Nudge or Sludge? An In-Class Experimental Auction Illustrating How Misunderstood Scientific Information Can Change Consumer Behavior

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Appendix 1 Teaching Notes

Statement of Purpose and Objectives:

The specific purpose of this activity is to illustrate the potential of behavioral economics to explain decision making. Providing the public with scientific information is common across sectors, and this in-class experimental game can facilitate the discussion of many different applications of this information and deciding whether they are positive nudges or negative sludges. Given the importance of nudges in different policy contexts, there is the additional value to extend the conversation to further lessons from behavioral economics on the role of safety and environmental information in decision and policy making.

The specific learning objectives to be considered include:

1. Students will be able to critically examine when information provided is a positive nudge or negative sludge.
2. Students will be able to evaluate the role of information in decision making as it relates to different public policy contexts, such as treated drinking water.
3. Students will understand and be able to define WTA.
4. Students will be able to participate in and understand a second price auction by stating their WTA for completing a task.
5. Students will be able to compare the distributions of WTA before and after receiving new scientific information.
6. Students will be able to critically assess the proper regulatory response to a situation where the public's assessment of a risk is different than the scientific/expert assessment.

Intended Audience:

This in-class experiment has been conducted successfully with several audiences, including high schoolers and their parents, undergraduate students, and professionals. The experiment was initially designed to test the impact of a behavioral nudge in consumer valuation of different types of water. We recommend it for courses that cover topics related to consumer preferences, behavioral economics, agricultural economics, resource and environmental economics, and policy. Undergraduate students, graduate students, and/or professional audiences interested in water policy or food labeling are appropriate for this activity. The analysis of the results and discussion can be tailored to the level of preparation of the class.

Teaching Strategy Statement:

This in-class experiment can be adapted to a variety of classroom settings. Depending on the class level and coverage, the instructor can tailor the experiment to emphasize a number of

topics. For example, the use of auctions to measure consumer valuation or the power of behavioral nudges, such as food labeling. The key concept examined by the activity is measuring the impact of information on consumer valuation of a product.

Additional materials

Instructors can incorporate additional materials to enrich this activity. Beyond the interviews (for example, www.npr.org/2021/07/27/1021438772/nudge-vs-shove-a-conversation-with-richard-thaler), articles, and books by Sunstein and Thaler, there are an abundance of online resources about nudges. For example, the "Nudge Unit" in the UK (www.instituteforgovernment.org.uk/explainers/nudge-unit) or the Center for Behavioral and Experimental Agri-Environmental Research (CBEAR) in the United States (https://centerbear.org/).

Journal articles using experimental approaches like second-price auctions can also illustrate how the classroom activity is similar to techniques used in research. See more below in supplementary materials.

Activity Statement

The materials required to run this experiment include printed handouts with instructions and information about the water sources, a labeled jug containing treated tap water, bottled water, a total dissolved solids (TDS) meter, envelope, cash to be used for payoffs, and small paper cups.

This experiment is an in-person activity. The data in this experiment can be collected using pen-and-paper (templates included in appendix), or electronically through a system such as Google Forms, Qualtrics, or Poll Everywhere

A suggested strategy for implementing this activity includes choosing locally available water sources and providing locally relevant articles on consumer response to recycled water.

Instructors should implement this in class activity using the following steps and between-subject design.

1. Introduce students to the experiment
2. Conduct a practice second-price WTA auction using training activity, discuss incentive-compatibility
3. Split class into two groups—this can be done in separate TA sessions, or by using spaces available in and out of the classroom
4. Control Group: Conduct a second-price WTA auction with two types of drinking water
5. Treatment Group:
    a. Test two types of water for TDS using a TDS meter.
    b. Conduct second-price WTA auction with two types of drinking water
6. Review results of auctions and discuss implications and discission topics listed below. This could be done in class after TA sessions, or all in one class session

Topic	Allocated Time	Content	Evaluation
Introduction	2 min	Introduce activity and pass out sheet	Interactive question and answer between the instructor and students
Second-Price Auction for Training Activity	10 min	Introduce auction, conduct auction for training activity.	Successful submission of bids for training
Split class into two groups			
Control Group: Second-Price Auction for Drinking Water	10 min	Conduct auction for water	Successful submission of bids for training
Treatment group only: Test water for TDS and Second-Price Auction for Drinking Water	10 min	Hand out TDS info sheet, test water samples using TDS meter. Conduct auction for water	Students know the difference TDS levels in water types
Recombine groups and collect results			
Discussion	18 min	See Discussion Topics below.	Interactive question and answer between the instructor and students

Suggested discussion topics and questions:

1. Nudges and sludges: Discuss examples from other contexts where informational nudging was or was not effective.
2. Response to recycled water: Discuss the issues involved in consumer response to different types of drinking water, specifically recycled or reused water
3. Scientific labels and fear: Discuss the role of science and consumer fears in policy making (e.g. total dissolved solids concentrations in water, labeling for GMOs, rbST, organic production). Indeed, there are ethical questions that arise, such as the opportunistic behaviors of profit seeking identities, who use their understanding of deeply rooted emotional behavior to their advantage; these ethical concerns may provide the basis for a broader classroom discussion on nudges and sludges.
4. Policy: Discuss the proper regulatory response to a situation where the public's assessment of a risk is different than the scientific/experiment assessment.

This discussion should take place after the experiment and could include a simple survey or interactive question-and-answer between the students and instructor to see how the TDS measure was perceived.

Modifications for smaller classes (i.e., fewer than 24 students)

Instructors should implement this in class activity using the following steps and within-subject design.

1. Introduce students to the experiment
2. Conduct a practice second-price WTA auction using training activity, discuss incentive-compatibility
3. Conduct a second-price WTA auction with two types of drinking water
4. Test two types of water for TDS using a TDS meter.
5. Repeat second-price auction with two types of drinking water.
6. Review results of auctions and discuss implications and discission topics listed below.

Topic	**Allocated Time**	**Content**	**Evaluation**
Introduction	2 min	Introduce activity and pass out sheet	Interactive question and answer between the instructor and students
Second-Price Auction for Training Activity	10 min	Introduce auction, conduct auction for training activity.	Successful submission of bids for training
Second-Price Auction for Drinking Water	10 min	Conduct auction for water	Successful submission of bids for training
Intervention: Test water for TDS	5 min	Hand out TDS info sheet, test water samples using TDS meter.	Students know the difference TDS levels in water types
Second-Price Auction for Drinking Water	5 min	Conduct auction for water	Successful submission of bids for training
Discussion	18 min	See Discussion Topics below.	Interactive question and answer between the instructor and students

Other suggestions

The authors have used a variety of different training activities to introduce students to using a second price WTA auction, for example, eating a piece of very dark chocolate that could invoke a range of consumer responses. We thank our reviewers for the additional suggestions of solving an algebra problem or eating some other divisive food such as popcorn jellybeans. One could also think about using more controversial items such as edible insects. The drawing and algebra problem share the convenience of not requiring additional materials beyond pen and paper.

Supplementary Materials and Examples:

A class could further discuss how product branding and processing, social preferences, and public decision making can help alleviate stigma (Kecinski and Messer 2018; Ellis, Savchenko, and Messer 2019; Savchenko et al. 2019). Labeling to communicate specific processing aspects and origins has become commonplace, and not always with good outcomes (Messer, Costanigro,

and Kaiser 2017). Discussion can be extended to the introduction of the rbST label for milk products, which has been shown to create stigma (Kanter, Messer, and Kaiser 2009). Other evidence includes how passing recycled water through a natural barrier, such as an aquifer, increases consumer acceptance of recycled water for potable and irrigation uses (Ellis, Savchenko, and Messer 2021).

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