

# Toward an Understanding of the Economics of Prosumers: Evidence from a Natural Field Experiment

Based on BFI Working Paper No. 2024-97, “[Toward an Understanding of the Economics of Prosumers: Evidence from a Natural Field Experiment](#),” by John A. List, University of Chicago; Ioannis C. Pragidis, Democritus University of Thrace; and Michael K. Price, The University of Alabama

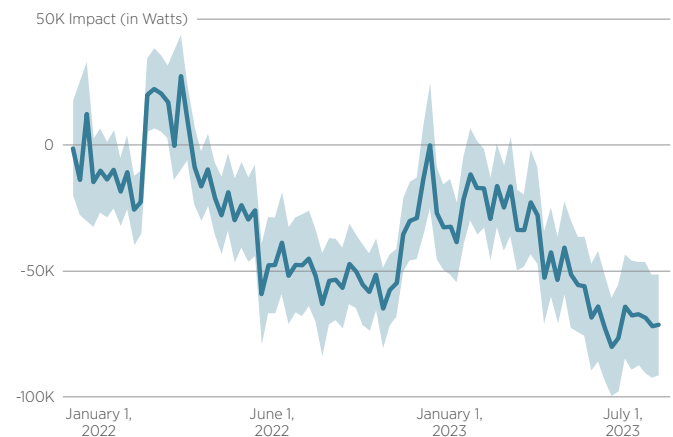
Nudging energy prosumers to conserve via a home energy report reduces their energy consumption, with significant variation across seasons and times of day. This suggests that prosumers both shift their energy use away from peak hours and conserve overall.

Solar panels have become increasingly popular over the last decade, and their adoptees play a unique role as **prosumers**—both producers and consumers—of energy. Governments around the globe have recognized the value of prosumers for reducing emissions and stabilizing energy supply, and often offer subsidies for the installation of rooftop PV systems.

At the same time, there is evidence to suggest that prosumers might *increase* their energy consumption after installing solar. This “solar rebound” may be attributable to a range of explanations, from financial incentives to moral reasoning. Importantly, an accurate assessment of the benefits of residential solar requires understanding the behaviors of energy prosumers.

In this paper, the authors explore the economics of prosumers using a **natural field experiment** covering 705 residential energy consumers in Sweden. Households were randomized into either

**Figure 1** • Impact on Weekly Energy Consumption



Note: This graph shows the average treatment effect on electricity consumption (in watts) weekly. The period of analysis is from December 7, 2021, to August 13, 2023. The shaded area shows 95% confidence intervals.

a treatment or control group, with the treatment group receiving an electronic home energy report (HER) every other week.

**Prosumer:** An individual or business that both produces and consumes within a specific market

**Natural field experiment:** A study in which researchers control the assignment mechanism in the field in a covert manner

The HER contained two sets of messages. First, descriptive messages compared treatment households' electricity consumption and purchases from the grid with a set of similar customers and with a set of the most energy efficient customers. The HERs also contained moral messages, conveyed as either emojis with expressions reflecting households' energy consumption relative to the set of like and efficient neighbors, or more general moral messages about the importance of energy conservation.

In total, customers in the treatment group received 36 HERs, with the final report delivered on August 13th, 2023. The authors use hourly data covering electricity consumption, purchases from the electric grid, and sales back to the grid to measure how HERs impact energy prosumers. They find the following:

- HERs are effective at managing energy use among prosumers. Households in the treatment group who receive the HER reduce their average weekly energy consumption by approximately 9.8% compared to those in the control group.
- The effects of HERs on energy consumption vary substantially across seasons. The treatment effect is significantly greater between April and September, when solar panels produce more energy. During winter months, the impact of the HER is substantially lower and, in many weeks, is **statistically insignificant**.
- There are similar differences in the effects of the HER on prosumers' consumption across time of day. During the overnight and early morning hours, the estimated hourly

treatment effects are statistically insignificant, while during the morning and early afternoon, the hourly treatment effects correspond to approximately 5% reductions in average hourly consumption. The hourly treatment effects increase substantially in the late afternoon and into the evening, reaching a peak of a roughly 10% around 6 p.m.

- Compared to the control group, treated customers increase their energy sales to the grid during daylight hours and reduce their sales in the evening and pre-dawn hours. The opposite is true for purchases *from* the grid: Treated customers purchase significantly more from the grid during the late evening/early morning hours than households in the control group, and purchase significantly less during the day. These patterns suggest that the observed hourly treatment effects are driven by a combination of **load shifting** and conservation.

These results have significant implications for designing interventions aimed at energy conservation. They indicate that peer comparisons can be an effective tool for managing resource use, leading to substantial reductions in overall electricity consumption. Additionally, peer comparisons and similar programs appear to influence intraday consumption patterns by highlighting opportunities for financial gain. Specifically, they encourage shifting energy use from periods of low solar production to times of higher production and promote charging in-home storage systems during periods of low spot prices, with the stored electricity being used during peak periods when prices are highest.

**Statistically insignificant:** A result that does not provide strong enough evidence to reject the null hypothesis, suggesting the observed effect may be due to chance

**Load shifting:** The practice of moving energy consumption from periods of high demand to periods of lower demand

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## ABOUT OUR SCHOLAR



### John A. List

*Kenneth C. Griffin Distinguished Service Professor in Economics and the College, Kenneth C. Griffin Department of Economics*

THE KENNETH C. GRIFFIN  
DEPARTMENT OF  
**ECONOMICS**  
THE UNIVERSITY OF CHICAGO