Precourt Energy Efficiency Center

Funded Project Final Survey Report

Principal Investigator(s): **Matthew C. Harding**

Co-investigator:

Project Title:

Paying for Good Deeds: Using Financial Incentives to Achieve Energy Efficiency

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1. Project Description:

The aim of this project is to understand, model and quantify the extent to which behavioral incentives or nudges (and reward schemes in particular) can be used as an effective policy tool for achieving energy efficiency.

The project develops a theoretical economic model of energy consumption, which explains how consumption and energy efficiency can be influenced by behavioral incentives, both classical (ie financial) and behavioral (in the form of psychological nudges).

The project then uses the theoretical insights in conjunction with extensive household level data on consumption and household characteristics to quantify the impact of incentive mechanisms on household energy efficiency.

Research Activities:

In order to evaluate the effectiveness of such schemes in the field I have partnered with a company called Efficiency 2.0, which is one of the leading providers of energy efficiency programs.

I have worked on two different sites to implement the goals of this proposal. The first site is located in the broader Chicago area. In this location Efficiency 2.0 has offered a website linked to a customer's utility account which performs a series of functions:
- Provides detailed informational feedback
- Provides an opportunity for the customer to select an energy efficiency goal
- Provides information of achieving energy efficiency
- Provides social comparisons
- Customers can earn reward points which can then be redeemed for merchandise from local retailers

One of the problems associated with the above approach however is that the Chicago site combines several different behavioral incentives and it is not possible to individually separate their effect. Thus, I have also worked on a second site in Massachusetts, which includes most of the Western Massachusetts residential areas. For this site I am taking a different approach. Together with Efficiency 2.0 and the local utility, I developed several distinct mailers. These mailers were randomized across the territory and provide households with different information and behavioral incentives. Each mailer adds to the information content of the previous one in order to measure the incremental benefit of different treatment designs. The different mailers are:
- Pure Information Treatment: this mailer informs households about the need for energy efficiency and provides target energy savings opportunities
- Information + Feedback Treatment: this mailer also includes important information about a household's past energy consumption

- Information + Personal and Social Feedback Treatment: in addition to personal feedback this mailer also provides a social comparison panel which allows the household to compare its performance to that of relevant neighbors
- Rank Treatment: this mailer is similar to the last one but provides a much stronger social component which more directly encourages households to compete with each other in terms of their relative rank in the outcome distribution

These mailers were sent out to a large number of households. Energy consumption before and after receipt is being measured and related to the type of treatment using a statistical model.

Major Findings:

I have found that, when correctly specified behavioral nudges can have a significant effect on energy consumption. In particular goal setting proved to be particularly potent. Households who commit to an energy efficiency goal do save. The average consumption path is as follows, where 0 denotes the time of signing up for a program:
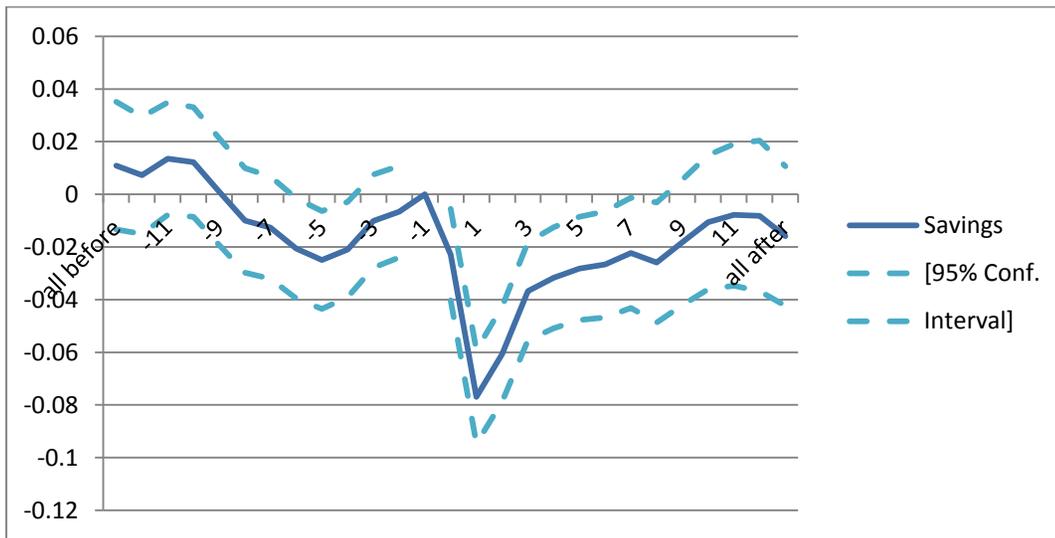
Immediately after adoption households save on average about 8%. The savings however diminish over time. Average savings over a 12 months period average 2-3%.

There is however substantial heterogeneity depending on the savings goals chosen by the household. Households who choose realistic goals ie goals in the 1-15% range save close to 10% on average. Households who choose unrealistic goals ie greater than 15% save for a few months and then give up.

Moreover, households who choose a goal of 0% are the households who are motivated by the financial rewards to join the program. I have found that these households also engage in savings but only for a limited period of time but then abandon their effort. I think this is partly to be explained by the relatively naïve way in which financial rewards are being allocated by companies. Reward points are mostly seen as a way of rewarding loyalty and companies are not very strict about only awarding them to deserving customers. Also financial rewards are typically rather "soft" ie come in the form of vouchers for other purchases and it is not clear that households know how to correctly value the monetary value of such rewards.
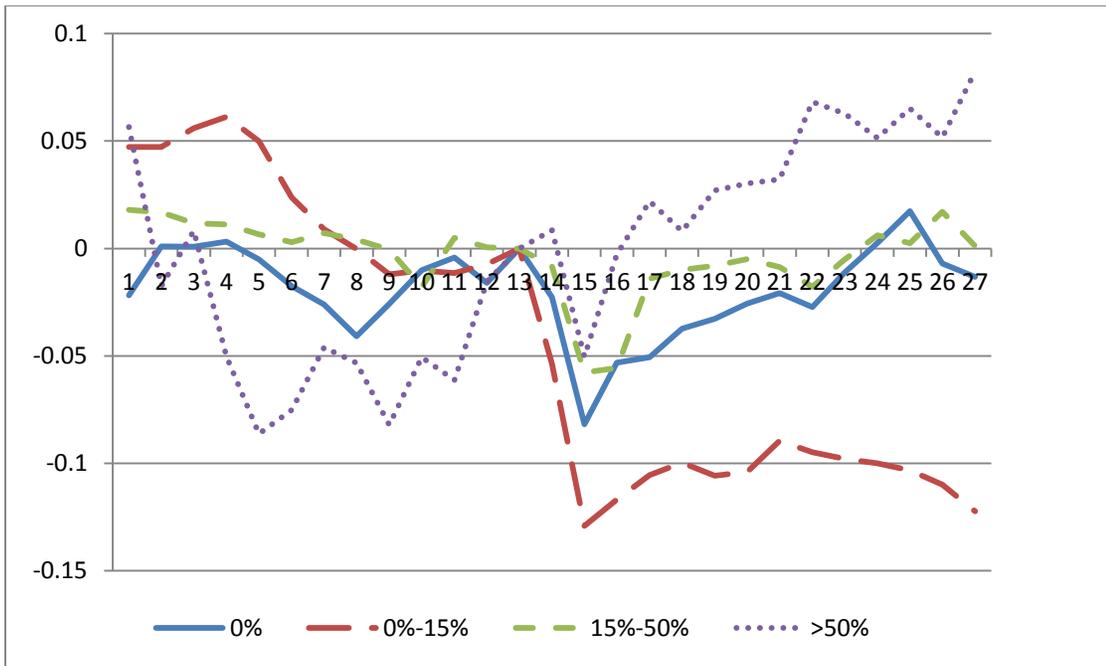
The experiment in Massachusetts very importantly showed that providing households with information about ways in which they can save energy is not sufficient to achieve significant savings. This is consistent with the psychology literature, which emphasizes the fact that information is a tool that can enable behavioral change but only when coupled with the provision of additional incentives. Moreover it showed that different behavioral nudges might produce significant savings. In the experiments both goal setting and neighbor comparisons worked very well. Rank comparisons did not work however. It is thus important to stress the fact that the design of incentive mechanisms is particularly important.

2. How have the results from this project contributed to the solution of energy efficiency challenges? How is it likely to contribute to solutions in the future?

This project involved collaboration with an actual company designing energy efficiency programs. The work has lead to direct energy savings as a result of implementing these pilot programs. Moreover the insights from this work are publicly available and informing and enabling other companies to use economic and behavioral incentives in their design of energy efficiency programs.

3. What undergraduate or graduate students, as well as Post-Doctoral fellows, were involved this project. How were they involved? *Please list their name, classification and a short description of their involvement.*

Ken Gillingham (MS&E Phd Student) – econometric analysis, literature review
Ana Gomez (Economics PhD Student) – econometric analysis
Marcel Priebsch (Economics PhD Student) – econometric analysis
Chris Sholley (MS&E Master's Student) – data cleaning
Sze Suen (MS&E Master's Student) – data cleaning
Kirill Demtchouk (Undergraduate Student) – data collection

4. Will you be continuing work on this project? How and with whom? Please include any comments.

I will extend the current work to understand the role social distance and social networks play in enabling the effectiveness of behavioral nudges to induce energy efficiency. I will collaborate on a large scale program currently being implemented by OPower and Facebook which enables users to compare their energy use to that of their friends.

5. Are you seeking or have you received additional funding as a result of this project, or for continued work on this project? *Please list the amount you are seeking/have received, source of the additional funding and a short description.*

The NRDC is funding the continuation of this project in the context of social networks. The awarded sum is $150,000.

6. Has this project generated any other projects? *Please describe.*

This project involved obtaining detailed household level demographic and property data. It has resulted in two projects related to this kind of data.

Project 1 involves understanding the extent to which household purchasing various energy efficiency features for their homes are able to capitalize on them when they sell their home. This involves the use of a large database from Zillow to measure the willingness of homebuyers to pay for energy efficiency.

Project 2 involves a careful statistical analysis of the demographic differences between households recorded from different sources such as the census or third party aggregators such as Acxiom or Aristotle. It aims to determine which data is best suited when marketing energy efficiency products.

7. What patents, if any, have you received or applied for?

N/A

8. Please list all academic and non-academic (Op-Eds, news magazines, etc) publications and conference presentations as well as articles in progress that came about as a result of this project. May we post these on the PEEC website? *If so, please list the URL or provide a pdf version.*

Paper 1: "Goals and Energy Efficiency"
Paper 2: "Information, Goals and Social Comparisons: Evidence from a Large Scale Field Experiment"

Both papers are currently being revised in preparation for journal submission and will be available in a working paper form suitable for distribution shortly.

9. Provide a URL address for any websites that provide more information for interested parties on your research project, including photos and videos. We will add this information to your project summary on the PEEC website.

N/A

10. Have you developed any specific products, (such as databases, physical collections, educational aids, software, etc), as a result of this project? *If so, please list along with a short description.*

N/A

11. Were any undergraduate or graduate courses generated as a result of this project? *If so, please list the course title and a short description.*

N/A

12. Have you provided any information regarding your research to any public or private institutions (e.g., legislative briefing, government panel, congressional testimony, corporate presentation) or any public or private institution asked you for information regarding your research? *If so, please list the organization, date and a short description.*

N/A

13. Have you partnered or worked with businesses, governmental agencies, NGOs, or other public or private organizations in connection with your project? If so, what role have they played? *Please list the institutional name, type of institution and a short description of the partnership.*

Yes, the project involved a close collaboration with Efficiency 2.0 in the implementation of the program and field experiment.

14. What public education activities have you undertaken in conjunction with this project?

N/A