THE EFFECTS OF PLATFORM DESIGN ON SOLAR PV PRICES IN AN ONLINE MARKETPLACE

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Overview

In this study, we analyze data obtained from the online solar PV marketplace EnergySage to investigate how several aspects of platform design influence installer pricing behavior and consumer valuation of residential rooftop PV. While most prospective PV customers in the U.S. currently obtain price quotes directly from PV installation companies, customers are increasingly turning to internet-based, third-party quote aggregators who obtain quotes on their behalf. This shift could fundamentally alter how prospective customers navigate the PV adoption process. From a societal point of view, it is hoped that this shift enhances PV market transparency, makes the adoption process easier for prospective customers to navigate, lowers prices, and stimulates swifter adoption.

Between 2013 and 2017, the period covered by our data, EnergySage introduced four design changes to its platform. By comparing quote prices offered before versus after these changes were introduced, we are able to determine how these particular aspects of platform design influence prices. The changes were (1) *customer map*, whereby new visitors to the website are shown a map with local customers who have obtained quotes through EnergySage; (2) *quote cap*, whereby the number of installers offering quotes to each customer is capped at seven; (3) *price reference*, whereby installers are given information about competitive prices in the customer's area before submitting quotes; and (4) *no pre-quote messaging*, whereby installers are no longer allowed to communicate directly with customers prior to offering quotes. With the residential PV market increasingly moving online, our findings have important policy implications for how online PV marketplaces should be designed to optimize market performance.

Methods

Our EnergySage dataset is unique in that it contains information about roughly 138,000 price quotes, including both unsuccessful quotes and offerings actually purchased by customers. This permits a more in-depth investigation of installer pricing behavior than would be possible with only transaction prices, which are more often analyzed.

The methodology is econometrics, and principally uses a regression discontinuity approach to compare price quotes offered before versus after each change in platform design. We control for a host of other explanatory variables such as quarter (of each year) fixed effects, county fixed effects, installer fixed effects, PV system size, number of installers offering quotes to the customer, panel quality rating, system equipment components, and so on. We run our regression model on the full sample of all price quotes to investigate installer pricing behavior, and on the restricted sample of only accepted quotes to assess how customers actually value certain attributes of PV systems.

Results

We find that all four platform design changes lower PV quote prices, and that these effects are all statistically significant at the 1% level. The strongest effect is observed for the introduction of the *price reference*, which reduces quote prices by approximately $0.104/W. This result suggests that price anchoring is occurring. Installers who would otherwise offer higher price quotes see the reference information and realize that they must offer more competitive price quotes in order to have decent chances of succeeding with this customer. The move to *no pre-quote messaging* lowers price quotes by $0.052/W. When pre-quote messaging was formerly allowed, installers were likely using their ability to communicate with customers to gauge their willingness to pay, and potentially succeed at higher price quotes by offering value-based prices.

Regression results based on the restricted sample of only accepted price quotes reveal that customers do not value *standard* quality panels much more than *economy* quality panels, but they are willing to pay significantly more for *premium* quality panels. Purchased systems with *premium* panels tend to be sold for $0.621/W more than those with *economy* panels. This result is an encouraging sign that online marketplaces like EnergySage are not causing a race to

the bottom in which equipment quality is sacrificed because customers only care about price. In fact, the coefficient on *premium* quality for the full sample of all price quotes ($0.503/W) is slightly lower than that for the restricted sample of only accepted quotes, so if anything, installers are undervaluing panel quality in their quotes relative to the additional value that customers assign to it.

Conclusions

Our findings have significant policy implications, especially as the residential PV market increasingly moves toward internet-based, third-party quote aggregator platforms. EnergySage received government funding through the U.S. Department of Energy's SunShot Initiative, with a stated goal of reducing PV prices. The U.S. government therefore has a direct interest in the outcomes achieved by EnergySage, and other governments interested in supporting the development of similar online PV marketplaces should be interested in how it has fared.

Results show that providing installers with price reference information and limiting their communication with customers prior to offering quotes are particularly effective platform design elements for reducing PV prices. Customers evidently assign substantial value to premium quality panels, assuaging concerns that online PV marketplaces create a race to the bottom in which equipment quality is sacrificed because customers only care about low price. Our findings thus demonstrate that internet-based, third-party quote aggregator platforms can have a desirable impact on the solar PV market, especially if they incorporate key design elements which we have shown lead to lower prices.