



# The Effects of Market Concentration on Residential Solar PV Prices: Competition, Installer Scale, and Soft Costs

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## Summary

Thousands of companies compete to install residential solar photovoltaic (PV) systems in the United States. Competition between numerous installers can drive down PV prices. At the same time, installers that accumulate market share may reduce their installation costs through experience and economies of scale. Such lower installation costs in markets with fewer competing installers may also put downward pressure on PV prices. This study examines the relationships between competition, installer scale, and PV prices. The findings generally indicate that the efficiency/price benefits of installer scale outweigh the benefits of increased competition in most PV markets.

## Context

The U.S. residential PV installation industry is growing and evolving. Most PV installers are companies that occasionally “dabble” in PV installation by installing one or fewer systems per month. About one third of installers are “singletons”: companies that installed a single system over the study period. Singletons and dabblers may be companies from related service industries, such as electrical contracting, that install PV as a side business. At the same time, some installers have firmly established themselves in the installation industry by installing more than 10 systems per month. Variation in the market shares of competing companies

defines the level of market concentration (Figure 1). A market where few large-scale firms hold large market shares is said to be concentrated. Over time, the PV installation industry has grown more concentrated as established installers have accumulated market shares.

## Data and Methods

The relationship between PV market concentration and prices is tested using an econometric model and data from Lawrence Berkeley National Laboratory’s *Tracking The Sun* data set. The study data set comprises 220,172 customer-owned PV systems installed from 2010 to 2016.

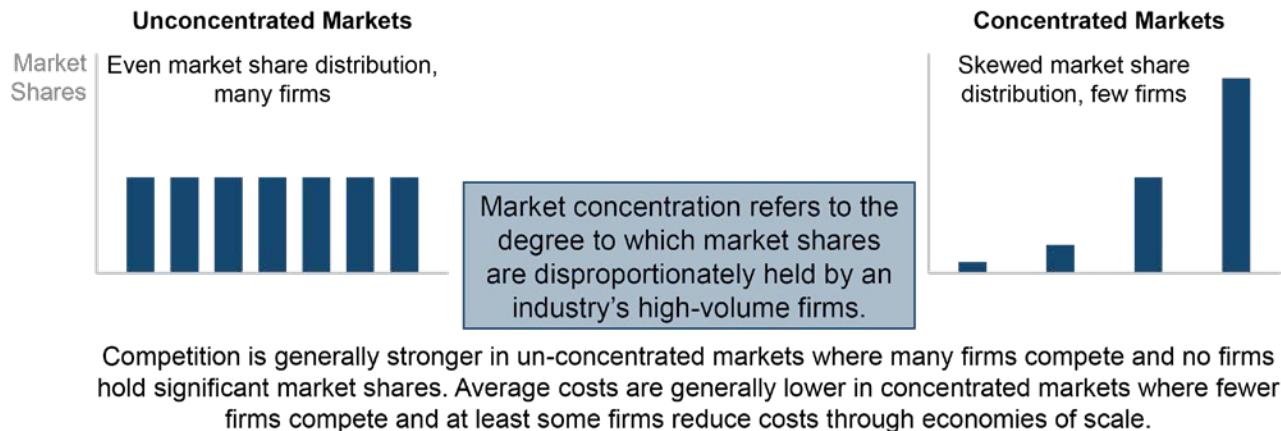


Figure 1. Unconcentrated versus concentrated markets

## Results

The results show PV prices are generally lower in more concentrated markets, suggesting the price-reducing benefits of installer scale outweigh the price-increasing effects of reduced competition in concentrated markets. The findings provide a rationale for policies that increase installer experience and scale, even if these policies temporarily reduce competition. At the same time the relationship reverses in concentrated markets, meaning that further market concentration increases prices in already concentrated markets. PV prices may be minimized through an optimal combination of installer scale and competition.

However, the relationship between installer scale and prices is not straightforward. Figure 2 plots mean normalized prices<sup>1</sup> against market shares by installer scale in unconcentrated and concentrated markets. Established installer system prices are lower than mid-scale installer system prices, consistent with returns to scale. Yet singleton and dabbler prices are also lower than mid-scale prices. Figure 2 also shows how market shares shift toward established installers in concentrated markets. Together, these results suggest prices are lower in more concentrated markets owing to a shift in market shares from mid-scale installers to established installers. But the data also suggest that smaller-scale installation may also have

some efficiency benefits. The full study report explores hypotheses for these results as well as potential future research to test the hypotheses.

## More Information

For more information, download the full technical report: O'Shaughnessy, Eric. 2018. *The Effects of Market Concentration on Residential Solar PV Prices: Competition, Installer Scale, and Soft Costs*. NREL/TP-6A20-71296. <https://www.nrel.gov/docs/fy18osti/71296.pdf>.

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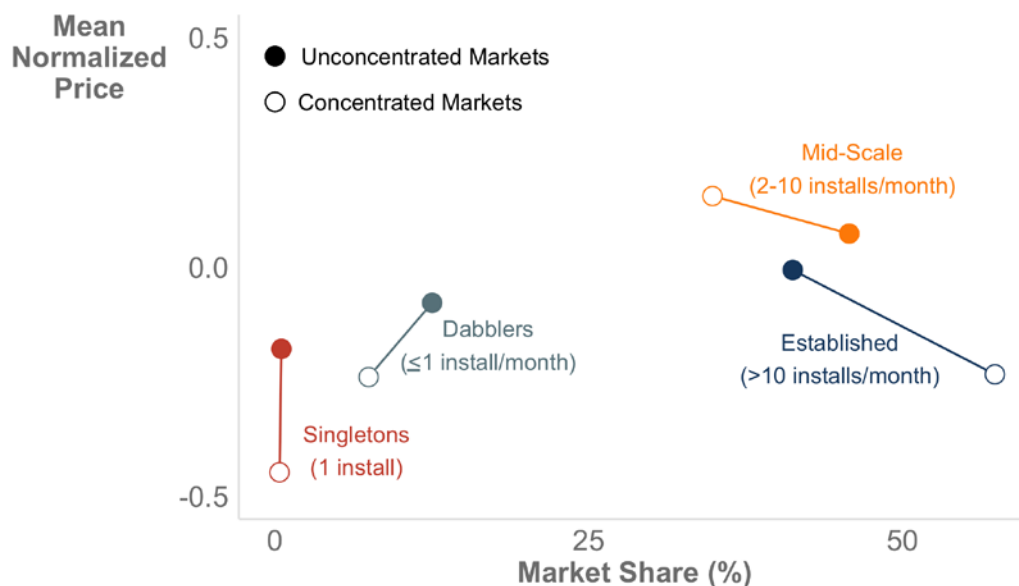


Figure 2. Mean normalized price vs. market share by installer scale in unconcentrated and concentrated markets (for markets larger than 100 systems installed per year)

1. Prices are normalized by state and year. The units are in standard deviations.