# Evaluating own-price dynamics in taxing environmental externalities

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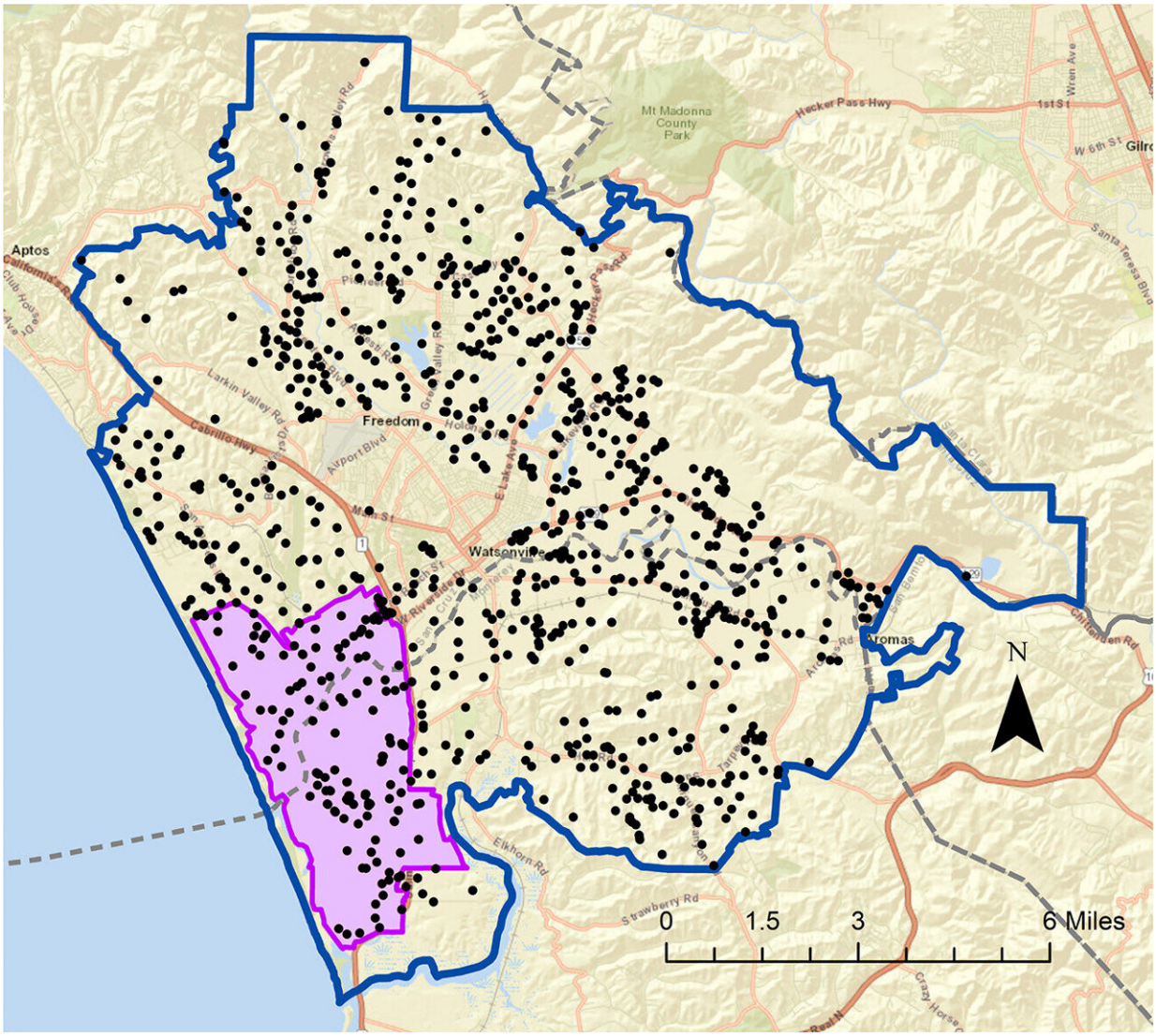


Irrigation district service area, rate zones, and wells. The service area of the Pajaro Valley Water Management Agency is divided into two different rate

zones. The shaded area delineates the Delivered Water Zone, where users began facing a higher water price in 2011. Each dot represents a groundwater well. The dashed line marks county boundaries; the service area is split between Santa Cruz County in the north and Monterey County in the south. Credit: *Journal of the Association of Environmental and Resource Economists* (2023). DOI: 10.1086/728988

Many parts of the world are experiencing severe drought, and with climate change, many of the planet's most productive agricultural regions will suffer from increased water scarcity. Agricultural water pricing may be a critical instrument to managing increasingly scarce resources. Thus, understanding agricultural firms' response to pricing is crucial to deploying prices to regulate water use.

The authors of a paper published in the *Journal Association of Environmental and Resource Economists* quantify the dynamic impacts of pricing groundwater extraction by leveraging a large shift from a single price for groundwater pumping to two geographically distinct prices and estimating how farmers respond each year following the price increase.

In "The Dynamic Impacts of Pricing Groundwater," authors Ellen M. Bruno, Katrina K. Jessoe, and W. Michael Hanemann exploit a price shift incurred by a subset of firms that persisted over several years to evaluate how the magnitude of firm response to prices evolves. The research design exploits a legal ruling that exposed some farms in the Pajaro Valley, a productive agricultural area in California, to a large and enduring water price increase. This policy change lends itself to an event study framework to evaluate the water use response in each of the five years following the ruling in a setting characterized by incomplete markets and dwindling supplies.

The authors find that average treatment effects obscure important dynamics in firm price response. On average, the 21% price increase reduced groundwater extraction by 22% following the price split. Over time, however, firms become increasingly responsive to prices, with the implied price elasticity doubling between the first and fifth year after the price change.

"Our groundwater results stand in contrast to the convention in the literature that water demand is inelastic," the authors write. "Over longer time intervals, agricultural groundwater demand is relatively price elastic as farmers adjust through margins that may simply be unavailable in the short run."

The authors note that the work underscores the limitations of using short-run estimates in the design and evaluation of long-run policies.

Ultimately, they write, the "difference in price sensitivity over time may be particularly acute in the agricultural water setting given that the available margins of response to farmers within a year—less irrigation all else equal—differs substantially from the margins available over a multiyear horizon—land use decisions."

**More information:** Ellen M. Bruno et al, The Dynamic Impacts of Pricing Groundwater, *Journal of the Association of Environmental and Resource Economists* (2023). DOI: 10.1086/728988

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