

Does ETS Contribute to China's Economic Agenda?

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China's Economic Aspiration

2020-2035: crossing high-income threshold

- implied economic growth rate: $\geq 3.95\%$

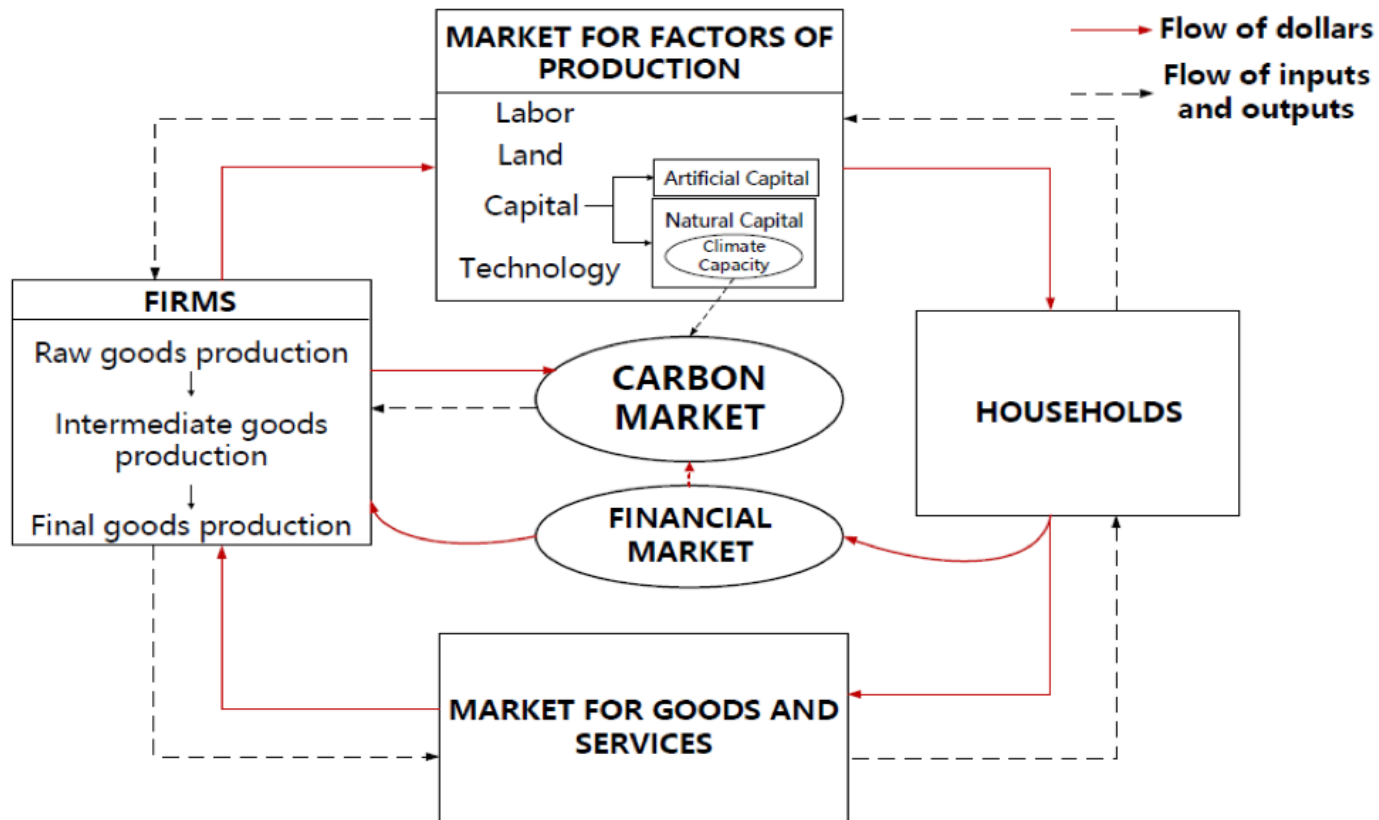
2035-2050: becoming a mid-level high-income economy

- implied economic growth rate: $\geq 5.43\%$

Challenge

- ambitious growth target vs carbon emission peak by 2030

Alignment of ETS with China's Economic Reform Strategy



ETS as A Growth-Friendly Climate Policy Instrument

Supply-side structural reform

- internalize the external costs of environment, energy, and natural resources

Revenue-neutral carbon pricing

- using revenues from carbon allowances to reduce other pre-existing distortionary taxes

Towards innovation-driven economic growth

- can ETS increase industrial competitiveness by stimulating innovation?

Research Question

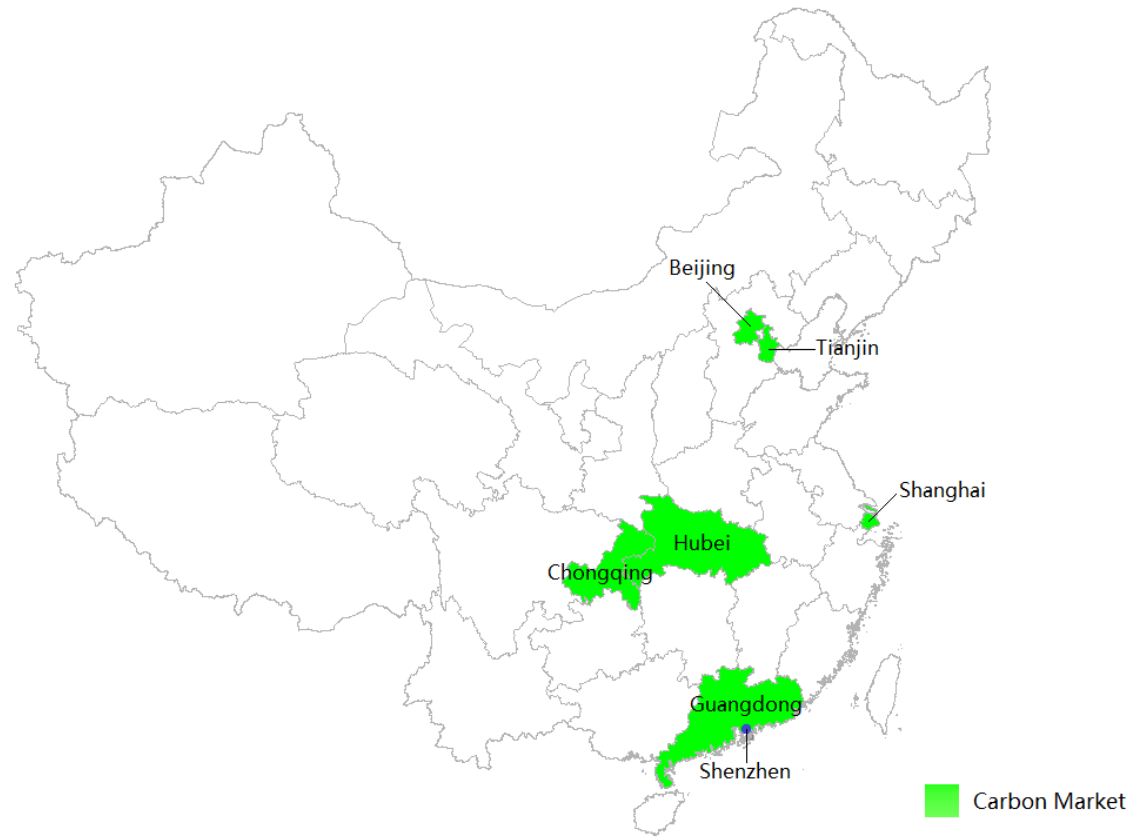
Porter hypothesis

- strict environmental regulations can induce efficiency and encourage innovations that help improve commercial competitiveness

Key policy question

- evaluate the causal effects of China carbon ETS pilots on firms' low-carbon innovation

China's Seven Carbon Market Pilots



Covered Sectors in Regional ETS Pilots

Pilot Region	Covered Sectors
Beijing	Electricity, heating, cement, petrochemical and other industries, large public buildings including hospitals, schools and governments
Chongqing	Electricity, metallurgy, chemical industries, cement, iron and steel
Guangdong	Electricity, cement, iron and steel, petrochemical industries, public services including hotels, restaurants and business
Hubei	Electricity, heating, metallurgy, iron and steel, automobile and equipment, chemical and petrochemical industries, cement, medicine and pharmacy, food and beverage, papermaking
Shanghai	Electricity, iron and steel, petrochemical and chemical industries, metallurgy, building materials, papermaking, textile, aviation, airports and ports, public and office buildings, railway stations
Shenzhen	Electricity, building, manufacturing, water supply
Tianjin	Electricity, heating, iron and steel, chemical and petrochemical industries, oil and gas exploration

Performance of Regional ETS Pilots by Market Activity

Pilot Region	Turnover Rate
Beijing	0.0296
Shanghai	0.0157
Tianjin	0.0067
Chongqing	0.0015
Hubei	0.0423
Guangdong	0.0159
Shenzhen	0.1139
Nationwide	0.0238

The turnover rate is defined by the ratio of trading volume on the secondary market to the total allowance.

One Explanation: Provincial Attitude Towards Market Mechanism

Pilot Region	Liberal-Nontraditional-Market Rank
Shanghai	1
Guangdong	2
Beijing	4
Tianjin	8
Hubei	10
Chongqing	13

Source: Pan & Xu, 2016. China's Ideological Spectrum.
Right leaning: liberal-nontraditional-market; left leaning:
authoritarian-traditional-nonmarket.

Empirical Strategy

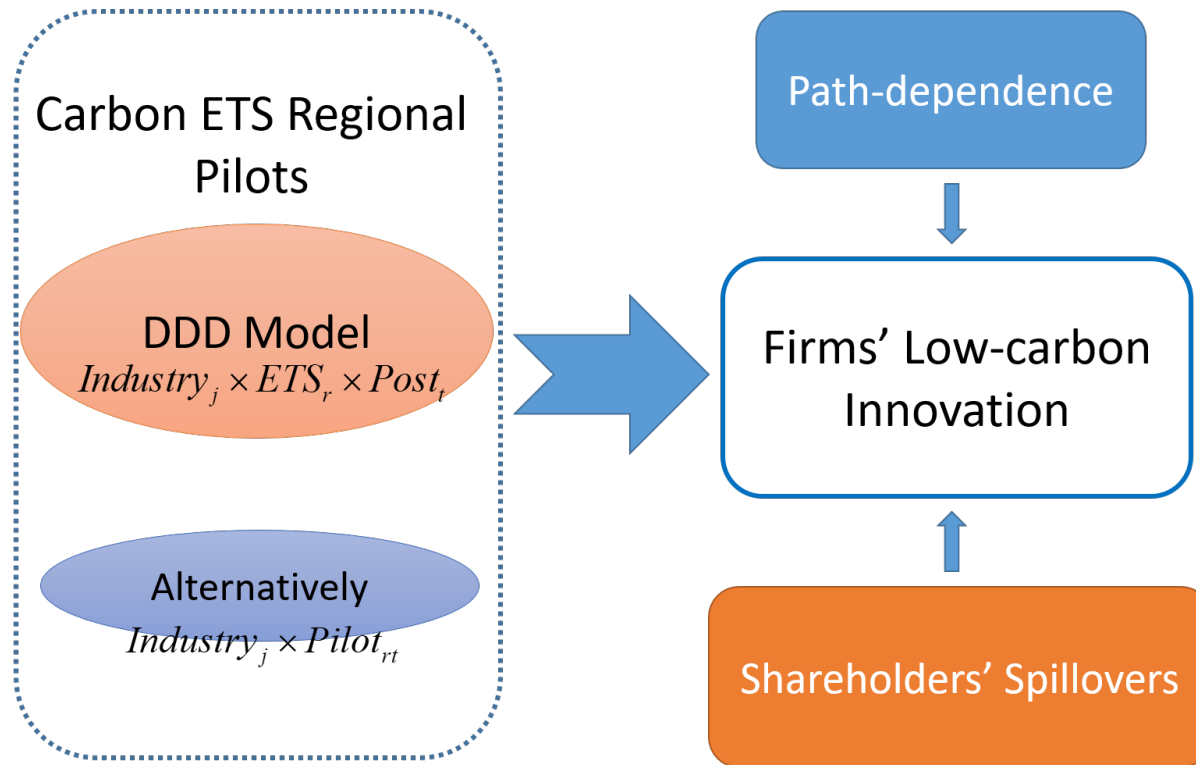
Empirical challenge

- confounders of low-carbon innovation

Difference-in-Difference-in-Differences (DDD)

- ETS pilot regions vs non-pilot regions
- covered firms vs other firms
- after ETS vs before ETS

Illustration of the Empirical Method



Data

Publicly-listed manufacturing companies

- Shanghai and Shenzhen stock markets(2003-2015)

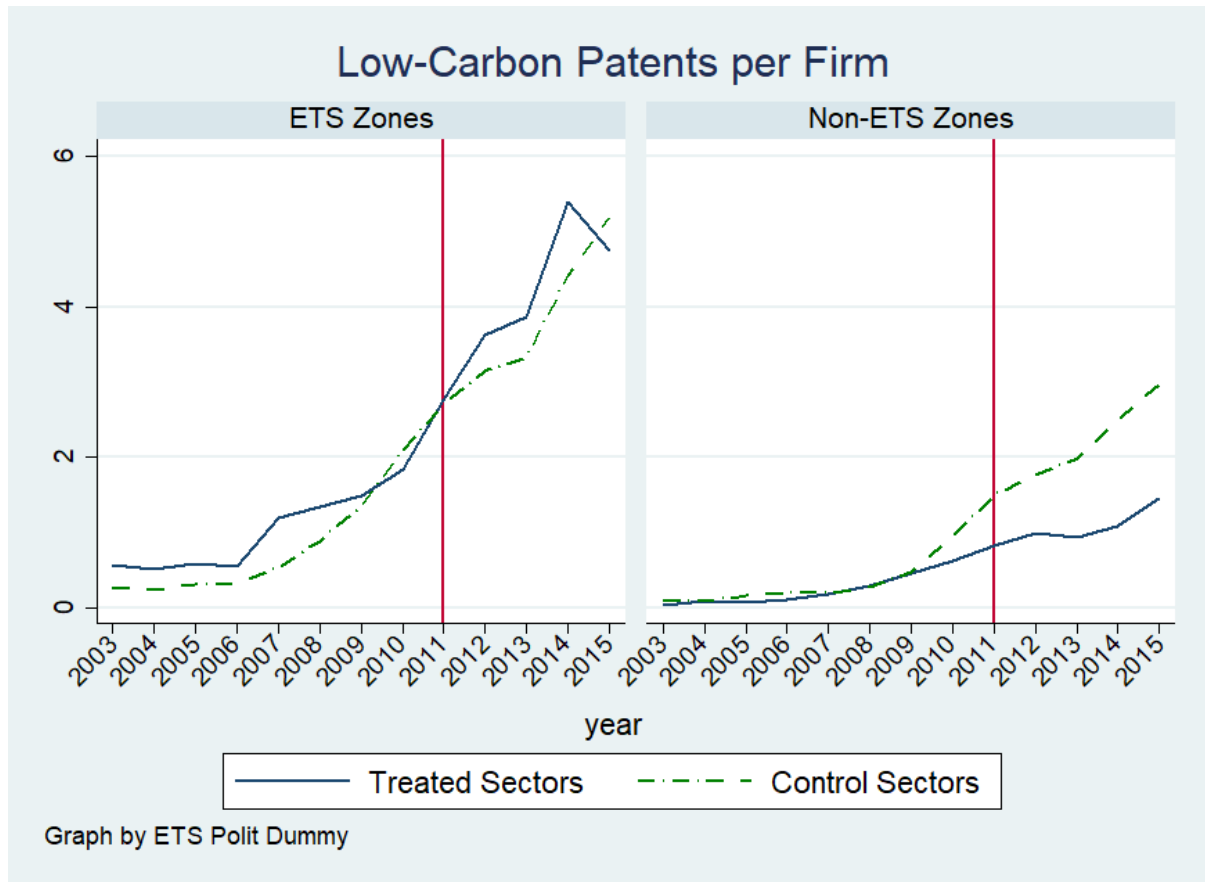
Firm-level patents data

- State Intellectual Patent Office (SIPO)

Financial and accounting data

- China Stock Market & Accounting Research (CSMAR)
- capital, cash, revenue, debt, net sales and profits
- shareholders' name, the ratio of shares, and ownership structure

Low-Carbon Innovation



Major Findings

- Regional Carbon ETS increases firms' low-carbon innovation
- Higher carbon price stimulates more innovation
- Active ETS has a positive effect on innovation
- These results are consistent and robust

Concluding Remarks

First empirical evidence that ETS incentivizes innovation

- active market leads to intensive low-carbon innovation

Firms' responses hinge on government's commitment to ETS

- short-term policy: compliance through transitory but costly behavior
- long-term commitment: engagement in innovation reduces cost of compliance

Limited data and information are available for empirical analysis

- transparency is important for ETS design, operation and assessment

More Information



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