

# **Tech-driven Comparative Advantage: Evidence from Solar Expansion in China**

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# Quick Summary

- Key questions:
  - How does the diffusion of utility-scale solar PV reshape the spatial allocation of electricity-intensive manufacturing?
  - Through what channels do renewable energy endowments translate into industrial restructuring?
  - Do solar-induced location advantages spill over across cities and across sectors?
- Research strategy:
  - Novel data integration: satellite-detected PV installations + LLM-coded blackout reports + SAIC firm registry + VAT records
  - Multi-layered identification: staggered DiD, long-difference IV, provincial border RD
  - Mechanism design: UHV-origin cities as placebo; industry-level heterogeneity by electricity intensity; spatial and vertical spillover

# Quick Summary

- Major findings:
  - Solar PV expansion in Northwest China is associated with higher firm entry, concentrated in electricity-intensive industries
  - The effect operates through reduced blackout frequency and lower industrial electricity prices, beyond supply-chain demand
  - Effects are muted in UHV-origin cities, consistent with the local-electricity-supply mechanism rather than alternative explanations
  - Positive spillovers to geographically adjacent cities and to vertically linked upstream sectors
- A timely and policy-relevant question
- An ambitious and original data construction effort, with diverse identification strategies
- A well-executed and mature paper

# Comment 1 – Comparative Advantage

- Current evidence documents local industrial expansion:
  - Firm entry and revenue rise in Northwest cities with solar PV expansion
  - Effects are stronger in electricity-intensive industries
- Ricardian comparative advantage is a stronger claim that additionally requires:
  - *Specialization deepens*: electricity-intensive sectors gain rising share in local output and in the national industry
  - *Relative cost advantage*: Northwest becomes cheaper relative to other regions, not merely cheaper than before
  - *Trade flows realign*: Northwest becomes a net exporter of electricity-intensive goods to the rest of China

# Comment 1 – Comparative Advantage

- An alternative explanation with local industrial expansion but without Ricardian comparative advantage:
  - Local governments, believing solar endowment justifies an electricity-intensive industrial strategy, deploy land grants, fiscal rebates, captive-power arrangements, and tax holidays to attract such firms
  - Firms enter in response to administrative incentives and political signals, not (only) to a real cost advantage
  - Firms may rely on captive coal or grid power at administered rates, blunting the role of solar PV as the actual cost driver
  - Capacity may migrate back when subsidies and political support expire

# Comment 1 – Comparative Advantage

- Specialization dynamics:
  - Compute Krugman specialization index, Theil concentration, etc. for electricity-intensive industries at the city-year level
  - Compare evolution in solar-region vs. non-solar-region cities
- Inter-regional trade flows:
  - Use VAT invoice geographic routing to construct province-pair flows of electricity-intensive products
  - Test whether Northwest's net export share of electricity-intensive goods rises post-PV expansion
- Persistence under policy normalization:
  - Use the post-2021 phase-down of solar-related subsidies as a natural experiment
  - Examine whether entrants remain, relocate, or exit

# Comment 2 – Curtailment Wedge

- The curtailment problem:
  - Before 2018, Northwest grid lacked load to absorb daytime solar output, when UHV transmission and inter-provincial dispatch were inadequate
  - Installed capacity grew much faster than effective local supply
  - Curtailment rates in Gansu, Xinjiang, etc. reached 20-30%
  - Policy response: the 2018 Clean Energy Consumption Action Plan mandating curtailment below 5% by 2020
- How this can strengthen the paper:
  - The results are likely a lower bound, which may help explain the relatively modest estimated elasticity
  - Subsample analysis excluding high-curtailment sample
  - Additional DID analysis based on the 2018 Plan and the historical curtailment exposure

# Minor Comments

- About the magnitude:
  - TWFE elasticity  $\approx 0.009$ ; IV  $\approx 0.04$ ; RD  $\approx 0.14$
  - All three may be internally consistent, but readers need guidance on which number is the policy elasticity
  - A short paragraph reconciling the three would be valuable
- Northwest as a black box:
  - Can the Northwest dummy be unpacked into some observable explanatory variables?
- More discussions on the pre-trend:
  - The “anticipatory investment during approval” interpretation is plausible but may not be the only one

# Summary

- A very important topic, impressive data construction effort, rich empirical analyses, and convincing results
- New insights on how technological changes reshape the geography of economic activity
- Distinguishing local industrial expansion from comparative advantage would further clarify the paper's contribution
- Accounting for curtailment and exploiting the 2018 Plan shock may further strengthen the story