THE EFFECT OF RENEWABLE PORTFOLIO STANDARDS ON BIOENERGY: AN ECONOMETRIC APPROACH

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Overview

This paper analyses the effect of renewable portfolio standards (RPS) on biomass consumption for electricity generation in the United States. In characterizing the effect of RPS policies, three questions are analysed. First, on average, what is the overall effect of RPS policies on biomass consumption at dedicated biomass facilities for electricity generation, in absolute terms as well as in comparison with other forms of renewable energy? Second, given the heterogeneity in RPS policies across states, what are the state-specific effects of RPS policies on biomass consumption at dedicated biomass facilities? Third, focusing on co-firing at coal-fired powerplants, how do RPS policies affect the usage of co-firing? To the best of our knowledge, this is the first econometric study to address the effect of RPS policies on bioenergy and to use the Synthetic Control Method (SCM) in its estimation.

Methods

The primary dataset for the analysis comes from EIA form 923 for the years 2001 through 2016. The outcome of interest is fuel consumption (heat input in mmBTUs) for electricity generation (EIA calculates heat input for non-combustible renewable energy by using fossil-fuel heat rates). The analysis implements the SCM in conjunction with a difference-in-differences (DiD) model. The SCM is a weighting process that weights the control group such that the differences between the control group (states/powerplants without an RPS) and treatment group (states/powerplants with an RPS) are minimized during the pre-treatment period (before an RPS is implemented). This weighted control group is the synthetic control group. By using a synthetic control group, two issues with DiD are addressed. First, the DiD assumption of constant unobservable confounders over time can be relaxed. Second, given the sensitivity of DiD to control group selection, SCM offers an objective data-driven method to control group selection.

Results

From the state-level regressions, there is insufficient evidence of RPS policies significantly impacting biomass fuel consumption. From the powerplant-level regressions, there are three conclusions that can be drawn. First, just as with the state-level regressions, there is insufficient evidence to suggest that RPS policies increase biomass fuel consumption for the average biomass powerplant; however, consumption does increase for other forms of renewable energy (e.g., wind, solar, and geothermal). Second, the post-2007 period is associated with an increase in biomass consumption for both the treatment and control groups. Finally, there is some evidence to suggest that powerplants in states with RPS policies are associated with less biomass consumption compared to their counterparts in states without RPS policies, both before and after an RPS policy is implemented. To determine if any specific states' RPS policy has an impact on biomass consumption for electricity generation we estimate separate state-specific DiD regressions, each with the SCM-weighted control group data. In estimating these state-specific regressions, there is no significant effect of RPS policies on biomass consumption for most states. However, some states exhibit a significant decrease in biomass consumption due to RPS policies. Overall, the evidence suggests that, on average, RPS policies have little to no effect on bioenergy. Focusing on a subset of bioenergy, we then apply our empirical approach to co-firing at coal-fired powerplants. From our reduced sample regressions, we do find some evidence of increased co-firing in response to RPS policies. This suggests that the average coal-fired powerplant covered under an RPS policy increased co-firing as a result of the RPS.

Conclusions

Our analysis provides news insights into the effectiveness question surrounding RPS policies, specifically with respect to bioenergy. We find that, on average, RPS policies do not significantly impact biomass consumption for electricity generation at dedicated biomass facilities. However, given the heterogeneity of states' RPS policies and

the markets they are operating in, we do find that the effect of an RPS policy varies by state. Furthermore, we do find that for some states co-firing significantly increases in response to the state's RPS.

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