



# POWER CONFERENCE

On Energy Research and Policy

## ABSTRACT

### ***"Spatial Externalities in Groundwater Extraction: Evidence from California Agriculture"***

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Agricultural and water pumping demand for electricity comprises about 8% of California's total electricity usage. Groundwater pumping, a significant share of this usage, creates even more external costs than typical electricity consumption. When one farm pumps groundwater, it lowers the level of the aquifer and increases pumping costs for neighboring farms—who now must pull groundwater a greater vertical distance. We study farmers' electricity usage for groundwater pumping and estimate the extent to which one farm's pumping behavior hurts neighboring farms. We assemble a novel dataset that combines (i) detailed data on farmers' electricity consumption, (ii) rich data from technical audits of these farmers' groundwater pumps, and (iii) publicly available measurements of groundwater depths in California aquifers. Using changes in agricultural electricity prices, we estimate farmers' pumping behavior to be far more price responsive in the medium-term than previously thought. However, we find no evidence that farmers respond to within-day price changes, suggesting limited opportunities for demand response from the agricultural sector. We then calculate the extent to which one farm's water pumping from a shared aquifer raises costs for neighboring farms. Our results suggest that the magnitude of the "pumping cost" spillover effect is fairly small compared to each farm's private cost of pumping groundwater.