Can the US Keep the PACE?
A Natural Experiment in Accelerating the Growth of Solar Electricity

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Overview

Growing global awareness of climate change has ushered in a new era demanding policy, financial and behavioural innovations to accelerate the transition to a clean energy economy. Dramatic price decreases in solar photovoltaics (PV) and public policy have underwritten the expansion of solar power, now accounting for the largest share of renewable energy in California and rising fast in other countries, such as Germany and Italy. Governments' efforts to expand solar generation base and integrate it into municipal, regional, and national energy systems, have spawned several programs that require rigorous policy evaluations to assess their effectiveness, costs and contribution to Paris Agreement's goals. Recent research has started to investigate the effectiveness of governmental policies on the generation of electricity from renewable sources. However rigorous policy evaluations of specific programs are still rare.

This paper contributes to this literature by evaluating the Property Assessed Clean Energy (PACE) program. While previous studies have mainly focused on other supporting policies, mostly feed-in tariffs (FiTs) and renewable portfolio standards (RPS), through econometric or engineering models, this study performs a rigorous evaluation of the PACE program relying on a natural experiment that exploits the geographic discontinuity in the implementation of the program.

PACE is an innovative energy scheme used in certain areas of the US to support renewable energy deployment. The installation of clean energy technology through PACE is financed by local governments, by issuing bonds whose proceeds are used to finance loans to homeowners for PV installations.

Methods

This study assesses PACE's effectiveness on new solar installations using a regression discontinuity (RD) exploiting the geographical discontinuity of the program. Under the RD design, a geographic or administrative boundary allows the investigator to select units into treated and control areas. Indeed, the unique characteristic of this design is the method by which research units are assigned to program or comparison groups as the units' placement depend solely on the basis of county border. This allows the investigator to control for unobserved confounding factors, which if uncontrolled will result in biased estimates. Making causal inference in policy evaluation exercises is challenging as it requires constructing a credible counterfactual, i.e. what the outcome of interest (PV installations) would have been in the absence of the policy intervention (PACE program). The RD approach permits to do just that.

Given that PACE was implemented only in Sonoma County, the county boundary determines whether households are eligible for the PACE financing program, thus allowing us to draw arbitrarily the treated (cities eligible for the program) and control groups (cities not eligible

for the program).

Results/Conclusions

In this paper, we exploit a natural experiment in northern California to assess the effectiveness of the PACE program to promote solar PV investment. Our analysis demonstrates that the PACE program more than doubled solar installations in Sonoma County compared to its neighboring counties, where the program was not implemented. In particular, in the first year of implementation solar installations increased by 45%, while the yearly impact raises to 82% in the 2009-2010 period, before slightly decreasing to 76% in the 2011-2012. The results are robust to using narrow distance ranges (from 15 to 40 km), with smaller effects obtained using shorter distance, which however remain statistically and economically significant. Overall, this analysis support the hypothesis that the PACE program has been highly effective in boosting residential PV installations in northern California.

This study is an example of a rigorous policy evaluation based on an experimental framework. This approach is still quite rare in the energy and environment policy field compared to other areas of social science probably because of scientists' lack of familiarity with this technique and specific issues linked to energy policy evaluations (such as missing baselines, long time lag between intervention and response, high outcome variability, lack of sufficiently detailed geographical data). From a methodological point of view, this paper advances our understanding about how to assess energy and environmental policies, by providing evidence on what types of interventions work and under what conditions. We believe the methodology used in this analysis is broadly applicable to other programs/policies and should become part of the toolbox of empirical studies in the energy and environment field to lead to better policy evaluation.

From a policy perspective, this study demonstrates that policies lowering financing barriers could increase the take-up of low-carbon technologies and will potentially enable renewable deployment on a large scale. The PACE case study suggests the importance and the need of financing programs which address the initial financial constraints risks and cash flow barriers of solar technologies to increase their take-up.