

# The Macroeconomic Effects of Climate Policy Uncertainty

Konstantinos Gavriilidis  
University of Stirling

Ramya Raghavan  
Northwestern University

Diego R. Känzig  
Northwestern University

James H. Stock  
Harvard University

*February 2026*

# Motivation

---

## Paris climate accord to take effect; Obama hails 'historic day'

By Alister Doyle and Roberta Rampton

October 5, 2016 5:03 PM PDT · Updated October 5, 2016



U.S. President Barack Obama delivers a statement on the Paris Agreement in the Rose Garden of the White House in Washington, U.S., October 5, 2016. REUTERS/Yuri Gripas [Purchase Licensing Rights](#)

- U.S. **climate policy** marked by reversals and uncertainty
  - Inconsistent stance on Paris agreement

# Uncertain times for climate policy

## Paris climate accord to take effect; Obama hails 'historic day'

News | Published: 08 June 2017

By [Jeff Tollefson](#)  
Oct **Trump pulls United States out of Paris climate agreement**

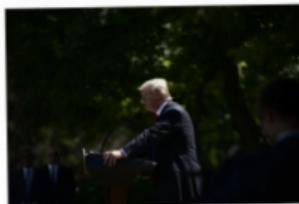
[Jeff Tollefson](#)

[Nature](#) 546, 198 (2017) | [Cite this article](#)

6129 Accesses | 33 Citations | 166 Altmetric | [Metrics](#)

**i** This article has been [updated](#)

**Withdrawal from global pact may take almost four years – which could give the winner of the 2020 presidential race the final word.**



U.S. P  
Octob

- U.S. **climate policy** marked by reversals and uncertainty
  - Inconsistent stance on Paris agreement

# Uncertain times for climate policy

## Paris climate accord to take effect; Obama hails 'historic day'

News | Published: 08 June 2017

By [Jeff Tol](#) | Oct  
**Trump pulls United States out of Paris climate**

**agri Biden announces return to global climate  
accord, new curbs on U.S. oil industry**

[Jeff Tol](#)

[Nature](#)

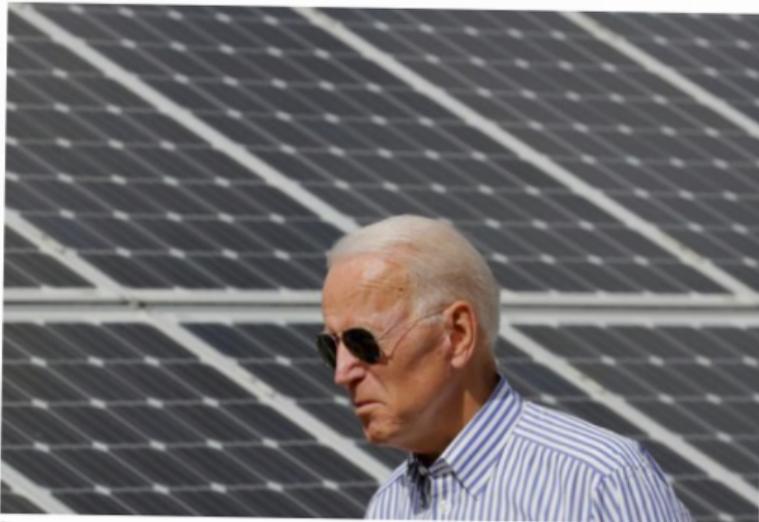
By [Valerie Volcovici](#) and [Trevor Hunnicutt](#)

6129 / January 20, 2021 6:46 PM PST - Updated January 20, 2021



1

With  
of th



FILE PHOTO: Democratic 2020 U.S. presidential candidate and former Vice President Joe Biden walks past solar panels while touring the

- U.S. **climate policy** marked by reversals and uncertainty
  - Inconsistent stance on Paris agreement

U.S. P  
Octob

# Uncertain times for climate policy

Paris climate accord to take effect;  
Obama hails 'historic day'

News | Published: 08 June 2017

By: **Trump pulls United States out of Paris climate**

Oct: **agri Biden announces return to global climate**

[Jeff Toll](#)

[Nature](#)

By Val

6129 / January

## Trump Withdraws US From Paris Climate Agreement For Second Time

BY MARTINA IGINI | AMERICAS | JAN 21ST 2025 | 4 MINS

EARTH.ORG IS POWERED BY OVER 150 CONTRIBUTING WRITERS



FILE PHOTO

- U.S. **climate policy** marked by reversals and uncertainty
  - Inconsistent stance on Paris agreement

U.S. P  
Octob

# Uncertain times for climate policy

## Paris climate accord to take effect; Obama hails 'historic day'

News | Published: 08 June 2017

By [Jeff Tol](#) | Oct 2017  
**Trump pulls United States out of Paris climate**

**agri Biden announces return to global climate**

[Jeff Tol](#)

[Nature](#)

By [Val](#)

6129

January

## Trump Withdraws US From Paris Climate Agreement For Second Time

BY MARTINA IGINI | AMERICAS | JAN 21ST 2025 | 4 MINS

EARTH.ORG IS POWERED BY OVER 150 CONTRIBUTING WRITERS



FILE PHOTO

- U.S. **climate policy** marked by reversals and uncertainty
  - Inconsistent stance on Paris agreement
  - Many other examples ...

# Uncertain times for climate policy

## Paris climate accord to take effect; Obama hails 'historic day'

News | Published: 08 June 2017

By: **Trump pulls United States out of Paris climate**

Oct **agri** **Biden announces return to global climate**

[Jeff Toll](#)

[Nature](#)

By Val

6129 /

January

## Trump Withdraws US From Paris Climate Agreement For Second Time

BY MARTINA IGINI | AMERICAS | JAN 21ST 2025 | 4 MINS

EARTH.ORG IS POWERED BY OVER 150 CONTRIBUTING WRITERS



FILE PHOTO

With  
of th

U.S. P  
Octob

- U.S. **climate policy** marked by reversals and uncertainty
  - Inconsistent stance on Paris agreement
  - Many other examples ...
- **Salient** dimension of policy uncertainty
  - Makes it difficult for households & firms to plan
- How does **climate policy uncertainty** affect the economy?

- We construct a new measure of **climate policy uncertainty** (CPU) based on newspaper coverage in the United States
  - Building on approach by Baker, Bloom, and Davis (2016)
  - Index spikes near important events related to climate policy:  
Presidential announcements on international climate agreements, congressional debates on climate bills, or disputes about the right of the EPA & states to regulate emissions . . .

- **Identification challenge:** climate policy uncertainty may increase in response to economic downturns
  - Propose new IV approach: Isolate plausibly exogenous increases in climate policy uncertainty, quantified using newspaper coverage in tight window around events
- Provide new estimates on the **dynamic causal effects** of climate policy uncertainty

## Main results: aggregate impacts

- **Climate policy uncertainty** has significant **macroeconomic effects**
  - Higher uncertainty causes fall in **output**, private **investment** & **employment**
  - But also **increases commodity** and **consumer prices**
  - Emissions fall following economic contraction, **no green paradox** at aggregate level
- Climate policy uncertainty transmits to the economy as **supply shocks**
  - Differs from **economic policy uncertainty** moving output & prices in same direction
  - Important implications for monetary policy
- **No increase** in other measures of uncertainty
  - Climate policy uncertainty is a distinct source of policy uncertainty
- **No effect** on government spending & emissions intensity unchanged
  - We successfully capture uncertainty and not news

## Main results: firm-level effects

- Climate policy uncertainty has substantial firm-level impacts
  - Firms view climate policy uncertainty as material financial risk
- Firms respond **more strongly** when their climate change **exposure is high**
  - Holds even when controlling for sector by time fixed effects
- We document rich **sectoral heterogeneity**
  - Most sectors lower investment and R&D
  - Mining, oil & utilities **increase investment**
- **But:** R&D decreases particularly strongly in these sectors
  - **Green paradox** at micro level
  - Exacerbate transition costs through misallocative forces

# Measuring climate policy uncertainty

---

# Defining climate policy uncertainty

- **Definition:** Lack of clarity/predictability of government actions on climate change
  - Focus on climate policy with national significance
  - Includes uncertainty about new climate policies as well as political/legal challenges to existing policies
- Measurement is challenging
  - We follow approach by Baker, Bloom, and Davis (2016) leveraging informational content in newspaper articles

## Measuring climate policy uncertainty

- **Idea:** use dictionary of words whose occurrence in newspaper articles is associated with coverage of topics related to climate policy uncertainty
  - **Climate:** *climate change, carbon dioxide, greenhouse gas, green energy, ...*
  - **Policy:** *regulation, legislation, white house, congress, ...*
  - **Climate policy:** *carbon tax, emissions trading, energy policy, EPA, ...*
  - **Uncertainty:** *uncertain\**
- We specify these dictionaries based on corpus of news articles from specialized climate policy reporting agencies:  
*Inside Climate News, Carbon Control News, Washington Week (Energy)*
- Identify article as CPU if it contains at least one term in: (**Climate** AND **Policy** AND **Uncertainty**) OR (**Climate policy** AND **Uncertainty**)



## Measuring climate policy uncertainty

- Our sample contains  $\sim 7.87$  million news articles published in leading American newspapers from mid-1980
  - *New York Times, Wall Street Journal, Washington Post, LA Times*
  - These outlets provide comprehensive & systematic coverage of national climate policy developments
- Index counts, each month, the number of articles discussing uncertainty about climate policy, divided by the total number of published articles
  - Manual & LLM-augmented audit of sample of articles revealed that only few articles are false-positives
  - Results robust to varying dictionary terms

# Climate policy uncertainty since the 80s

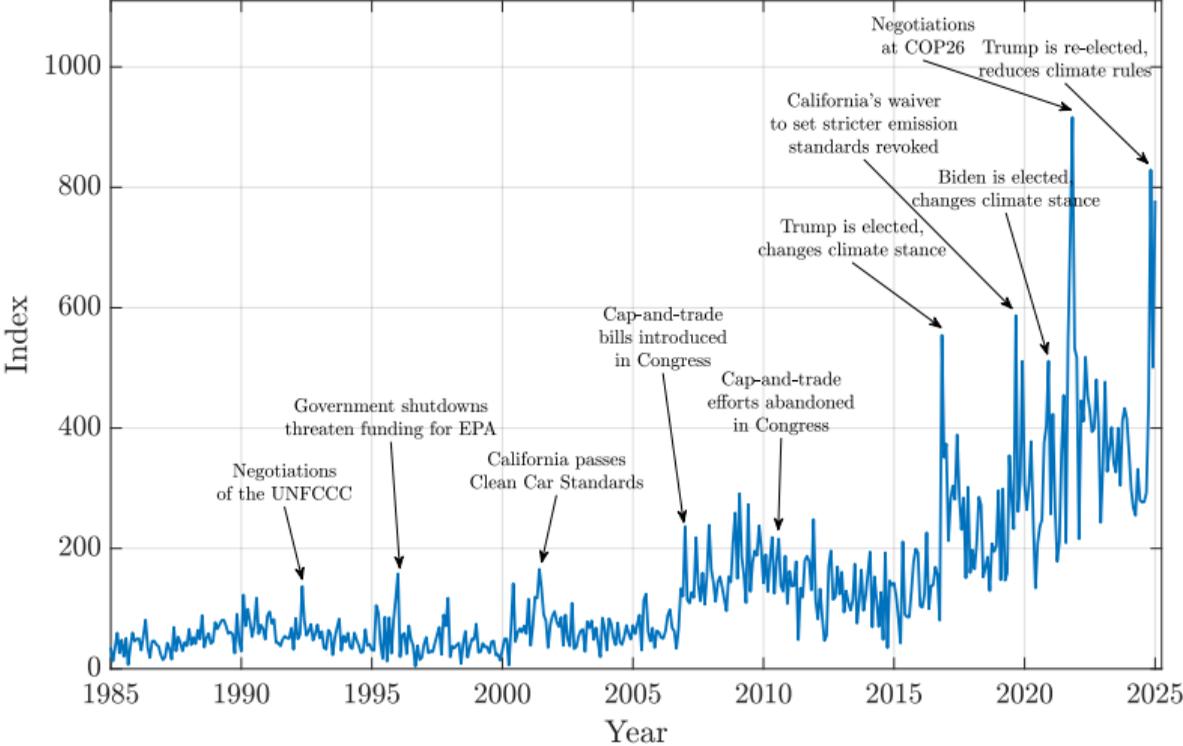


Figure 2: Climate policy uncertainty index

## Climate policy uncertainty since the 80s

- Climate policy uncertainty **increased** substantially, especially in recent years
  - Some notable spikes in first part of the sample, marked increase in late 2000s amid emissions trading proposals
  - Stark increase in uncertainty following Paris agreement and election of Trump
- Index uncorrelated with VIX & geopolitical risk
- Weakly correlated with EPU and trade policy uncertainty
  - Results robust to controlling for other uncertainty measures
  - CPU captures distinct variation from other dimensions of policy uncertainty

# Identification

---

# Identification

- Uncertainty about climate policy may increase in times of **economic distress**
- Isolate plausibly **exogenous** increases in climate policy uncertainty
  - Driven by climate-related, political or ideological considerations
- Based on **narrative account** of U.S. climate policy history, identify 146 events
  - Legislative, regulatory, & judicial actions leading to climate policy uncertainty [▶ More](#)
- **Examples:**
  - Inconsistent stance on international agreements like Kyoto or Paris agreement
  - Debates over proposed legislation such as cap-and-trade policies
  - Disputes about the right of the EPA and states to regulate emissions

## A new climate policy uncertainty IV

- Events may contain both policy news and uncertainty. **But:**
  - Changes in policy stringency & uncertainty often move in opposite directions
  - Direction of stringency is readily observed
- Our approach thus consists of **two steps**:
  1. Measure change in climate policy reporting intensity around events  $d$ :

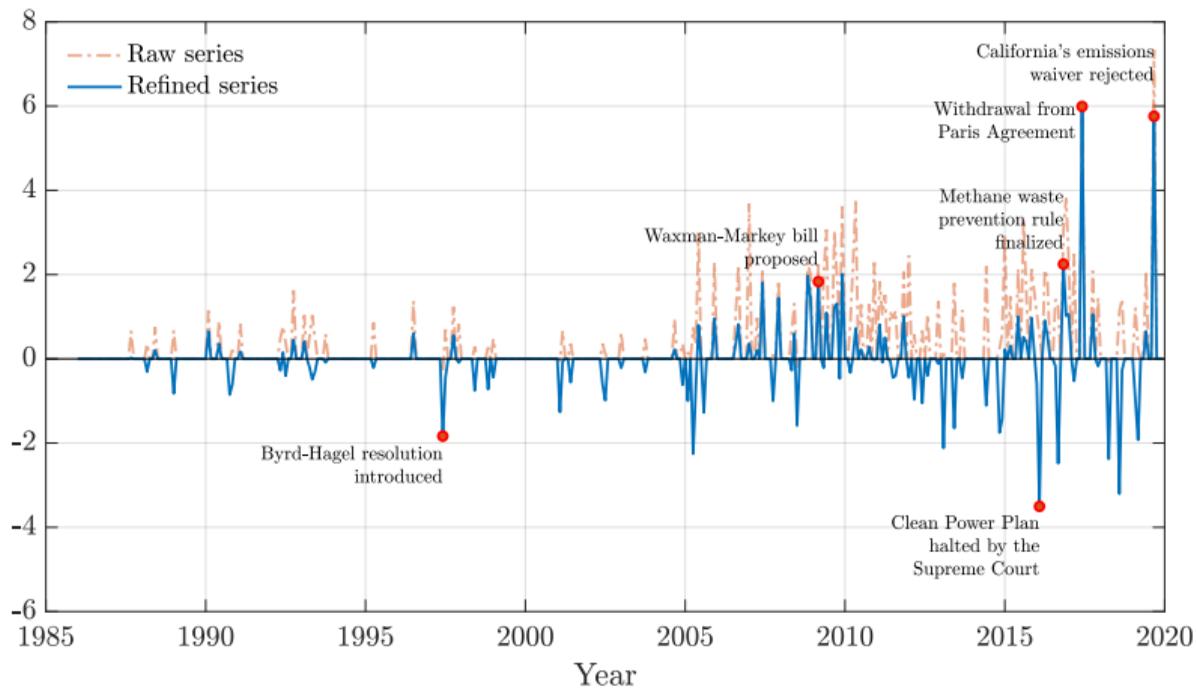
$$\Delta cp_{i,d}^{\text{intensity}} = n_{i,d}^{\text{cp}} - n_{i,d-1}^{\text{cp}}$$

2. Purge reporting intensity from changes in climate policy stringency

$$\Delta cp_{i,d}^{\text{intensity}} = \alpha_i + \beta_i \times \Delta cp_{i,d}^{\text{stringency}} + \Delta cp_{i,d}^{\text{uncertainty}}$$

- Aggregate over newspaper and time to **monthly** IV series,  $\Delta cp_t^{\text{uncertainty}}$

# Major climate policy uncertainty events



**Figure 3:** Climate policy uncertainty event series

# Econometric framework

- Use  $z_t = \Delta cp_t^{\text{uncertainty}}$  as IV to identify a climate policy uncertainty **shock**

- **Identifying assumptions:**

▸ Details

$$\mathbb{E}[z_t \varepsilon_{1,t}] = \alpha \neq 0 \quad (\text{Relevance})$$

$$\mathbb{E}[z_t \varepsilon_{2:n,t}] = \mathbf{0}, \quad (\text{Exogeneity})$$

- For estimation, we rely on VAR techniques given the short sample
  - Sample: 1985 – 2019
  - Specification: 12 lags, 6 variables

CPU index, industrial production, unemployment rate, commodity prices, consumer prices, policy rate

▸ Data

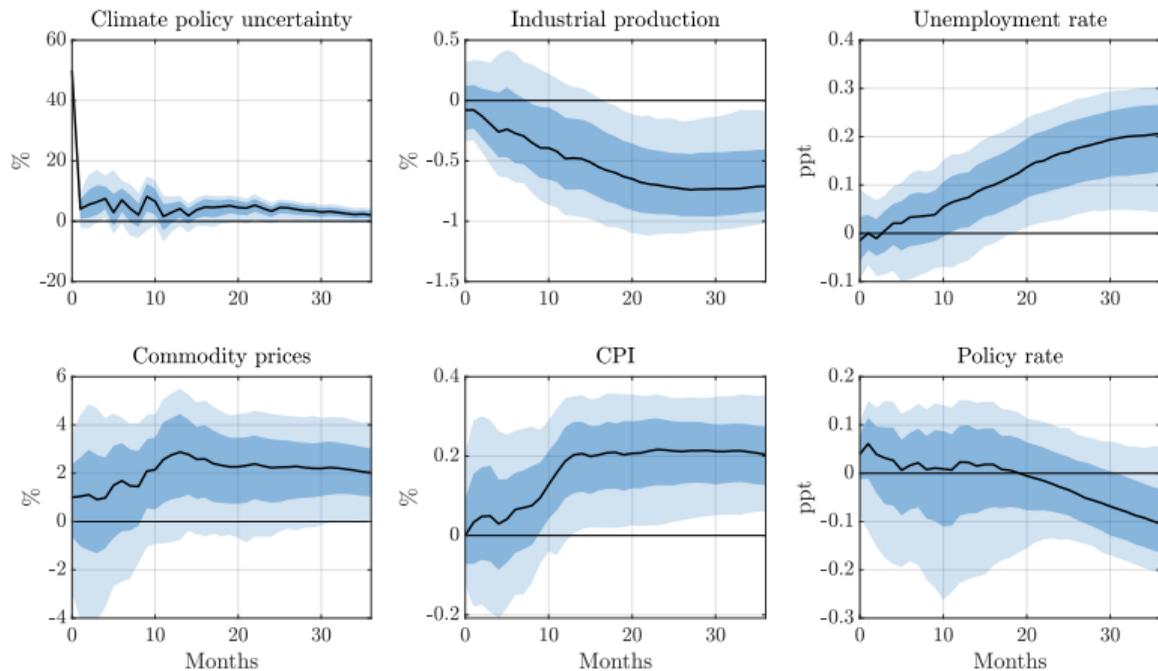
- Use local projections as robustness and to map out wider effects

▸ More

## Aggregate Effects

---

# The macro effects of climate policy uncertainty



First-stage regression: F-statistic: 23.54,  $R^2$ : 2.81%

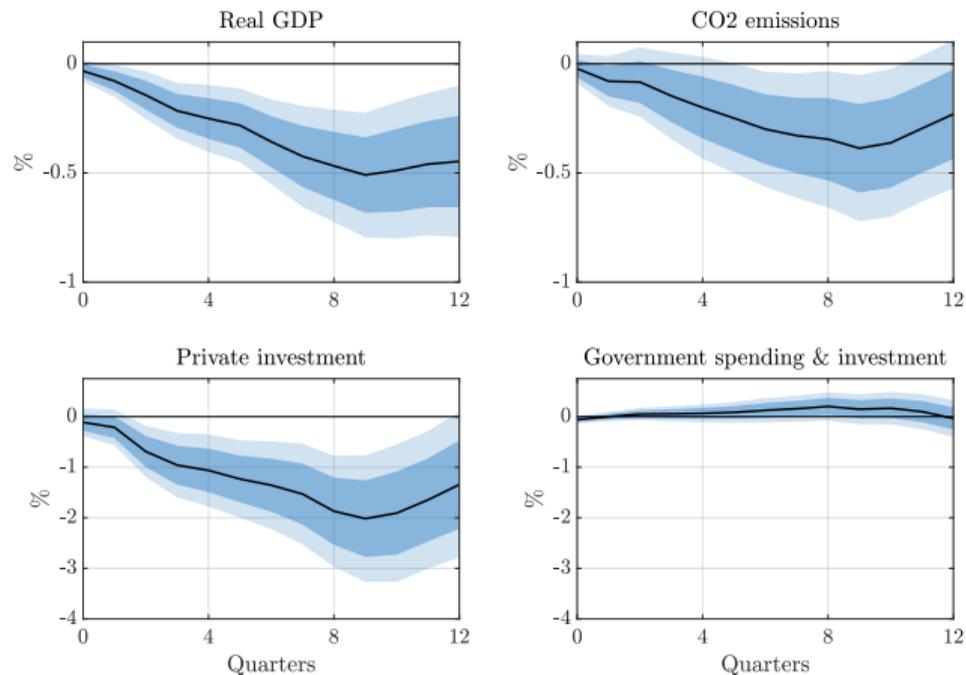
**Figure 4: Baseline VAR**

# The macro effects of climate policy uncertainty

- Climate policy uncertainty has **meaningful** economic effects
  - Leads to significant fall in industrial production and an increase in unemployment
  - Importantly, commodity and consumer prices increase
  - Monetary response is ambiguous
- Thus, transmit more like **supply shocks**

▶ LP-IV

# The macro effects of climate policy uncertainty



- Significant fall in GDP and **investment**
- No response of government spending & investment
- Emissions fall but emissions intensity **unchanged**
- No evidence for **green paradox**

**Figure 5:** Impacts on GDP, emissions and investment

- CPU has **no** significant effect on other uncertainty measures [▶ Detail](#)
  - Economic policy uncertainty, trade policy uncertainty, geopolitical risk, financial uncertainty, ...
- Results **robust** to
  - Controlling for other uncertainty measures (other policy uncertainty, financial uncertainty, oil price uncertainty)
  - Controlling for first moment shocks using climate news index [▶ Detail](#)
  - Relaxing VAR assumptions (invertibility, dynamic VAR structure) [▶ Detail](#)

## Is climate policy uncertainty special?

- What do we learn from looking at **climate policy uncertainty**?
- Contrast with effects of broader **economic policy uncertainty**
  - Use index from Baker, Bloom, and Davis (2016)
  - Estimate responses based on recursive VAR

# The effects of economic policy uncertainty

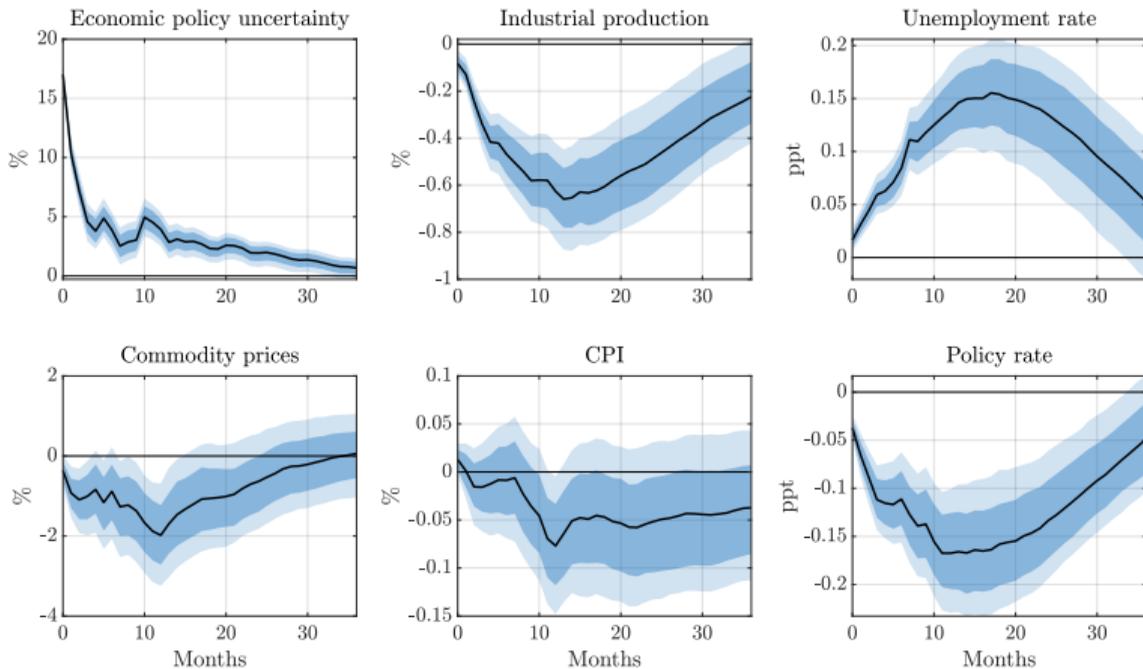


Figure 6: VAR with EPU

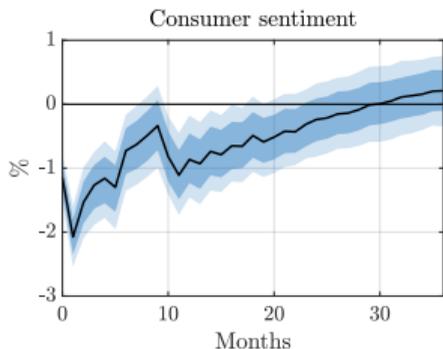
## Climate versus economic policy uncertainty

- Economic policy uncertainty transmits **differently** from climate policy uncertainty
  - Economic policy uncertainty leads to fall in production
  - But commodity and consumer prices also tend to **decrease**
  - Monetary response **accommodates** the shock
- They thus transmit more like **demand shocks**
  - This is true for most uncertainty measures, e.g. an innovation to the VIX has very similar effects
- Response of prices to uncertainty shocks theoretically ambiguous
  - Different channels: precautionary demand, real options, precautionary pricing, ...
  - Price response depends on relative strength of supply- and demand-side effects

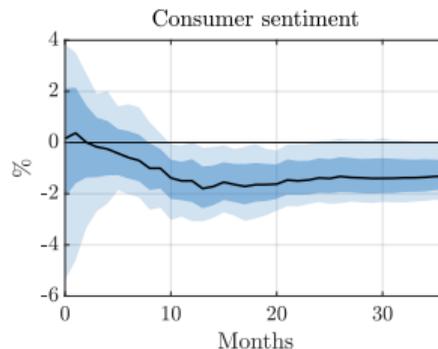
# Why is climate policy uncertainty inflationary?

- For CPU **supply-side** effects dominate, for EPU **demand-side** effects dominate
  - Consistently, consumer sentiment falls significantly for EPU but **not** for CPU shock

(a) Economic policy uncertainty shock



(b) Climate Policy Uncertainty (CPU) shock



**Figure 7:** Impacts on sentiment

## Firm-level effects

---

## Firm-level impacts

- We revisit effects of climate policy uncertainty shocks in panel of firms
  - Construct quarterly panel of U.S. listed firms
  - Unbalanced panel from 1986 to 2019 (136 quarters) with 11,872 firms
- Average effects on sales, employees consistent with aggregate data [▶ Details](#)
- **But:** average effect may mask substantial **heterogeneity**

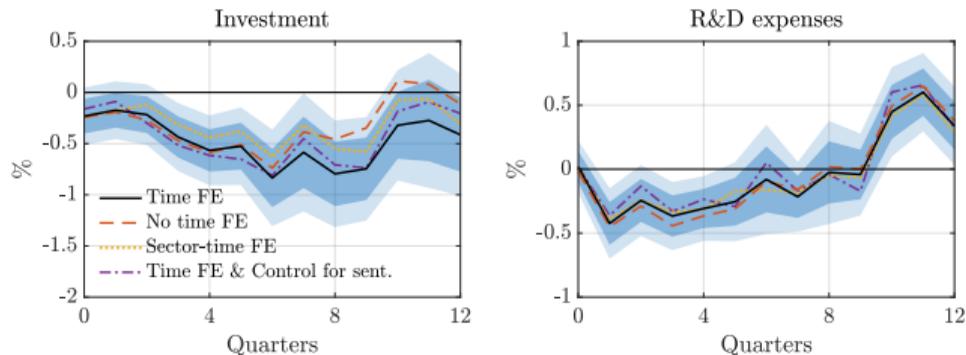
## Heterogeneity by climate exposure

- How does effect vary with firm-level **climate change exposure**?
  - use exposure measures by Sautner et al. (2023) based on earnings conference calls
- Estimate local projection on shock **interacted** with exposure

$$y_{i,t+h} = \mu_{i,h} + \delta_t + \theta_h(\text{Exp}_{i,t-1} - \overline{\text{Exp}_i}) \times \varepsilon_{1,t} + \gamma'_h \mathbf{x}_{i,t-1} + \nu_{i,t+h},$$

- Focus on **within-firm** variation to net out permanent differences: how does time- $t$  exposure compare to average exposure of firm  $i$
- Allows to control for **time fixed effects**

## Heterogeneity by climate exposure



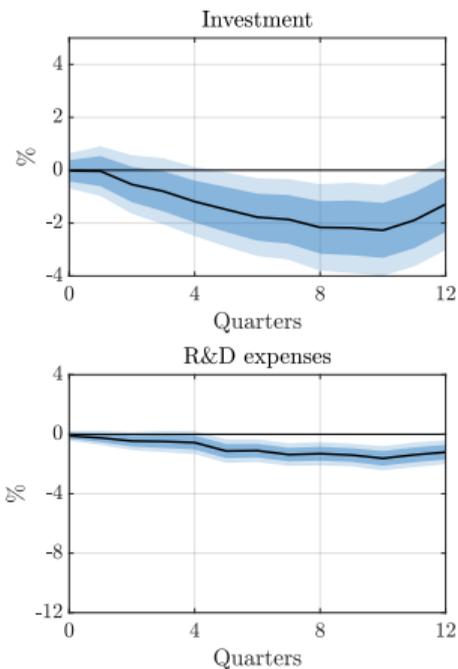
**Figure 8:** Heterogeneous effects based on prior climate exposure

- Firms display **stronger fall** in investment and R&D when climate exposure is high
- Statistically and economically significant
- Robust to time or sector by time fixed effects

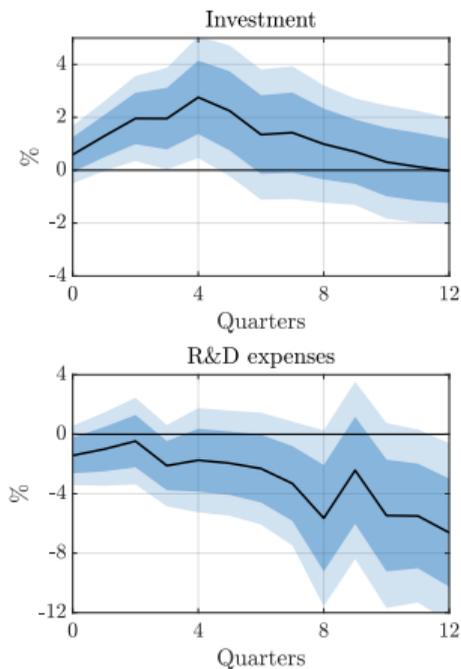
- How do effects vary by **sectors**?
- Estimate panel local projections, conditioning on different industries
  - Of particular interest: Mining, oil & gas and utilities

# Sectoral impacts

(a) All ex. oil, gas, utilities



(b) Oil, gas, and utilities



- Most sectors show significant fall in investment and R&D
  - Consistent with **average** response
- **Oil, gas and utilities** stand out
  - Investment increases!
  - R&D falls substantially

► Sales

## Longer-term impacts

- Results are consistent with **green paradox** at micro level
- Climate policy uncertainty strengthens incentives to extract fossil fuels
- **But:** reduces R&D expenses that spur the green transition
- Climate policy uncertainty can exacerbate transition costs via **misallocative** forces
- Confirmed by significant and persistent fall in TFP ▶ Longer-term impacts

# Conclusion

---

# Conclusion

- Climate policy uncertainty has **pervasive economic** effects at macro & firm-level
  - Broad-based effects beyond brown sectors
  - Effects more pronounced when exposure to climate is high
- Contrary to other uncertainty shocks, climate policy uncertainty transmits more like **supply shocks**
  - Very persistent impacts dragging on investment and innovation
  - Monetary policy can make matters worse by leaning against inflationary pressures
- Illustrates importance of **clear and predictable** climate policies & coordination between fiscal and monetary policy

**Thank you!**

## Related literature

**Climate policy actions:** Anderson, Marinescu, and Shor 2019; Martin, De Preux, and Wagner 2014; Metcalf 2019; Metcalf and Stock 2023; Bernard and Kichian 2021; Känzig 2025

**Measuring policy uncertainty:** Saiz and Simonsohn 2013; Baker, Bloom, and Davis 2016; Caldara and Iacoviello 2022; Caldara et al. 2020; Gambetti et al. 2023

**Climate news and uncertainty:** Engle et al. 2020; Sautner et al. 2023; Gavriilidis 2021; Basaglia et al. 2025; Noailly, Nowzohour, and Van Den Heuvel 2022; Fried, Novan, and Peterman 2021

# Index validation

- **Validation exercise:**
  - To validate the index, we use OpenAI's `gpt-4o-mini` model
  - We sample a set of articles from our `Climate AND Policy` corpus
  - Next, we ask the LLM to classify articles into CPU and non-CPU articles
  - This yields a false-positive rate **below 10%**
  - Human audit of subset of articles confirms the accuracy of the classification
- **Robustness:**
  - Results are robust to using less restrictive set of dictionary terms
  - Expanding the set of newspapers

# Methodology for event selection

## 1. **International agreements**

- Agreement, signature, or ratification of key treaties and protocols

## 2. **Judicial actions**

- Court rulings or stay orders influencing climate policy

## 3. **Legislative actions**

- Proposal, introduction, passage, signing, or blocking of climate-related bills
- Pioneering California bills that influence federal policy included

## 4. **Presidential actions**

- Statements of intent, policy positions, policy proposals, or executive measures

## 5. **Regulatory actions**

- Proposal, final rule, revision, or withdrawal of Federal agency regulations

- **Narrative account:** ✓ **Accords well** with accounts on key historical episodes
- **Forecastability:** ✓ **Not** forecastable by macroeconomic or financial variables
- **Orthogonality:** ✓ **Uncorrelated** with measures of other structural shocks  
(e.g. other uncertainty, oil, or fiscal shocks)

**Table 1:** Granger causality tests

<b>Variable</b>	<b>p-value</b>
Instrument	0.1191
Climate policy uncertainty	0.7881
Industrial production	0.5294
Unemployment rate	0.7117
Commodity prices	0.1946
PPI	0.9390
CPI	0.7291
Policy rate	0.9874
Climate policy news	0.9118
Climate policy sentiment	0.9980
Economic policy uncertainty	0.4363
Trade policy uncertainty	0.7953
Geopolitical risk	0.6969

# Orthogonality

Shock	Source	$\rho$	p-value	n	Sample
<i>Panel A: Uncertainty shocks</i>					
Uncertainty	Bloom (2009)	-0.04	0.48	384	1986M01-2017M12
	Baker, Bloom, and Davis (2016)	0.03	0.54	384	1986M01-2017M12
	Piffer and Podstawski (2017)	-0.02	0.68	355	1986M01-2015M07
<i>Panel B: Oil shocks</i>					
Oil price	Hamilton (2003)	-0.06	0.23	384	1986M01-2017M12
Oil supply	Kilian (2008)	0.04	0.58	225	1986M01-2004M09
	Caldara, Cavallo, and Iacoviello (2019)	0.04	0.48	360	1986M01-2015M12
	Baumeister and Hamilton (2019)	-0.02	0.74	408	1986M01-2019M12
Global demand	Kilian (2009)	0.04	0.49	264	1986M01-2007M12
	Kilian (2009)	-0.07	0.25	264	1986M01-2007M12
Oil-specific demand	Kilian (2009)	0.03	0.63	264	1986M01-2007M12
Oil supply news	Känzig (2021)	0.03	0.53	408	1986M01-2019M12
<i>Panel C: Productivity and news shocks</i>					
Productivity	Basu, Fernald, and Kimball (2006)	-0.03	0.77	104	1986Q1-2011Q4
	Smets and Wouters (2007)	0.10	0.40	76	1986Q1-2004Q4
News	Barsky and Sims (2011)	0.16	0.13	87	1986Q1-2007Q3
	Kurmann and Otrok (2013)	0.14	0.21	78	1986Q1-2005Q2
	Beaudry and Portier (2014)	-0.08	0.42	107	1986Q1-2012Q3
<i>Panel D: Monetary policy</i>					
Monetary policy	Romer and Romer (2004)	0.04	0.66	132	1986M01-1996M12
	Gertler and Karadi (2015)	-0.04	0.50	324	1990M01-2016M12
	Miranda-Agrippino and Ricco (2021)	0.08	0.23	228	1991M01-2009M12
	Bauer and Swanson (2023)	0.04	0.48	383	1988M02-2019M12
	Aruoba and Drechsel (2024)	-0.01	0.81	274	1986M01-2008M10
<i>Panel E: Fiscal policy shocks</i>					
Fiscal policy	Romer and Romer (2010)	-0.04	0.68	88	1986Q1-2007Q4
	Fisher and Peters (2010)	0.00	0.98	92	1986Q1-2008Q4
	Ramey (2011)	-0.07	0.48	100	1986Q1-2010Q4
<i>Panel F: Financial shocks</i>					
EBP	Gilchrist and Zakrajšek (2012)	-0.04	0.46	360	1986M01-2015M12
Loan supply	Bassett et al. (2014)	0.03	0.78	76	1992Q1-2010Q4

## External instrument approach

- Structural VAR

$$\mathbf{y}_t = \mathbf{b} + \mathbf{B}_1 \mathbf{y}_{t-1} + \cdots + \mathbf{B}_p \mathbf{y}_{t-p} + \mathbf{S} \boldsymbol{\varepsilon}_t, \quad \boldsymbol{\varepsilon}_t \sim N(0, \boldsymbol{\Omega})$$

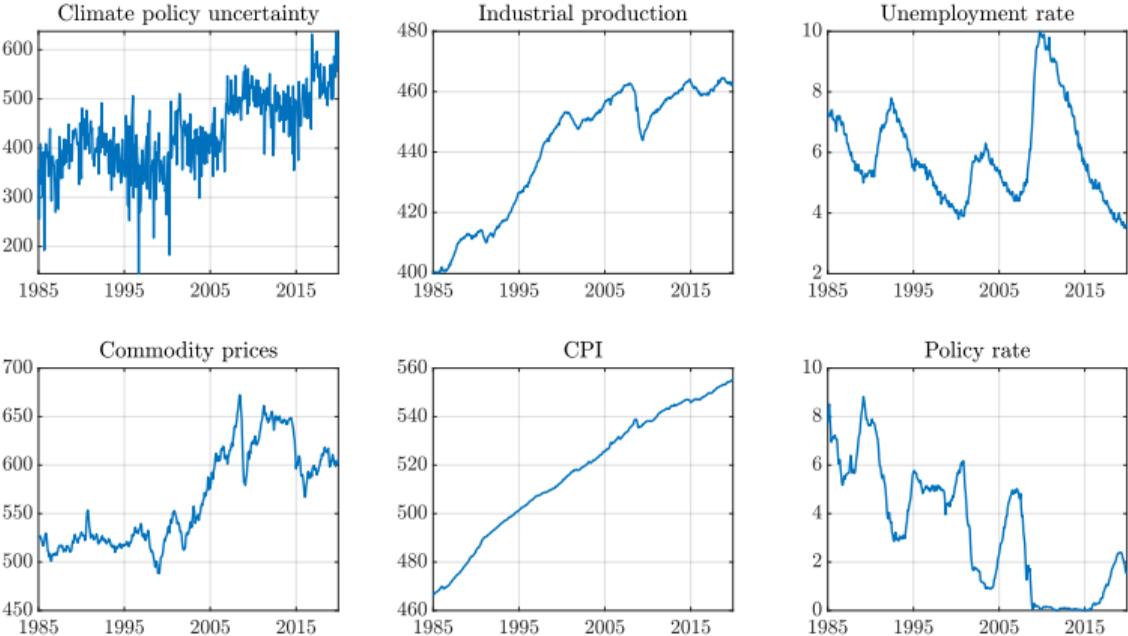
- **External instrument:** variable  $z_t$  *correlated* with the **shock of interest** but *not* with the **other shocks**
- **Identifying assumptions:**

$$\mathbb{E}[z_t \boldsymbol{\varepsilon}_{1,t}] = \alpha \neq 0 \quad (\text{Relevance})$$

$$\mathbb{E}[z_t \boldsymbol{\varepsilon}_{2:n,t}] = \mathbf{0}, \quad (\text{Exogeneity})$$

$$\mathbf{u}_t = \mathbf{S} \boldsymbol{\varepsilon}_t \quad (\text{Invertibility})$$

- Use **climate policy uncertainty event series** as *external instrument* for **climate policy uncertainty index**



**Figure 10:** Transformed data series

- Use identified **climate policy uncertainty shock**,  $\varepsilon_{1,t}$  in local projection

$$y_{i,t+h} = \beta_{h,0}^i + \psi_h^i \varepsilon_{1,t} + \beta_{h,1}^i y_{i,t-1} + \dots + \beta_{h,p}^i y_{i,t-p} + \xi_{i,t,h}$$

- Assess possible truncation bias by relaxing dynamic VAR structure
- Can also estimate effects on variables only available at lower frequencies
- To relax invertibility requirement, also present results from local projections-instrumental variable specification

# The macro effects of climate policy uncertainty

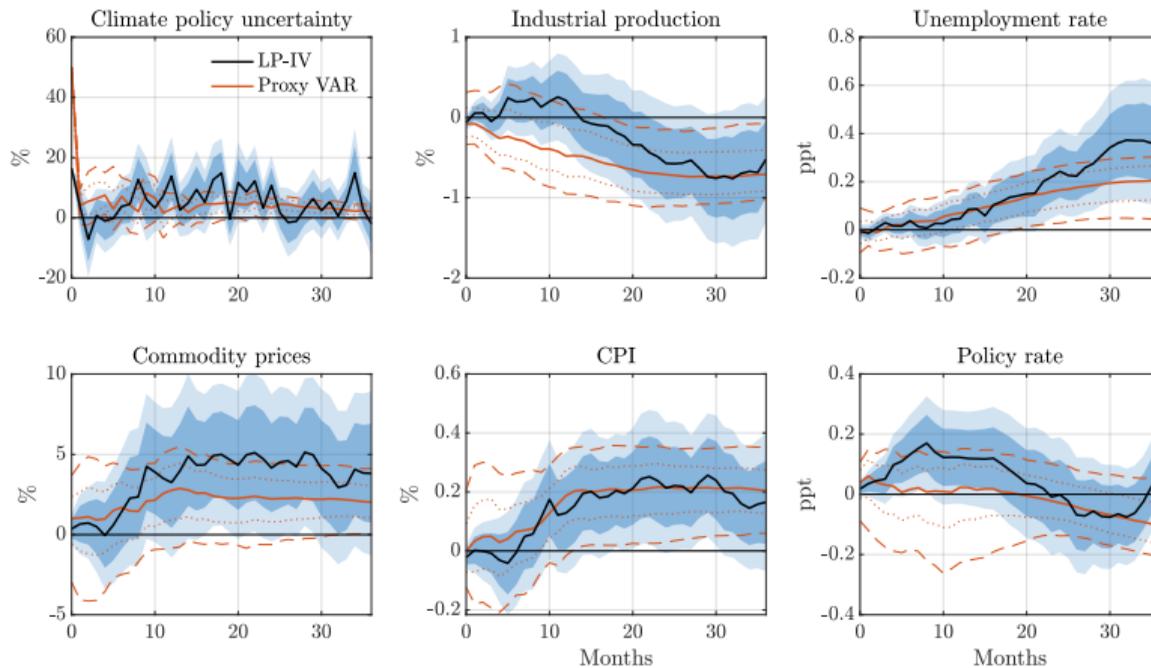
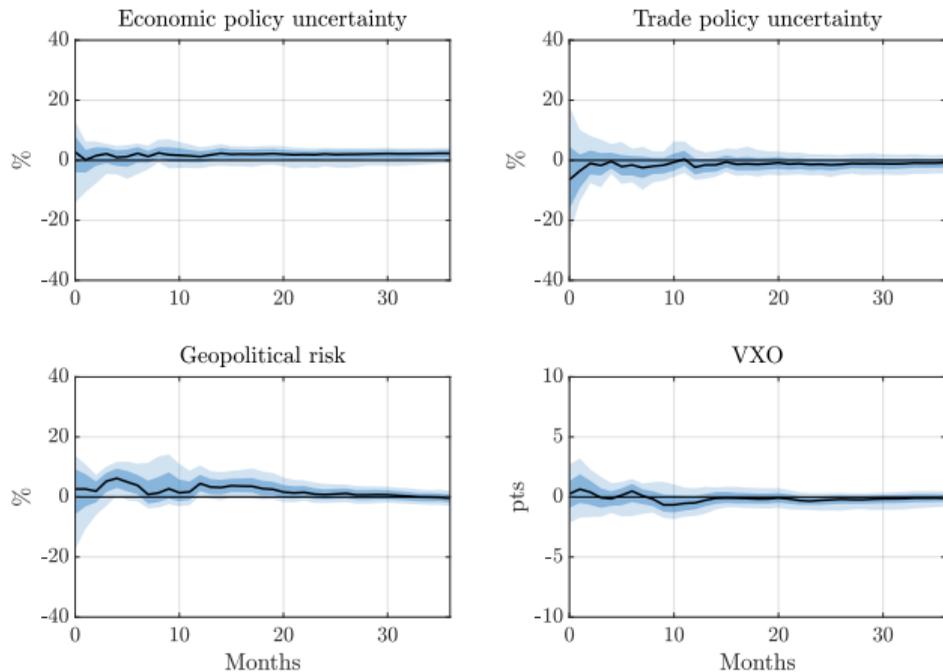


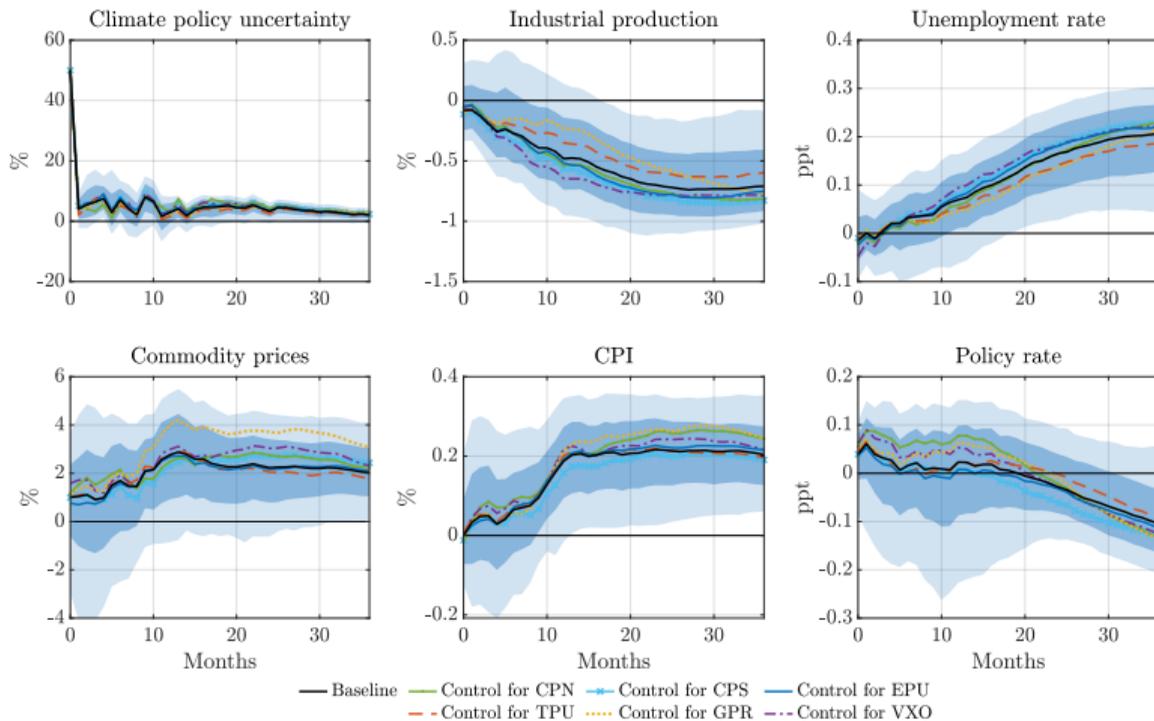
Figure 11: Local projections

# Impacts on other uncertainty measures



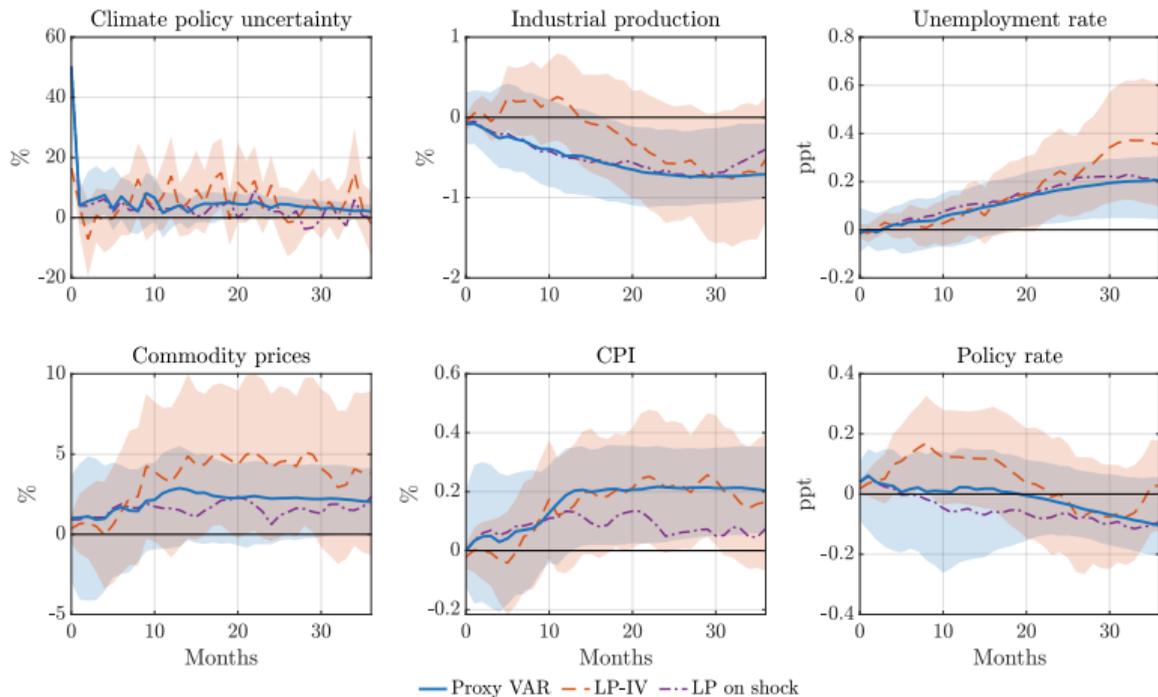
**Figure 12:** Impacts on other uncertainty measures

# Controlling for news and other uncertainty measures



**Figure 13:** Additional controls

# Relaxing VAR assumptions



**Figure 14:** Relaxing VAR assumptions

# Why is climate policy uncertainty inflationary?

- Response of prices to uncertainty shocks theoretically ambiguous
- Key channels
  - **Precautionary demand:** Higher uncertainty leads agents to cut spending, **reducing prices** via lower demand
  - **Real options channel:** After a rise in uncertainty, firms delay investment and hiring. Price response **depends** on strength of demand- and supply-side effects
  - **Precautionary pricing:** Increased uncertainty raises the potential for higher future costs, leading firms to **raise prices** preemptively
- Price response depends on relative strength of supply- and demand-side effects

▶ Simple model

## A simple two-sector NK model

- Why are CPU shocks inflationary?
- Study propagation of different uncertainty shocks in NK model with two sectors:
  - **Energy sector** producing energy/emissions using labor
  - **Non-energy sector** producing consumption good using energy and labor
- Standard household sector and fiscal/monetary authority

## Non-energy sector

- Technology

$$y_t = Z_{x,t} e_t^\alpha n_{x,t}^{1-\alpha}$$

- Cost-minimization

$$p_{e,t} = \alpha mc_t \frac{y_t}{e_t}$$

$$w_t = (1 - \alpha) mc_t \frac{y_t}{n_{x,t}}$$

- Price setting

$$\pi_t (\pi_t - \bar{\pi}) = \beta \mathbb{E}_t \left[ \frac{\lambda_{t+1}}{\lambda_t} \pi_{t+1} (\pi_{t+1} - \bar{\pi}) \frac{y_{t+1}}{y_t} \right] + \frac{\varepsilon}{\Omega_p} \left( mc_t - \frac{\varepsilon - 1}{\varepsilon} \right)$$

- Consider uncertainty shock about productivity,  $\sigma_{Z_{x,t},t}$

# Energy sector

- Technology

$$e_t = Z_{e,t} n_{e,t}$$

- Cost-minimization

$$(1 - \tau_t) p_{e,t} = \frac{\eta}{\eta - 1} \frac{w_t}{Z_{e,t}}$$

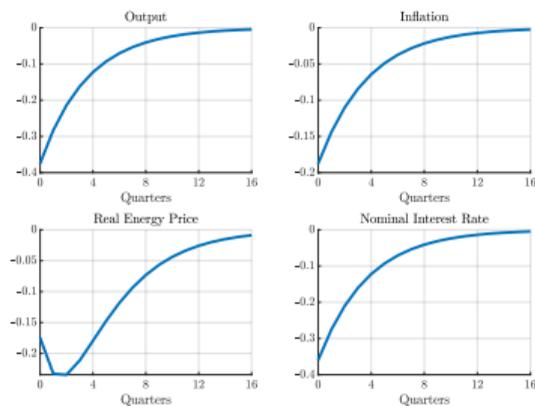
- Price setting

$$\pi_t^e (\pi_t^e - \bar{\pi}^e) = \beta \mathbb{E}_t \left[ \frac{\lambda_{t+1}}{\lambda_t} \pi_{t+1}^e (\pi_{t+1}^e - \bar{\pi}^e) \frac{e_{t+1}}{e_t} \frac{p_{e,t+1}}{p_{e,t}} \right] + \frac{\eta}{\Omega_p^e} \left( \frac{w_t}{Z_{e,t} p_{e,t}} - \frac{(1 - \tau_t)(\eta - 1)}{\eta} \right)$$

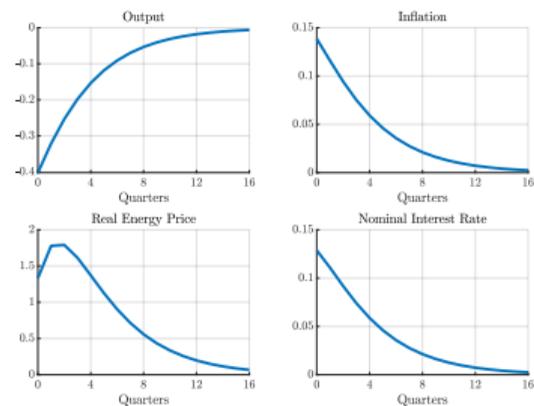
- In line with the data assume that energy prices much more flexible than goods prices
- Consider uncertainty shock about carbon tax,  $\sigma_{\tau_t,t}$

# The differential impact of uncertainty shocks

## (a) Uncertainty about productivity



## (b) Uncertainty about carbon tax



**Figure 15:** Uncertainty shocks in model

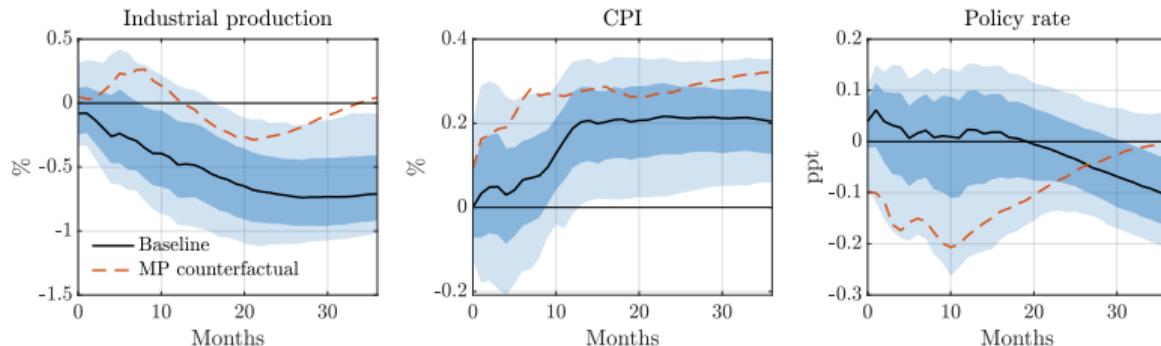
# The differential impact of uncertainty shocks

- Uncertainty about productivity in non-energy sector has very different implications
- Consistent with data, uncertainty about productivity is **disinflationary** while climate policy uncertainty is **inflationary**
- Precautionary pricing channel dominates precautionary demand channel for climate policy uncertainty

# The role of monetary policy

- How important is **monetary policy** for transmission of climate policy uncertainty?
- Perform a **counterfactual exercise** using McKay and Wolf (2023) approach
  - Use monetary shocks from Bauer and Swanson (2023)
  - Robust to Lucas critique
- Use MP shocks to impose same monetary reaction after CPU shock as for EPU shock

# The role of monetary policy



**Figure 16:** Monetary policy counterfactual

- Monetary policy response **matters** for the transmission of CPU shocks
  - Mitigates industrial production response substantially
  - Comes at cost of tolerating slightly higher inflation
- Should monetary policy respond **differently** to different sources of uncertainty?

## Firm-level impacts

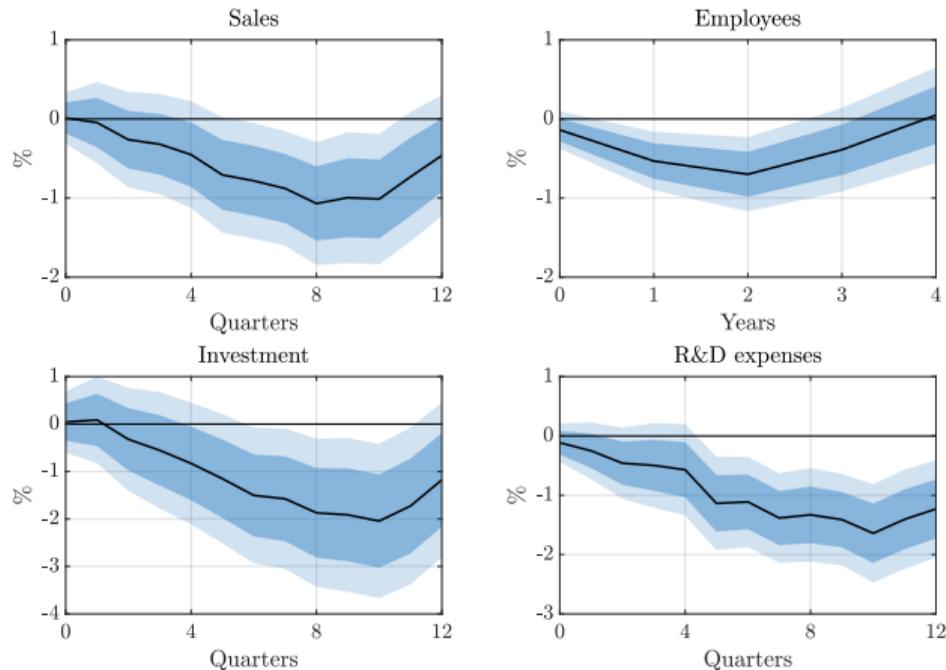
- Estimate effects on firm-level outcomes using panel local projections:

$$y_{i,t+h} = \mu_{i,h} + \beta_h \varepsilon_{1,t} + \gamma_h' \mathbf{x}_{i,t-1} + \nu_{i,t+h}$$

where  $\varepsilon_{1,t}$  is the identified climate policy uncertainty shock

- **Outcomes:** sales, employees, investment, R&D

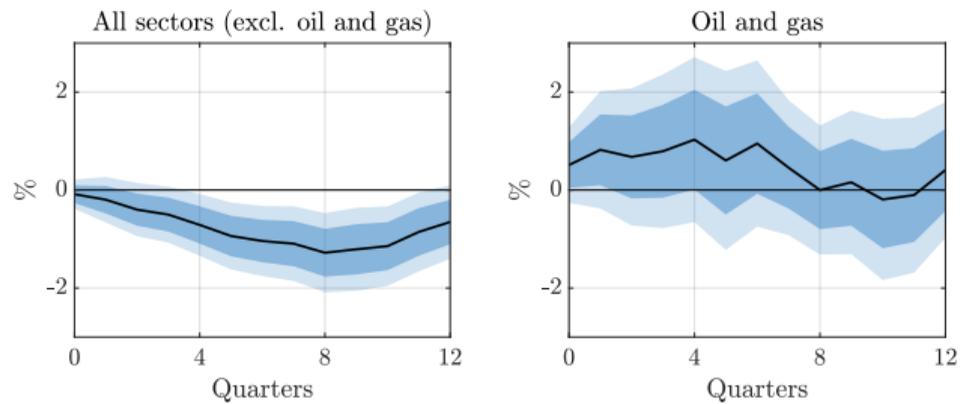
# Average effect



**Figure 17:** Average effect on firm outcomes

- Sales and employees fall significantly
- Substantial fall in firm-level **investment** and **R&D**
- Evidence consistent with macro results

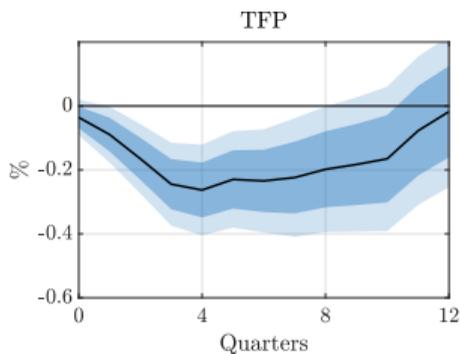
# Sectoral impacts



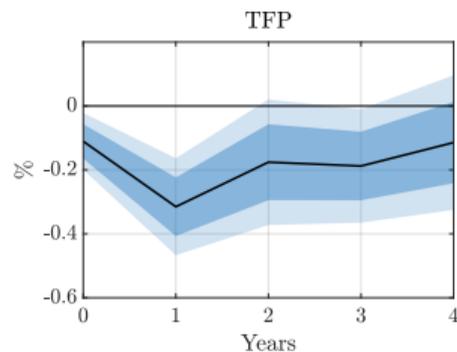
**Figure 18:** Sectoral impacts

# Longer-term impacts

(a) Aggregate TFP



(b) Average firm-level TFP



- Climate policy uncertainty is a drag on investment and innovation
- Distorts allocation leading to overinvestment in firms with uncertain long-term viability
- Confirmed by significant and persistent fall in TFP