

Behavioral Economics: Developments and Opportunities in the Environmental/Water Field

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Motivations for BE and Env.

- The behavioral economics and food research area has been very productive and interesting and has had an impact
- Huge potential given the relatively poor track record of traditional education efforts and high transaction costs associated with other policies
- May be able to bypass legislative efforts in some cases, useful if there is gridlock

Behavioral economics and decisions

Relevant findings from Nudge:

- People are influenced by a multitude of cognitive biases, including: framing effects, poor at predicting consequences, hot states, and status quo/inertia
- May also be influenced by social norms, some of which may be communicated by the default option
- Automatic vs reflective systems (economics assumes the latter for all decisions)

Implications from Nudge:

- Who uses, chooses, pays and profits, i.e. incentives still matter, but:
- Maximizing choice set can be problematic especially if the issue is complicated and people don't get timely feedback
- Default option is powerful, needs to be harnessed
- Small channel factors can have large influence
- Frame issues as relative gains to overcome loss aversion
- “Libertarian paternalism” via choice architecture is a third way

Behavioral economics and the environment: Examples

- People can see the purchase of a Prius but not the purchase of Honda hybrid or green energy (Grickevicius et al. 2010)
- Energy use is invisible. An ambient orb that glowed red when energy use was high reduced energy use by 40% during peak periods (Thompson 2007)
- “Green Lights” program to reduce energy use by firms has been successful (cited by Sunstein and Thaler, 2008)
- Green energy default in a conservative part of Germany was chosen by > 90% (vs about 1%) due to default (cited in Sunstein and Reisch 2013)

Examples, cont.

- Disclosure requirements in the Toxic Release Inventory have by themselves reduced toxic releases (cited in Sunstein and Thaler, 2008)
- Social norms (smiley faces) have been successful in reducing electricity use (Allcott 2011).
- At Rutgers, having double-sided be the printer default reduced paper use by 44% (cited in Sunstein and Reisch 2013)
- (And the default printing for Powerpoint needs to be handouts rather than slides!)

Examples, cont.

- Use of financial incentives seems to not crowd out intrinsic motivations based on empathy (Czap et al.)
- There do seem to be social preferences affecting voting behavior for a public good, i.e. people deviate from selfish voting behavior (Messer et al. 2010)
- In Ann Arbor, Michigan, a ban on P fertilizers to homeowners (unless they could demonstrate a need) resulted in a statistically significant reduction in ambient P concentrations within three years (Lehman et al. 2011)

Arocha and McCann (2013)

“Behavioral Economics and the Design of a Dual-Flush Toilet”

- Dual flush toilets invented in Australia in 1980
- Provides a choice between a high flush volume for solids and a lower flush volume for liquids (e.g. 1.6/0.8 gallons per flush)
- BUT: some are easier to operate than others which is especially important in public restrooms!
 - Lower frequency
 - Less personal incentive to save water

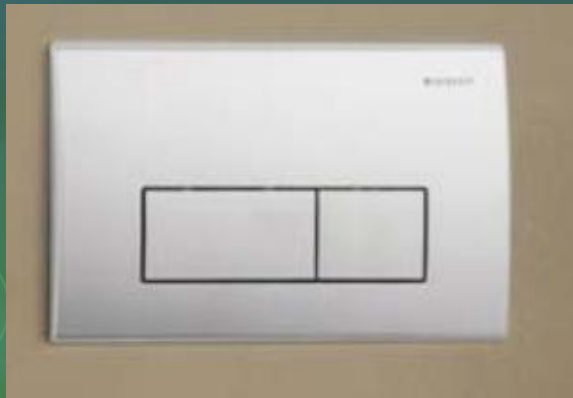
Examples of dual flush mechanisms



Grohe



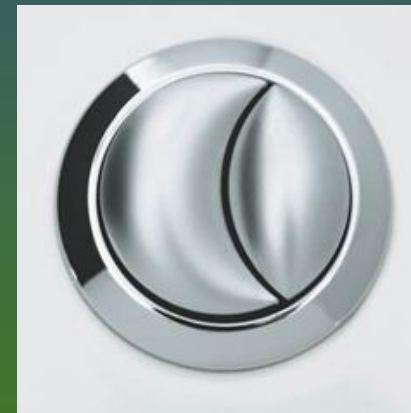
Caroma



Gerberit



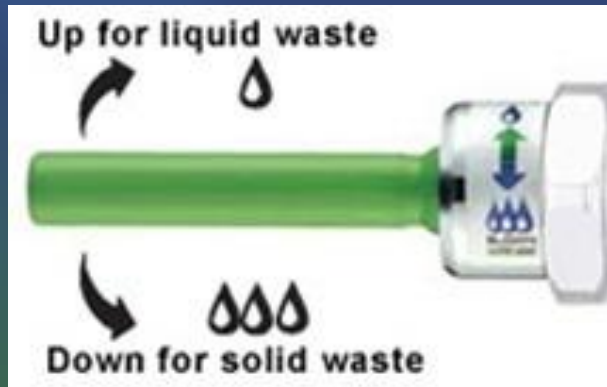
Sloan



Kohler

The Sloan Uppercut[®] flushometer

Unlike other dual flush toilets, the Uppercut[®] uses the same interface (handle) for both solid and liquid flushes.



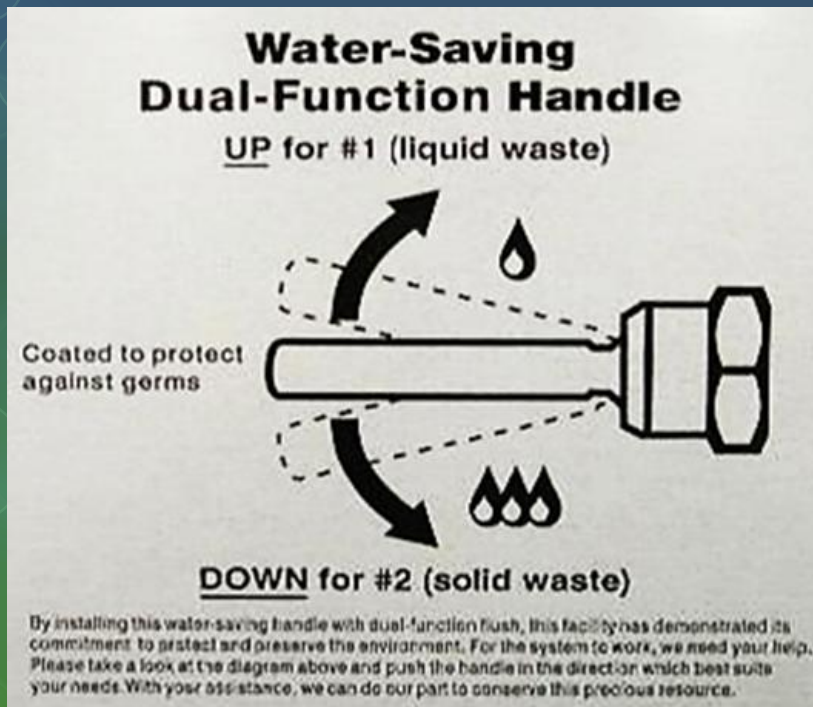
Thus, the user is presented with a 'default' option—and most people are conditioned to push a toilet handle *down*.



The Sloan Uppercut[®] flushometer

If water savings are the goal, the design of the default option on an Uppercut[®] is counterproductive.

Building owners/contractors may purchase additional signs, at extra cost, to be mounted in stalls.



Overview of data collection

Data were collected:

- From restrooms located in the new Columbia City Hall building
- From a total of eight women's toilet stalls (two restrooms on different floors with a total of four stalls each)
- Office of Sustainability located on 2nd floor

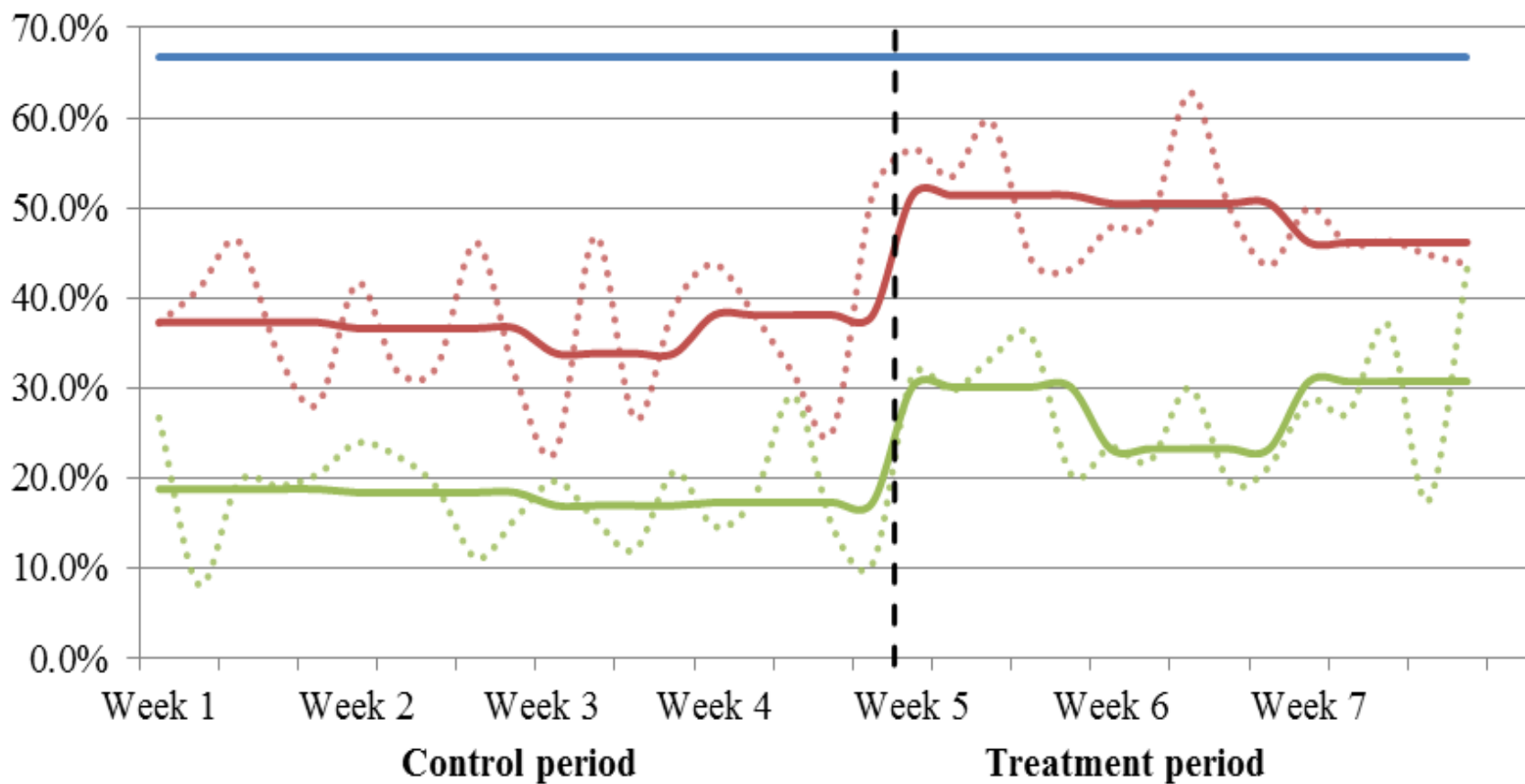


Projected small/up flush counts were needed to test hypotheses relating to the effect of the default and signage. We used the conservative estimate from Sloan, 2:1, implying 66% should be up flushes (others indicate ratios as high as 5:1)

Two stages of research:

1. *Control period*: the number of up and down flushes was recorded and compared to the projected usage over a period of four weeks.
2. *Treatment period*: Two wall plates were added to each stall to determine the effects of adding instructional signs and flush counts were recorded over three weeks.

- The toilets were fitted with sensors that counted the number of up and down flushes.
- No signs had ever been posted to alert the user as to the handle's specialized functions other than the instructional stickers attached to the flush handles themselves.
- Building employees and other users were not given any information about the study or the flush counting sensors unless they requested it.



- Expected low volume flushes
- Floor 2 actual
- Floor 3 actual
- Floor 2 weekly average
- Floor 3 weekly average

Implications of research

- Given that individuals need a low-volume flush most of the time, a far more intelligent design would be to reverse the mechanism such that pushing the handle down results in a low flush.
- Those that have two separate buttons eliminate a default option altogether; it is an active choice.
- This study has been used in discussions of water fixture use in California

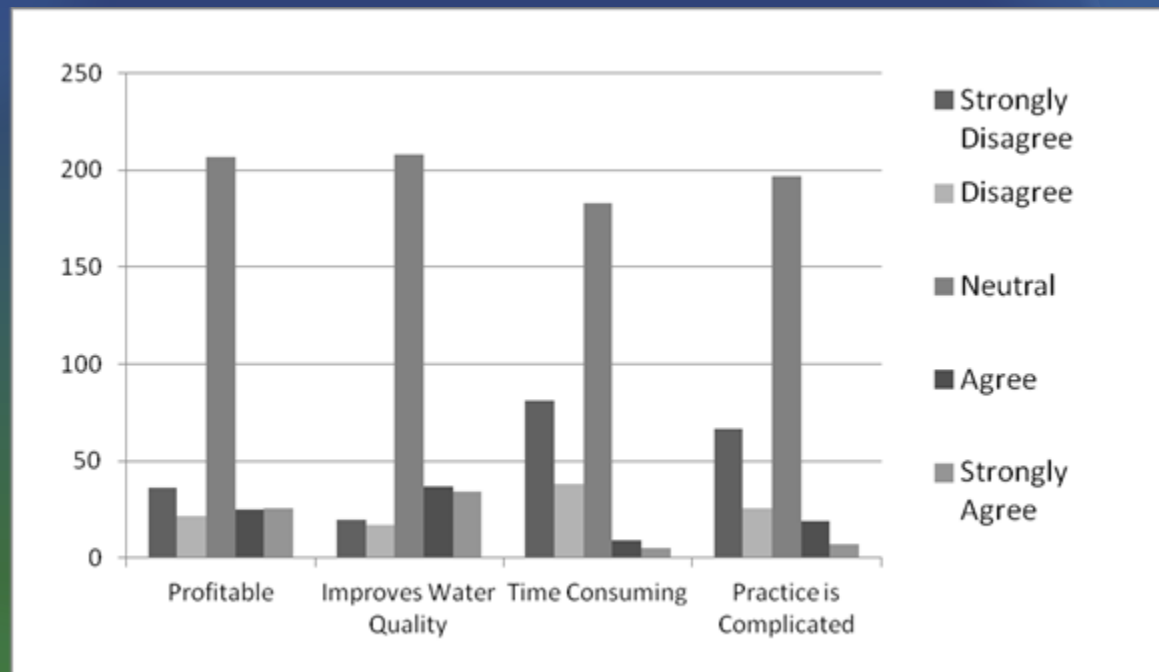
Stahlman and McCann (2012) “Technology Characteristics, Choice Architecture and Farmer Knowledge: The Case of Phytase”

- Phytate in feed ingredients means that non-ruminants can't digest all the phosphorous in their diet
- Phytase is a win-win technology that reduces P content of manure and also use of added dicalcium phosphate
- Maryland has had a phytase mandate since the 1990's
- Was mandated in the Netherlands in 1990's
- Incorporated in premix by integrators and feed companies due to price since about 2002 – essentially all farmers use it

Survey findings

- A survey of Iowa and Missouri livestock farmers in 2006 found that only 16% of non-ruminant farmers knew they used phytase
- 34% said they didn't know and 45% said they didn't use it
- Compared to other practices, more farmers left the survey questions blank and more responded with a neutral answer

Response Count of Non-Ruminant Farmers' Opinions of Phytase Characteristics



Why this unknowing adoption?

- Research became more than an adoption study
- Induced innovation and competition reduced phytase costs from \$12/lb to \$4/lb in 10 years, phytase is now the default
- Phytase is invisible in a premix, looks a bit like ground soybeans, names vary
- Who chooses often depends on the contract but even independent producers buy a premix formulated for them based on stage of growth, i.e. complex choice structuring exists

Implications of research

- Given that adoption rates for even win-win practices such as soil testing are fairly low, this highlights a way to increase use of technologies with certain characteristics
- Invisible technologies can thus have both advantages (get around inertia, status quo bias) and disadvantages (as Sunstein discusses for energy)
- Companies choose defaults for us all the time, can we make them ones that are win-win?
- The structure of the industry matters as far as available levers

McCann et al. (2014) “Effects of Observability and Complexity on Farmers’ Adoption of Environmental Practices”

- Modeling of nonpoint source pollution usually assumes that farmers know the impact of their actions but regulators don’t.
- This study tried to explain an anomaly; why were stated adoption rates of manure testing so much lower than application setbacks when the perceived profitability was similar (18% vs 60%)?
- Hypothesis was that it could potentially be explained by two factors which differed between the practices, observability and complexity.



Results

- Farmers thought that setbacks were better for the environment than manure testing although scientists don't (significant factor for setbacks)
- They were also less likely to agree that setbacks were time-consuming and complicated (the latter was negative and significant for manure testing)
- Contrary to all other practices that were examined, those with solid manure systems were significantly more likely to adopt setbacks than those with liquid manure
- Having a lake or stream on the property, or HEL significantly increased adoption of setbacks but not manure testing

Implications

- Nutrients, like energy use, are essentially invisible which poses problems, even for people who might want to improve water quality
- Making the invisible, visible may have potential in educational campaigns
- Technological fixes may have potential (e.g. instantaneous manure tests)
- “What can be observed, gets managed”

Recommendations from Sunstein 2013

- Harness the power of inertia, defaults
- Choose win-win defaults or ones that have low consumer costs and large environment benefits
- Provide better feedback/information/disclosure to consumers (e.g. Energy Star)
- Make information “concrete, straightforward, simple, meaningful and salient”
- Influenced active choosing, provide one option first, explain main advantages and disadvantages
- Provide information about others’ behavior to take advantage of social norms

Recommendations from Weber 2013

- People have a broad range of goals that can be selectively activated, for example churches can frame environment as a moral issue
- Priming individualistic goals has detrimental effects on environmental choices
- Don't present issues in an abstract statistical way – when automatic and reflective systems are in conflict, emotion/fear wins
- Take advantage of loss aversion by changing the reference points, talk about benefits before costs
- Provide visual evidence of near-term effects on things/places that matter to people

Recommendations from McCann

- General issue, under what conditions can we bypass human decisions versus convincing many people to do things differently?
- Research under what conditions technological solutions to replace human decisions, vs institutional or educational solutions, are useful (e.g. Australia P example)
- Develop technologies that are cheap, simple and automatic, but that avoid things like irrigating while it is raining (or heat when it will shortly warm up), offer a prize?
- Build good decisions into products

McCann's recommendations, cont.

- Need more research on farmer behavior since they are “Humans” too (e.g. salience of yields vs profits)
- BE and TC may imply more of an emphasis on structural practices such as buffers
- Can government or non-profits pick up/sell manure for farmers? (inertia)
- Can we use “water cams” to show farmers and/or homeowners what is happening during storms?
- Mandate (almost) win-win defaults, e.g. nitrogen inhibitors in fall, or active choosing with farmers having to check that they want to waste N
- Make environmental choices the easy ones