

Does Energy Consumption Respond to Price Shocks?



Using unique features of a tariff schedule for natural gas in Buenos Aires, we find that a price increase causes a prompt and significant decline in residential consumption.



The results also indicate that consumers respond more to past bills—actual cost paid—than to expected prices.



Policymakers and regulators need to move beyond the assumption of perfect awareness of complex price schedules by consumers.

CONTEXT

Climate change, the war in Ukraine, disruptions in global supply chains, and domestic turmoil have all heightened the relevance of restricting energy consumption. Since the price-mechanism is one of the tools at policymakers' disposal, economists are interested in estimating how consumption responds to price changes. However, measuring the impact of those changes is generally difficult because consumers typically experience different events at essentially the same time. Evaluating the effect of a common price change by looking at consumption before and after is not very reliable because the price effect may be confounded with other events taking place in the economy.

PROJECT

We focus on the short-run impact of a 2008 increase in residential gas tariff in the Greater Buenos Aires region. In particular, the introduction of a threshold for defining unit prices based on previously accumulated consumption approximates a randomly assigned price differential. Using a regression discontinuity (RD) design, we focus our analysis on households with annual accumulated consumption barely above and barely below a 1,500 m³ threshold. In May 2009, consumers above the threshold received a gas bill with unit prices about 25 percent higher than those below. We then compare the subsequent average consumption of the consumers just above and just below this threshold.

Key Concept



PRICE ELASTICITY OF CONSUMPTION

The ratio of the percentage change in quantity consumed of a product to the percentage change in price.

RESULTS

Our main results show that a price shock, in this instance a 25 percent increase, induces a statistically significant drop in gas consumption of 15.9 m³ in the subsequent period—or roughly 3.8 percent of average gas consumption. [Figure 1](#) below shows that there is a clear positive relationship between consumption in period 1 (when consumers above and below the threshold experienced different prices) and normalized annual accumulated consumption in period 0, as would be expected given that consumers with higher consumption in the past also tend to consume more in the future. However, this positive relationship that happens below the threshold breaks at exactly 1,500 m³. Gas consumption falls discontinuously at the threshold, suggesting that households react to the price shock by significantly reducing consumption in the subsequent two-month period. In economic terms, this means that households display a price elasticity of consumption of about 0.15. That is, a price increase of 10 percent is expected to reduce gas consumption by 1.5 percent. This is calculated considering the price shock and the fall in consumption (3.8 percent / 25 percent).

The evidence provides little support, however, for a hypothesis that consumption responses are motivated by strategic behavior, as consumers respond more to recent past bills than to expected prices. This is because consumers above and below the threshold received different prices for their past consumption but face the same price schedule for the future.

Two additional conclusions emerge. First, the way in which customers process information about complex tariff structures is an important driver of their behavior. Second, households do not appear to change their gas consumption in relation to the relevant threshold, despite strong incentives for doing so under the prevailing price determination mechanism.

POLICY IMPLICATIONS

Prices matter for energy consumption, even in the short run. Consequently, policy interventions via the price mechanism are powerful instruments to influence residential energy utilization patterns. However, regulators must take into consideration that consumers do not appear to possess perfect awareness of complex price schedules. The results coming from a survey of consumers, for example, shows that only about 4 percent of consumers were fully aware of the gas price structure and the determinants of the final gas consumption price.

IDB RESEARCH ON ENERGY CONSUMPTION

This study is part of the IDB's efforts to understand the determinants of energy and water consumption, with a particular emphasis on the price mechanism and institutions. The IDB Behavioral Economics Group has also studied ways to reduce energy and water consumption by analyzing the effectiveness of different messages and communication methods.

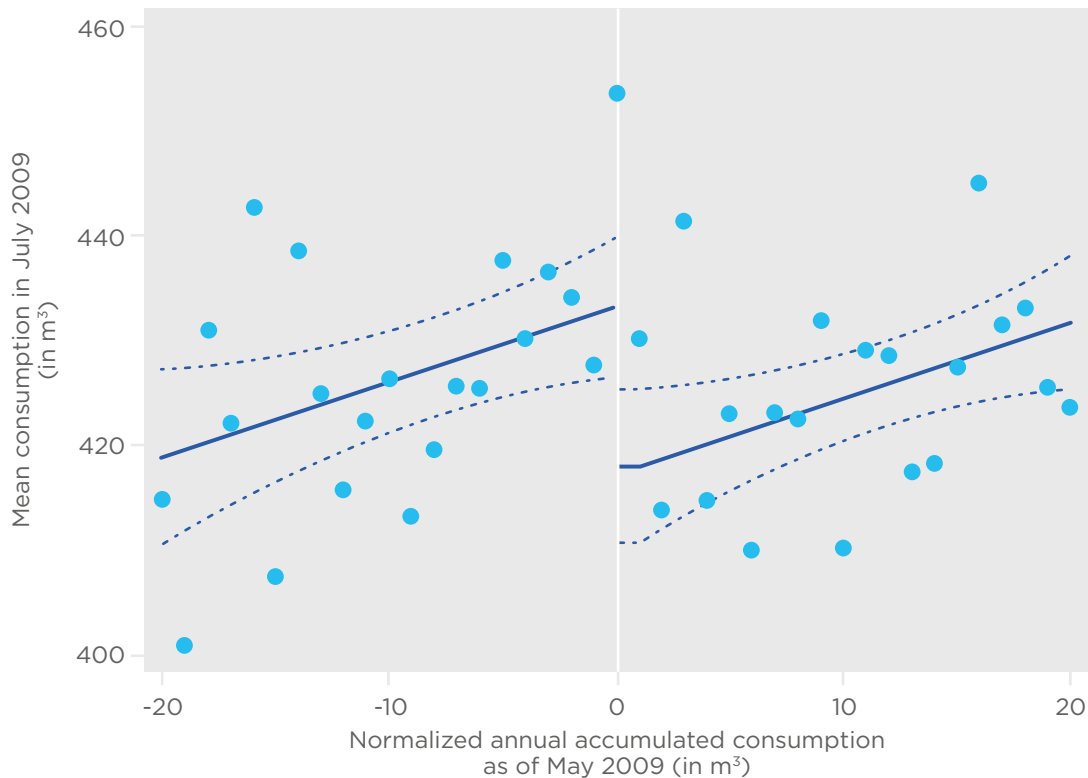
Key Concept



REGRESSION DISCONTINUITY DESIGN

A quasi-experimental evaluation method that assesses the responses of individuals below and above a threshold or cut-off score.

Figure 1. Normal Annual Accumulated Consumption as of May 2009 (in m³)



Note: Scatter points represent local averages computed by bins with a bandwidth of 1 unit of normalized AAC. Solid lines represent parametric fits generated from regressions that include a constant, a treatment dummy and a linear term for normalized AAC. Dashed lines are the 95% confidence interval.



FULL STUDY

[Bastos, P., L. Castro, J. Cristia, and C. Scartascini. 2015. “Does Energy Consumption Respond to Price Shocks? Evidence from a Regression-Discontinuity Design.”](#)

This study has also appeared in [The Journal of Industrial Economics](#).

DEPARTMENT OF RESEARCH AND CHIEF ECONOMIST

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Authors: Paulo Bastos, Lucio Castro, Julián Cristia, and Carlos Scartascini

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