Ray of Hope? China and the Rise of Solar Energy

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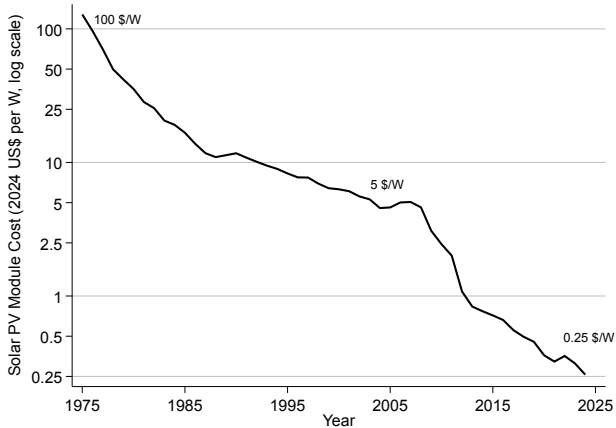
Cost of solar has fallen dramatically

- Huge fall in cost relative to other energy sources and exceeding forecasts

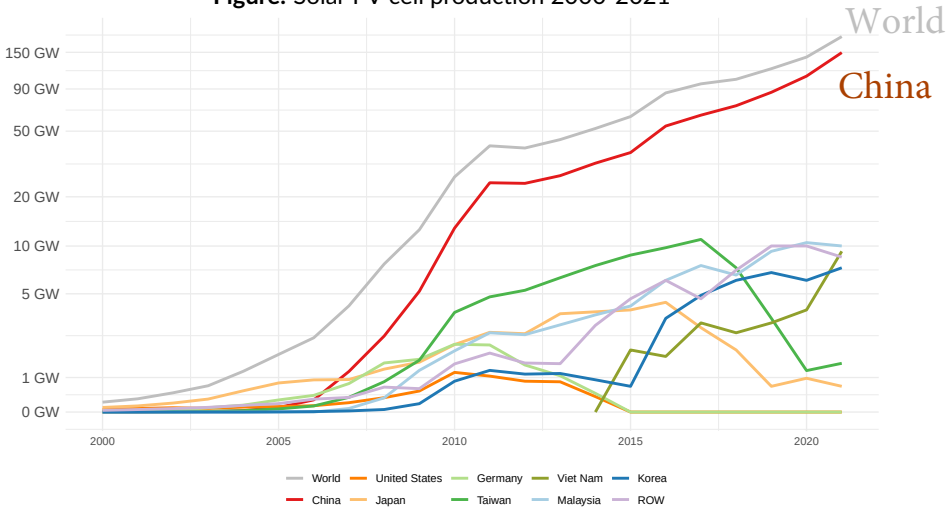
Figure: Global average price of solar PV modules (in 2024 US$ per Watt)



Source: Our World in Data, LaFond et al. (2017) & IRENA Database

In a context of huge growth in global solar production

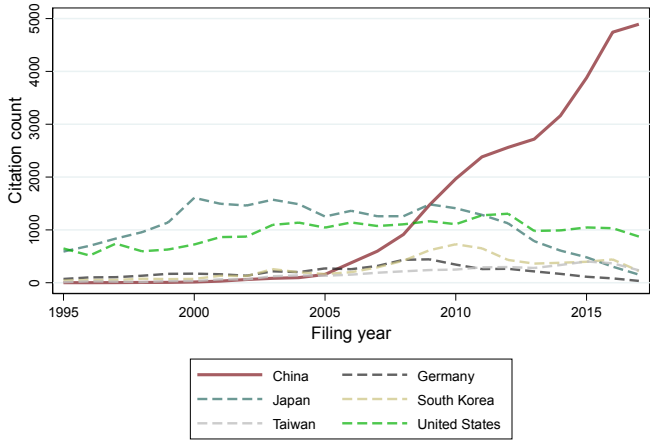
Figure: Solar PV cell production 2000-2021



Source: International Energy Agency (IEA) & Earth Policy Institute

China is not just imitating. It also produces solar innovations

Figure: Cite-weighted Chinese solar patents



Note: Total yearly citations are divided by the number of years since the patent's filing to adjust for differences in the number of years when patents can be cited.

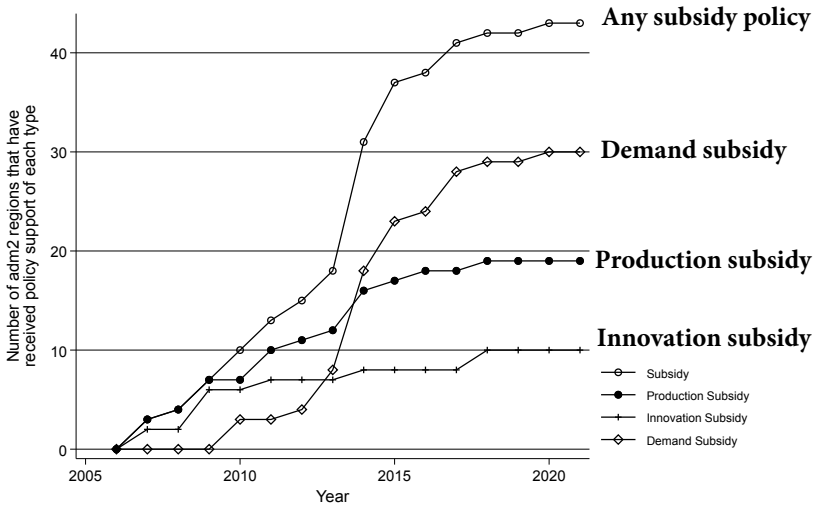
Source: PATSTAT database: Patents by priority date in all patent offices.

This paper: study impact of local subsidies on Chinese solar industry

- Retrieve policy text data from **PKULaw Database** and classify solar subsidies
  - Production, Innovation, and Demand/installation (cf. Juhasz et al., 2022

Time series of policy support

Figure: Number of cities treated with supply & demand subsidies



This paper: study impact of local subsidies on Chinese solar industry

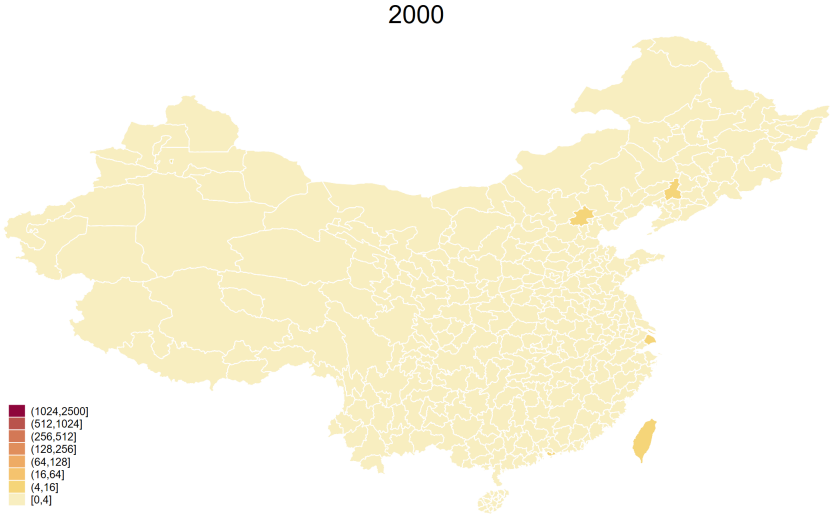
- Retrieve policy text data from **PKULaw Database** and classify solar subsidies
  - Production, Innovation, and Demand/installation (cf. Juhasz et al., 2022)
- Gather rich new micro-data on universe of solar panel manufacturers in China
- Implement Synthetic DID approach (Arkhangelsky et al., 2021)
  - exploiting staggered introduction of city-level solar policies over time
- Estimate trade model to analyse aggregate outcomes, counterfactuals, and welfare

Preview of results

- **Innovation & production subsidies** generate city-wide increases in solar industry
  - **innovation**
  - firm count
  - production
  - revenues
  - exports
  - productivity

Our analysis compares city-level policies & industry outcomes

Patent counts and any subsidy



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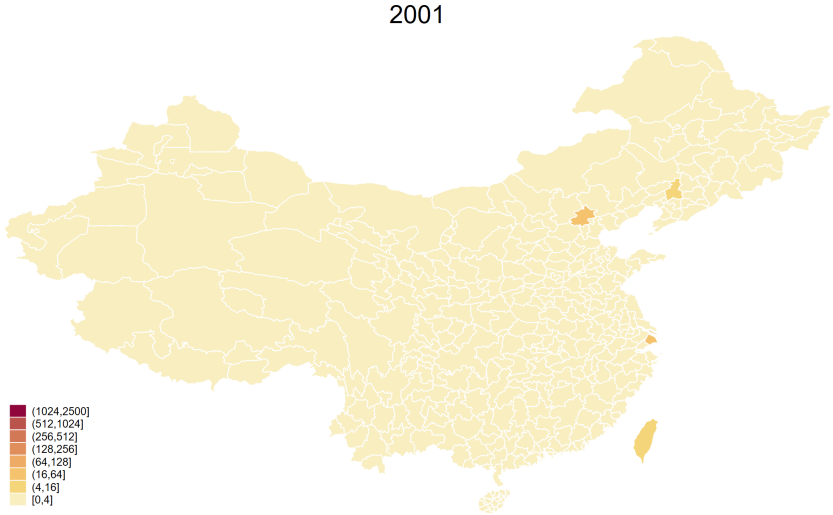

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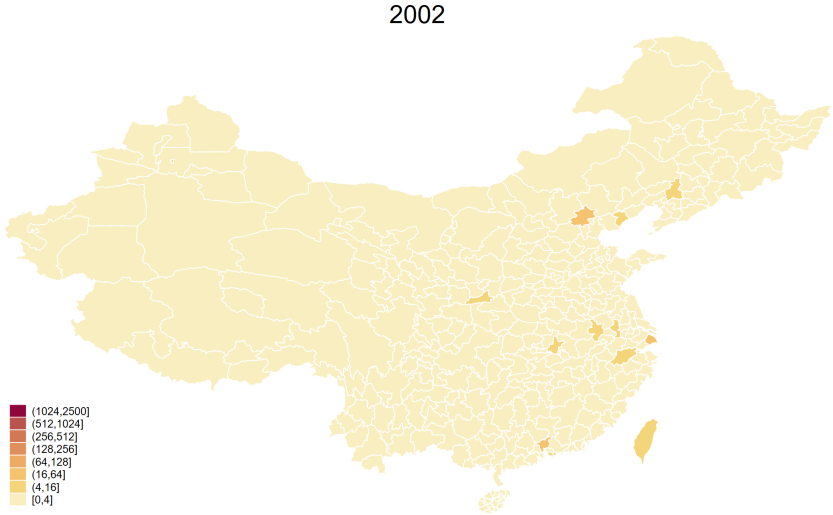

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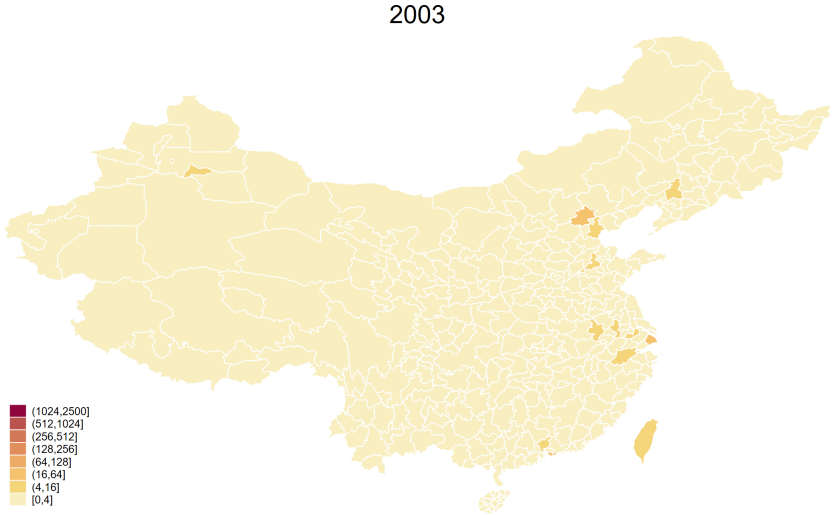

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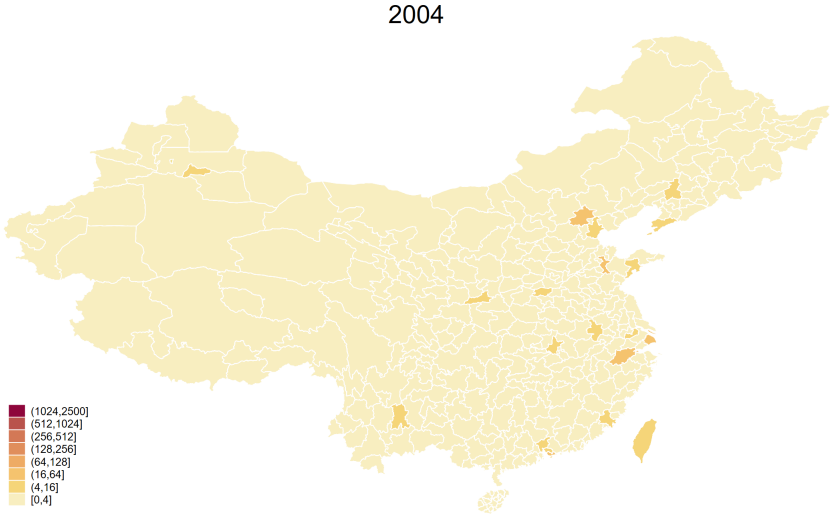

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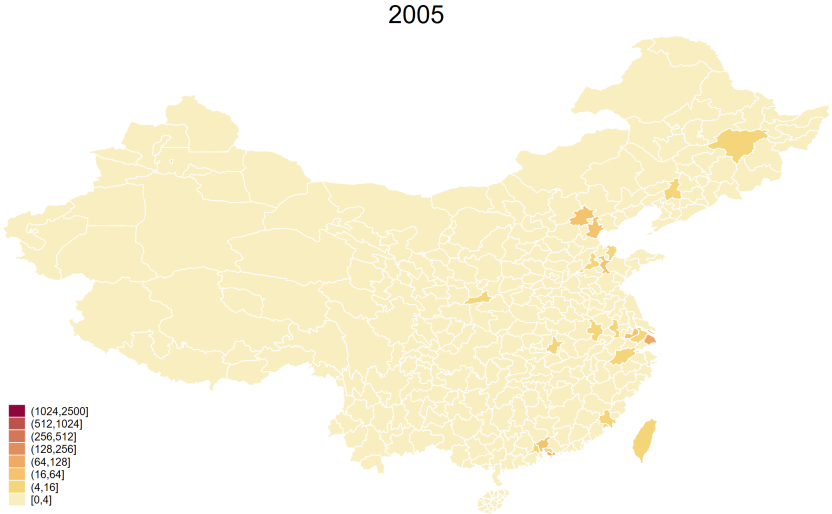

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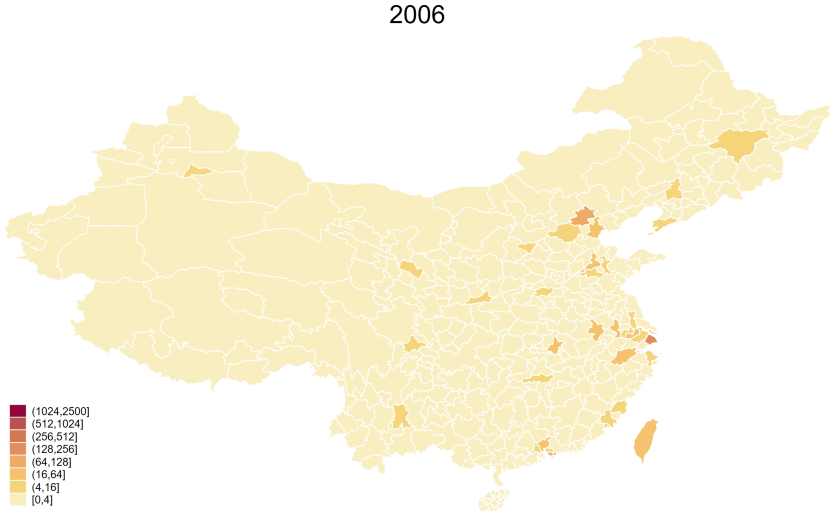

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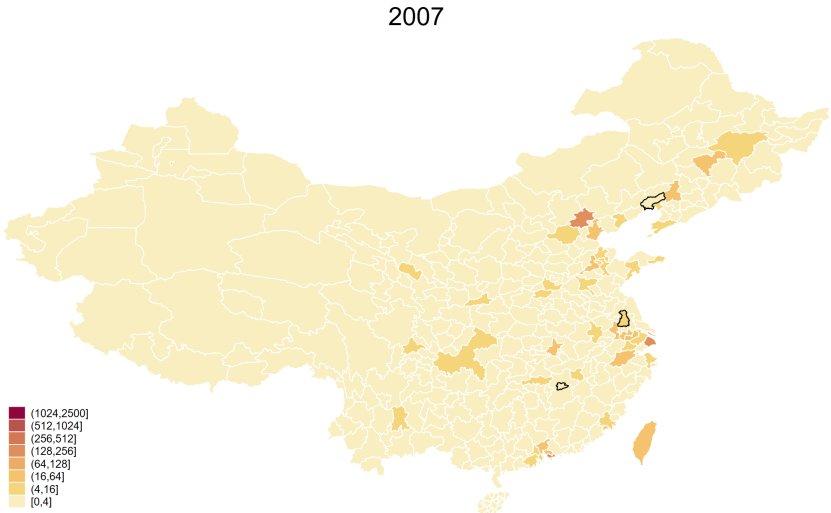

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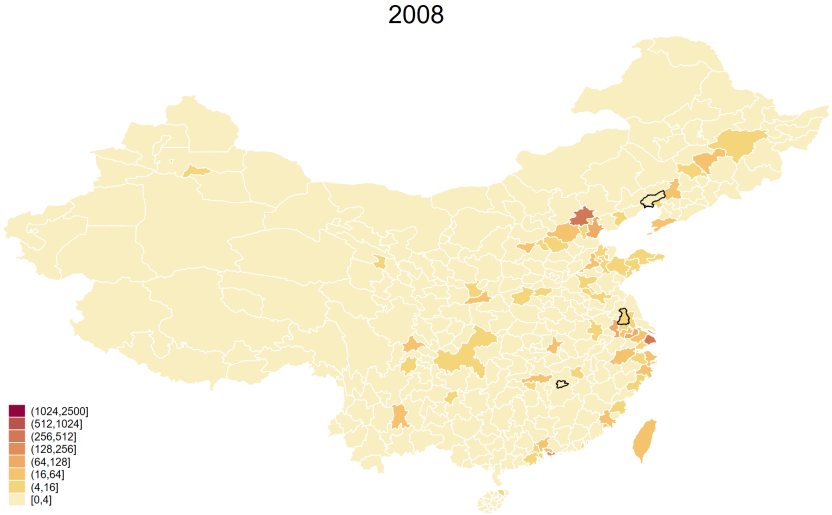

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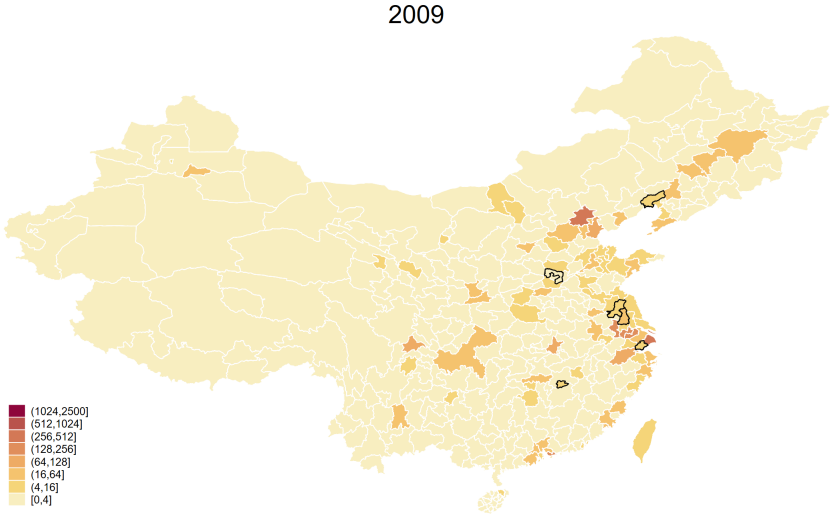

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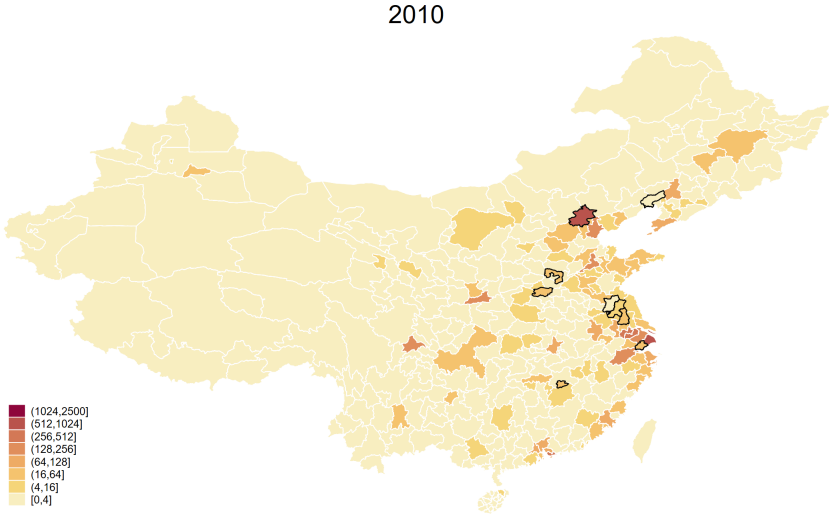

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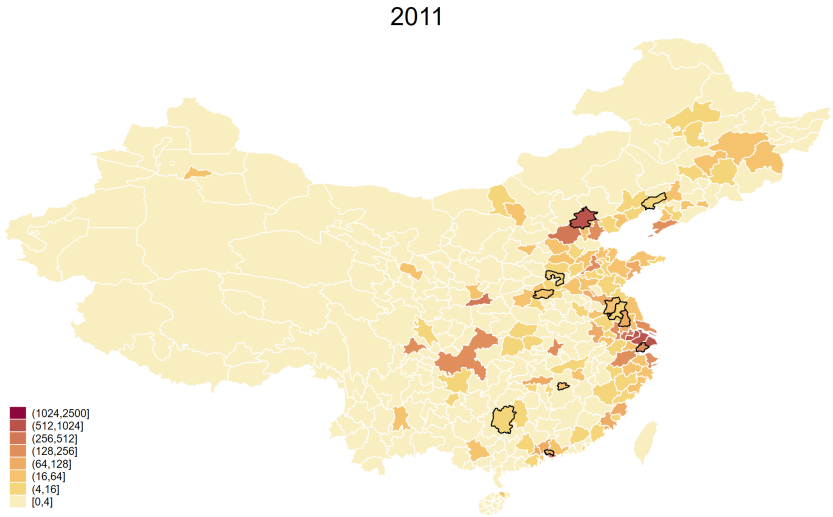

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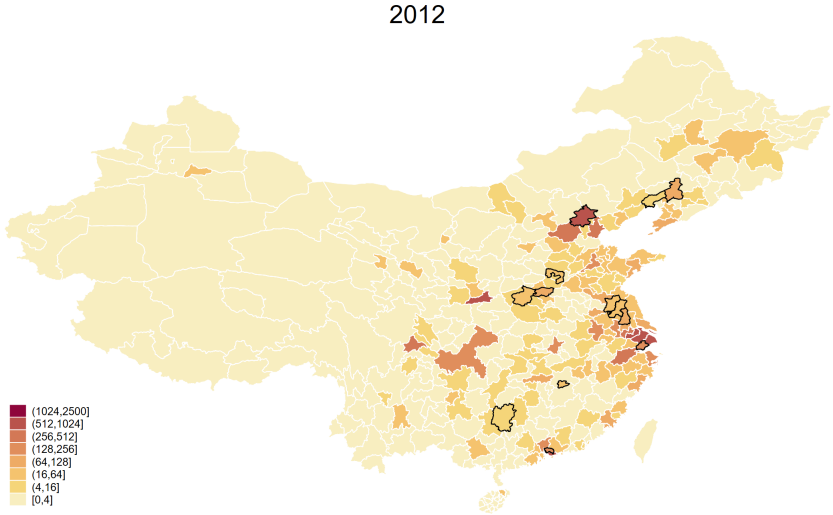

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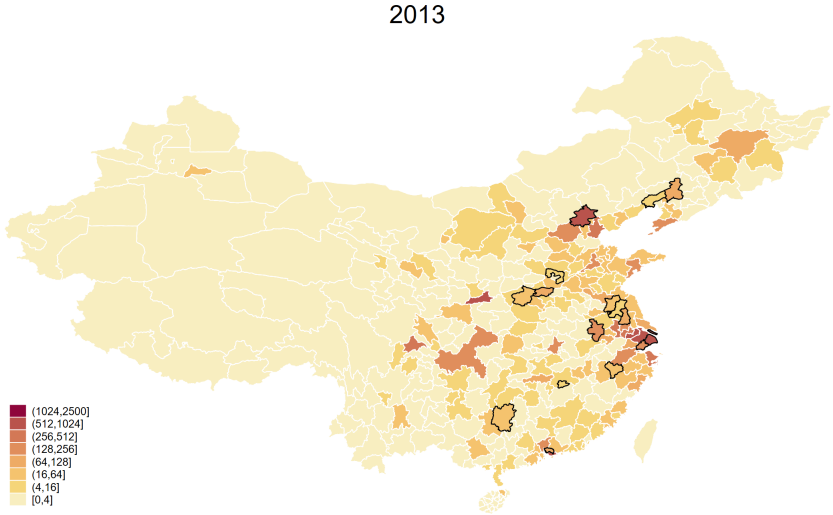

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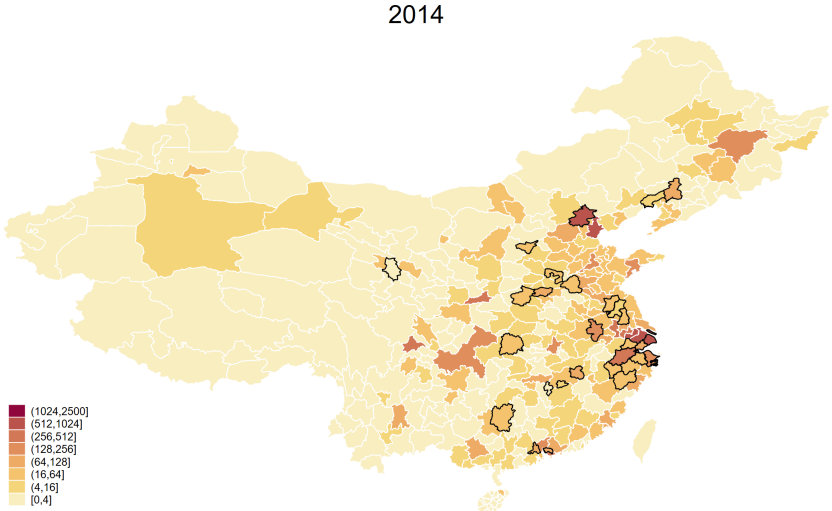

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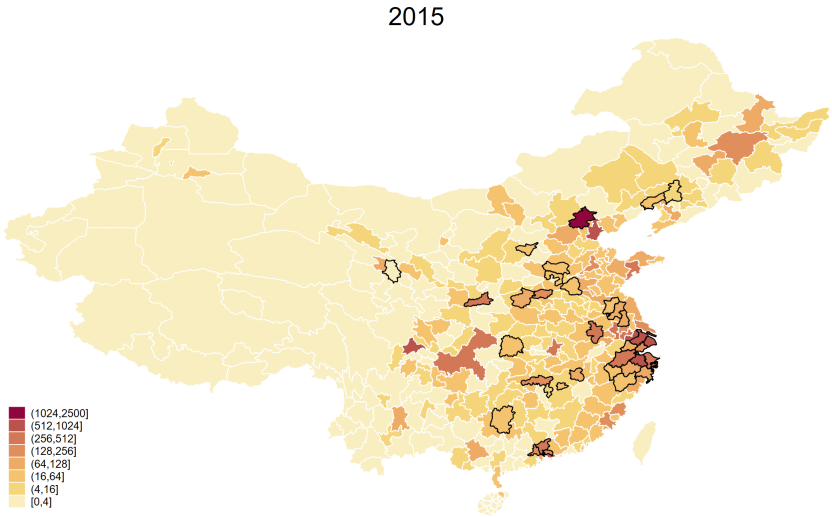

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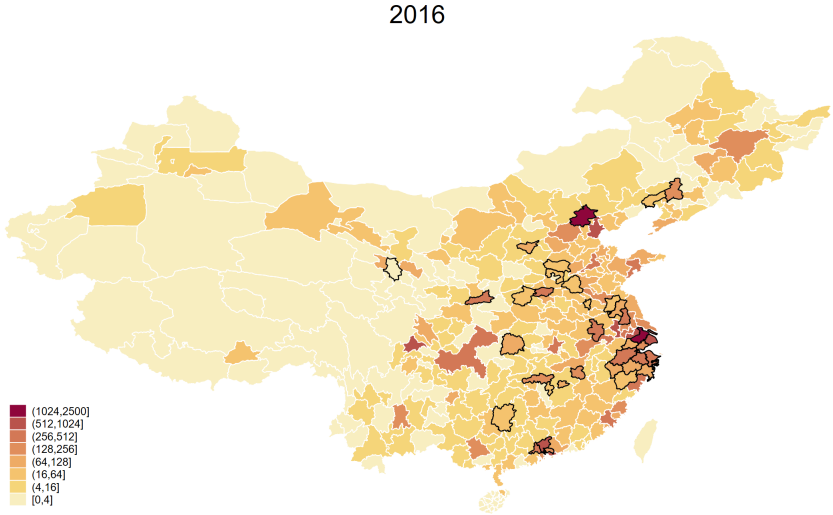

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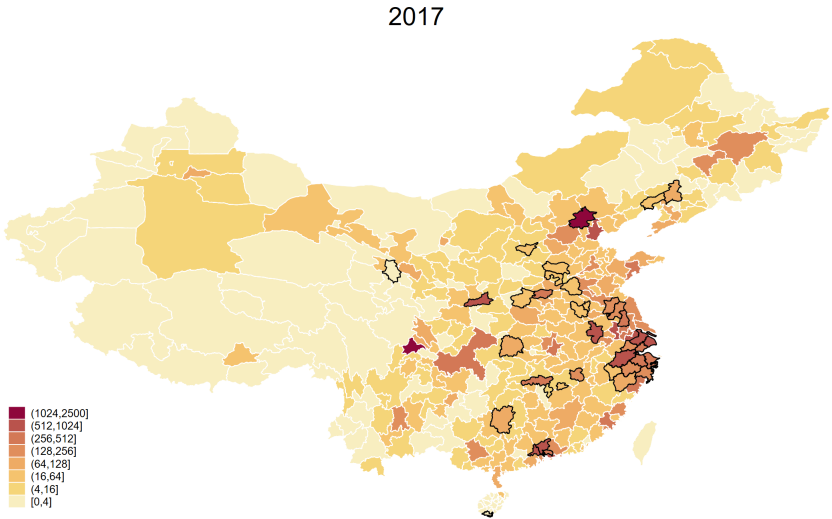

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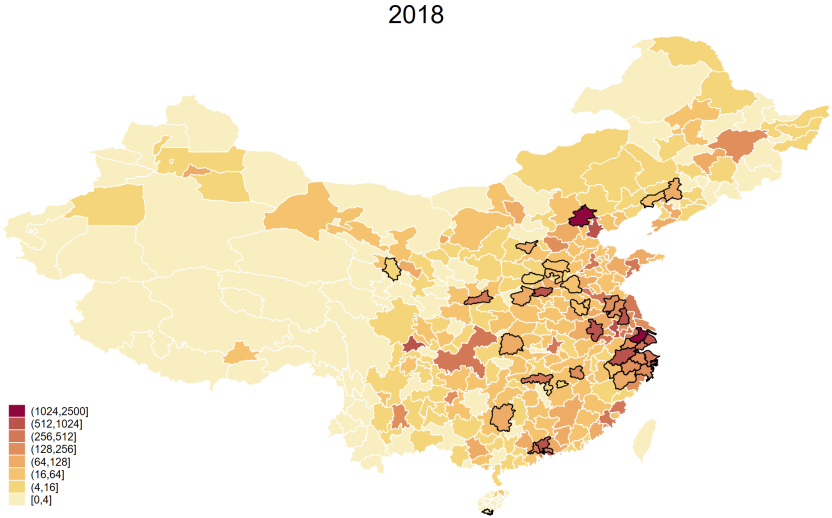

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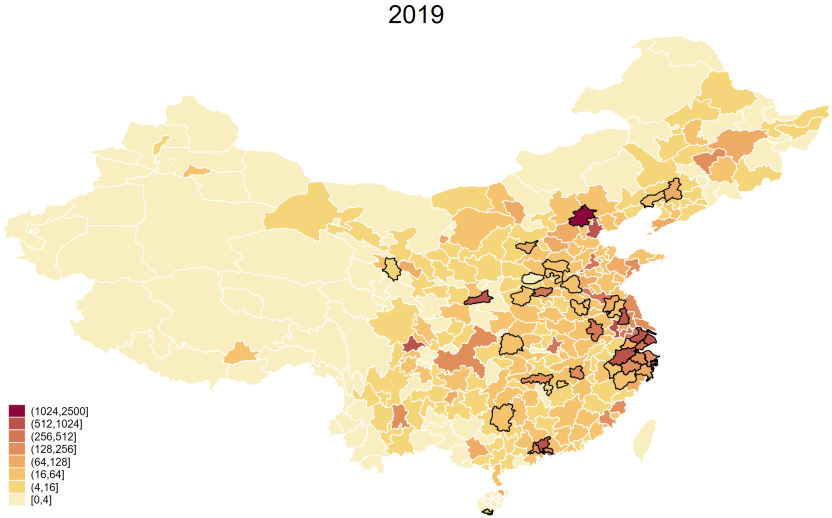

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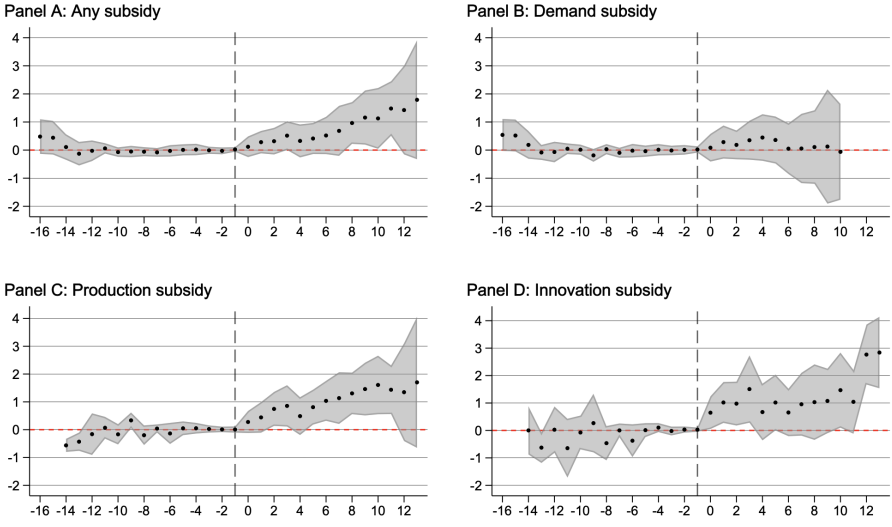
Outline

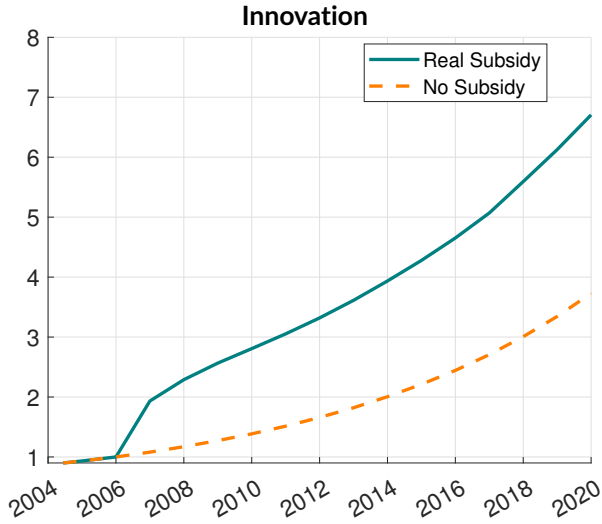
Results: Patents



Outline

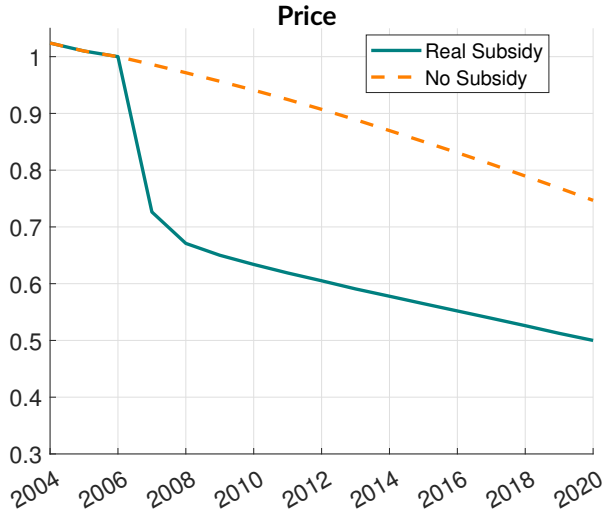
Counterfactuals without subsidies

Industrial policies explain about half of increase in Chinese innovation



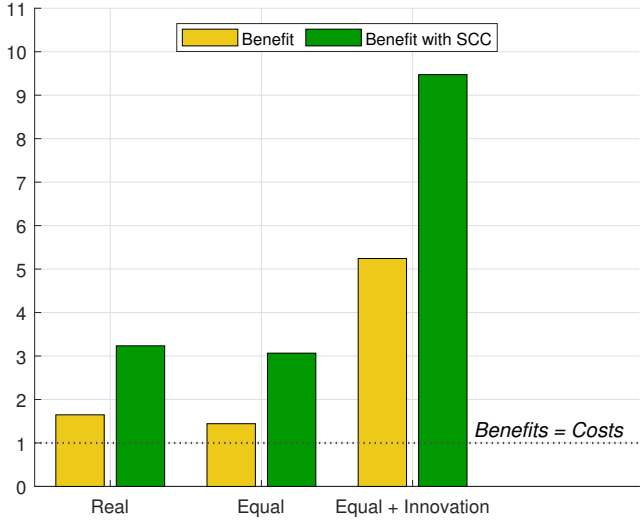
Counterfactuals without subsidies

Industrial policies explain about half of fall in solar prices



Modelling Counterfactuals: Social Benefit-Cost Ratios

Including Social Cost of Carbon (SCC) doubles the benefits



Conclusions for Policy

- Some green industrial policies can be a win-win: reduce emissions and benefit citizens
- A focus on innovation has greatest welfare effects (R&D policy vs. demand or production subsidies)
- Which sectors/technologies should be the focus?
  - Opportunities for spillovers (shipbuilding)
  - A country's (latent) comparative advantage
  - Co-ordination (not all countries can be wind power superpower)