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Mineral Availability and Social License to Operate

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Motivation

- Social License to Operate (SLO)
- NIMBYism (Not In My Back Yard) effects
- Resource Availability: Will society be able to mine what it needs?
 - Concern shift from physical to social availability Tilton (2010)
- Previous studies qualitative: social constraints important in mining
- Contribution:
 - How important?
 - What mechanism?

Research Question

- How do local and statewide environmental preferences impact resource availability?
- Particularly:
 - Do mines close faster in places with strong environmental preferences?
 - Mechanism: Is the effect primarily channeled through policy?

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Why closings?

- High fixed capital costs, economies of scale
 - Unlikely to see annual output change
- Data availability

Preview of Findings

- Federal voting as a proxy for environmental preferences/ social license
 - Annual % yes votes on environmental legislation (US House and Senate)
- Stronger environmental preferences speed mine closures
 - A 1 s.d. change about the mean in voting \rightarrow mines close 1.2-1.4x faster
 - Policy channel: The size of the effect varies by state legislature control

Estimation and Identification Strategy

Scope: All hard rock mines in US, 1971-2014 (MSHA) Cox Proportional Hazard model intuitively represented by:

$$P(Closure_{it}|time_{it}^{FromOpen}) = \beta_1 \widehat{Vote_{it}} + \beta_2 x_{it} + \varepsilon_{it}$$
(1)

- Vote_{it=T}: percent of times that mine *i*'s federal representatives (House and Senate) voted "green" final year of mine (closed/censored). Data from LCV.
- x_{it}: vector of other mine and county-level controls
- Problem: $Vote_{it=T}$ is endogenous Solution: IV
- Exploit resolution at vote level (10-50 votes per year) and aggregate (Mixed 2-Stage Residual Inclusion Model (2SRI). 2-stage least squares biased for non-linear second stage.)

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IV Strategy for voting

Utilize cross-sectional and time variation in DC congressional office location

- 6 Congressional Office buildings, 3-5 floors each.
- Leave-out mean of legislator's office-floor vote. How did the other 10-20 reps on my office floor vote?
 - This captures common shocks in voting and (possible) peer effects
- Office selection is based on lottery/seniority, quasi-random with respect to important mining unobservables. Legislators have basic selection criteria: Space, view, Metro access, food, etc...

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First Stage Results

	Dependent variable:		
	Green Vote		
Bldg-Floor Avg Vote	0.562***		
	(0.004)		
State Dummy	Yes		
Observations	328,137		
R ²	0.142		
Excluded Inst. F-Statistic	15659***		
Note:	*p<0.1; **p<0.05; ***p<0.01		

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Results: 2SRI Closure Response

	Dependent variable:				
	Closure Rate				
	(1)	(2)	(3)		
Local (House) Green Vote	-0.016*** (0.001)	-0.002 (0.001)	-0.004*** (0.001)		
Statewide (Senate) Green Vote	0.006*** (0.001)	0.006*** 0.014*** 0.0 (0.001) (0.001) (0			
Commodity Prices		-0.143*** (0.006)	-0.150*** (0.007)		
First Stage Residual State Dummy Other Controls	Yes No No	Yes Yes No	Yes Yes Yes		
Observations	18,650	18,629	18,222		
Note:	*p<0.1; **p<0.05; ***p<0.01				

Channel of SLO Effect

- Is the SLO effect being channeled through policy?
- Federal policy
 - Rule out by sub-setting on votes that:
 - Don't apply to mining OR
 - Failed to pass
 - If vote does not apply to mining or did not become law, no federal policy effect
- State-wide policy effect
 - State legislative productivity:
 - If state legislature is split controlled (unproductive), less likely state policy effect

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Results: 2SRI, Non-mining votes and Failed Votes

		Dependent variable	22	
	Closure Rate			
	2SRI	2SRI No Mining Votes		
Local (House) Green Vote	-0.004*** (0.001)	-0.004*** (0.001)	-0.022*** (0.001)	
Statewide (Senate) Green Vote	0.009*** (0.001)	0.010*** (0.001)	0.011*** (0.001)	
Commodity Prices	-0.150*** (0.007)	-0.150*** (0.007)	-0.149*** (0.007)	
First Stage Residual State Dummy Other Controls	Yes Yes Yes	Yes Yes Yes	Yes Yes Yes	
Observations	18,222	18,222	18,221	
Note:		*p<0.1: **p<0.	.05: ***p<0.01	

Side-wide preferences - State policy channel?

- Howell et al (2000) Divided government less effective at policy-making
- Interact state legislative control: (Rep, Dem, or Split), and preferences

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Results: 2SRI, State-wide Policy Effect

	Closure Rate
Dem St Legislature	1.533***
-	(0.084)
Rep St Legislature	0.356**
	(0.127)
Local (House) Green Vote	0.026***
	(0.003)
Statewide (Senate) Green Vote	-0.003
	(0.002)
Dem St Legislature*Local (House) Green Vote	-0.031***
	(0.003)
Rep St Legislature*Local (House) Green Vote	-0.042***
	(0.003)
Dem St Legislature*Statewide (Senate) Green Vote	0.001
	(0.002)
Rep St Legislature*Statewide (Senate) Green Vote	0.026***
	(0.003)
Commodity Prices	-0.137***
	(0.007)
First Stage Residual	Yes
State Dummy	Yes
Other Controls	Yes
Observations	18045

Standard errors in parentheses

* p < 0.05, ** p < .01, *** p < .001

Closure Impact of State-wide preferences (Senate Voting) by State Legislative Control



Closure Impact of local preferences (House Voting) by State Legislative Control



Conclusions

- Findings
 - Mines respond to local and statewide SLO effects, depending on the context
- Future Work
 - Additional mechanism: civil resistance (Gdelt project data)
 - Further test of first stage IV

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Results: Naive and 2SRI Vote Response

		Dependent variable:			
	Closure Rate				
	(1)	(2)	(3)	(4)	
Local (House) Green Vote	0.002*** (0.0003)	-0.016*** (0.001)	-0.002 (0.001)	-0.004*** (0.001)	
Statewide (Senate) Green Vote	0.002*** (0.0003)	0.006*** (0.001)	0.014*** (0.001)	0.009*** (0.001)	
Commodity Prices			-0.143*** (0.006)	-0.150*** (0.007)	
First Stage Residual State Dummy Other Controls	No No No	Yes No No	Yes Yes No	Yes Yes Yes	
Observations	18,650	18,650	18,629	18,222	
Note:		*p<	0.1; **p<0.05	5; ***p<0.01	

Local or State Effects?

- If not federal policy, then do mines respond more to local preferences or state policy?
- If local preferences- House of Rep. effect should dominate in larger states
- If State policy Senate effect should dominate in larger states
- Small states should be the same in either case, unless Senators or House Reps intrinsically have more influence.

Voting Effect by Delegation Size, All Votes



Number of Districts

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