

# Sentiment and Uncertainty about Regulation

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# Motivation

"Stockman [U.S. Office of Management and Budget director at the time] said that a quarter of the nation's savings and loan institutions have failed because of government deregulation ..." (Boston Globe, Feb. 4, 1985)

"Owners ... saw the drive-through window as an opportunity for disabled patients and frequent customers. They invested \$100,000 last summer on an intercom system, high-resolution cameras and secure garage doors. But without a change in statewide regulations, the drive-through couldn't legally open." (The Washington Post, Apr. 30, 2020)

"U.S. stocks surged Thursday, on track to extend their sharpest weekly rally since April, as investors cheered the prospect of curbs on new regulations and diminished chances of higher taxes under a split Congress." (Wall Street Journal, Nov. 5, 2020)

# Preview

- We construct news-based measures of sentiment and uncertainty about regulation from Jan 1985 to Aug 2020, both in aggregate and for 15 regulatory policy areas.
- We examine the responses of macroeconomic indicators to sentiment and uncertainty shocks about regulation.

## Key Findings:

- A negative shock to sentiment about regulation is associated with large, persistent drops in future output and employment, while a regulatory uncertainty shock reduces output and employment temporarily.
- The impulse response patterns remain after controlling for existing measures of general news sentiment or economic policy uncertainty.
- Economic outcomes are particularly sensitive to sentiment and uncertainty around certain regulatory policy areas.

# What are Regulations?

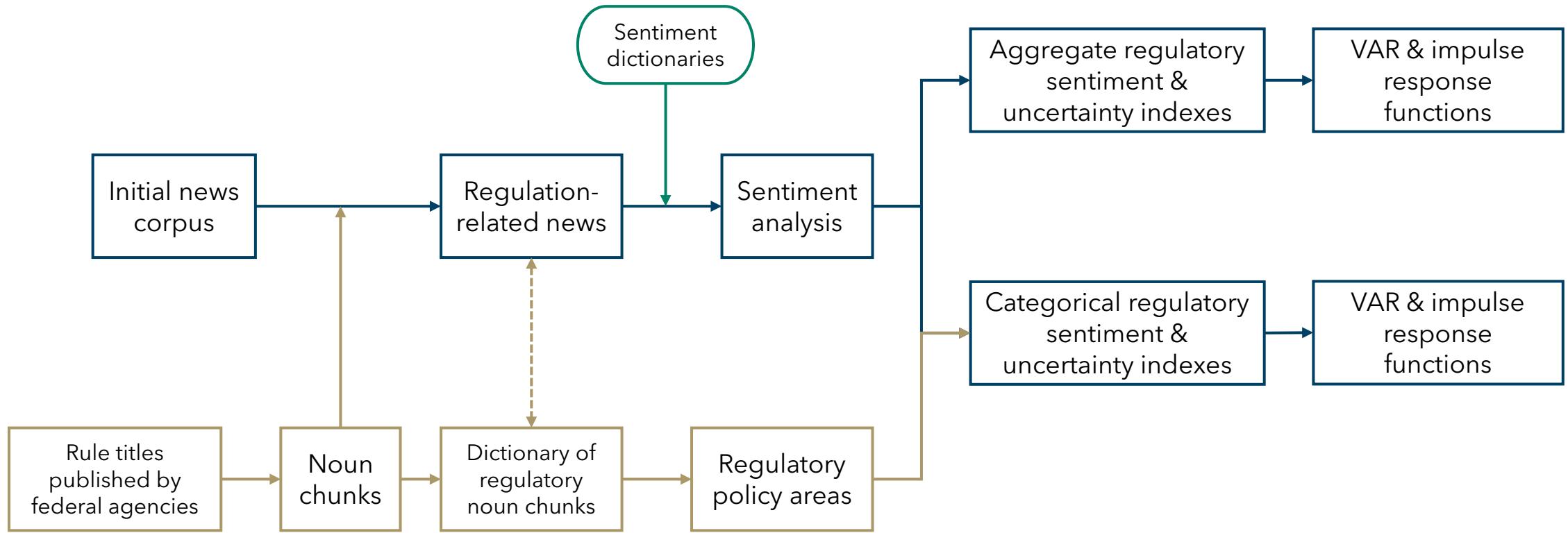
Regulations, or rules, are the primary tools that the government uses to implement laws and achieve policy goals.

- “specific standards or instructions concerning what individuals, businesses, and other organizations can or cannot do” (Dudley and Brito 2012, p.1)
  - EPA & DOT: the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule
  - FDA: Required Warnings for Cigarette Packages and Advertisements
- divert resources that otherwise might be used for production and innovation (Eads 1980; Coffey et al. 2020)
- change the firm's ability to calculate the payoffs to investments (Eads 1980; Bloom 2014)
- stimulate innovation—“Porter hypothesis” (Porter and Van der Linde 1995)

# Literature

- Economic sentiment
  - Survey-based measures (Carroll et al., 1994; Benhabib and Spiegel, 2019)
  - News-based measures (Shapiro et al., 2020; Kalamara et al. 2020)
- Policy uncertainty
  - Economic policy uncertainty (EPU) index (Baker et al., 2016)
- Economic effects of regulation
  - Cumulative volume or restriction of regulation (Coffey et al., 2020; Dawson and Seater, 2013)

# Methodological Workflow



# Newspaper Data

Initial corpus: 822,737 news articles that contain the keyword "regulat\*" or "deregulat\*"  
(Seven U.S. newspapers, Jan 1985 - Aug 2020, from ProQuest TDM Studio)

	All articles	Unique articles	Regulatory articles	First regulatory article	Last regulatory article
Wall Street Journal	251,983	242,084	163,788	1985-01-02	2020-08-31
New York Times	125,270	117,441	72,852	1985-01-01	2020-08-31
Los Angeles Times	121,406	120,802	73,568	1985-01-01	2020-08-31
The Washington Post	116,772	109,216	67,448	1987-01-01	2020-08-31
Chicago Tribune	90,023	89,600	51,740	1985-01-01	2020-08-31
Boston Globe	78,922	72,456	43,445	1985-01-01	2020-08-30
USA Today	38,361	36,917	20,577	1987-04-01	2020-08-31
Total	822,737	788,516	493,418	-	-

# Regulation-Related News

## True Positive

"Mr. Shad asserted that he doesn't see enough evidence of fraud or other abuses by financial planners to justify additional federal regulation."

(Wall Street Journal, 1986-6-12)

## False Positive

"Western led 35-33 at halftime, but the Warriors fought back to take a 57-49 lead on two David Boone free throws with 8:11 left in regulation."

(Chicago Tribune, 1987-1-13)

# A Dictionary of Regulatory Noun Chunks

- ① Identify noun chunks from unique titles of all rules considered by federal agencies from 1995 to 2019 (Unified Agenda data)

Test Procedures for the Analysis of Trace Metals Under the Clean Water Act



[“test procedure”, “analysis”, “trace metal”, “clean water act”]

- ② Match noun chunks in the news corpus

A Regulatory Section:

“Researchers developing vaccines for horses have some advantages over their counterparts looking for a vaccine for humans. Animal drugs face lower regulatory barriers. And the horse vaccine benefited from shortcuts that couldn't be allowed in human research.” (WSJ, 2003-8-29)

- ③ Conduct human checking and correction

- 10,645 regulatory noun chunks
- 493,418 news articles with regulatory sections

# Most Common Regulatory Noun Chunks

Noun Chunks	Occurrences	Noun Chunks	Occurrences
new regulation	29880	food and drug administration	11,989
federal regulation	22168	hedge fund	11,942
health care	17897	natural gas	11,356
real estate	17401	state regulation	11,207
federal reserve	16590	nuclear regulatory commission	10,891
new rule	15906	mutual fund	10,498
federal government	15414	financial institution	10,215
attorney general	14667	environmental protection agency	9,921
government regulation	13776	small business	9,664
interest rate	12065	public health	8,746

*Notes:* Occurrence is the frequency of the noun chunk occurring in the regulatory sections across the 493,418 news articles.

# Monthly News Attention Index

Baker et al. (2016) approach:

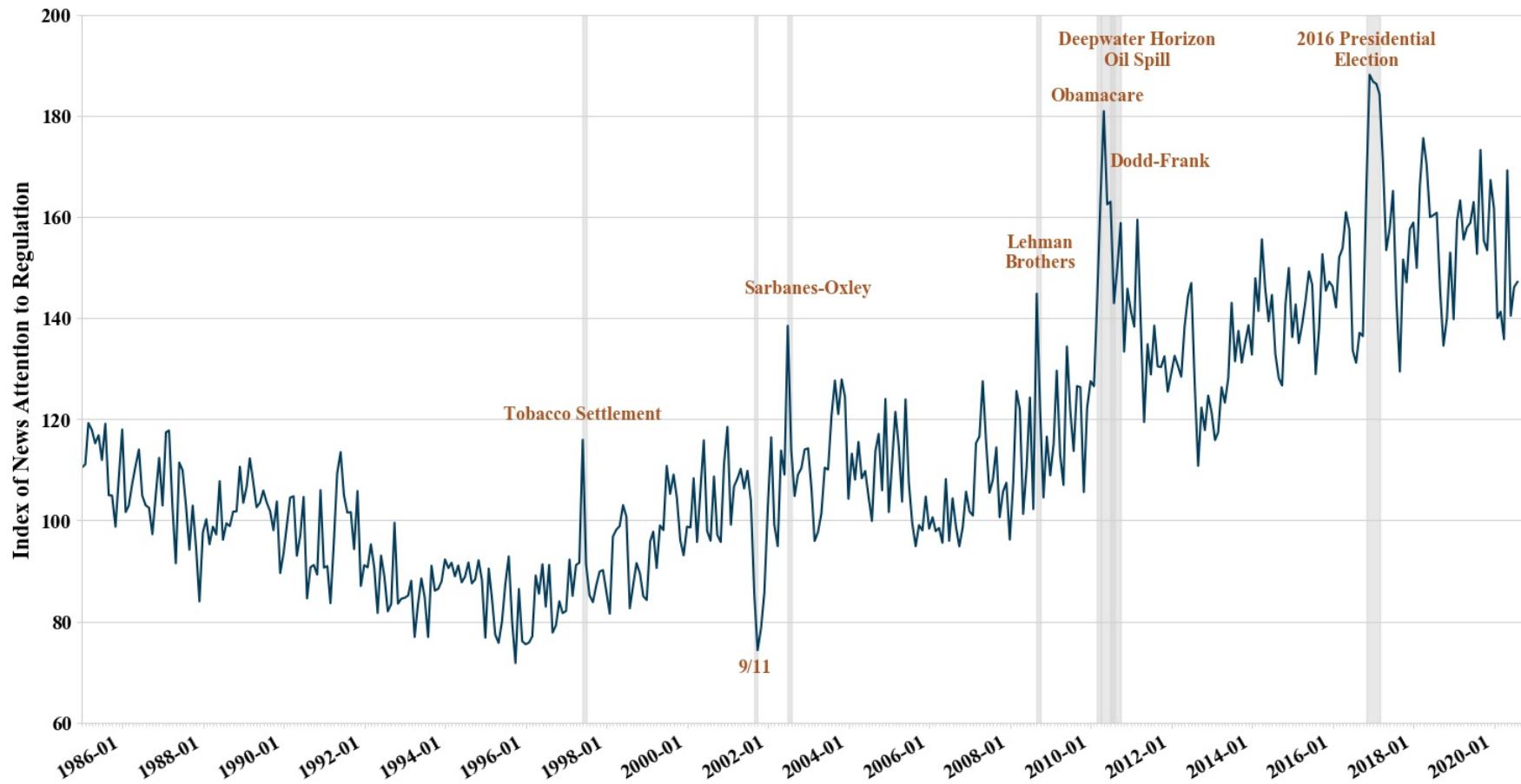
$$NA_t = z_t \frac{100}{\frac{1}{\tilde{T}} \sum_{t=1}^{\tilde{T}} z_t},$$

where  $z_t$  is the mean of standardized monthly counts over newspapers:

$$z_t = \frac{1}{K} \sum_{i=1}^K \frac{x_{it}}{N_{it} \delta_{i,\tilde{T}}},$$

where  $i = \{1, 2, \dots, K\}$  denotes the newspaper,  $t = \{1, 2, \dots, T\}$  denotes the month,  $x_{it}$  denotes the raw count of articles related to regulation in newspaper  $i$  in month  $t$ ,  $N_{it}$  is the total number of news articles published in newspaper  $i$  in month  $t$ ,  $\delta_{i,\tilde{T}}$  is the standard deviation of the scaled count  $\frac{x_{it}}{N_{it}}$  over the time interval  $\tilde{T}$  for standardization and normalization (January 1985 - December 2009)

# Increasing News Attention to Regulation



*Notes:* The index is constructed by standardizing the monthly counts of regulation-related news articles scaled by the monthly counts of all news articles in each newspaper and normalizing the time series to a mean of 100 from January 1985 to December 2009. The index is calculated using data from seven U.S. newspapers including Boston Globe, Chicago Tribune, Los Angeles Times, New York Times, USA Today, Wall Street Journal, and the Washington Post. Data for the Washington Post are available from January 1987, and data for USA Today are available from April 1987.

# Lexicon-based Sentiment Analysis

- Assessing sentiment (with negation)

- Loughran and McDonald (LM) dictionary
- Harvard General Inquirer (GI) dictionary
- Lexicoder Sentiment Dictionary (LSD)

$$SentimentScore = \frac{PositiveWordCount - NegativeWordCount}{TotalWordCount} * 100$$

- Assessing uncertainty

- Loughran and McDonald (LM) dictionary

$$UncertaintyScore = \frac{UncertaintyWordCount}{TotalWordCount} * 100$$

# An Example

"But McCracken said Obama has not been aggressive enough in compelling banks to loosen lending policies. And in many instances, he said, tax relief is secondary to the regulatory burdens that leave many small businesses **uncertain**. In Old Town Manassas, several small-business owners said Obama's comments - if they had heard about them - had not elicited a strong reaction one way or the other." (The Washington Post, 2012-07-26)

	Negative	Positive	Score
LM sentiment	burden; strong (with negation)	-	-3.08
GI sentiment	compel; tax; burden	aggressive (with negation); relief	-1.54
LSD sentiment	burdens; uncertain; strong (with negation)	aggressive (with negation); relief	-1.54
LM uncertainty	uncertain		1.54

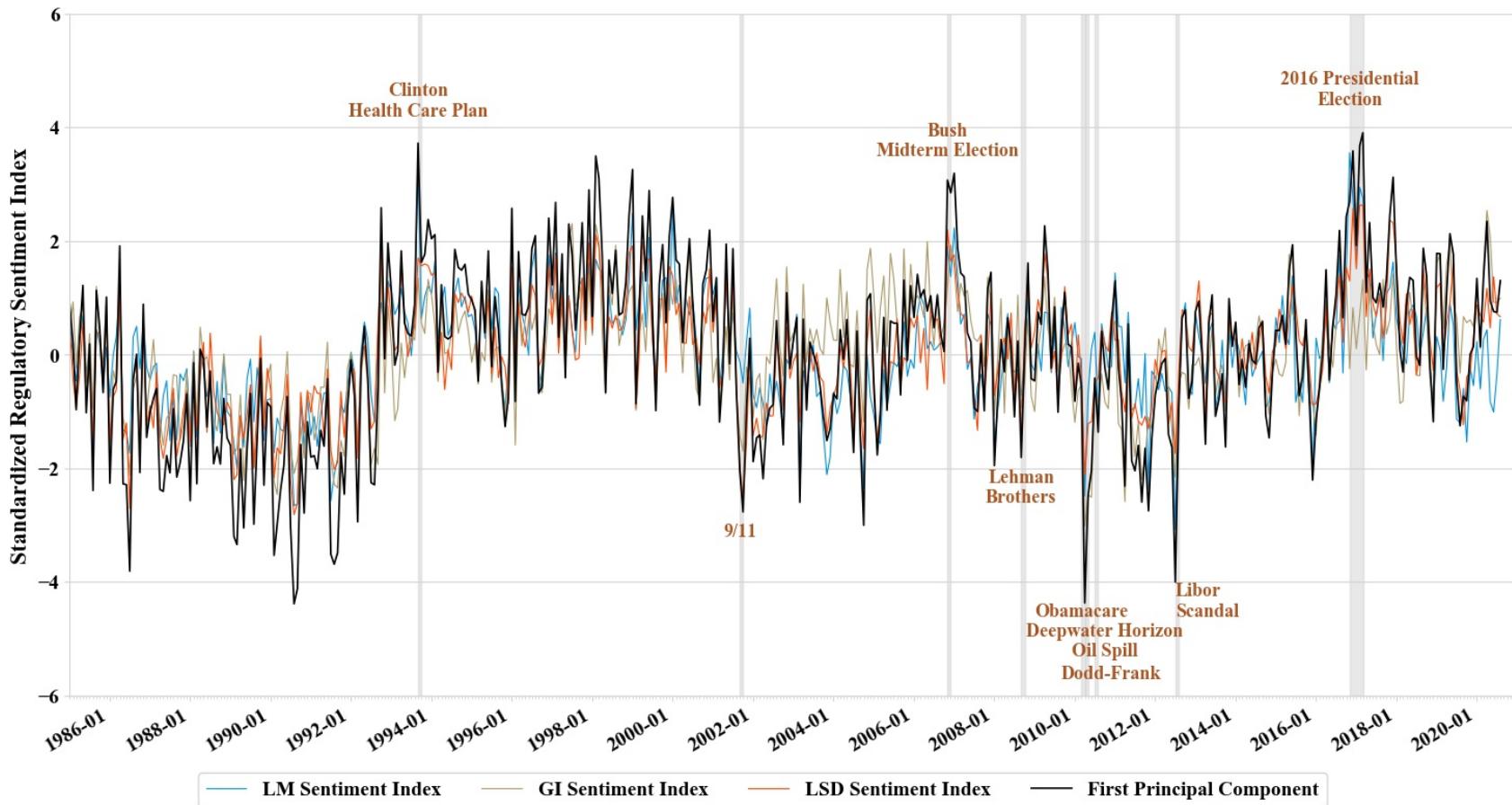
# Compute Indexes

Following Shapiro et al. (2020):

$$s_j = u_{t(j)} + v_{i(j)} + \epsilon_j,$$

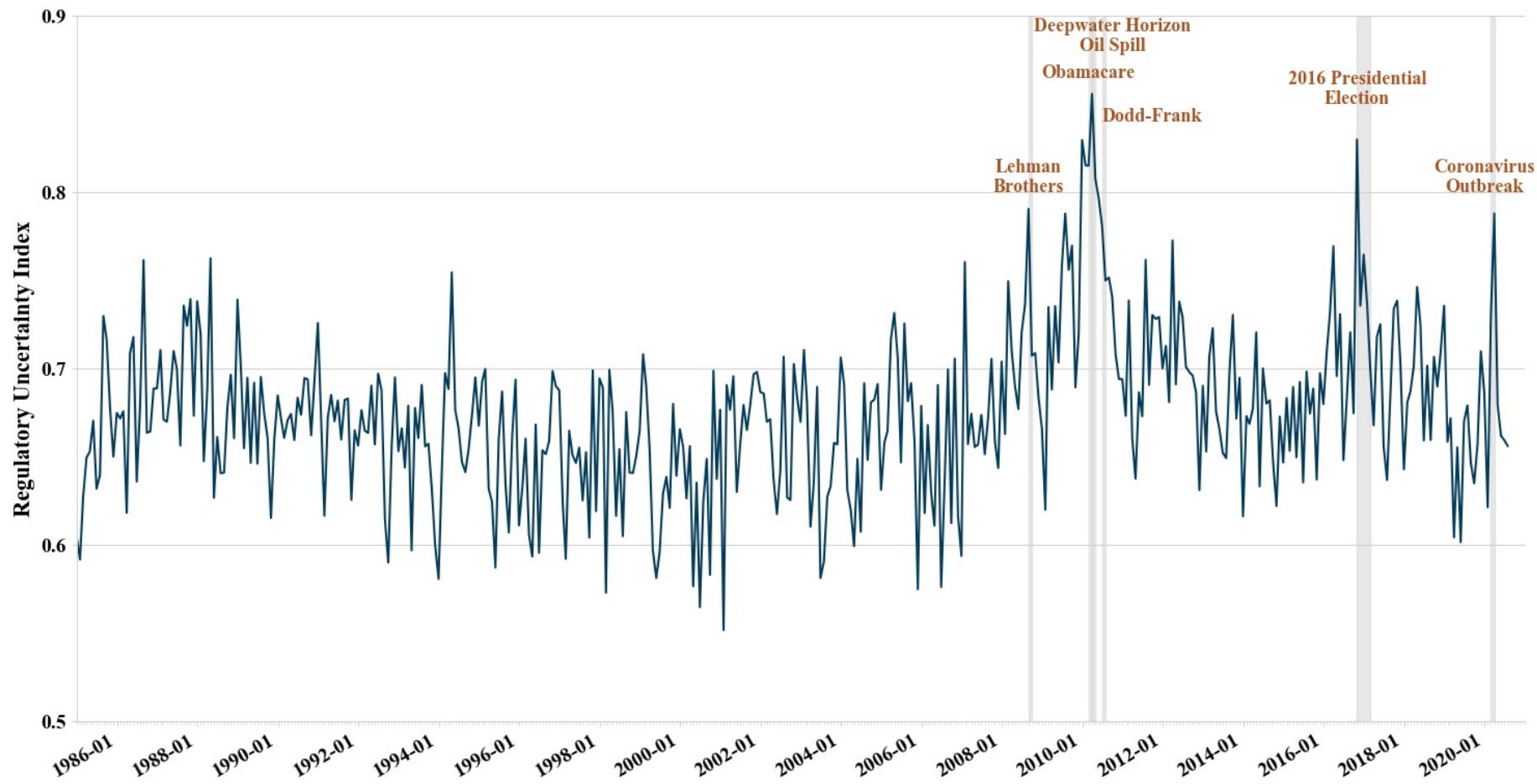
where  $s_j$  is the estimated sentiment or uncertainty score for article  $j$ ,  
 $u_{t(j)}$  is a year-month fixed effect, and  $v_{i(j)}$  is a newspaper fixed effect.

# Regulatory Sentiment Index



*Notes:* The figure plots three sentiment indexes estimated using the Loughran and McDonald (LM) dictionary, the General Inquirer (GI) dictionary, and the Lexicoder Sentiment Dictionary (LSD), respectively, and the first principal component of the three indexes. All indexes are normalized to have mean equal to zero and standard deviation equal to one.

# Regulatory Uncertainty Index



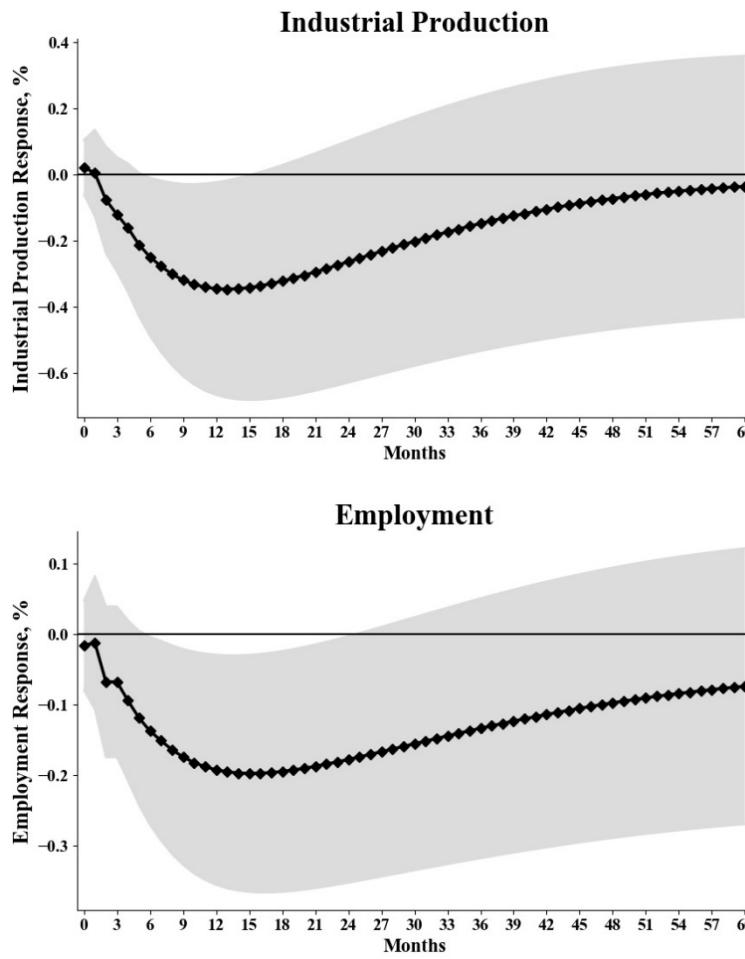
*Notes:* The figure plots the regulatory uncertainty index estimated using the uncertainty category of the Loughran and McDonald (LM) dictionary.

# VAR

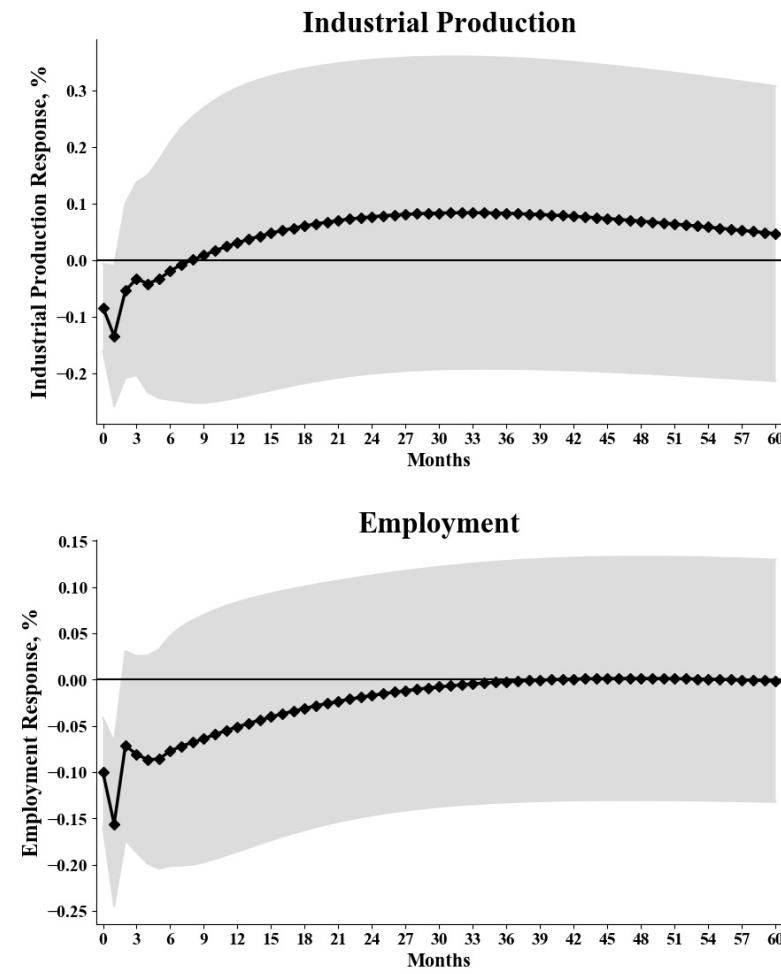
Monthly VAR of Baker et al. (2016):

- A one-standard-deviation negative sentiment shock or a one-standard-deviation upward uncertainty shock
- Orthogonalized by using the Cholesky decomposition with the following ordering of variables: our regulatory sentiment or uncertainty index, the log of S&P500 index, the federal funds rate, log employment, and log industrial production.
- Three lags of all variables
- Robustness checks:
  - reverse ordering
  - bivariate VAR
  - add time trends
  - add news sentiment index of Shapiro et al. (2020)
  - add the EPU index of Baker et al. (2016)
  - drop S&P
  - bivariate VAR with reverse ordering
  - add the Michigan Consumer Sentiment Index
  - add VIX

## Impulse Responses to Sentiment Shocks about Regulation

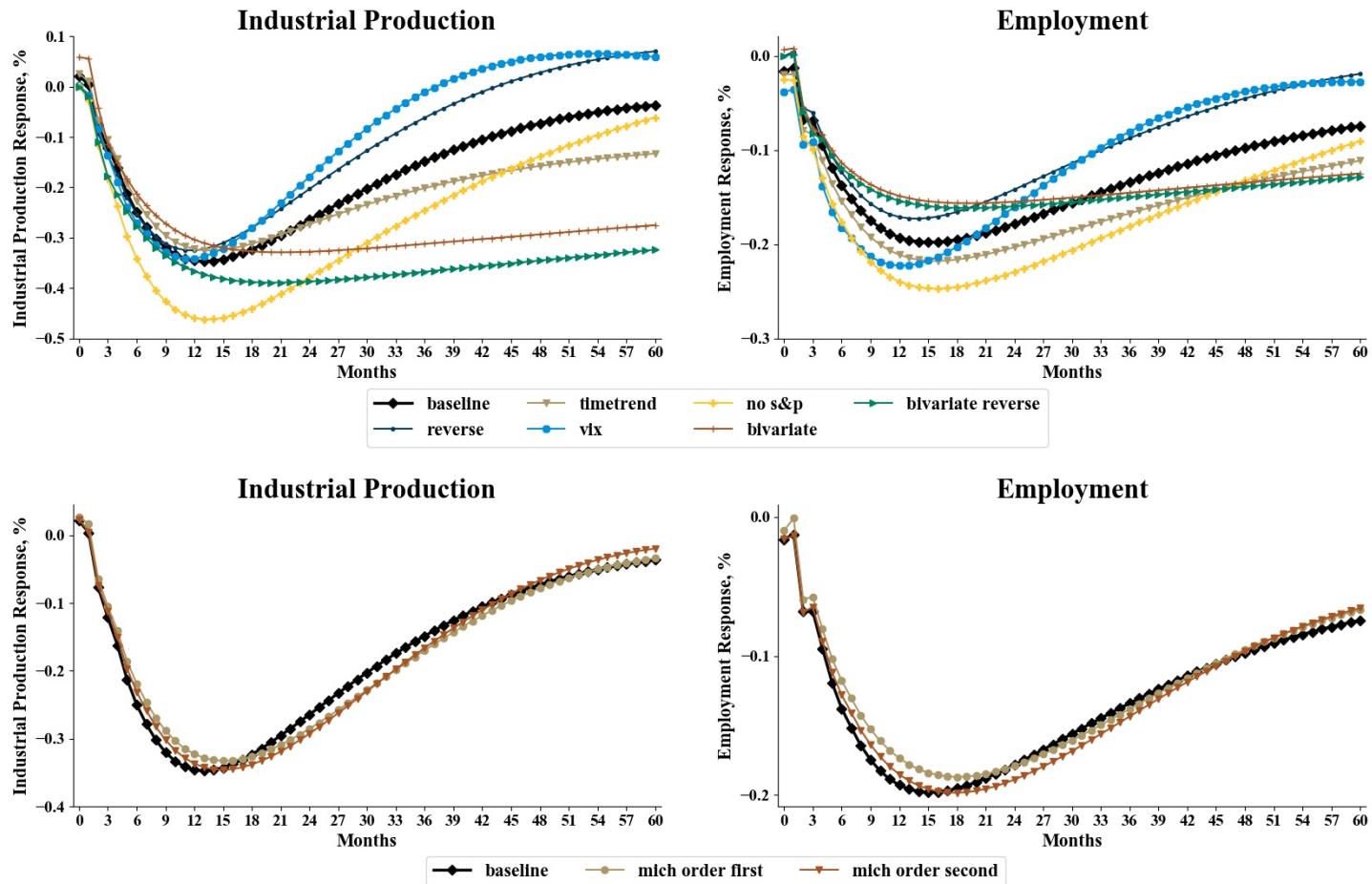


## Impulse Responses to Uncertainty Shocks about Regulation



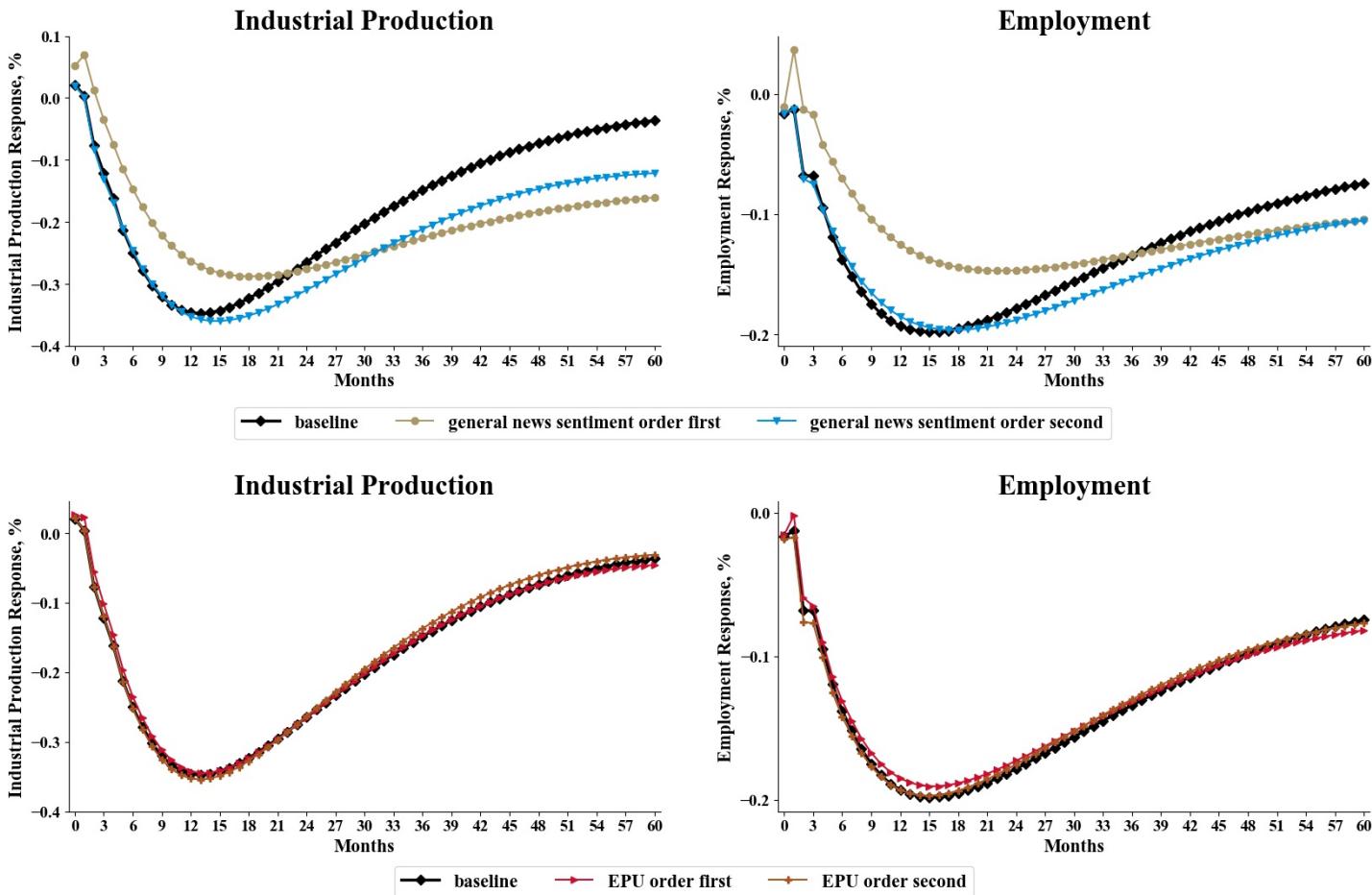
*Notes:* The figures plot VAR-estimated impulse response functions for industrial production and employment to a one-standard-deviation negative shock to sentiment about regulation or to a one-standard-deviation upward shock to uncertainty about regulation. The gray areas are 90% confidence bands.

# Robustness Checks 1: Responses to Sentiment Shocks



*Notes:* The figures plot VAR-estimated impulse response functions for industrial production and employment to a one-standard-deviation upward shock to uncertainty about regulation, with several modifications to the baseline specification.

# Robustness Checks 2: Responses to Sentiment Shocks

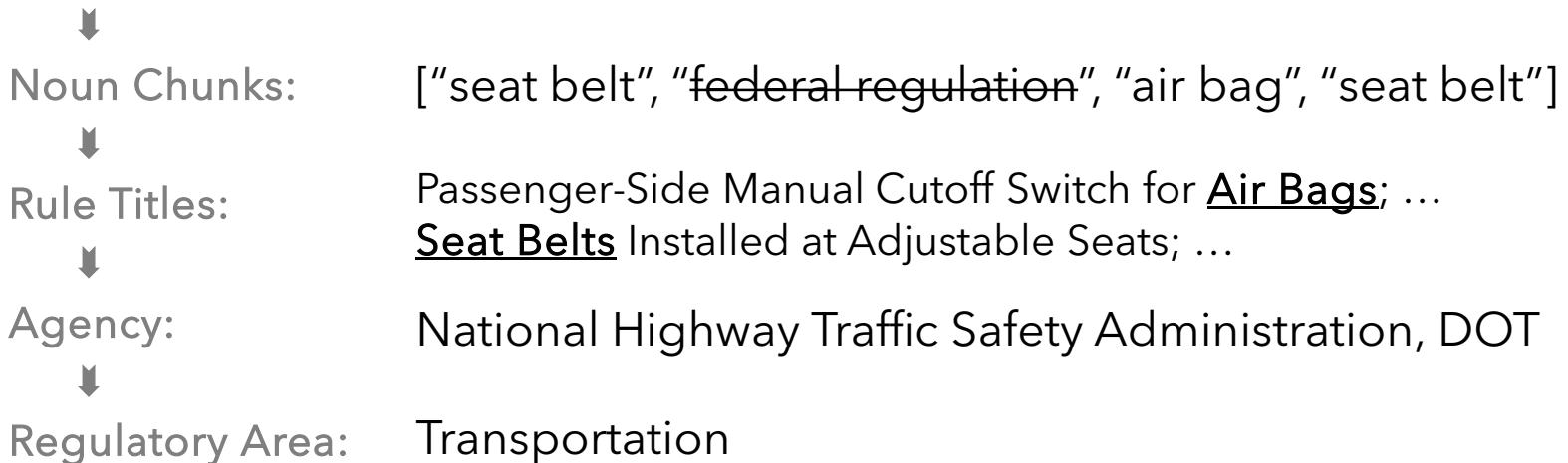


*Notes:* The figures plot VAR-estimated impulse response functions for industrial production and employment to a one-standard-deviation upward shock to uncertainty about regulation, after adding the news sentiment index of Shapiro et al. (2020) or the EPU index of Baker et al. (2016).

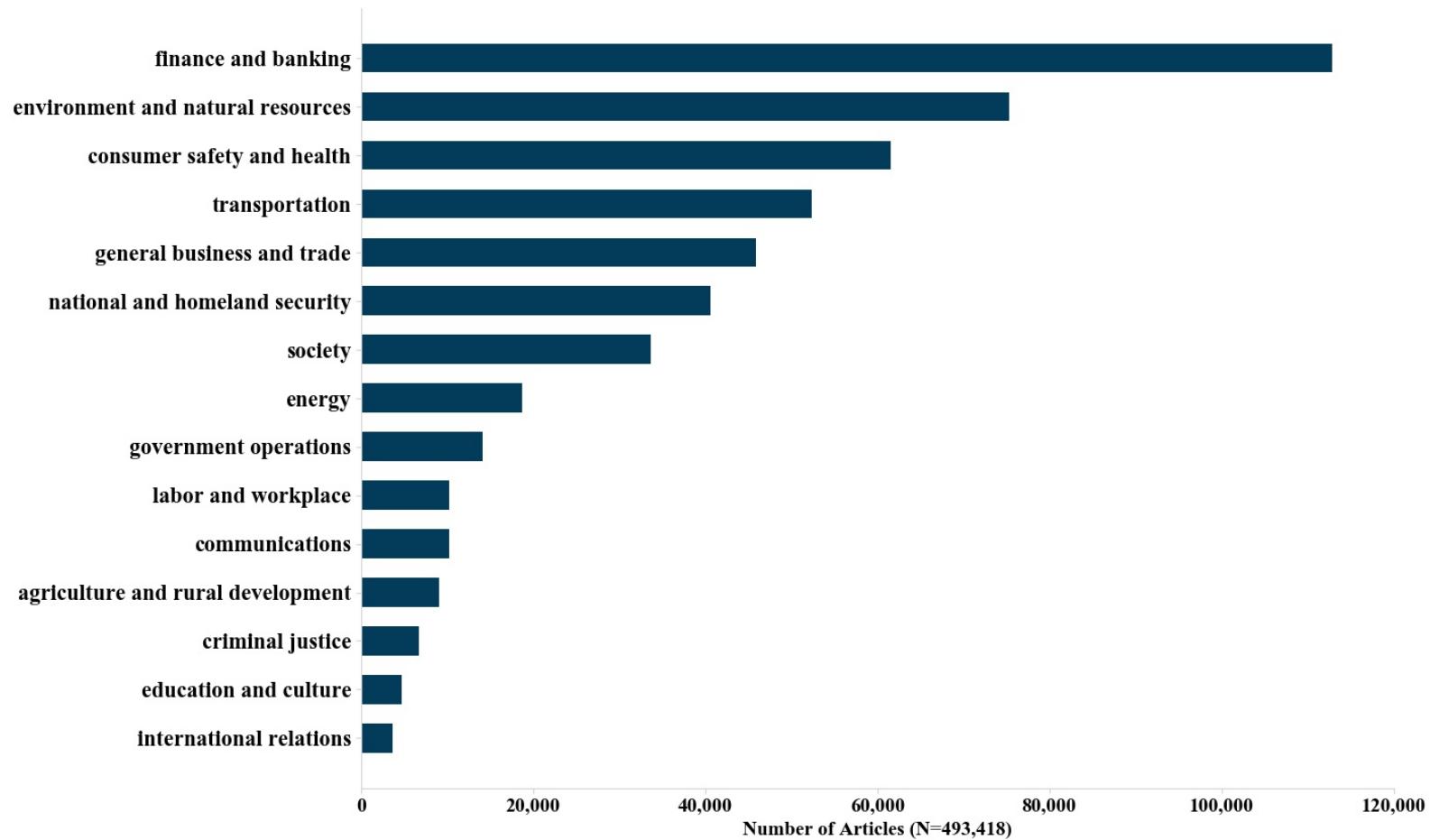
# Categorizing News Content

A regulatory section:

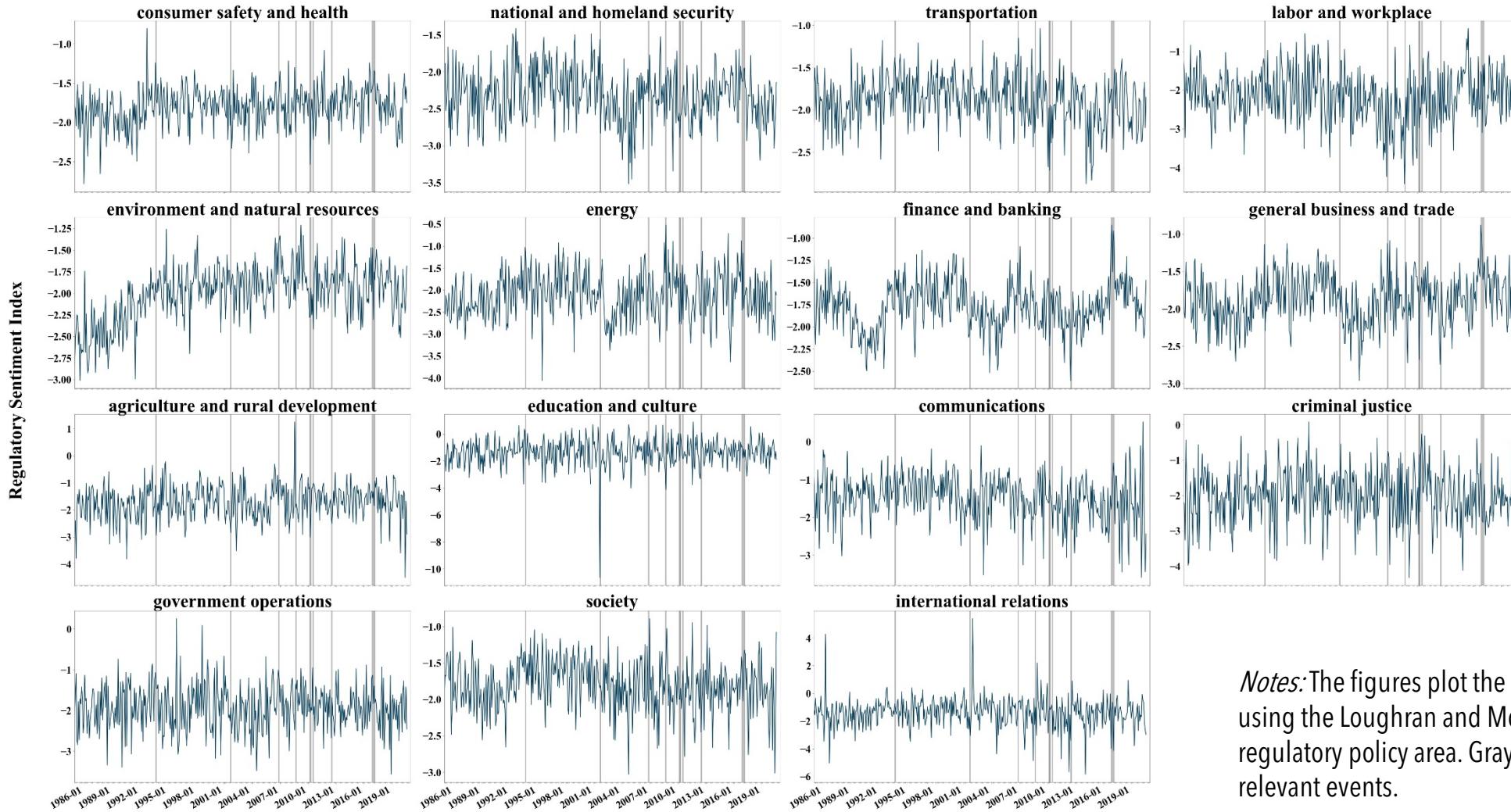
"Automobile manufacturers are financing a multimillion dollar lobbying campaign aimed at persuading state legislatures to require motorists to buckle up their seat belts, a move designed to kill a federal regulation requiring the industry to equip vehicles with more expensive air bags by 1989. Last year, legislatures in New York, New Jersey and Illinois adopted mandatory seat belt laws and legislation already has been led on Beacon Hill to bring about the same end." (Boston Globe, 1985-1-30)



# Frequencies of Articles by Regulatory Area

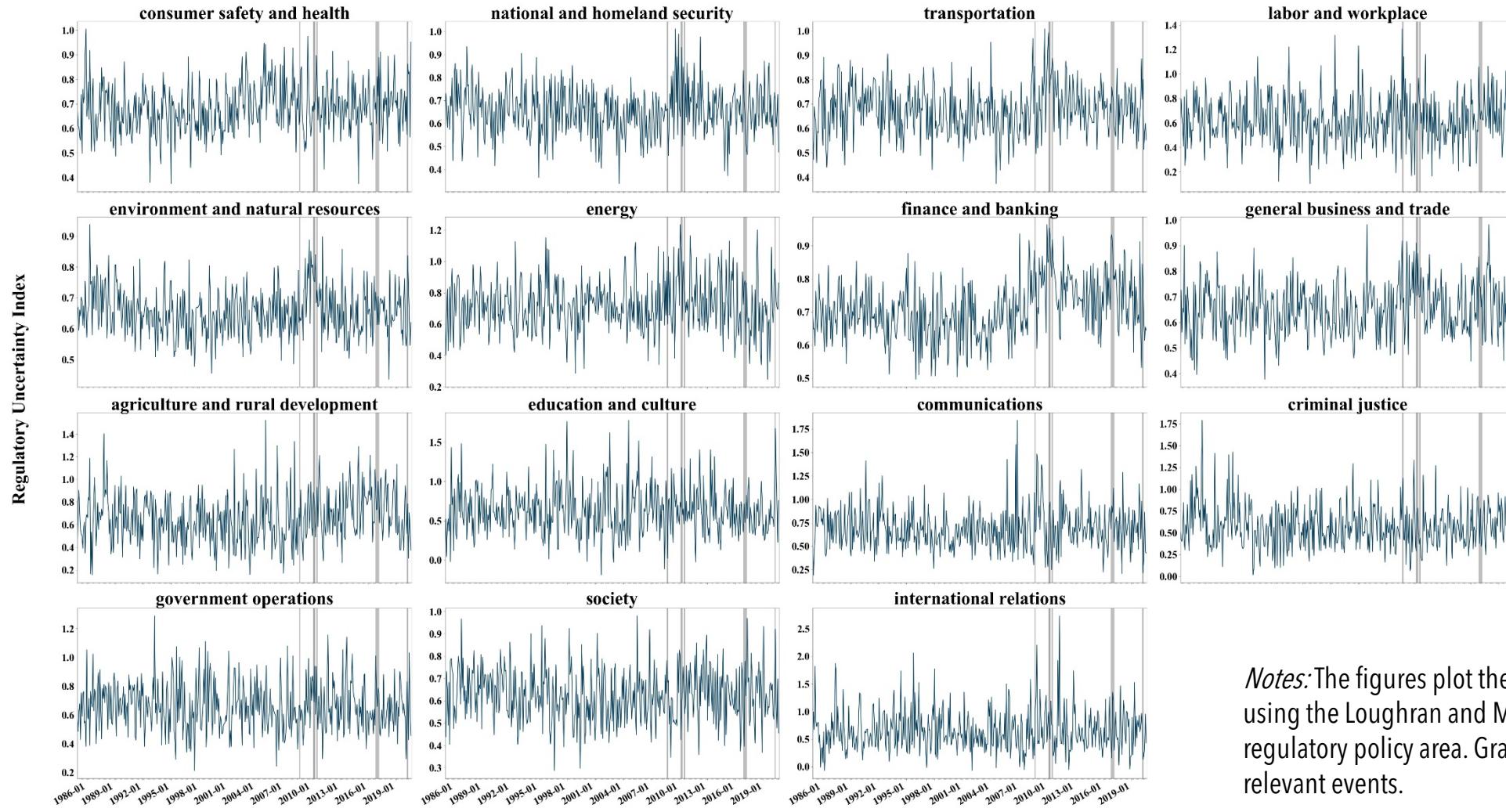


# Categorical Sentiment Indexes by Regulatory Area



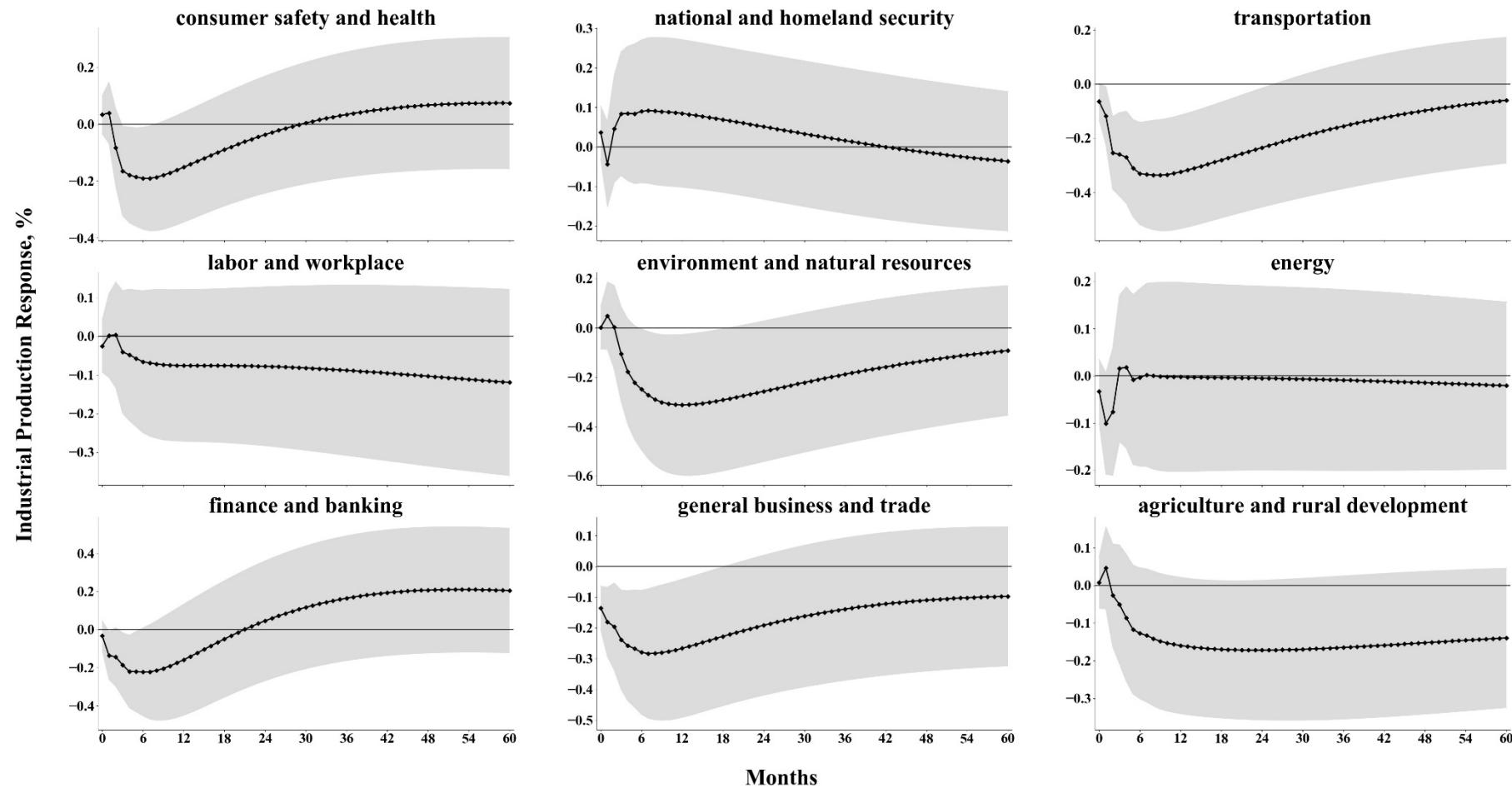
*Notes:* The figures plot the sentiment indexes estimated using the Loughran and McDonald (LM) dictionary for each regulatory policy area. Gray areas indicate potentially relevant events.

# Categorical Uncertainty Indexes by Regulatory Area



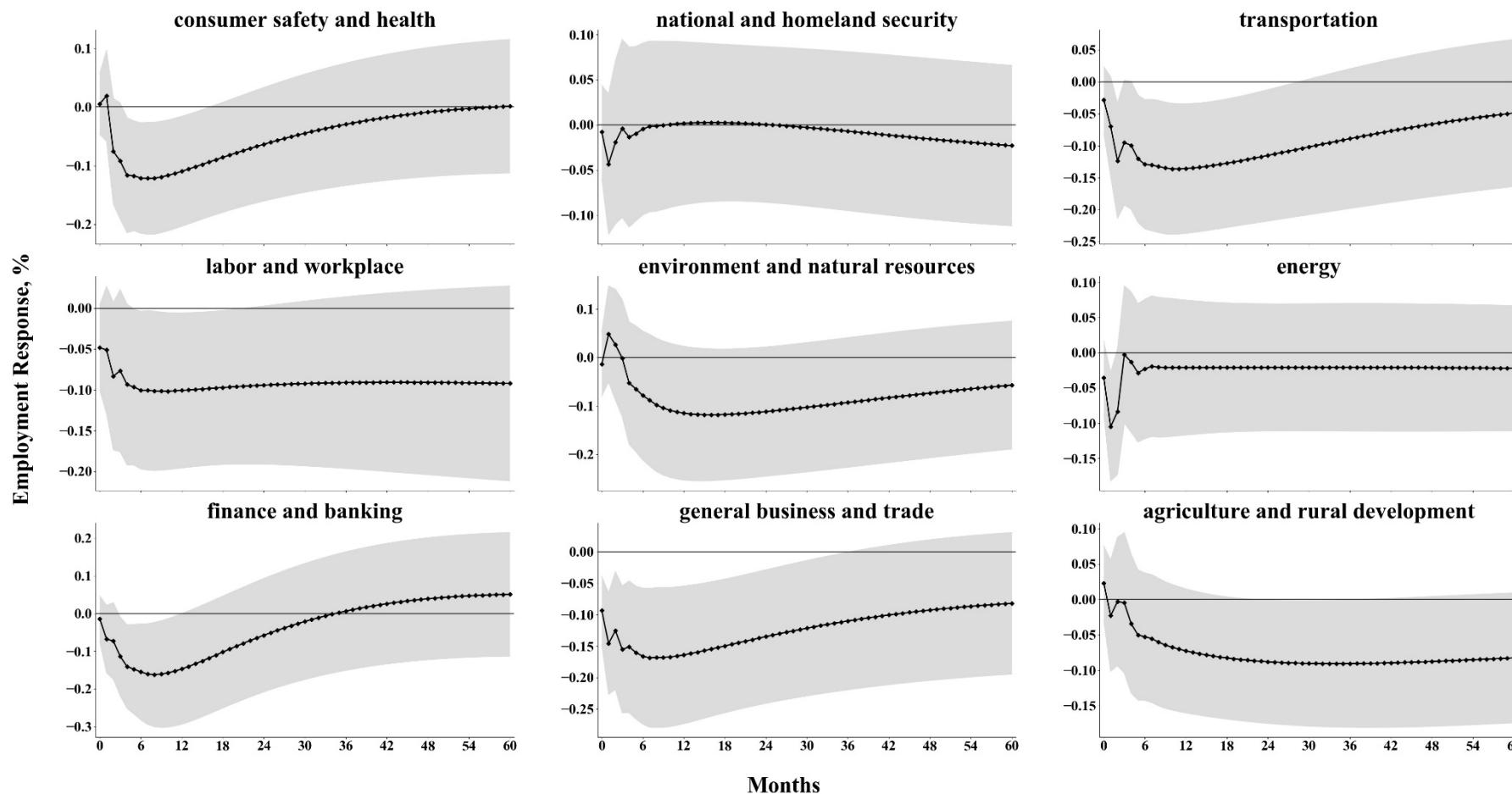
*Notes:* The figures plot the sentiment indexes estimated using the Loughran and McDonald (LM) dictionary for each regulatory policy area. Gray areas indicate potentially relevant events.

# Output Responses to Regulatory Sentiment Shocks



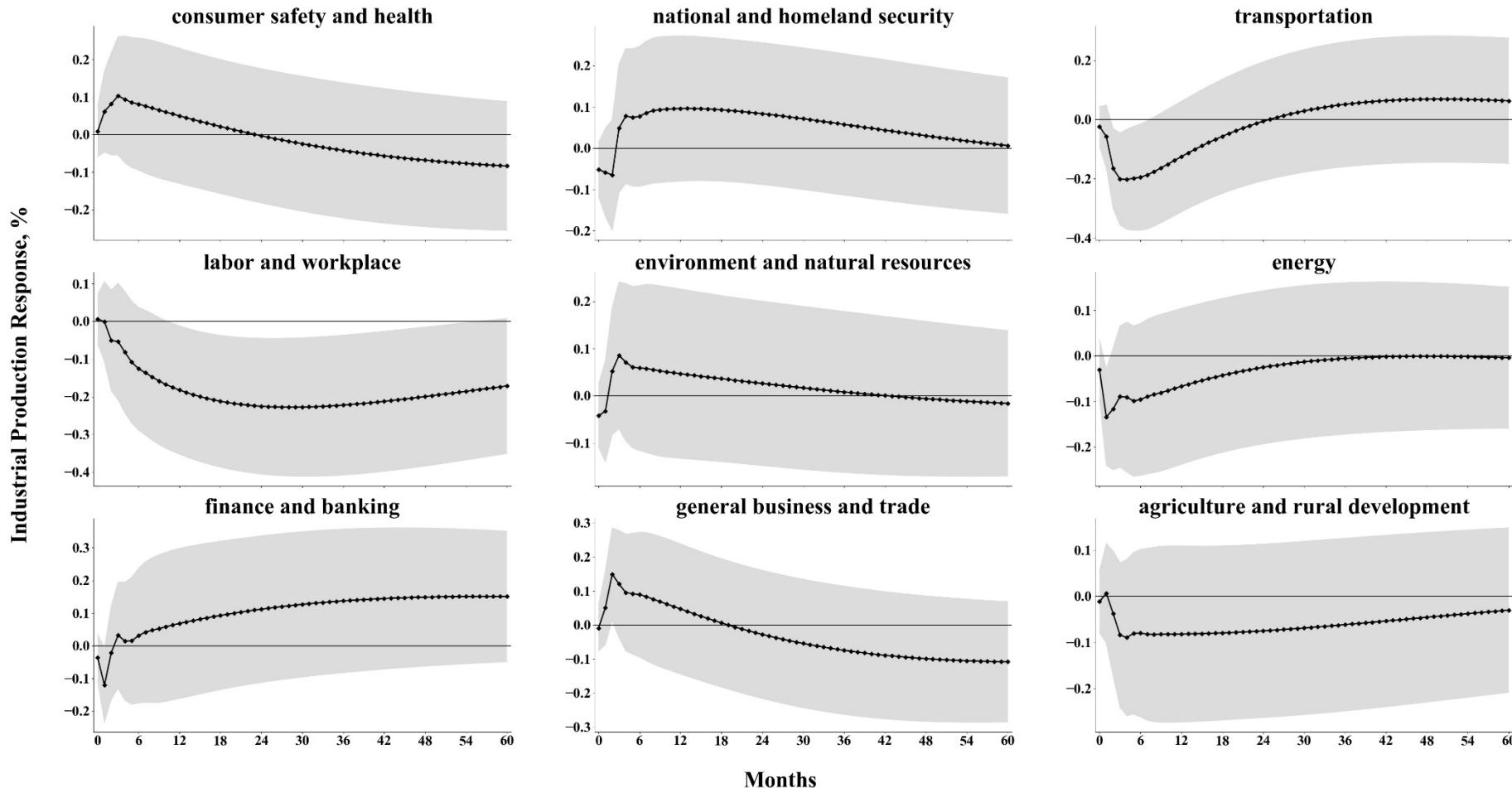
*Notes:* The figures plot VAR-estimated impulse responses of industrial production to a one-standard-deviation negative sentiment shock for each regulatory policy area. The gray areas are 90% confidence bands.

# Employment Responses to Regulatory Sentiment Shocks



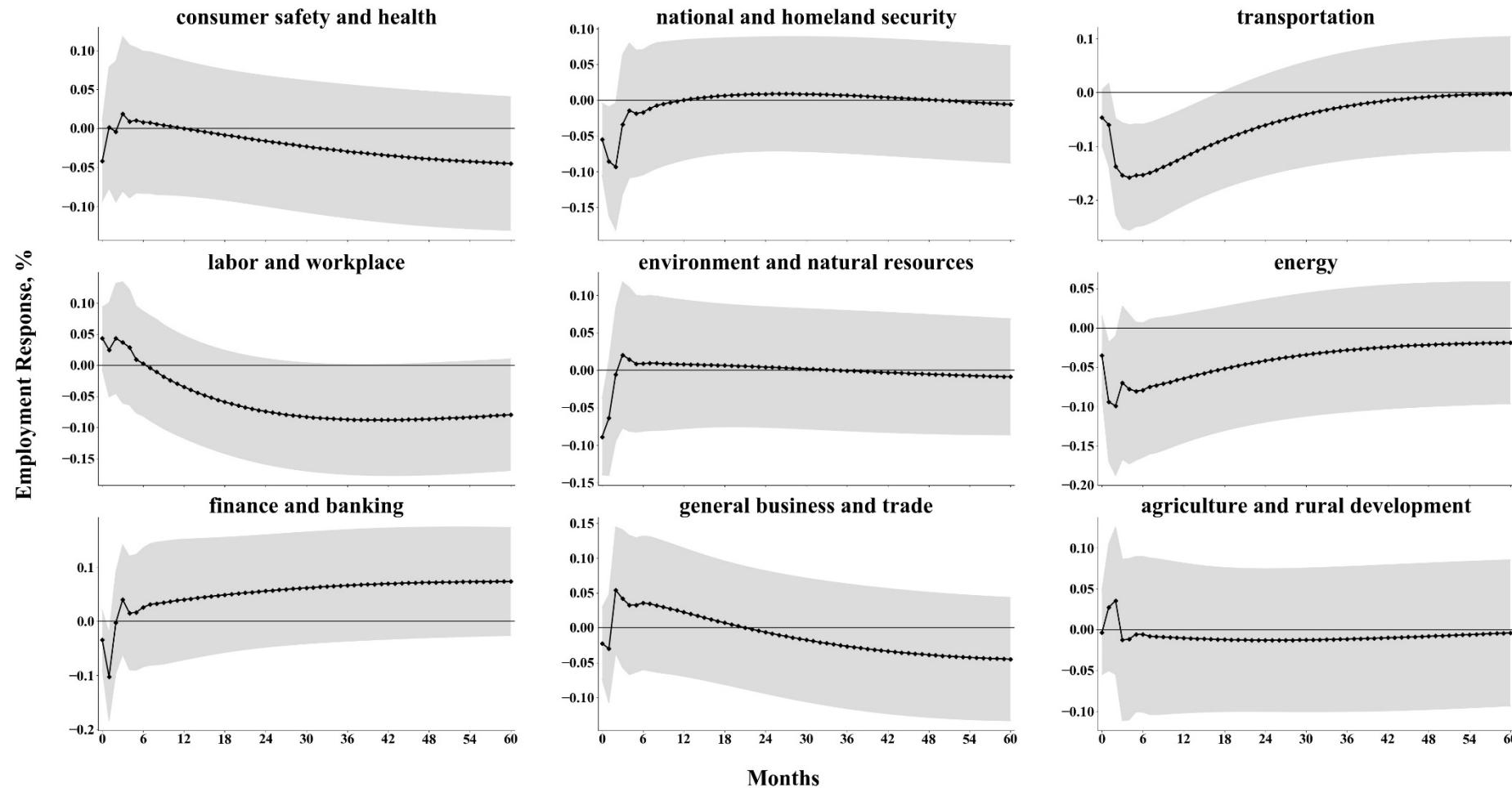
*Notes:* The figures plot VAR-estimated impulse responses of employment to a one-standard-deviation negative sentiment shock for each regulatory policy area. The gray areas are 90% confidence bands.

# Output Responses to Regulatory Uncertainty Shocks



*Notes:* The figures plot VAR-estimated impulse responses of industrial production to a one-standard-deviation upward uncertainty shock for each regulatory policy area. The gray areas are 90% confidence bands.

# Employment Responses to Regulatory Uncertainty Shocks



*Notes:* The figures plot VAR-estimated impulse responses of employment to a one-standard-deviation upward uncertainty shock for each regulatory policy area. The gray areas are 90% confidence bands.

# Conclusion

- We constructed news-based measures of sentiment and uncertainty about regulation.
- Negative news about regulation may lead to persistent drops in future output and employment, while increased regulatory uncertainty overall has transitory effects.
- Economic outcomes are particularly sensitive to sentiment and uncertainty around certain regulatory policy areas:
  - Sentiment around transportation & general business and trade
  - Uncertainty around transportation & labor and workplace

# Future Work

- Improve classification accuracy for categorical indexes
- Explore industry-level measures and analyses
- Explore channels through which sentiment about regulation affects economic outcomes
- Examine the effects of regulatory uncertainty conditional on regulatory sentiment
- Use the regulatory measures in forecasting

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# Thank you!

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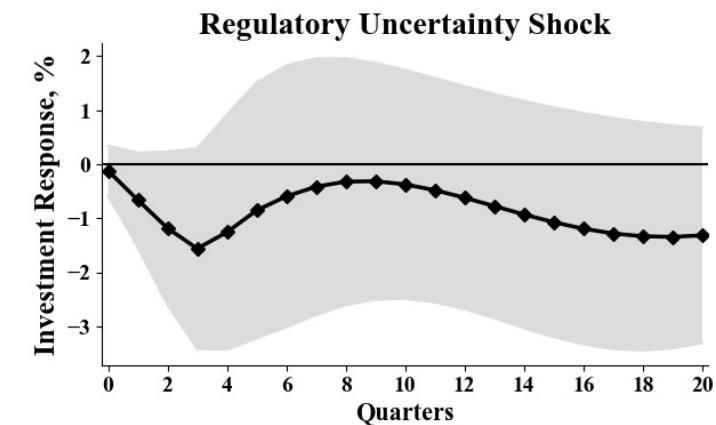
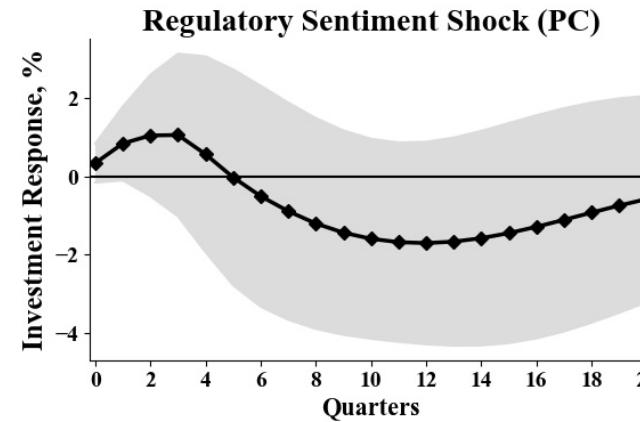
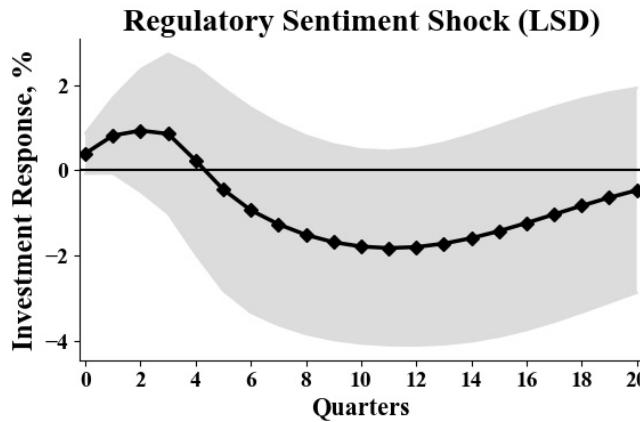
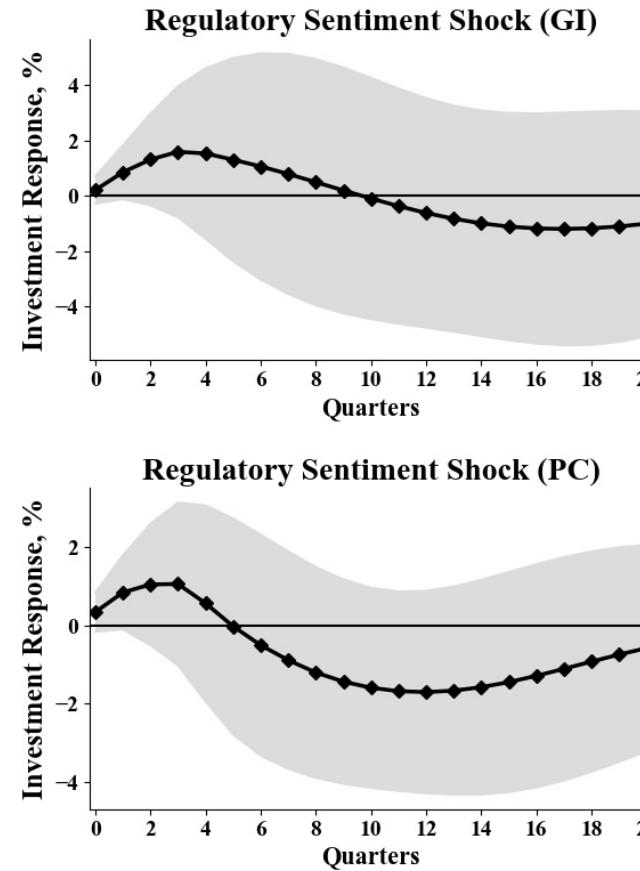
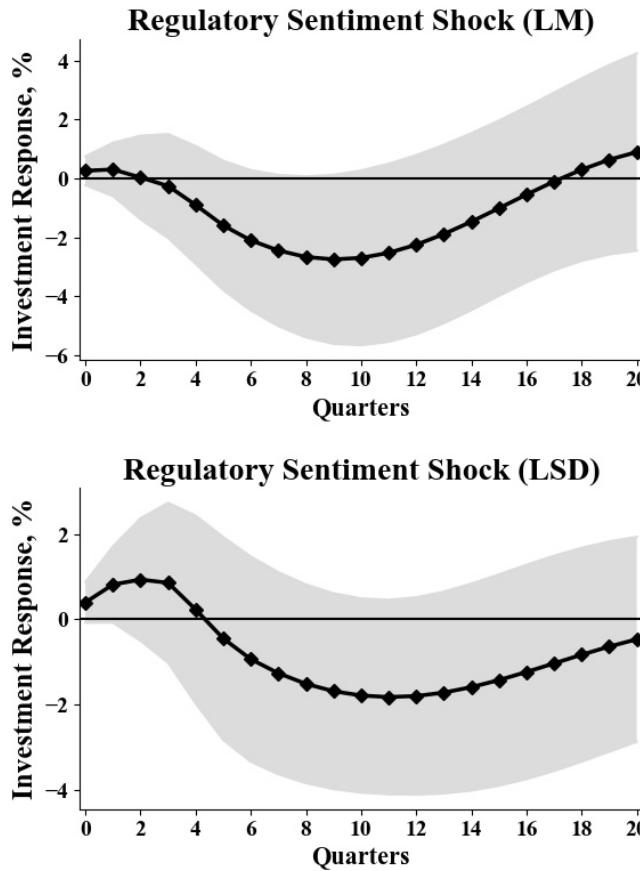
# Appendix C

## C Stationarity Tests for the Regulatory Sentiment and Uncertainty Indexes

Index	ADF test statistic	Phillips-Perron test statistic	KPSS test statistic
LM sentiment index	-3.4107 (p=0.0106)	-15.2300 (p<0.0001)	0.2542 (p=0.1833)
GI sentiment index	-2.0719 (p=0.2560)	-16.6369 (p<0.0001)	0.6249 (p=0.0195)
LSD sentiment index	-4.1658 (p=0.0008)	-14.5903 (p<0.0001)	0.8013 (p=0.0072)
Sentiment PC	-2.3863 (p=0.1456)	-15.1323 (p<0.0001)	0.6713 (p=0.0149)
Uncertainty index	-3.7472 (p=0.0035)	-17.0986 (p<0.0001)	0.8722 (p=0.0049)

*Notes:* The sentiment PC represents the first principal component of the LM, GI, and LSD sentiment indexes.

# Appendix E: Investment Responses to Regulatory Sentiment and Uncertainty Shocks (Quarterly VAR)



# Appendix F: Examples of Agencies, Regulatory Areas, and Rule Titles

Regulatory Area	Agency	Rule Title	Regulatory Area	Agency	Rule Title
agriculture and rural development	Agricultural Marketing Service	National Organic Program	general business and trade	Small Business Administration	Certificate of Competency
communications	Federal Communications Commission	Streamlining the Commission's Rules and Regulations for Satellite Application and Licensing Procedures (IB Docket No. 95-117)	government operations	General Services Administration	Nondiscrimination on the Basis of Race, Color, National Origin, and, Where Applicable, Sex
consumer safety and health	Centers for Medicare & Medicaid Services	Deduction of Incurred Medical Expenses (Spenddown) (HCFA-2020-F)	international relations	Agency for International Development	Administration of Grants and Cooperative Agreements
criminal justice	Bureau of Prisons	Volunteer Community Service Projects	labor and workplace	Employment and Training Administration	Airline Deregulation: Employee Benefit Program
education and culture	Office of Elementary and Secondary Education	Improving Basic Programs Operated by Local Educational Agencies	national and homeland security	Bureau of Citizenship and Immigration Services	Employment Verification by Employers That Are Members of a Multi-Employer Association
energy	Energy Efficiency and Renewable Energy	Energy Efficiency Standards for Room Air Conditioners	society	Office of Fair Housing and Equal Opportunity	Economic Opportunities for Low- and Very-Low-Income Persons (FR-2898)
environment and natural resources	Environmental Protection Agency	National Volatile Organic Compounds (VOC) Emission Standards for Consumer Products; Amendments	transportation	Federal Aviation Administration	Objects Affecting Navigable Airspace
finance and banking	Commodity Futures Trading Commission	Review of Commission Disclosure Requirements Concerning Commodity Pool Operators			