

**Online Appendix, "Rapid Increases in Methane Concentrations Following August 2020 Suspension of the US Methane Rule," Xinming Du, Muye Ru, and Douglas Almond. In Environmental and Energy Policy and the Economy volume 6. University of Chicago Press, 2025.**

Table S1: Methane in pixels with leak sites

	CH <sub>4</sub> (ppb)				
	(1)	(2)	(3)	(4)	(5)
Post	14.942*** (0.993)	8.744*** (1.122)	9.671*** (1.016)	4.641*** (1.038)	5.862*** (0.977)
Post × OG	4.227*** (1.019)	3.967*** (1.056)	3.135*** (0.936)	3.170*** (1.006)	2.167** (0.923)
Observations	15619	15619	15619	15619	15619
R-squared	0.585	0.641	0.650	0.667	0.684
Y-mean	1886.325	1886.325	1886.325	1886.325	1886.325
Y-sd	24.744	24.744	24.744	24.744	24.744
Year FEs		Y	Y	Y	Y
Quarter FEs		Y			
State*Quarter FEs			Y		
Month FEs				Y	
State*Month FEs					Y
Pixel FEs	Y	Y	Y	Y	Y

*Notes:* Sample pixels include coordinates experiencing at least one high emission events Jan 2019 - Aug 2020. Pixels are required to have at least half non-missing CH<sub>4</sub> data in the pre- and post-period. There are 78 weeks in the pre-period and 57 weeks in the post-period, so pixels have at least 39 and 29 obs in the pre- and post-period. Standard errors are clustered at the pixel level.

Table S2: Single difference analysis

	CH <sub>4</sub> (ppb)				
	(1)	(2)	(3)	(4)	(5)
Post	21.006*** (0.049)	9.702*** (0.056)	9.566*** (0.055)	4.860*** (0.053)	5.017*** (0.052)
Observations	797790	797790	797790	797790	797790
R-square	0.510	0.599	0.625	0.630	0.663
Y-mean	1862.163	1862.163	1862.163	1862.163	1862.163
Y-sd	20.116	20.116	20.116	20.116	20.116
Year FEs		Y	Y	Y	Y
Quarter FEs		Y			
State*Quarter FEs			Y		
Month FEs				Y	
State*Month FEs					Y
Pixel FEs	Y	Y	Y	Y	Y

*Notes:* Sample is at the pixel-week level Feb 8, 2019 - Dec 31, 2020. *Post* is one if the week is between between Aug 13, 2020 - Dec 31, 2020. Pixels are required to have at least half non-missing CH<sub>4</sub> data in the pre- and post-period. There are 78 weeks in the pre-period and 57 weeks in the post-period, so pixels have at least 39 and 29 obs in the pre- and post-period. Standard errors are clustered at the pixel level.

Table S3: Methane in pixels with natural gas facilities

	CH <sub>4</sub> (ppb)				
	(1)	(2)	(3)	(4)	(5)
Post	15.740*** (0.055)	11.607*** (0.074)	11.082*** (0.073)	3.694*** (0.092)	3.480*** (0.092)
Y2020	9.652*** (0.041)				
Post × Y2020 × Well	2.122*** (0.079)	2.276*** (0.078)	2.240*** (0.070)	1.850*** (0.077)	1.851*** (0.068)
Post × Y2020 × Processing	-1.354*** (0.349)	-1.456*** (0.343)	-1.360*** (0.301)	-1.298*** (0.332)	-1.247*** (0.289)
Post × Y2020 × Pipeline	2.63*** (.0761)	2.71*** (.0749)	2.99*** (.0669)	2.2*** (.0733)	2.55*** (.0646)
Post × Y2020 × Compressor	-.443 (.284)	-.362 (.287)	.0644 (.233)	-.431 (.282)	.101 (.219)
Observations	797790	797790	797790	797790	797790
R-squared	0.568	0.610	0.635	0.629	0.662
Y-mean	1862.163	1862.163	1862.163	1862.163	1862.163
Y-sd	20.116	20.116	20.116	20.116	20.116
Year FEs		Y	Y	Y	Y
Quarter FEs		Y			
State*Quarter FEs			Y		
Month FEs				Y	
State*Month FEs					Y
Pixel FEs	Y	Y	Y	Y	Y

*Notes:* Sample is at the pixel-week level Feb 8, 2019 - Dec 31, 2020. *Post* is one if the week is between Aug 13, 2019 - Dec 31, 2019 or between Aug 13, 2020 - Dec 31, 2020. Pixels are required to have at least half non-missing CH<sub>4</sub> data in the pre- and post-period. There are 78 weeks in the pre-period and 57 weeks in the post-period, so pixels have at least 39 and 29 obs in the pre- and post-period. Standard errors are clustered at the pixel level.

Table S4: Heterogeneity across facilities

Panel A: Storage and transmission facilities					
	CH <sub>4</sub> (ppb)				
	(1)	(2)	(3)	(4)	(5)
Post	14.467*** (0.065)	10.412*** (0.088)	9.909*** (0.088)	2.517*** (0.112)	2.289*** (0.112)
Y2020	8.519*** (0.046)				
Post × Y2020	5.133*** (0.071)	5.360*** (0.065)	5.448*** (0.062)	4.661*** (0.064)	4.788*** (0.063)
Observations	592283	592283	592283	592283	592283
R-squared	0.569	0.613	0.640	0.630	0.667
Y-mean	1862.758	1862.758	1862.758	1862.758	1862.758
Y-sd	20.317	20.317	20.317	20.317	20.317
Panel B: Other facilities					
Post	15.400*** (0.101)	10.871*** (0.128)	10.406*** (0.125)	3.710*** (0.152)	3.716*** (0.153)
Y2020	9.567*** (0.081)				
Post × Y2020	4.728*** (0.113)	4.871*** (0.107)	5.000*** (0.103)	3.808*** (0.106)	4.032*** (0.104)
Observations	205507	205507	205507	205507	205507
R-squared	0.569	0.607	0.631	0.626	0.659
Y-mean	1860.448	1860.448	1860.448	1860.448	1860.448
Y-sd	19.424	19.424	19.424	19.424	19.424
Year FEs		Y	Y	Y	Y
Quarter FEs		Y			
State*Quarter FEs			Y		
Month FEs				Y	
State*Month FEs					Y
Pixel FEs	Y	Y	Y	Y	Y

*Notes:* Sample is at the pixel-week level Feb 8, 2019 - Dec 31, 2020. *Post* is one if the week is between Aug 13, 2019 - Dec 31, 2019 or between Aug 13, 2020 - Dec 31, 2020. Pixels are required to have at least half non-missing CH<sub>4</sub> data in the pre- and post-period. There are 78 weeks in the pre-period and 57 weeks in the post-period, so pixels have at least 39 and 29 obs in the pre- and post-period. Standard errors are clustered at the pixel level.

Table S5: Triple difference

	CH <sub>4</sub> (ppb)				
	(1)	(2)	(3)	(4)	(5)
Post	15.400*** (0.101)	11.292*** (0.108)	10.351*** (0.102)	3.650*** (0.120)	3.006*** (0.115)
Y2020	9.567*** (0.081)				
Post × Y2020	4.728*** (0.113)	4.892*** (0.108)	4.998*** (0.105)	3.998*** (0.107)	4.176*** (0.104)
Post × Facility	-.933*** (.12)	-1.05*** (.113)	-.42*** (.1)	-1.12*** (.111)	-.478*** (.0993)
Y2020 × Facility	-1.05*** (.0931)	-1.09*** (.0931)	-1.2*** (.0926)	-1.13*** (.0933)	-1.19*** (.0918)
Post × Y2020 × Facility	.404*** (.133)	.455*** (.127)	.471*** (.123)	.589*** (.126)	.597*** (.122)
Observations	797790	797790	797790	797790	797790
R-squared	0.570	0.612	0.637	0.630	0.663
Year FEs		Y	Y	Y	Y
Quarter FEs		Y			
State*Quarter FEs			Y		
Month FEs				Y	
State*Month FEs					Y
Pixel FEs	Y	Y	Y	Y	Y

Notes: Single term *Facility* is absorbed by pixel FEs. Standard errors are clustered at the pixel level.

Table S6: Methane in pixels with natural gas facilities

	CH <sub>4</sub> (ppb)				
	Panel A: Drop pixels with landfill facilities				
	(1)	(2)	(3)	(4)	(5)
Post	14.804*** (0.056)	10.556*** (0.075)	10.108*** (0.074)	2.963*** (0.094)	2.804*** (0.095)
Y2020	8.816*** (0.041)				
Post × Y2020	4.990*** (0.062)	5.217*** (0.057)	5.331*** (0.055)	4.414*** (0.056)	4.593*** (0.055)
Observations	746899	746899	746899	746899	746899
R-squared	0.571	0.613	0.637	0.631	0.663
Y-mean	1862.344	1862.344	1862.344	1862.344	1862.344
Y-sd	20.139	20.139	20.139	20.139	20.139
Panel B: Drop counties in the top quartile of CAFO intensity					
Post	15.112*** (0.062)	10.731*** (0.083)	10.202*** (0.083)	3.103*** (0.105)	2.930*** (0.106)
Y2020	9.029*** (0.046)				
Post × Y2020	4.456*** (0.065)	4.756*** (0.061)	4.971*** (0.060)	3.985*** (0.061)	4.232*** (0.061)
Observations	613092	613092	613092	613092	613092
R-squared	0.578	0.615	0.638	0.632	0.663
Y-mean	1861.936	1861.936	1861.936	1861.936	1861.936
Y-sd	20.101	20.101	20.101	20.101	20.101
Year FEs		Y	Y	Y	Y
Quarter FEs		Y			
State*Quarter FEs			Y		
Month FEs				Y	
State*Month FEs					Y
Pixel FEs	Y	Y	Y	Y	Y

*Notes:* Sample is at the pixel-week level Feb 8, 2019 - Dec 31, 2020. *Post* is one if the week is between Aug 13, 2019 - Dec 31, 2019 or between Aug 13, 2020 - Dec 31, 2020. Pixels are required to have at least half non-missing CH<sub>4</sub> data in the pre- and post-period. There are 78 weeks in the pre-period and 57 weeks in the post-period, so pixels have at least 39 and 29 obs in the pre- and post-period. Standard errors are clustered at the pixel level.

Table S7: Major emission events with emission rate, pre-trend test

	#Emission events				
	(1)	(2)	(3)	(4)	(5)
Pre Q5 $\times$ OG	-0.019 (0.061)	-0.019 (0.061)	-0.078 (0.131)	-0.019 (0.061)	-0.169 (0.200)
Pre Q4 $\times$ OG	0.001 (0.056)	0.001 (0.056)	0.007 (0.056)	0.001 (0.055)	0.016 (0.057)
Pre Q3 $\times$ OG	0.042 (0.056)	0.042 (0.056)	-0.010 (0.075)	0.042 (0.055)	-0.140 (0.140)
Pre Q2 $\times$ OG	0.066 (0.056)	0.066 (0.056)	0.010 (0.113)	0.066 (0.055)	-0.082 (0.189)
Post	.0701* (.0387)	.0191 (.0473)	.0444 (.0547)	-.112 (.0767)	-.0225 (.101)
Post $\times$ OG	.168*** (.0547)	.168*** (.0545)	.118 (.0773)	.168*** (.0544)	-.0103 (.143)
OG	.00741 (.0384)	.00741 (.0383)		.00741 (.0382)	
Observations	1438	1438	1438	1438	1438
R-squared	0.051	0.063	0.064	0.071	0.082
Y-mean	0.090	0.090	0.090	0.090	0.090
Y-sd	0.322	0.322	0.322	0.322	0.322
Year FEs		Y	Y	Y	Y
DOW FEs		Y	Y	Y	Y
Quarter FEs		Y			
Sector*Quarter FEs			Y		
Month FEs				Y	
Sector*Month FEs					Y

*Notes:* Sample includes emission events at the sector-day level, oil and gas (OG) and coal, January 4, 2019 - December 22, 2020.

Table S8: Ultra-emission events in non-US countries

	#Emission events				
	(1)	(2)	(3)	(4)	(5)
Post	-0.000 (0.003)	-0.007** (0.003)	-0.007** (0.003)	-0.013*** (0.003)	-0.013*** (0.003)
Post $\times$ OG	-0.004 (0.004)	-0.004 (0.004)	-0.004 (0.004)	-0.004 (0.004)	-0.004 (0.004)
OG	0.023*** (0.002)	0.023*** (0.002)	0.023*** (0.002)	0.023*** (0.002)	0.023*** (0.002)
Observations	43860	43860	43860	43860	43860
R-square	0.055	0.058	0.074	0.059	0.088
Y-mean	0.017	0.017	0.017	0.017	0.017
Y-sd	0.159	0.159	0.159	0.159	0.159
Country FEs	Y	Y		Y	
Year FEs		Y	Y	Y	Y
DOW FEs		Y	Y	Y	Y
Quarter FEs		Y			
Country*Quarter FEs			Y		
Month FEs				Y	
Country*Month FEs					Y

*Notes:* Sample includes emission events at the country-sector-day level, 30 countries, 2 sectors oil and gas (OG) and coal, January 1, 2019 - December 31, 2020.



Table S9: List of companies within S&amp;P 500 and MSCI World

Company Name	Ticker	Sector
Aker Bo Asa	AKRBP	Oil & Gas Exploration & Production
Apache Corp	APA	Oil & Gas Exploration & Production
Conocophillips	COP	Oil & Gas Exploration & Production
Coterra Enercoterra Energy inc	CTRA	Oil & Gas Exploration & Production
Devon Energy	DVN	Oil & Gas Exploration & Production
Eog Resources	EOG	Oil & Gas Exploration & Production
Diamondback Energy Inc	FANG	Oil & Gas Exploration & Production
Hess Corporation	HES	Oil & Gas Exploration & Production
Inpex Corp	INPEX	Oil & Gas Exploration & Production
Lundin Energy Ab	LUNE	Oil & Gas Exploration & Production
Marathon Oil Corp	MRO	Oil & Gas Exploration & Production
Pioneer Natural Resources	PXD	Oil & Gas Exploration & Production
Santos Ltd	STO	Oil & Gas Exploration & Production
Tourmaline Oil	TOU	Oil & Gas Exploration & Production
Woodside Petroleum Ltd	WPL	Oil & Gas Exploration & Production
Washington H. Soul Pattinson	SOL	Coal & Consumable Fuels
Clp Holdings Ltd.	2	Electric Utilities
Power Assets Holdings Ltd.	6	Electric Utilities
Enel Spa	441	Electric Utilities
Ck Infrastructure Holdings Ltd.	1038	Electric Utilities
Hk Electric Investments And Hk Electric Investme	2638	Electric Utilities
Sse Plc	4208	Electric Utilities
Tokyo Electric Power Company Holdings Inc	9501	Electric Utilities
Chub Electric Power Co Inc	9502	Electric Utilities
The Kansai Electric Power Co Inc	9503	Electric Utilities
Fortum Ovi	24271	Electric Utilities
Rsted	122544	Electric Utilities
Terna	290022	Electric Utilities
Elia System Op.	1110103	Electric Utilities
Edf	1110855	Electric Utilities
Energias De Portugal	1111424	Electric Utilities
American Electric Power Company	AEP	Electric Utilities
Constellation Energy - W/I	CEGVV	Electric Utilities
Duke Energy Corp	DUK	Electric Utilities
Edison Intl	EIX	Electric Utilities
Endesa,S.A.	ELE	Electric Utilities
Emera Inc	EMA	Electric Utilities
Eversource Energy	ES	Electric Utilities
Entergy Corporation	ETR	Electric Utilities
Evergy Inc	EVRG	Electric Utilities
Exelon Corp	EXC	Electric Utilities
Firstenergy Corp	FE	Electric Utilities
Fortis	FTS	Electric Utilities
Hydro One Ltd	H	Electric Utilities
Acciones Iberdrola	IBE	Electric Utilities

Alliant Energy Corp	LNT	Electric Utilities
Mercury Nz Ltd	MCY	Electric Utilities
Nextera Energy Inc	NEE	Electric Utilities
Nrg Energy Inc	NRG	Electric Utilities
Verbund Ag	OEZVY	Electric Utilities
Origin Energy Ltd	ORG	Electric Utilities
Pg&E Corp	PCG	Electric Utilities
Pinnacl West Cap	PNW	Electric Utilities
Ppl Corp	PPL	Electric Utilities
Red Electrica Corporacion, S.A.	REE	Electric Utilities
Southern Co	SO	Electric Utilities
Xcel Energy Inc	XEL	Electric Utilities

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Table S10: Stock price responses

	Normalized close price			
	(1)	(2)	(3)	(4)
Post	-0.011** (0.005)	-0.008 (0.005)	0.011* (0.006)	0.011** (0.004)
Post $\times$ OG	0.018 (0.011)	0.010 (0.010)	-0.067*** (0.009)	-0.067*** (0.008)
OG	-0.549*** (0.088)	0.000 (.)	-0.344*** (0.064)	0.000 (.)
Observations	1149	1149	1140	1140
R-square	0.304	0.996	0.313	0.993
Y-mean	0.013	0.013	0.101	0.101
Y-sd	0.426	0.426	0.298	0.298
Company FEs		Y		Y

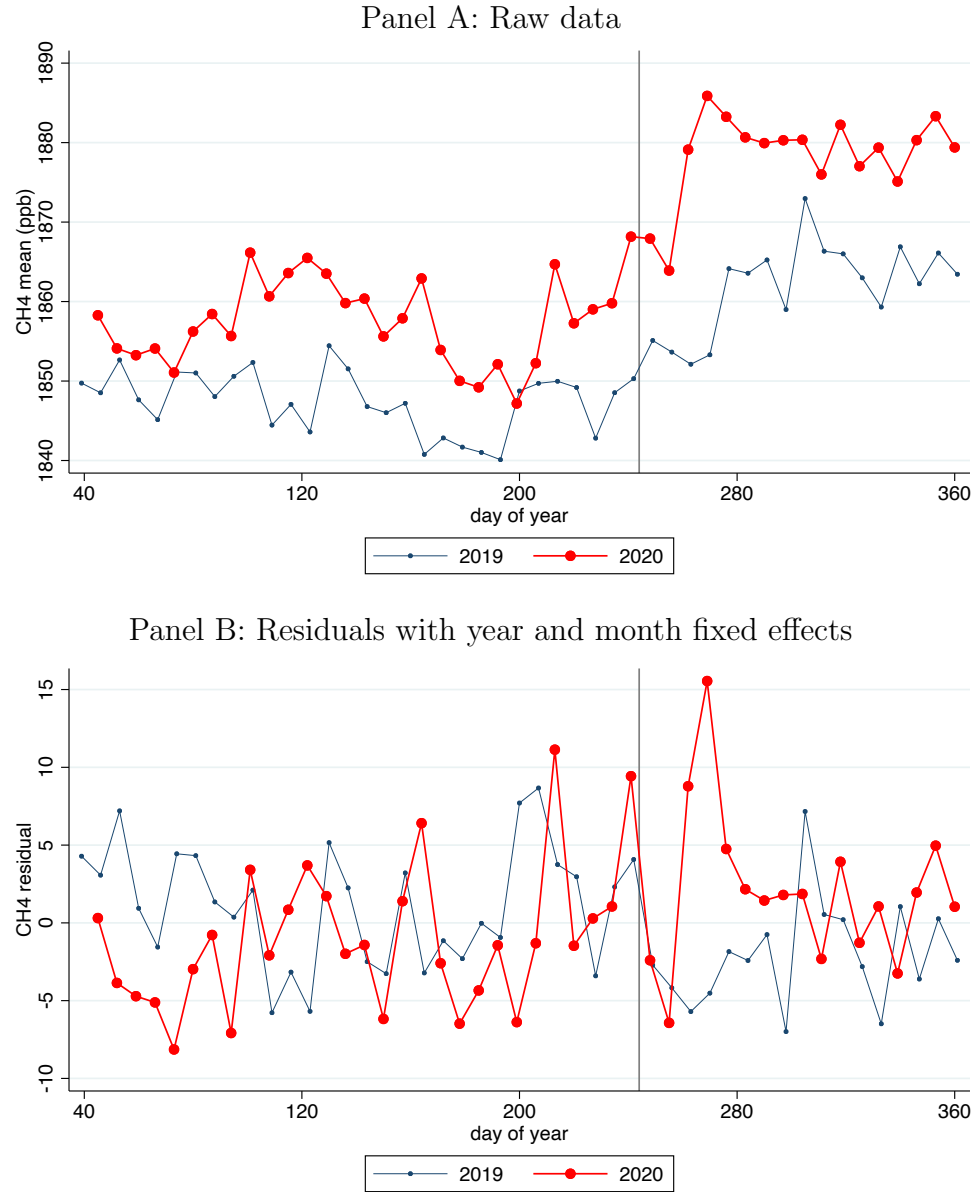
*Notes:* Sample includes normalized close price at the company-day level, 15 S&P500 oil and gas companies and 42 coal and electric utilities companies. *OG* is a binary classification, oil & gas or other company. In Column (1) and (2), sample includes 2 weeks before to 2 weeks after August 13, 2020. In Column (3) and (4), sample includes 2 weeks before to 2 weeks after September 24, 2020. Standard errors are clustered at the company level.

Table S11: Environmental enforcement responses to the COVID and policy roll-back

Panel A: Name matches					
	#Inspection				
PostCOVID	-3.6189*** (0.1596)	-6.7890*** (0.3012)	-6.8436*** (0.3010)	-5.3364*** (0.3335)	-5.4643*** (0.3353)
PostCOVID $\times$ Treated	1.0550** (0.5284)	1.0550** (0.5284)	1.5998** (0.6437)	1.0550** (0.5284)	2.3309*** (0.6439)
PostRollback	0.6881*** (0.1939)	2.6591*** (0.2386)	2.6536*** (0.2415)	3.2765*** (0.2539)	3.4534*** (0.2558)
PostRollback $\times$ Treated	-2.0854*** (0.7938)	-2.0854*** (0.7938)	-2.0300** (1.0057)	-2.0854*** (0.7938)	-3.8515*** (1.2069)
Treated	1.796*** (.6594)	1.796*** (.6594)		1.796*** (.6594)	
Observations	6067256	6067256	6067256	6067256	6067256
R-squared	0.0001	0.0008	0.0008	0.0016	0.0017
Y-mean	15.8403	15.8403	15.8403	15.8403	15.8403
Y-sd	155.6107	155.6107	155.6107	155.6107	155.6107
Panel B: High methane emitters					
PostCOVID	-3.6189*** (0.1596)	-7.0284*** (0.3028)	-7.0232*** (0.3028)	-5.6820*** (0.3404)	-5.6948*** (0.3406)
PostCOVID $\times$ Treated	0.5957 (0.9714)	0.5957 (0.9714)	0.1575 (1.0558)	0.5957 (0.9714)	1.6751 (1.1332)
PostRollback	0.6881*** (0.1939)	2.6210*** (0.2411)	2.6393*** (0.2417)	3.3859*** (0.2548)	3.4534*** (0.2558)
PostRollback $\times$ Treated	-0.3208 (1.2396)	-0.3208 (1.2396)	-1.8646 (1.5204)	-0.3208 (1.2396)	-6.0035*** (1.6905)
Treated	-5.536*** (.5989)	-5.536*** (.5989)		-5.536*** (.5989)	
Observations	5524896	5524896	5524896	5524896	5524896
R-squared	0.0001	0.0009	0.0009	0.0017	0.0017
Y-mean	15.5941	15.5941	15.5941	15.5941	15.5941
Y-sd	152.7799	152.7799	152.7799	152.7799	152.7799
Year FEs		Y	Y	Y	Y
Quarter FEs		Y			
Treated*Quarter FEs			Y		
Week FEs				Y	
Treated*Week FEs					Y

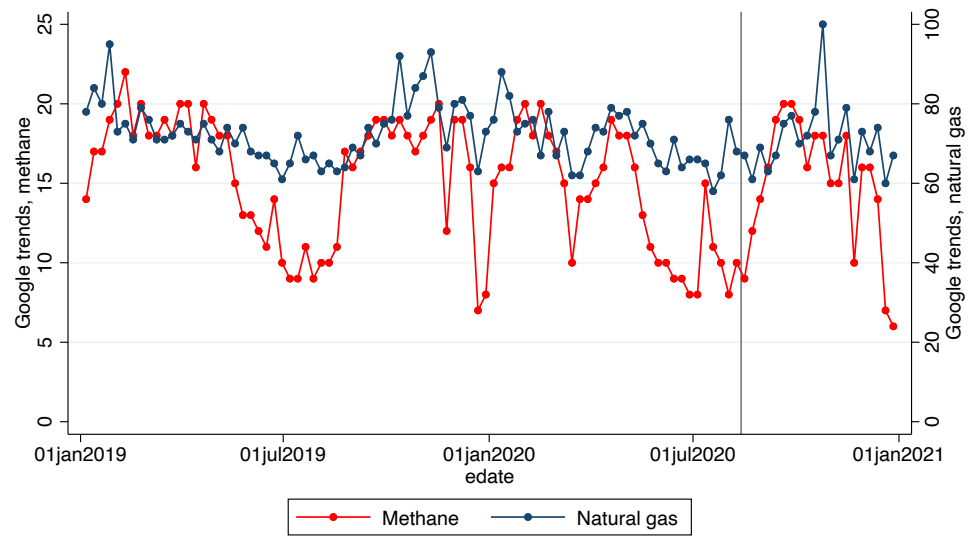
*Notes:* Sample includes inspection events at the facility-week level 2019-2020. Outcome variable is multiplied by 1000. Standard errors are clustered at the facility level.

Figure S1: Methane in pixels with natural gas facilities, 2019 vs. 2020



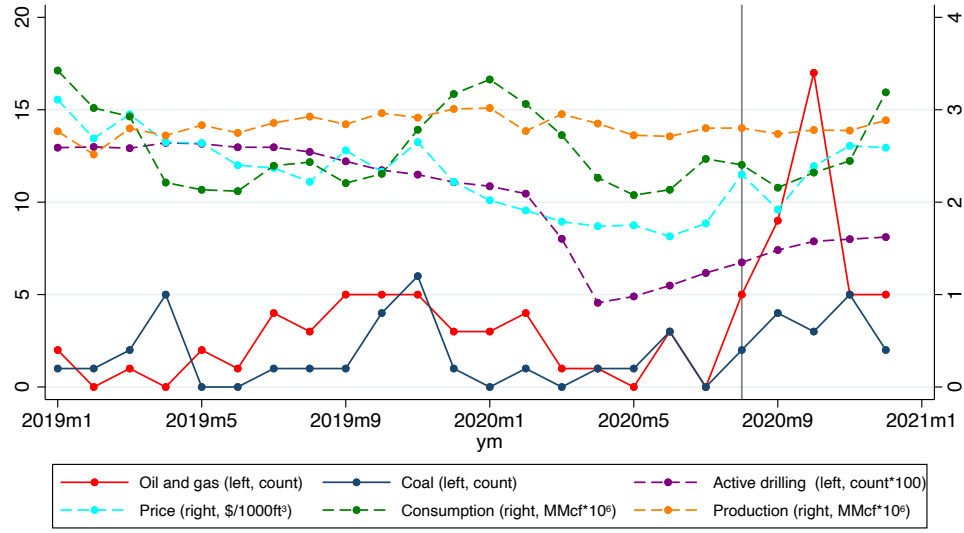
Notes: 0.1-degree sample pixels have at least one drilling well, processing plant, distribution pipeline, or compressor station inside. Methane data is aggregated to the weekly level from TROPOMI daily product Feb 8 - Dec 31 in 2019 and 2020. The upper figure plots time series of raw data. The lower figure plots residuals after controlling for year fixed effects and month fixed effects.

Figure S2: Google trends, interest in “methane” and “natural gas”



Notes: This figure shows weekly interest in google trends for word “methane” in red and “natural gas” in blue. The vertical gray line is the week of August 13, 2020.

Figure S3: Natural gas market activities



Notes: This figure shows monthly series of natural gas market activities. The first two items in the legend, i.e. oil and gas and coal, report the number of ultra-emission events at the sector-month level, same as those in Figure 3. Other four lines show the number of active drilling, natural gas price, consumption, and production, with units and y-axis specified in parentheses. The vertical gray line is August 2020.