Testing the Effectiveness of Using Loss Aversion to Encourage Adoption of Energy Efficiency Recommendations on Wisconsin Dairy Farms

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OVERVIEW

- Lit Review
  - Economics of Energy Efficiency
  - Behavioral Economics & Behavioral Failures
  - Prospect Theory
    - Loss Aversion
- Experiment
  - Letters encouraging adoption of EE recommendations
  - Phone calls one month later
  - Results
  - Conclusions

"The central characteristic of agents is not that they reason poorly but that they often act intuitively. And the behavior of these agents is not guided by what they are able to compute, but by what they happen to see at a given moment." Daniel Kahneman

Energy Efficiency Gap

The apparent gap between the optimal level of energy efficient technology, and the actual amount adopted in the marketplace (Jaffe & Stavins, 1994)

20-24% for electricity (Nadel, Shipley & Elliot, 2004)

Potential to save $48 Billion annually on electricity (0.35% of U.S. Economy)

Demand-Side Management (DSM)

Utility programs to promote energy efficiency and load-shifting

Spending ($2008)

- $4B in 1993
- $1.5B in 2003
- $3.7B in 2008 (EIA,2008)

Focus on Energy - Wisconsin

Economics and Energy Efficiency

Slow diffusion of technology

Market barriers (Brown, 2001)

- Principle-agent problems
- Bounded rationality
- Low priority on energy efficiency
- Incomplete markets for energy efficiency

Market failures (DeCanio, 2004)

- Monopolies
- Externalities
- Public goods

Behavioral Economics

Behavioral Failures (Shogren and Taylor, 2008)

Bounded rationality (Simon, 1955)

Anchoring and adjustment (Kahneman & Tversky, 1974)

Certainty and pseudo-certainty effects (Kahneman & Tversky, 1979, 1981)

Endowment effect (Thaler, 1980)

Status quo bias (Samuelson & Zeckhauser, 1988)

Accessibility bias (Kahneman, 2003)

Expectations bias (Ariely, 2008)

Framing effects (Hammon, Keeney & Raiffa, 2006)

Loss aversion (Kahneman & Tversky, 1979)

Prospect Theory (Kahneman & Tversky, 1979)

Carriers of value are changes in wealth or welfare, rather than final states

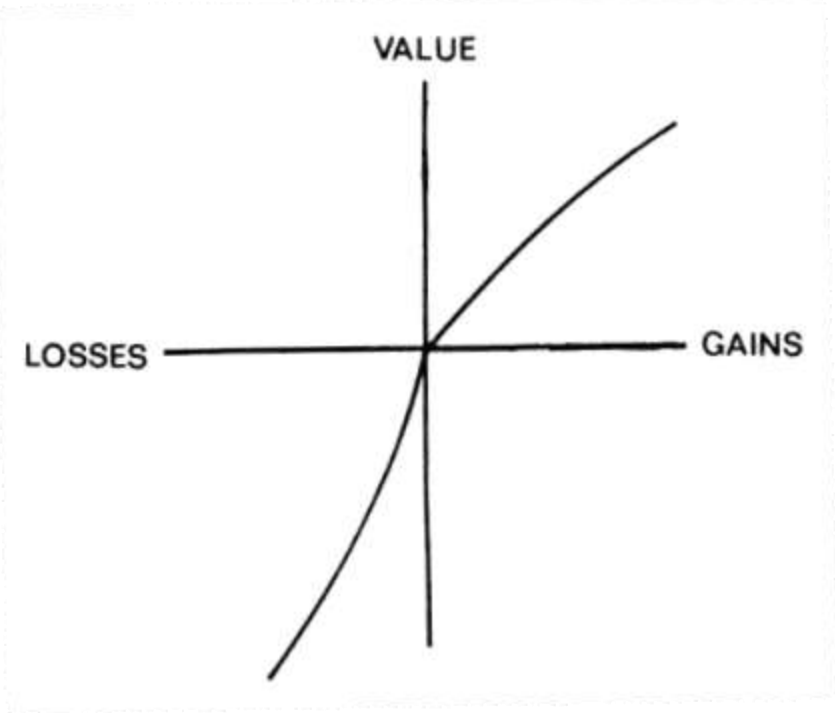
S-shaped value function:

Reference dependent

Defined on gains and losses

Steeper for losses than gains

Shows loss aversion



Loss Aversion

"The aggravation that one experiences in losing a sum of money appears to be greater than the pleasure associated with gaining the same amount," (Kahneman & Tversky, 1979, p279).

Found in many lab studies, and used to explain the equity premium puzzle, (Benartzi & Thaler, 1995), seller behavior in real estate markets, (Genosove & Mayer, 2001), the high volatility of individual stock prices, (Barberis & Huang, 2001), and risk taking in international politics, (Jervis, 1992).

Question?

Can loss aversion be used to encourage adoption of energy efficiency recommendations?

Experimental Design

Send one of two versions of a letter to dairy farmers that had received energy audits through Focus on Energy in 2009.

Recipients randomized into two treatment groups and a control group.

All letters will encourage the farmers to contact Focus for help implementing the best remaining energy efficiency improvement from the earlier audit.

Experimental Design

Hypothesis: subjects receiving a message of financial *loss* due to energy costs will respond at a higher rate than subjects receiving a message of financial *savings* in energy costs resulting from the installation of new equipment.

Null hypothesis: there will be no significant difference in the response rates of the two treatment groups.

Experimental Design

531 farms were split into 3 groups: two treatments and one control

357 letters were sent out, each one customized to the particular recipient

179 “Losing” letters

178 “Save” letters

174 Controls

Data Collection

Letters were mailed July 1, 2010.
Responses were received until July 31, 2010.

Beginning in August, three telephone attempts were made to reach each non-respondent, prompting them for a response to the letter.

The caller was blind to which treatment letter had been sent to each subject.

Results

Letters	Losing letter	Save Letter
Positive Response	5	2
No positive response	174	176

Losing 2.7%, Save 1.1% p=.4485

Combined Letters	Letters/phone	Controls
Positive response	43	1
No positive response	113	173

Letters & Phone 27.6%, Controls 0.6%, p<.0001

Letter & Phone Call	Losing letter	Save Letter
Positive response	15	28
No positive response	58	55

Losing 20.5%, Save 33.7%, p=.0745

All results were placed into 2 x 2 contingency tables and analyzed for significant differences In response rates using Fishers exact test.

Conclusions

The results of the letter campaign were inconclusive, due to the low response rate (N).

The results of the combined letter and telephone treatment trended toward the Save letter being more effective than the Losing letter, although the results only approached significance, $p=.0745$.

The combined letter and telephone treatment showed significant effects over no treatment (controls), $p<.0001$.

Answer to Primary Question

There was no evidence to support that a message of loss led to increased interest in adopting the recommended efficiency improvement.

Contrary to expectations, the save message may have been more effective than the losing message.

Possible explanations

Low N

Homogeneous group may respond differently than other groups

Subjects may have interpreted save as "not losing"

Specific language in the "Losing" letter may have created an affective (emotional) response in subjects

Further research

Within same population, attempting to get higher number of responses.

Test specific language with focus groups and refine it before going to larger field trials.

Closing

Loss aversion is a robust finding. Despite the results of the current study, fine tuning the message may enable programmers to increase adoption of energy efficiency measures.

Questions?

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