

Becker Meets the Behavioralist: Promoting Compliance with Outdoor Watering Restrictions

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General Motivation

- Policy-makers frequently rely upon non-pecuniary measures to manage water supplies
 - Rationing strategies and outdoor watering restrictions
 - Public education campaigns that highlight import of conservation and efficient utilization of resource stocks
- Strategies originally implemented as temporary measures to cope with extreme drought events
 - Easier to implement than price based interventions
 - Ample evidence that individuals are significantly more pro-social in times of “disaster”

General Motivation

- Growing body of evidence suggesting that non-pecuniary policies can influence demand (intensive margin)
 - Social comparisons
 - Normative appeals
- Open question whether such policies can influence rates of compliance (extensive margin)

Motivating Problem

- Outdoor watering restrictions that allow households to water lawns on two assigned days per week
- Restrictions initially implemented in 1992 as reaction to prolonged period of drought
- Restrictions made permanent in 1996
 - Guard against droughts through sufficient water storage
 - Assure adequate flows of Truckee River to Pyramid Lake

Motivating Problem

- Enforcement of regulations is problematic
 - Infrequent water patrols
 - Nominal fines for repeated violations in same calendar year
- Truckee Meadow Water Authority considering change in policy to allow thrice a week watering
- Ensuring compliance with restriction takes on added import

Specific Aims and Approach

- Gather empirical evidence on relative effectiveness of these different message types
- Natural field experiment
 - Households are unaware that they are part of experiment
 - Randomization serves as instrument to permit clean evaluation of “treatment”
- Provide apples-to-apples comparison of messages that focus on monitoring versus pro-social appeal

Experimental Design

- Daily monitoring project of 4,800 residential water consumers over an eight week period in summer 2007
 - Readings are taken during overnight hours from households with smart-meter technology
- Households randomly assigned to control group or one of three treatments
 - Schedule reminder
 - Drought letter with pro-social appeal
 - Monitoring letter – Unusual patterns of usage in the area

Experimental Design

- Within subject design as treatment letters were mailed during fourth week of project
 - Identification of treatment effects will be based on diff-in-diff approach
 - Compare change in use after intervention across treatment and control groups
- Subset of households are monitored during summer 2008 to examine persistence of treatment effects

Experimental Results

- Identify days where use suggests outdoor watering
- Restrict data to subset of unassigned days to examine change in rates of compliance after intervention
- Estimate random effects probit of compliance on indicators for various letter types and other controls

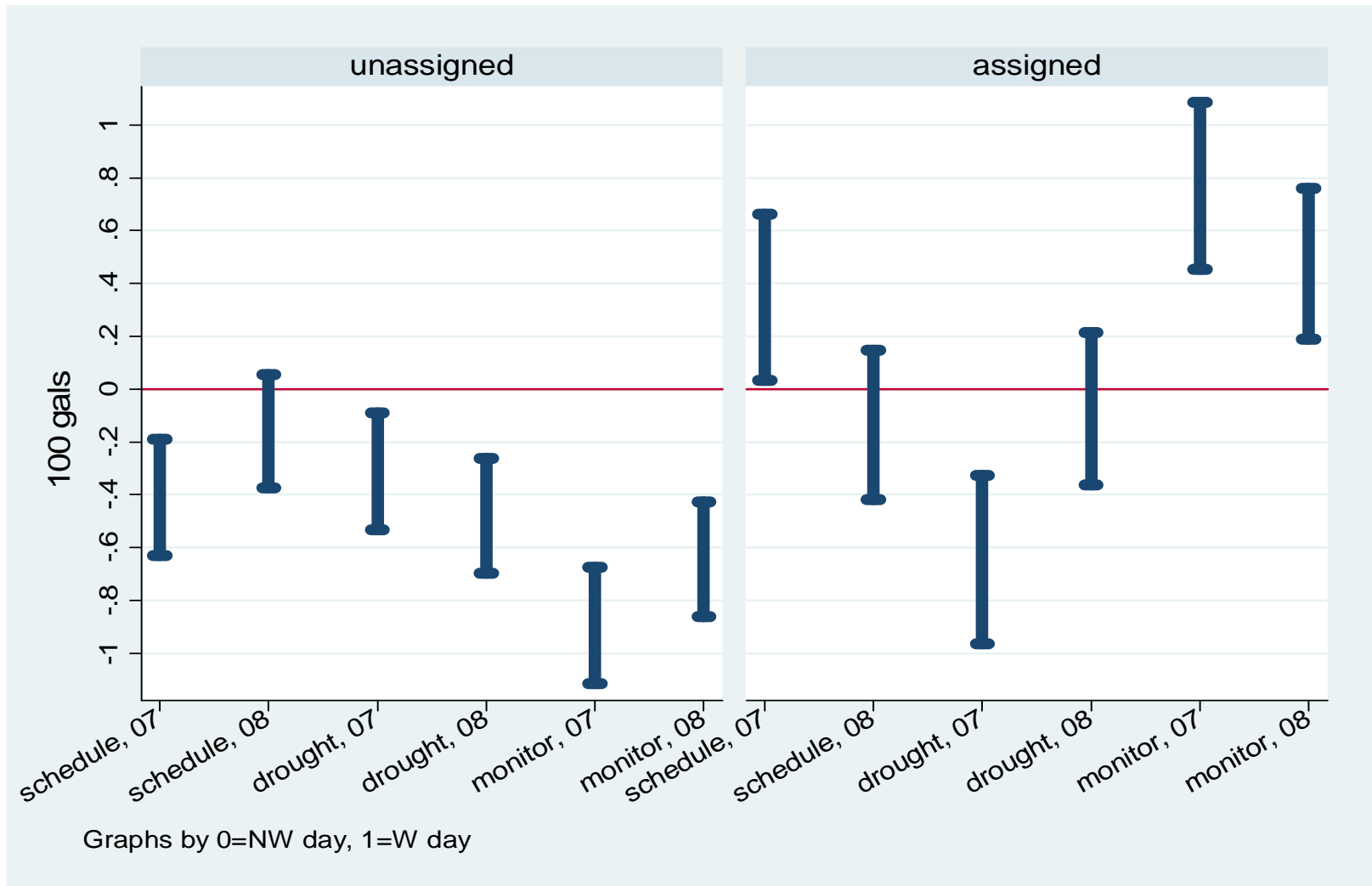
Experimental Results

- Estimate an approximate 23% likelihood of watering on unassigned day in pre-intervention period
- No difference in rates of compliance amongst control group in post-intervention period
- Treatment effects
 - Schedule reminder generates 2.2 percentage point reduction in non-compliance
 - Normative appeal generates a 1.5 percentage point reduction in non-compliance
 - Monitoring letter generates a 3.5 percentage point reduction in non-compliance

Experimental Results

- Unassigned days
 - No discernable difference in use after intervention amongst control group
 - Significant decline in use after intervention – 6.4 to 11.9 percent – amongst treatment groups
- Assigned days
 - Increased use amongst households in all treatment groups following intervention
 - Relative to control group:
 - Significant increase in use for households assigned the schedule and monitoring letter
 - Significant reduction in use after intervention - for households assigned the drought letter

Experimental Results



Experimental Results

- Individuals eschew watering schedule unless prompted
 - Unable to parse whether ignore restrictions or were unaware of assigned day
- Households respond to the likelihood of “punishment”
 - Shift consumption from unassigned to assigned days
 - Significant reduction in estimated incidence of cheating
- Appeals to pro-social preferences promote conservation on both assigned and unassigned days
 - Approximate 5.2 percent reduction in overall water use relative to control group

Experimental Results

- Permanence of treatment effects
 - Monitor subset of households during summer of 2008
- Some evidence that treatment effects persist
 - Reductions in use on unassigned days for both drought and monitoring letters
 - Increase in use on assigned days for households assigned the monitoring letter
- Suggests treatments may have prompted “technological” change