

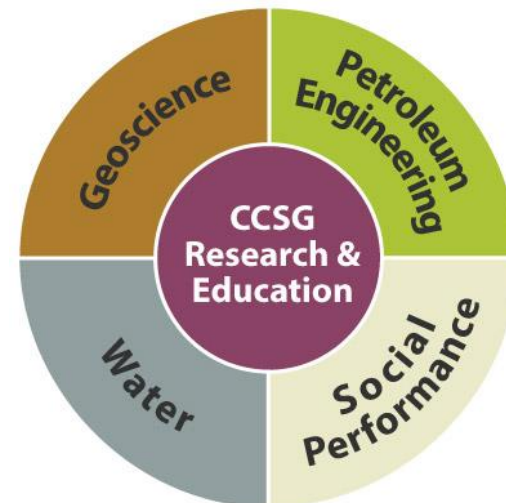
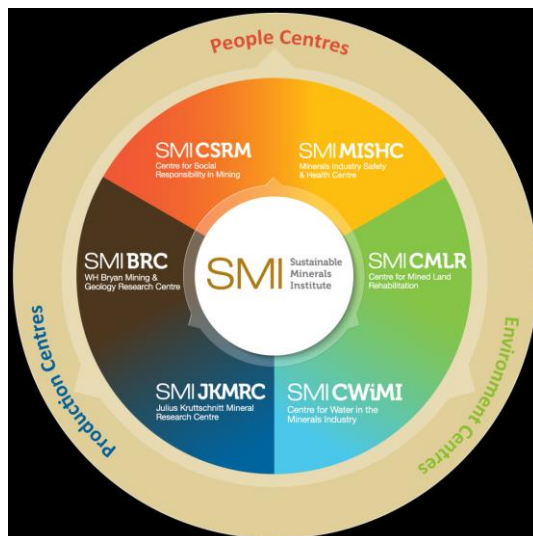
Can Environmental Regulation Make Extractive Industries More Innovative?

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Overview of mining and gas research at UQ







Polarised Debate on Mining Regulation

- “Industry confidence in Australia’s regulatory framework has declined in the face of a steady stream of ad hoc regulatory changes, usually characterised by poor process.” (MCA, 2013)
- “Every minute our mining companies spend pandering to government is a minute they don't spend hiring an additional employee, or discovering new innovative and efficient processes.” (IPA, 2016)

Public undecided on government effectiveness and don't understand the industry (CSIRO national survey)



ITEM	MEAN AGREEMENT (STANDARD DEVIATION)			
	 OVERALL	 MINING	 NON-MINING	 METROPOLITAN
State and federal governments are able to hold the mining industry accountable	2.81 (SD = 1.05)	2.71 (SD = 1.06)	2.76 (SD = 1.03)	2.90 (SD = 1.04)
Legislation and regulation can be counted on to ensure mining companies do the right thing	2.85 (SD = 1.02)	2.74 (SD = 1.04)	2.80 (SD = 1.02)	2.94 (SD = 1.00)

Rated on a scale from 1 (not at all) to 5 (very much so).

...giving momentum to citizen activists



David Pocock
@pocockdavid



Locked on selfie with 5th generation farmer, [@RickIaird14](#), protesting Whitehaven's new coalmine in Leard State Forest

1:03 PM - Nov 29, 2014

Miners are under new pressures due to perceived regulatory weakness

- “There was a time when major mining companies could make the case that these issues were being adequately addressed by this framework of government regulation and operational practice. Times have changed.” (Morrison, 2016)
- Local conflict is costly and potentially ruinous for mining business (see Henisz: Spinning Gold)

Environmental regulation and industry development... win-win?

- “Our central message is that the environment-competitiveness debate has been framed incorrectly...we will argue that properly designed environmental standards can trigger innovation that may **partially or more than fully offset the costs of complying** with them [and] can even lead to absolute advantages over firms in foreign countries not subject to similar regulations”

Porter and Van Der Linde, 1995

Strong and weak versions of the “Porter Hypothesis”

- Weak version: environmental regulation promotes innovation. Doesn't extend to profitability and competitiveness.
- Strong version: environmental regulation promotes innovation which drives competitiveness. Extension of Porter's “Competitive Advantage of Nations” thesis.

Case example: Respiratory Mask (Herris, 2009)

USA coal mining deaths at 2000/year around 1900.

Federal government forms US Bureau of Mines in 1910 and after WW1 approves and promotes use of gas masks in mines.

1930s: 500 workers die from silicosis after one tunnel dig. Congress inquiry leads to lung protection legislation and standards.

1994: New regulation to measure higher filtration standards. Challenge for manufacturers to comply without making mask unwearable.

Result: Melt-blown fibres and improved mask design



General Support for the Weak Hypothesis

- Numerous large sample studies in manufacturing and utilities
- Measurements include regulation intensity, R&D spend and patents (measuring innovation)
- One survey (4000 OECF firms) showing management perception of environmental compliance correlated with higher environmental program investment.
- Outcome-based regulation more effective

Mixed support for the strong hypothesis

- Much more difficult to test. Need good econometric skills to isolate innovation effect on performance.
- Early studies showed environmental regulation decreased productivity growth but didn't measure innovation.
- Direct effect of regulation negative but indirect via new processes *sometimes* positive (Barbera and McConnell, 1990).
- Regulation linked to innovation improves business performance but overall effect of regulation on sample is negative (n=4200) (Lanoie et al. 2010)

Many other factors involved

- Lagged relationship between environmental investments and productivity growth. Magnified by competitive pressure (Lanoie, 2008)
- Government regulation leads to innovation performance during low market uncertainty (Blind et al. 2017)
- Many factors drive innovation and productivity growth and that matters for public policy.

The case of coal seam gas to LNG in Australia



CSG-LNG New to the World Industry

Coal Seam Gas to Liquefied Natural Gas (CSG-LNG)

- **First in the world application**

Tens of thousands of coal seam gas wells

Gas collected, processed, piped to Curtis Island

Compressed to LNG and put on ships bound for Asia

- **\$80b spent so far in Queensland**

- **Major international firms**

- **Queensland government struggling with regulatory processes but favours ‘end of pipe’ regulations- most around land access and water quality.**

Innovation examples from CSG-LNG

MURPHY
PIPE & CIVIL



easternwell
all together better



Groundworks Eco-blanket



Data collection and analysis

- Survey instrument adapted from Cambridge business growth and innovation survey.
- 80 respondents from APPEA membership list. 30% response rate. 15 in-depth interviews.
- Data analysis: factor analysis and logistic regression models in STATA
- Full paper with methods published in Journal of Cleaner Production.

Key Measures and Variables

- Innovation: Novel and Incremental
- Environmental compliance ‘burden’
- Non-environmental regulatory compliance burden
- R&D expenditure
- Service firm or operator

Findings: Novel innovation regression model

- High environmental compliance 3x more likely to introduce novel (new to the industry) innovations
- Technical ability (standing): 2x
- R&D spend: 7x
- Service firm: 3x

Findings: Incremental innovation

- Environmental compliance not significant for modification of existing processes and technology.
- Technical skills (standing) not significant
- Networking (2x) and collaboration (3x) significant
- R&D (4x) not as large as novel innovation
- Service firm again significant (3x)

Key Points

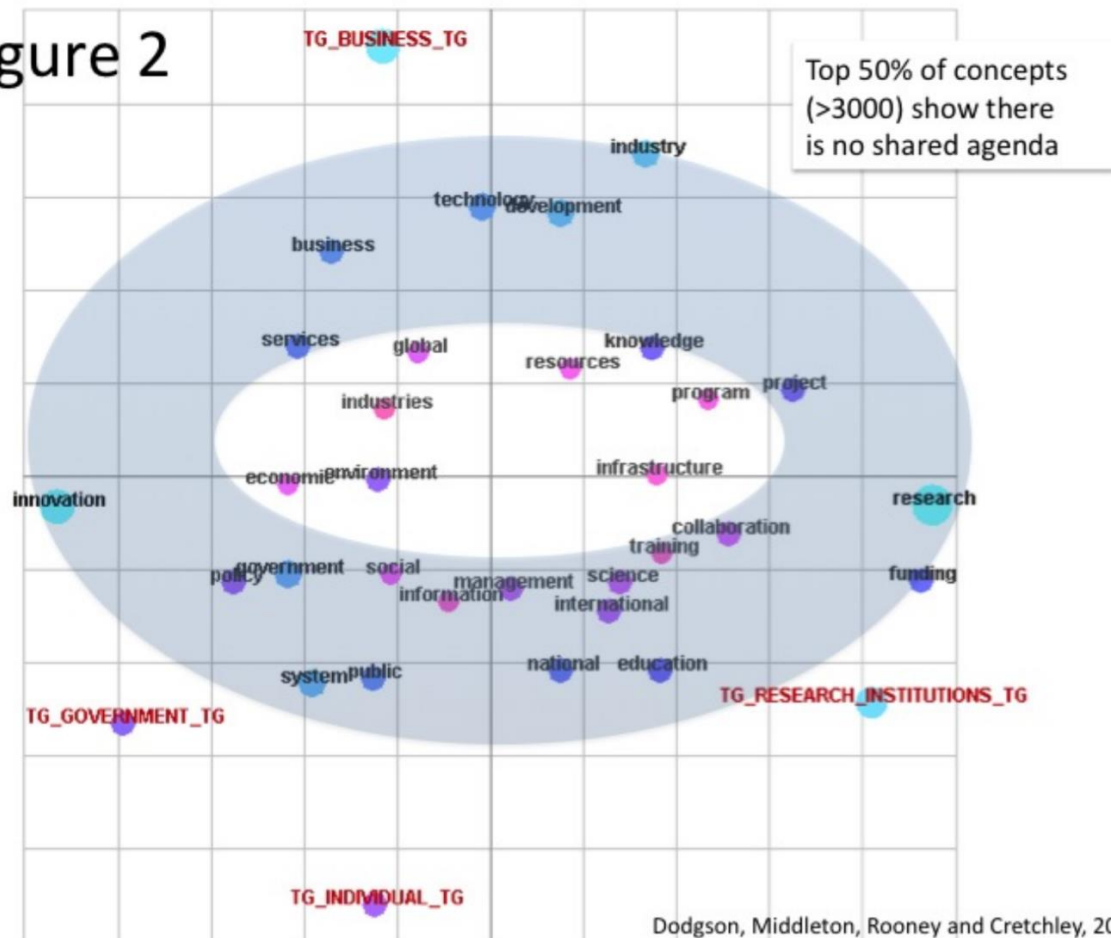
- Environmental regulation important for novel innovation but so is technical skill and reputation.
- Regulation needs to be sensitive to the level of industry development and technical capability.
- Exceeding compliance and pushing industry standards can be good business strategy.
- Service firms much more likely to introduce innovations of any type.
- Environmental policy, industry policy and innovation policy are connected here!

Connecting policy silos

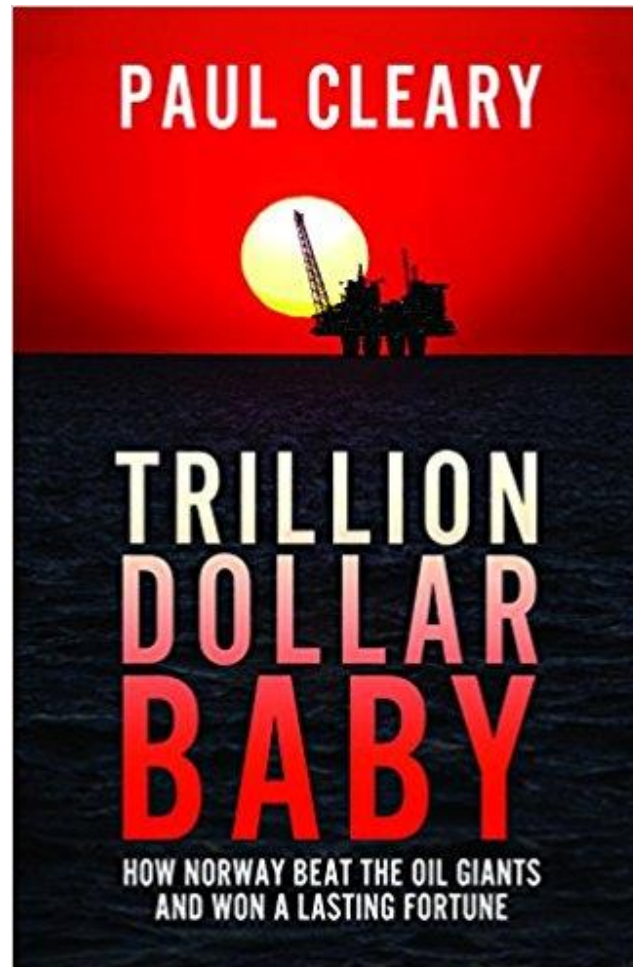
- Environmental protection isn't just an environmental agency problem
- Also connects to productivity and international competitiveness (Industry policy)
- Also connects to research and development and workforce skills (Education and research policy)

Overcoming the innovation policy 'bagel'

Figure 2



Policy capability and sectoral knowledge matters a lot!



Conclusions

- Arm wrestle between environmental protection and business competitiveness is misguided
- Good environmental policy helps business and business can use environmental performance for competitive advantage
- Need to connect government policy silos and engage in dialogue between policy makers and industry. Overall objectives are often similar...

