

Million Dollar on the Roof: Development Effects of Solar Energy

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Abstract

Solar energy is becoming one of the biggest sources of electrical power globally and a cost-effective way to reduce carbon dioxide emissions. To facilitate the clean energy transition, the Chinese government launched the “Whole County Photovoltaic” program in June 2021, dramatically expanding household rooftop solar installations to 500 gigawatts by 2023. This paper studies the economic and environmental impacts of this large-scale household rooftop solar adoption program. We exploit the policy rollout using regression discontinuity and difference-in-differences designs at the county-level. Combining proprietary household-level solar production data from one of China’s leading solar companies, which tracks 30,000 households with over 20 million observations on actual power generation at daily frequency from 2021 to 2023, with local economic statistics and satellite-based pollution measures, we evaluate the causal effects of distributed solar adoption. We document 30% increases in solar capacity and electricity generation in treated counties. These energy gains translate into significant economic and environmental benefits: a 2.5% increase in local manufacturing activity and pollution reductions of 2% for PM_{2.5} and 2.5% for NO₂. Our findings suggest that household rooftop solar programs can function as a form of place-based green industrial policy, delivering both development and environmental benefits. The results highlight the potential for distributed renewable energy to contribute to clean growth in emerging economies.

JEL classification: Q42, Q48, O13, O25, R11

Keywords: Solar, Energy Transition, Renewables, Green Energy Subsidies, Diffusion, Climate Change, Emissions.

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