The actual evolution of the unemployment rate (in deviations from its mean) is depicted as the orange broken line. The black solid line shows the contribution of climate policy uncertainty shocks. The dark and light shaded bands represent the 68 and 95 percent confidence bands, respectively.

We have seen that climate policy uncertainty shocks can have significant effects on emissions and the economy. Another interesting question is how important climate policy uncertainty was in explaining historical fluctuations. In Figure 3, we show the historical contribution of climate policy uncertainty shocks to the unemployment rate. We can see that these shocks contributed significantly to the variations in unemployment, particularly during early 1990s, the early 2000s and from 2010-2014. On average, they account for about 10 percent of the variations in unemployment at horizons up to two years. Climate policy uncertainty shocks also explain a meaningful share of the variations in other variables. As expected, they account for the bulk of variations in the climate policy uncertainty indicator. At the two year horizon, they also account for of about 11 percent of the variations in emissions and industrial production and for close to 20 and 15 percent of the variations in commodity prices and headline consumer prices, respectively. Reassuringly, they only make up for a negligible share the variations in economic policy uncertainty and basically don't explain any variation in interest rates.

4.2. Climate and economic policy uncertainty

An important question is how climate policy uncertainty differs from economic policy uncertainty more broadly. Or put differently, does the source of policy uncertainty matter for the ensuing economic effects? From our VAR model, we can also study the effects of a shock to economic policy uncertainty, following the approach in Baker, Bloom, and Davis (2016).

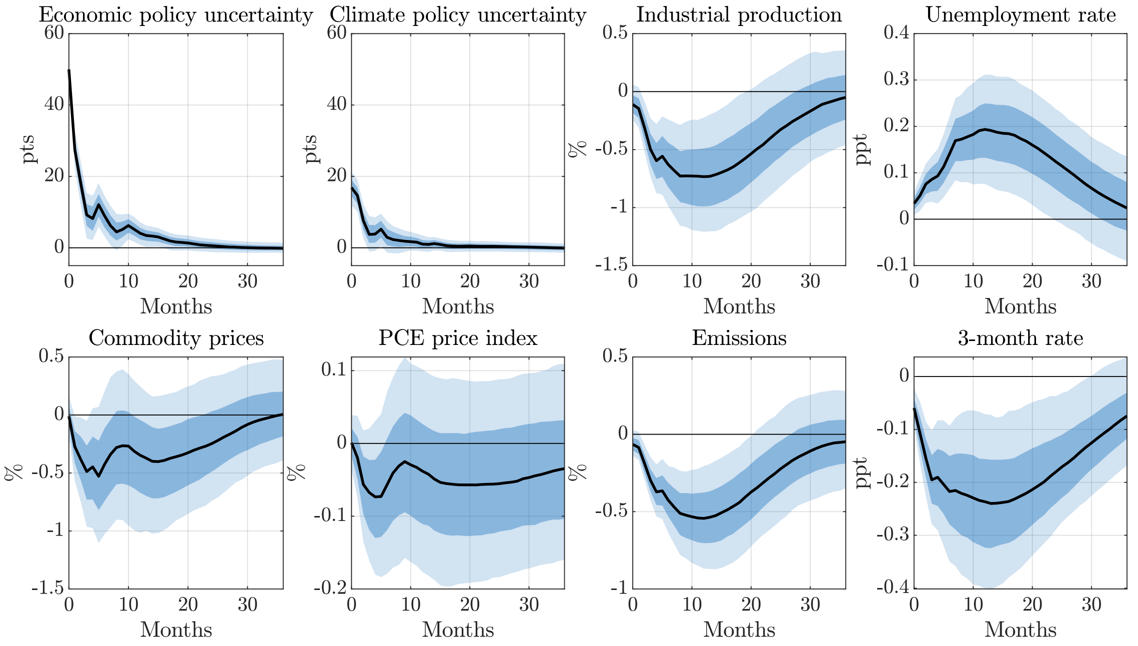

Figure 4: The impact of economic policy uncertainty

Figure 4 shows the responses to an economic policy uncertainty shock, normalized to increase the economic policy uncertainty index by 50 points. We can see that an increase in economic policy uncertainty leads to a significant fall in industrial production and an increase in the unemployment rate. The responses are comparable to the ones presented in Baker, Bloom, and Davis (2016). Importantly, however, commodity and consumer prices *decrease* after the shock. Thus, economic policy uncertainty shocks appear to transmit to the economy as aggregate demand shocks, consistent with the evidence in Leduc and Liu (2016). This stands in stark contrast to our evidence on climate policy uncertainty shocks, which appear to transmit to the economy as supply shocks.

The fall in economic activity after economic policy uncertainty shocks also turns out to be smaller in magnitude and the responses are much less persistent. A crucial difference between the two shocks concerns the monetary policy response. Because output and prices move in the same direction after economic policy uncertainty shocks, the so-called divine coincidence applies, i.e. there is no trade-off for the monetary authority between stabilizing output and prices. Indeed, after an economic uncertainty shock, we observe a significant easing by the Fed, lowering short-term rates by about 25 basis points.

This situation is very different from climate policy uncertainty shocks, where higher inflation and a fall in activity create a trade-off for the central bank and we do not observe a significant easing. The differential monetary response helps explain the stronger economic effects of climate policy shocks.

4.3. The role of monetary policy

Formally study the role of monetary policy, use the approach by Wolf and McKay to look at response under counterfactual monetary policy response!

4.4. Why does climate policy uncertainty transmit as supply shocks?

Show differential impacts of the two in model similar to Leduc and Liu

5. Sensitivity analysis

In this section, we perform a battery of sensitivity checks, in particular with regards to the construction of the climate policy uncertainty measure and our assumptions to identify climate policy uncertainty shocks. During our audit, we have varied the search terms in the dictionaries quite a bit and the results turned out to be very robust to the exact terms used, with the resulting climate policy uncertainty indicators being very highly correlated. As a concrete alternative, we consider a climate policy uncertainty indicator that is based on a wider selection of climate and climate policy terms. See Table B.1. in the Appendix for a detailed summary of all search terms used. Figure B.2 shows the responses using this wider climate policy uncertainty measure as the relevant climate policy uncertainty variable. The results turn out to be very similar to our baseline.

A potential concern with our identification strategy may be that we also capture shocks to economic policy uncertainty, as historically some episodes of elevated climate policy uncertainty also have been associated with high economic policy uncertainty more broadly. To address this concern, we control for contemporaneous changes in economic policy uncertainty. However, our results are robust to how we control for economic policy uncertainty. In fact, just controlling for lagged economic policy uncertainty or not controlling for economic policy uncertainty produces very similar results, see Figures B.3–B.4 in the Appendix. Furthermore, the differential responses of climate and economic policy uncertainty also help mitigate the concern that our results are driven by broader policy uncertainty.

Another concern relates to the assumption that climate policy uncertainty is predetermined with respect to the US economy. To address this concern, we construct a refined climate policy uncertainty index, trying to purge it from any remaining endogeneous variation. The approach is similar in spirit to Bluwstein, Hacioglu Hoke, and Miranda-Agrippino (2020). We use an information-rich environment to estimate a number of factors that summarize different dimensions of the economy, including real activity, prices, and expectations. In particular, we rely on the data and approach in McCracken and Ng (2016), which builds on previous work by Stock and Watson (2005). In a next step, we regress changes in the climate policy uncertainty index on the estimated factors and construct a refined climate policy uncertainty index as the cumulative sum of the residuals in this regression. The responses using this refined climate policy uncertainty index are shown in Figure B.5 in the appendix.

A related challenge with our news-based approach is to disentangle changes in uncertainty from changes in expected policy actions. One approach to address this concern is to control for forward-looking variables such as asset prices or sentiment, as these variables incorporate future expectations. Therefore, we estimate models that include a stock price index, a house price index and a measure of consumer sentiment, respectively. The results are shown in Figures B.6–B.8 in the appendix. We can see that the results are robust to controlling for forward-looking variables. This also helps to further mitigate concerns about non-invertibility. Furthermore, if we use a climate news index instead, such as the index proposed by Engle et al. (2020), we find responses that are substantially attenuated, see Figure B.9. If our climate policy uncertainty measure would capture to a significant extent, we would expect the climate news measure to produce similar results. However, this is not the case.

An alternative to assuming that climate policy uncertainty is predetermined with respect to the US economy is that macroeconomic variables only respond to changes in climate policy uncertainty with a lag. In the local projections framework, this amounts to controlling for contemporaneous macro variables as well. This assumption is particularly reasonable for quantities but may be less appealing for faster-moving variables such as commodity prices. However, apart from commodity and consumer prices, which respond a bit faster under our baseline identification scheme, the results are very similar, see Figure B.10.

Another robustness check concerns the number of lags included in the models. Recall, we use 6 lags in the baseline specification. In Figures B.11–B.12, we present the results based on alternative lag specifications. We can see that the VAR responses are somewhat sensitive if we use very parsimonious lag specifications. This illustrates the importance of controlling for sufficient lags to capture the dynamics accurately. If we use a very generous lag specification, the responses become more jagged, which could be an indication of overfitting. In contrast, the local projection responses turn out to be much less sensitive to the number of lags used as controls.

Finally, we check the sensitivity with respect to the sample period. In particular, we exclude the global financial crisis period, which was associated with a lot of uncertainty, and the Trump years, which were associated with a sharp increase in climate policy uncertainty. The results turn out to be robust, see Figures.B.14–B.13.

6. Conclusion

An influential literature has shown that policy uncertainty can have significant effects on the economy. In recent years, climate policy uncertainty has been a pervasive source of policy uncertainty. In this paper, we study the economic and environmental impacts of climate policy uncertainty. Measuring climate policy uncertainty is challenging, however.

We build on previous work on uncertainty to construct new measures of climate policy uncertainty using information contained in news articles. Equipped with these new measures, we map out the dynamic causal effects of climate policy uncertainty shocks. Our identifying assumption is that changes in climate policy uncertainty are predetermined to the US economy, after controlling for economic policy uncertainty more broadly. We find that climate policy uncertainty has significant effects on the US economy. Industrial production falls and the unemployment rate rises. Importantly, commodity and consumer prices increase as well. Thus, climate policy uncertainty shocks transmit to the economy as supply shocks. This is very different from other uncertainty shocks, which have been shown to propagate more like aggregate demand shocks. Relatedly, the shocks are also associated with a very different monetary policy response. While monetary policy eases after economic policy uncertainty shocks and helps to mitigate the impact on activity, there is no significant monetary response after climate policy shocks, consistent with the trade-off between stabilizing output and prices ensuing after such shocks. This has important implications for monetary policy making in that the adequate policy response to uncertainty may depend on the particular source of uncertainty.

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Appendix

A. Data

The newspaper data to construct the climate policy uncertainty indicators is from Factiva. The sources of the macro data is summarized in the below table A.1.

Table A.1: Data description and sources

Variable	Description	Source
Uncertainty indicators		
CPU	News-based climate policy uncertainty indicator	Factiva/own construction
EPUNEWS	News-based economic policy uncertainty index	Baker, Bloom, and Davis (2016)
CNEWS	News-based climate news index (WSJ)	Engle et al. (2020)
Macro indicators		
INDPRO	Industrial production	FRED
UNRATE	Unemployment rate	FRED
PPIACO	Producer price index all commodities	FRED
PCEPI	Personal consumption expenditures chain-type price index	FRED
EMISSCO2TOTUS	Total CO2 emissions from all sectors, interpolated using Chow-Lin	FRED/own calculations
TB3MS	3-month Treasury bill secondary market rate	FRED

The data is depicted in Figure A.1.

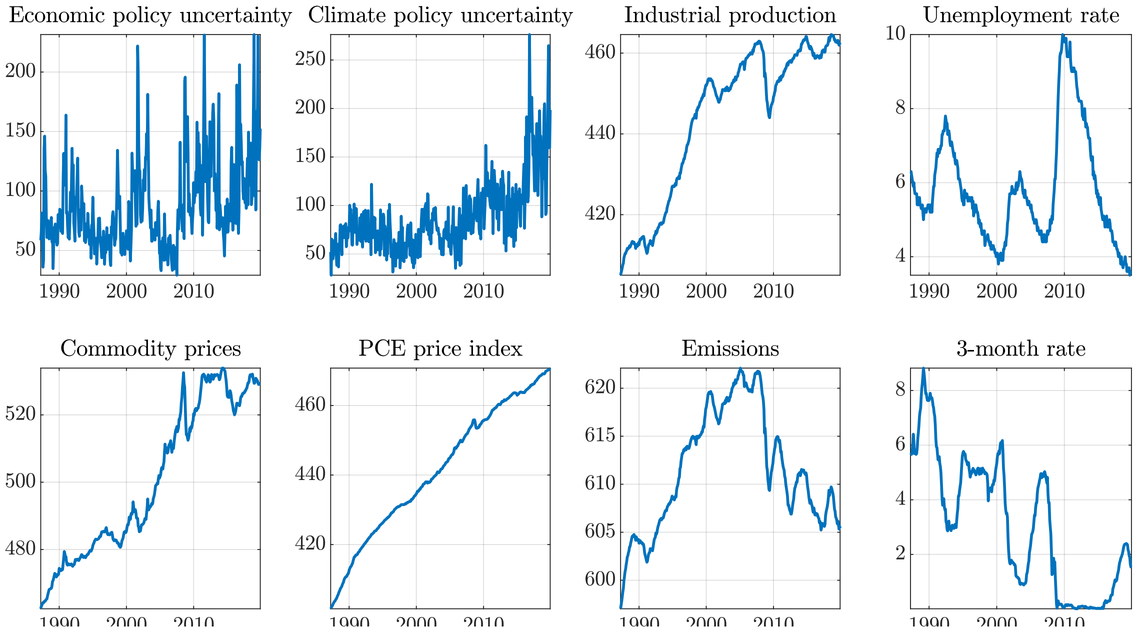

Figure A.1: Transformed data series

B. Additional Figures

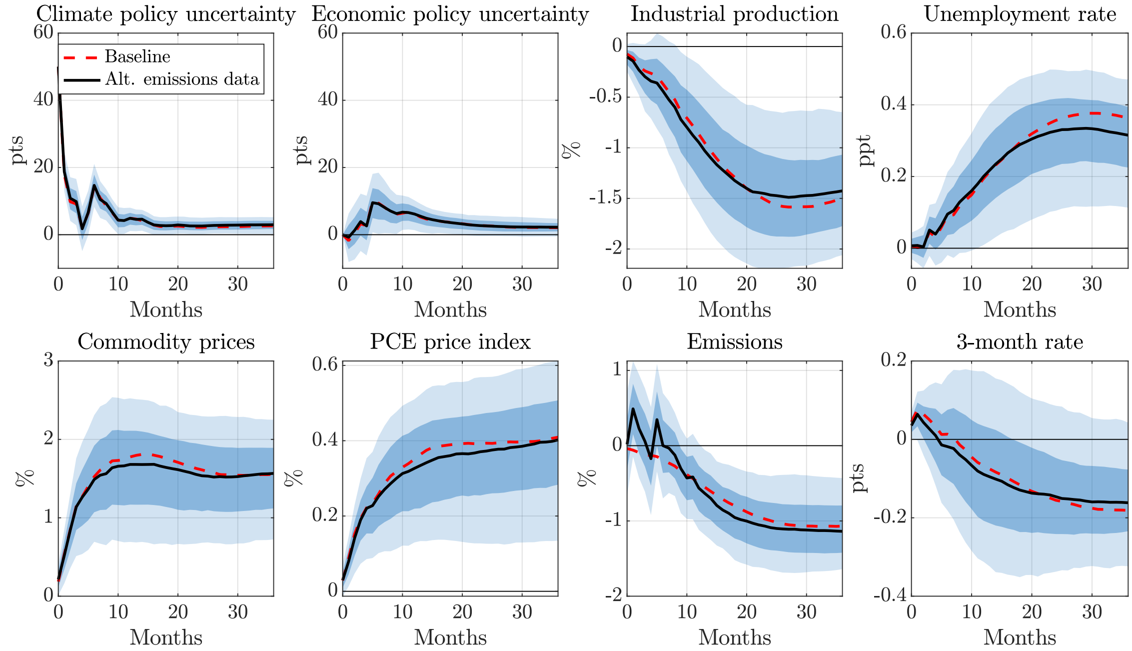

Figure B.1: Alternative emissions measure

Table B.1: Dictionaries for the climate policy uncertainty index, wider set of terms

Dictionaries	Terms
Single dictionaries	
Climate	biomass, carbon dioxide, CO2, climate, climate change, electric cars, emission, emissions, energy, environment, environmental, EV, greenhouse gas, GHG, global warming, green energy, hydro, NOx, offshore drilling, particulate matter, photovoltaic, PV, renewable energy, renewable, renewables, SO2, solar, wind power, wind energy, wind farm, wind farms, wind turbine, wind turbines
Policy	regulation, regulatory, legislation, legislative, white house, congress, policy, policies, law, laws, subsidy, subsidies
Uncertainty	uncertain, uncertainty, uncertainties
Joint dictionaries	
Climate policy	carbon tax, tax on carbon, carbon market, market for carbon, carbon pricing, carbon price, price on carbon, cap and trade, drilling restrictions, ETS, emissions trading, energy policy, energy tax, environmental law, environmental protection agency, EPA, environmental restrictions, fuel tax, gasoline tax, gas tax, pollution control
Policy uncertainty	transition risk
Climate uncertainty	climate risk
Exclusion words	
	business climate, economic climate, general climate, financial climate, political climate

Notes: This table summarizes the terms in the dictionaries used to construct the climate policy uncertainty index for our wider selection of climate terms. Articles are classified as covering climate policy uncertainty if they contain a term from each of the single dictionary or a term of a joint dictionary and the corresponding single dictionary or two joint dictionaries. We exclude articles that contain words from the exclusion list.

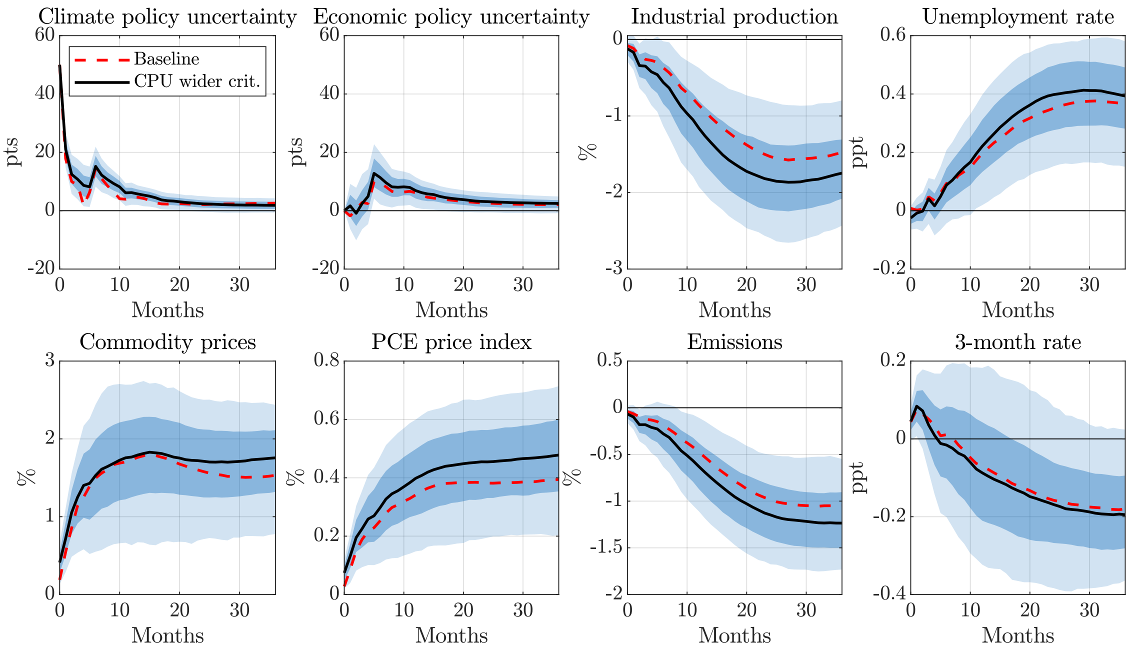

Figure B.2: Results based on CPU constructed using broader climate dictionaries

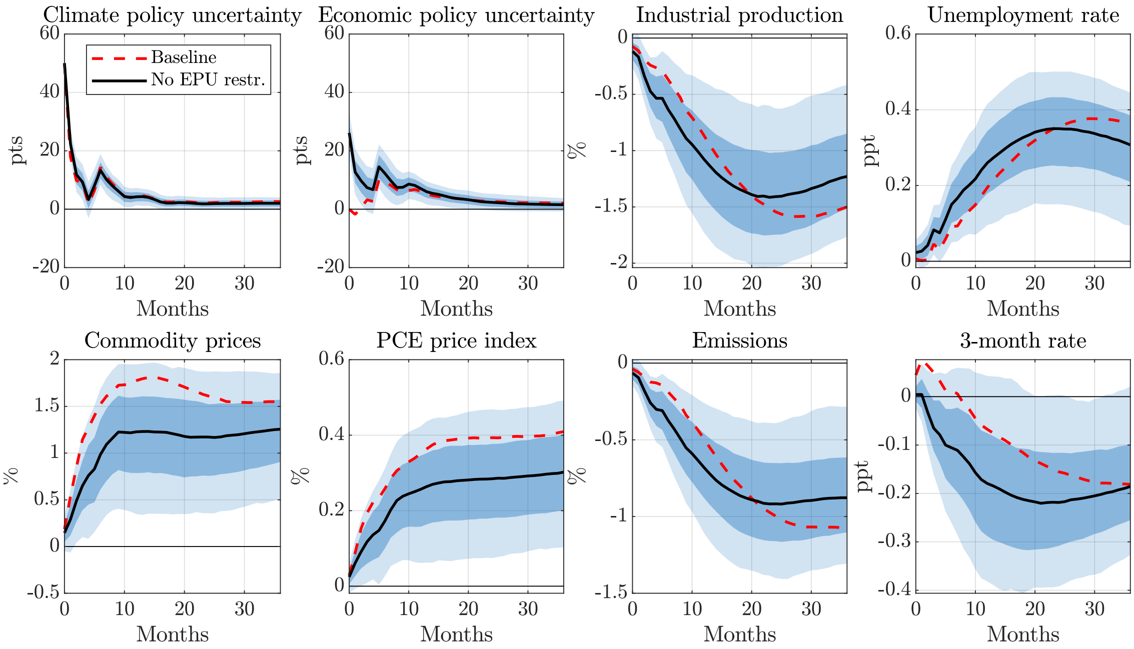

Figure B.3: Not controlling for contemporaneous economic policy uncertainty

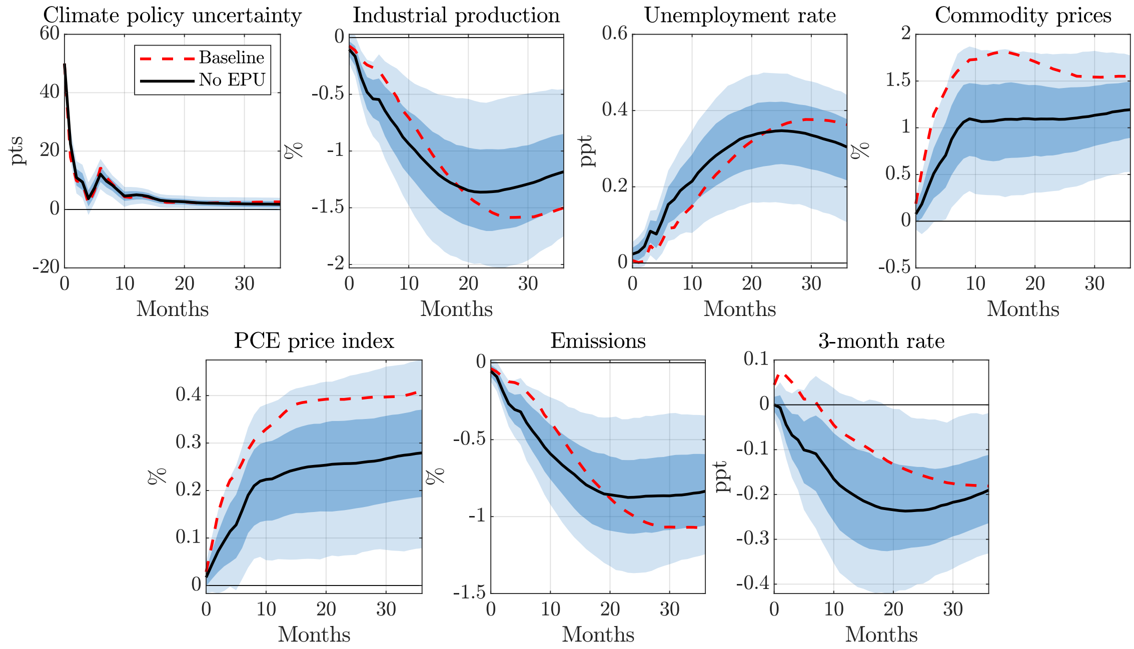

Figure B.4: Not controlling for economic policy uncertainty

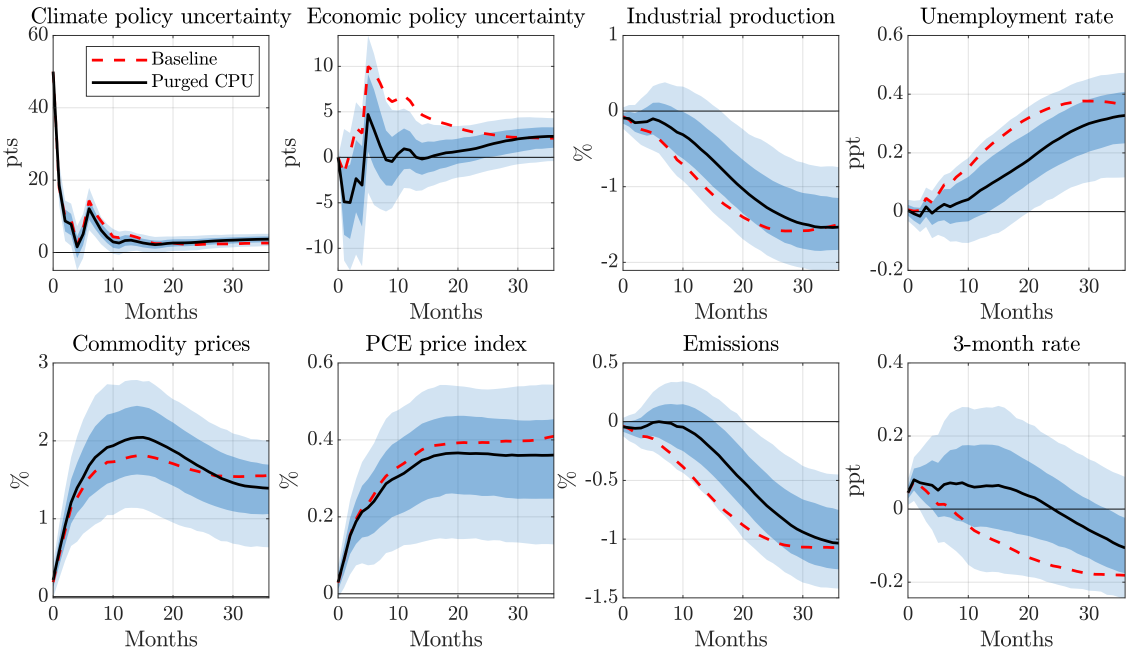

Figure B.5: Results based on purged climate policy uncertainty measure

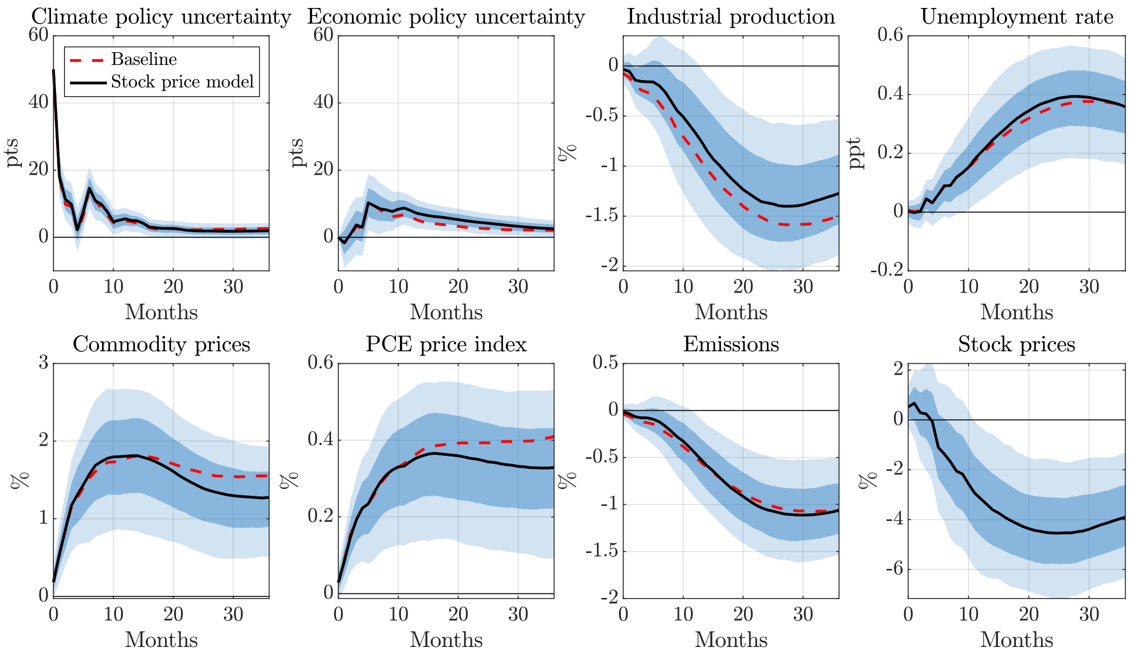

Figure B.6: Controlling for stock prices

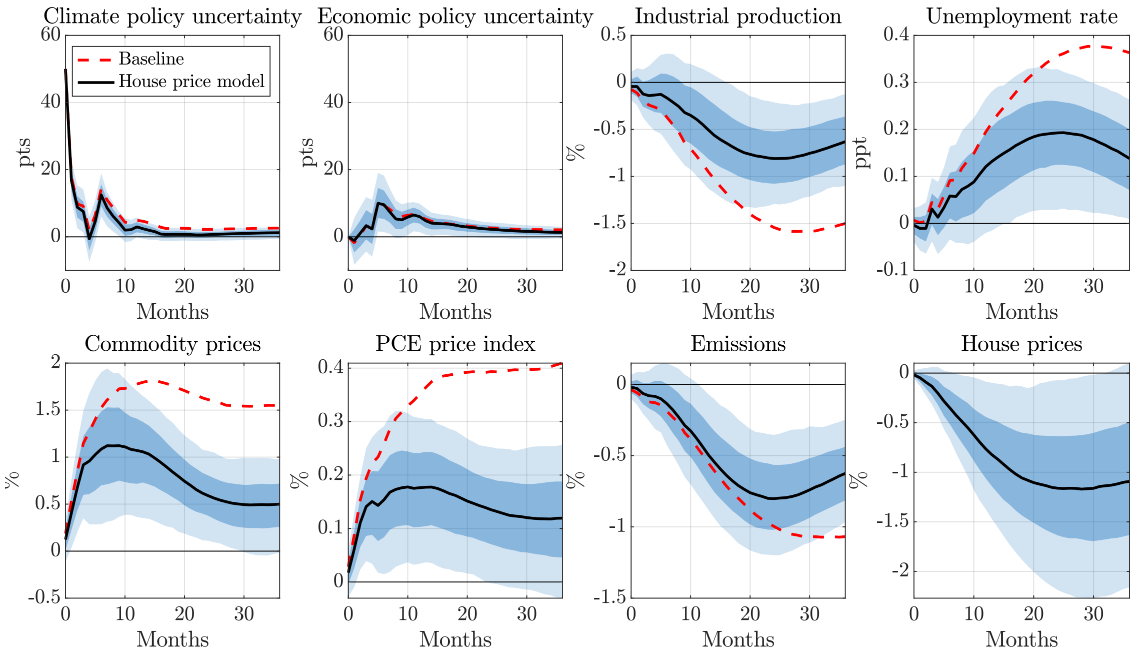

Figure B.7: Controlling for house prices

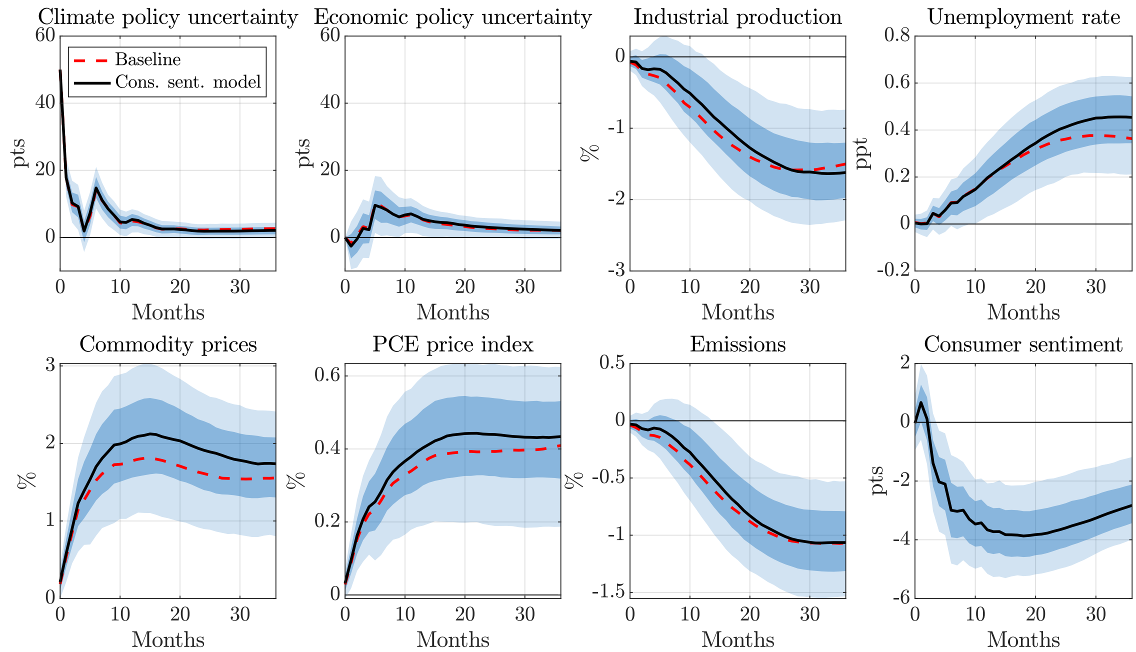

Figure B.8: Controlling for consumer sentiment

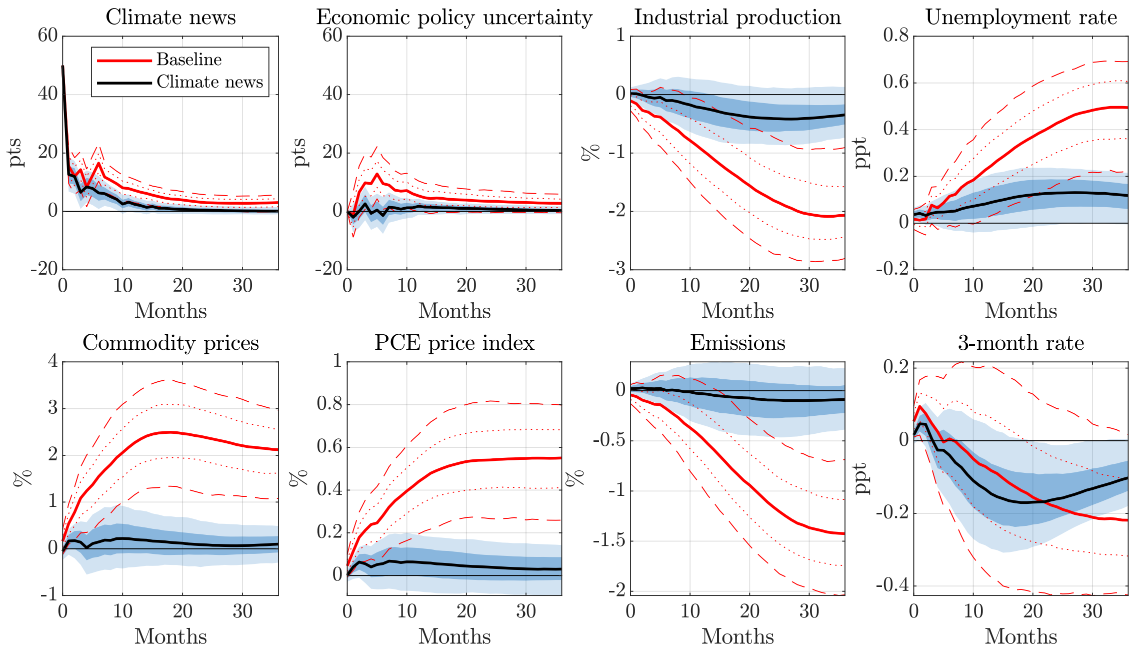

Figure B.9: Climate news versus climate policy uncertainty

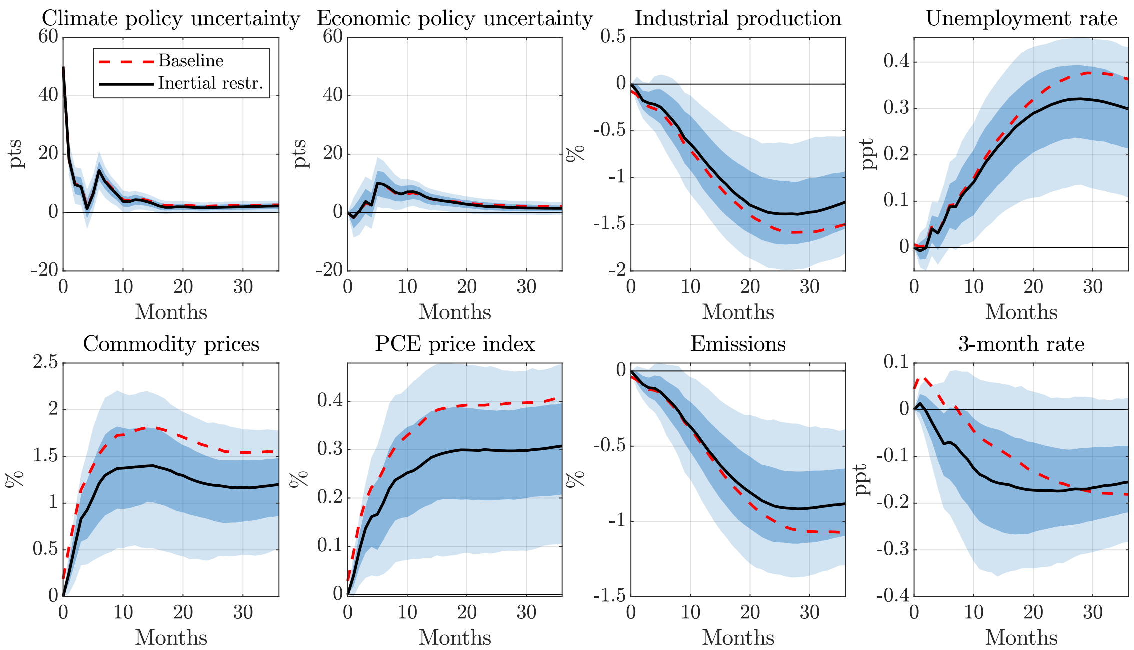

Figure B.10: Identification using inertial restrictions

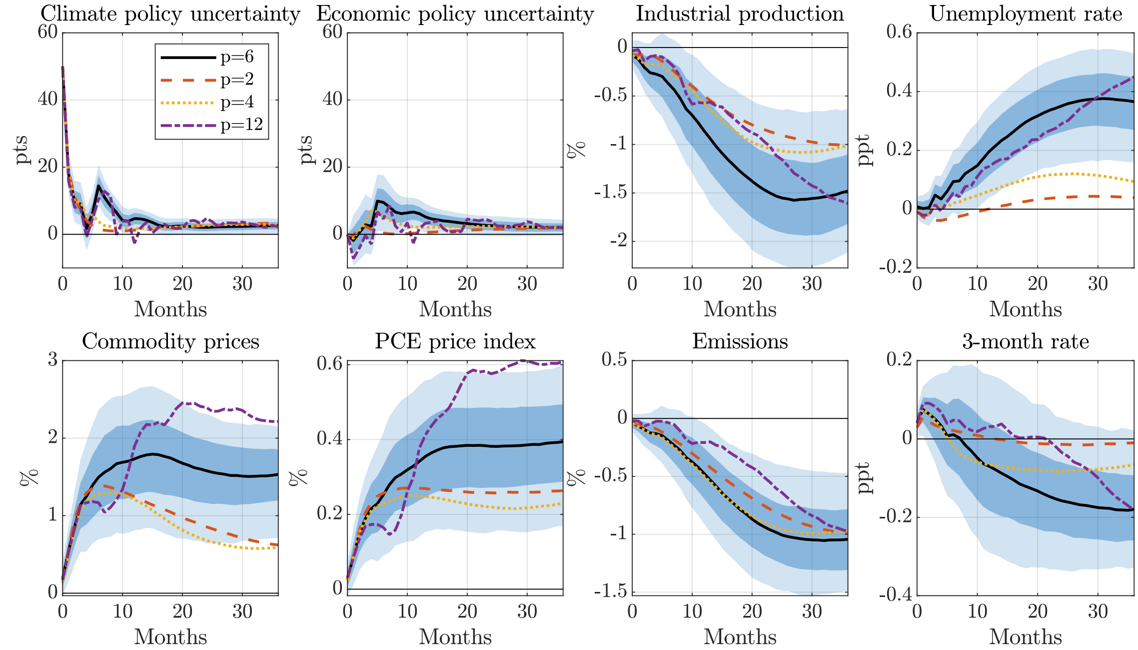

Figure B.11: Sensitivity with respect to lag order in VAR

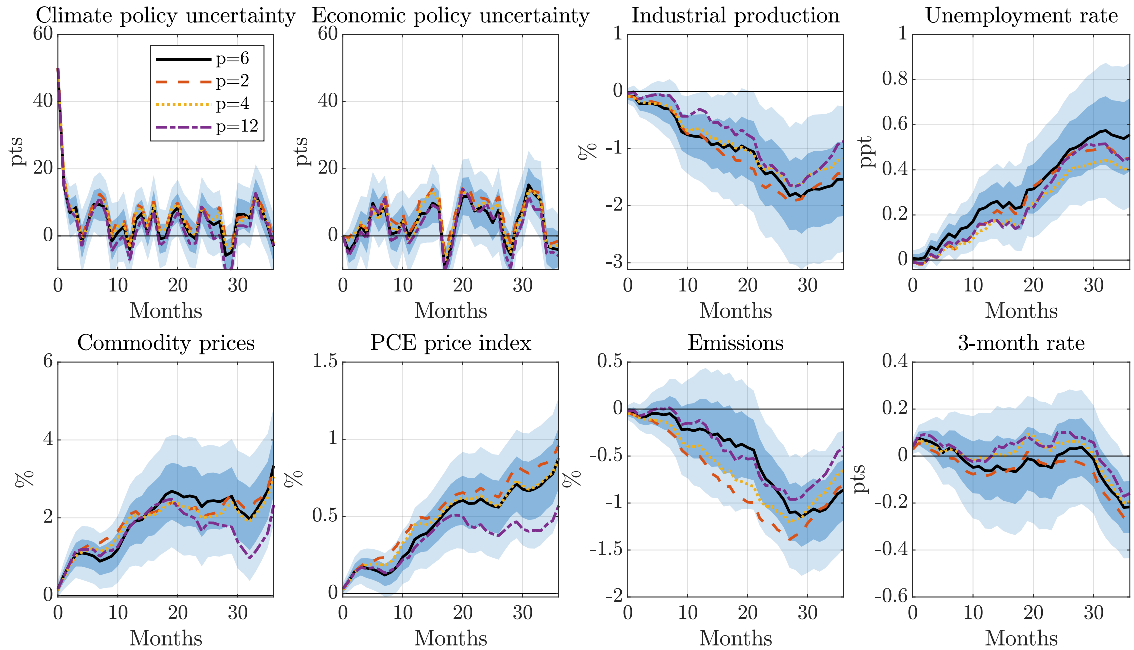

Figure B.12: Sensitivity with respect to lagged controls in local projections

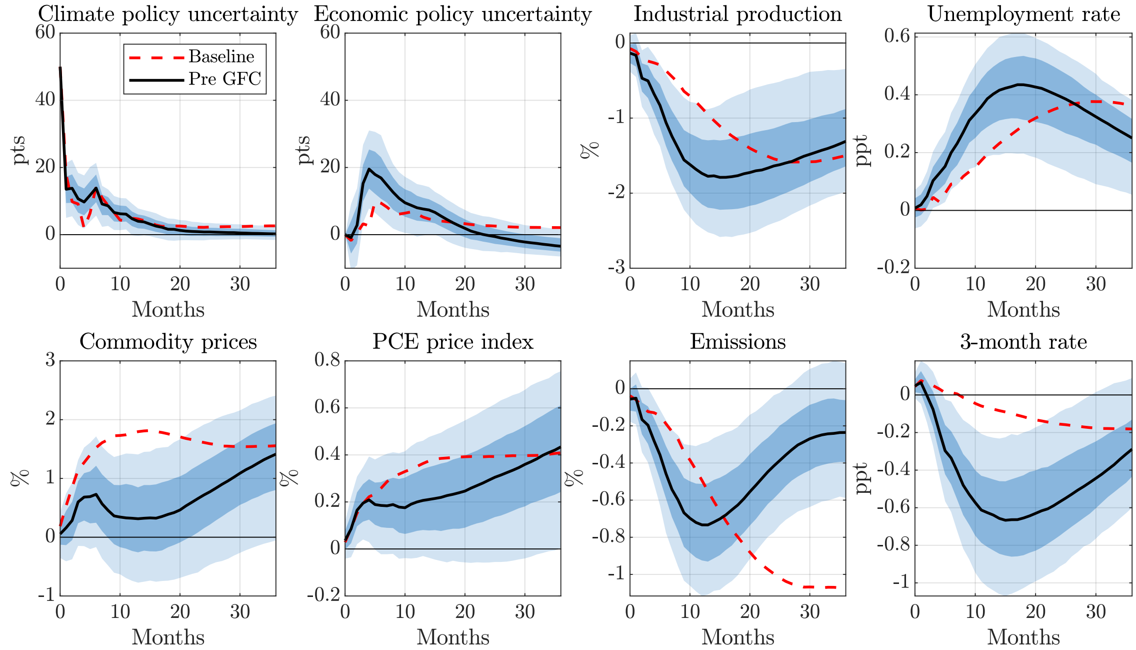

Figure B.14: Excluding global financial crisis

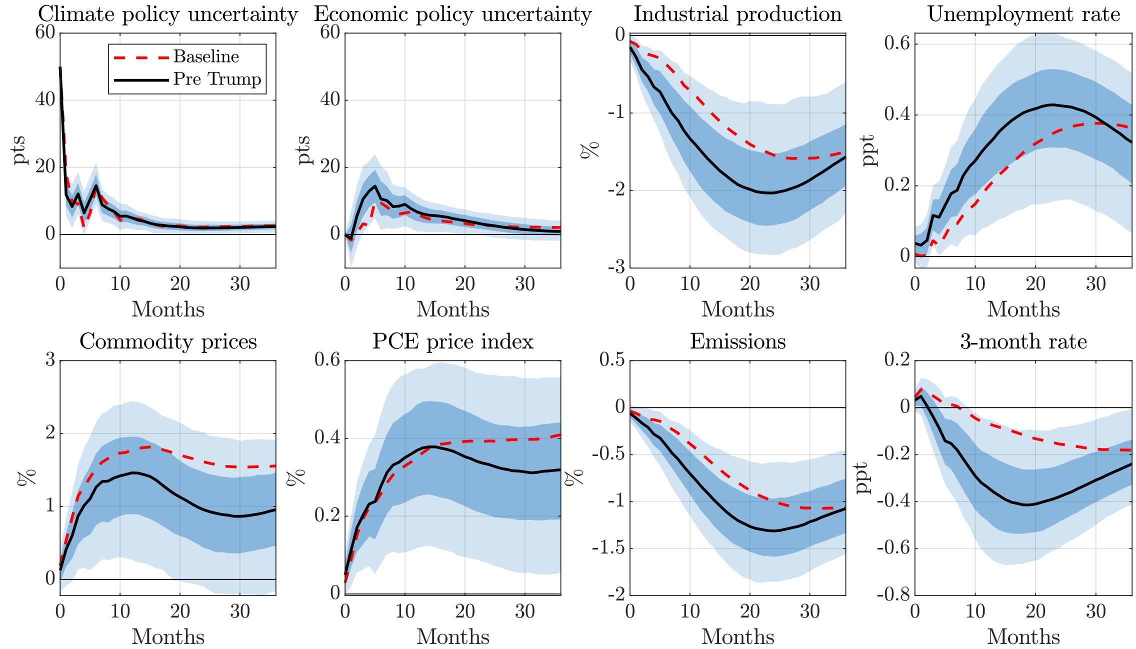

Figure B.13: Excluding Trump years