

# Induced Innovation, Inventors, and the Energy Transition

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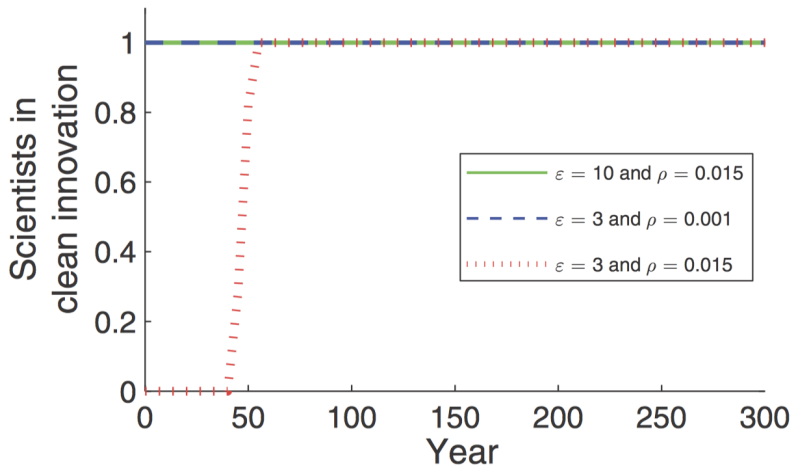
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# Motivation

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- Firms respond to incentives (e.g., high energy prices, environmental policies)

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- Clean energy innovation is critical to reducing the costs of climate mitigation
  - Firms respond to incentives (e.g., high energy prices, environmental policies)
  - Carbon pricing and R&D subsidies can generate a switch from dirty to clean.
- For example, Acemoglu et al. (2012):



# Human Capital

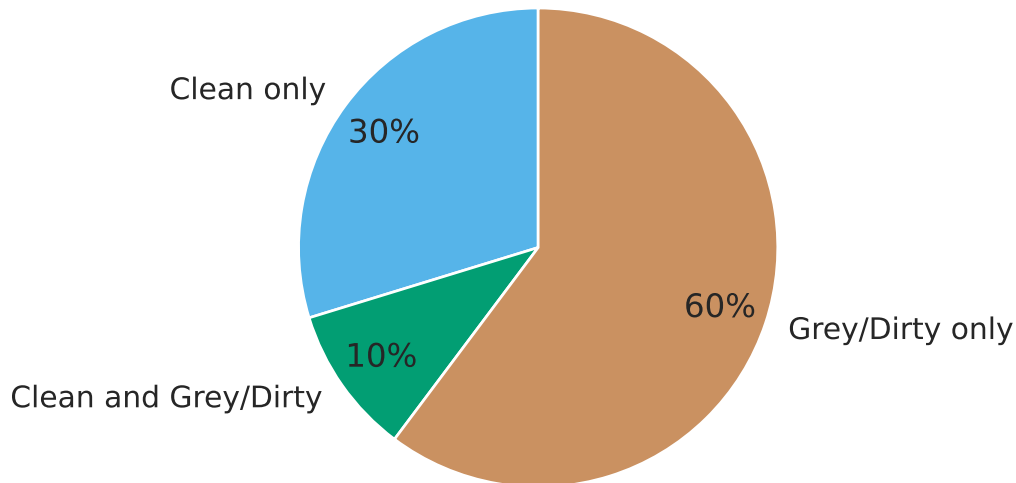
# Human Capital

To what extent can inventors be induced to work on different fields?  
What is the role of new entrants vs incumbents?

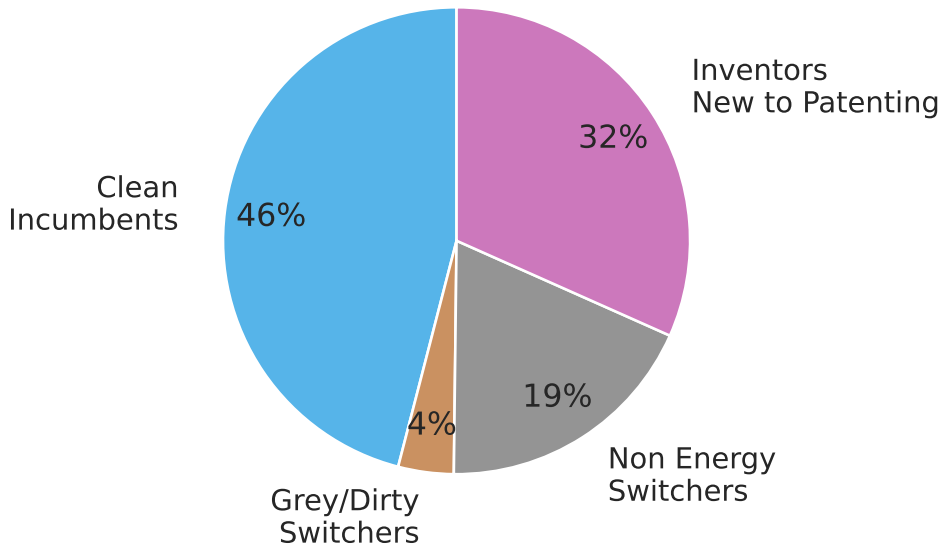
- We document the types of inventors behind clean innovation and the extent to which they respond to economic incentives
- Measure innovation using global data on patent applications (PATSTAT)
  - Electricity generation-related patents (classified based on patent technological codes)
  - Inventors with at least one OECD patent post 1990
- Document stylized facts about energy inventors
- Estimate how individual inventors respond to changes in natural gas prices
  - Both intensive and extensive margin responses
  - Natural gas prices  $\uparrow \Rightarrow$  expected demand for substitutes in the future  $\uparrow$
  - Simulate how inventors would respond to carbon pricing
    - Using a SCC of 51 \$/tCO<sub>2</sub>

## Fact 1: Energy Inventors Specialize in Clean or in Dirty

⇒ Clean Patents Come Primarily from Inventors Who Specialize in Clean



## Fact 2: About Half of Clean Patents Come from “New Entrants”





## Decomposing the Induced Innovation Effect by Inventor Type

Source	Induced Innovation Effect	Total Number of Clean Families
<i>Intensive margin response</i>		
Incumbent inventors	<b>81%</b>	46%
<i>Extensive margin response</i>		
Entry to patenting	<b>14%</b>	32%
Entry from grey/dirty	<b>4%</b>	4%
Entry from non-energy	<b>1%</b>	19%

- Entrants are less responsive on the margin compared to their contribution to overall patenting

⇒ Need for future work to study the formation of human capital in clean energy

**Thank you!**

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