Energy, groundwater, and crop choice

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Abstract

Groundwater is a key resource for agricultural production globally. Increasingly rapid aquifer drawdowns—as well as the policies intended to increase their sustainability—increase costs to agricultural producers, with unknown consequences. This paper provides the first large-scale empirical estimates of how farmers respond to changes in groundwater costs in one of the world's most valuable agricultural areas: California. Using rich administrative data and exogenous variation in the price of electricity, a key input into groundwater extraction, we find that farmers are very price responsive: we estimate large price elasticities of demand for electricity (-1.17) and groundwater (-1.12). We demonstrate that crop switching and fallowing are the main channel through which farmers respond to increases in groundwater costs. Using a static discrete choice model, we estimate that a counterfactual \$10 per-acre-foot groundwater tax—a level consistent with California's sustainability targets—would lead farmers to reallocate 3.9 percent of cropland, with increases in fallowing and high-value fruit and nut perennials, and decreases in annual crops and low-value perennials.

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