

## Free Power, Irrigation and Groundwater Depletion: Impact of the Farm Electricity Policy of Punjab, India

**Disha Gupta**

Delhi School of Economics, India  
disha@econdse.org

### Abstract:

India is the world's largest user of groundwater with increasing reliance on electric-operated tubewells for irrigation. Power subsidies in the form of flat-rate pricing or free provision of electricity have led to debates on whether such policies contribute to over-extraction of groundwater resources calling into question their sustainable use. In most Indian states, farmers pay a flat rate or fixed charge on the basis of horsepower rating of the water pump as opposed to a unit price for the use of electricity for groundwater pumping. Till date, flat-rate pricing policies govern the electric supply in agriculture in most of the states. This paper quantifies the impact of change in the policy regime from flat-rate to free farm electricity pricing introduced in Punjab, an agriculturally important state of India, in February 1997 using a difference-in-differences framework. The policy of free farm electricity has implications for groundwater use in the state through various channels. Post the policy of free electricity, electric pumps became cheaper to use in Punjab due to lower operational costs and freed up resources which would incentivize farmers to invest in electric pumps. Moreover, since farmers were now not charged a flat-rate fee based on the horsepower rating of the pump, they had an incentive to invest in pumps with higher horsepower rating. The price of electricity at the margin continued to be zero before and after the policy change. For a given electric-operated tubewell and pump, we would therefore not expect much of a first-order change in pumping. But we would expect a larger number of electric-operated tubewells and higher horsepower, leading to greater overall pumping. This channel would lead to greater extraction of the groundwater resources resulting in deepening of the groundwater depths. This is the first study to quantify the impact of free farm electricity using causal methods. Based on village-level data from the second (1993-94) and the third (2000-01) rounds of the Minor Irrigation Census, the study finds a differential increase in the number of electric-operated tubewells, horsepower load and potential discharge capacity of pumps in Punjab as compared to an agriculturally-similar neighbouring state, Haryana, which is taken as the control group. Through these channels, the study also finds a differential increase in percentage deviation in groundwater depth from its mean in the baseline period by 16 per cent. Nationally-representative data on groundwater levels from Central Ground Water Board shows impact heterogeneity with sharper effect on groundwater depth for farmers who are closer to the cut-off of about 10 meters where a technological shift from centrifugal to submersible is required for groundwater pumping. The results indicate increased pumping of groundwater resulting in greater depletion of groundwater resources post implementation of the free farm electricity policy in Punjab.

**Keywords:** Water Pricing, Power Subsidies, Groundwater Depletion, Irrigation, Agriculture

**JEL Codes:** O13, Q18, Q25, Q48