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Measuring Stigma:

The Behavioral Implications of Disgust

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MEASURING STIGMA: THE BEHAVIORAL IMPLICATIONS OF DISGUST

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Abstract
Our experiments provide insight into the behavioral responses of disgust from an economic perspective. Stigmatization of products and technologies can lead to large monetary losses even when there are no associative risks. We use a dead sterilized cockroach to 'contaminate' drinking water and generate willingness-to-pay and willingness-to-accept measures of participants' reactions. Contrary to previous results, not involving economic incentives, we find that (1) most participants' values remain unchanged for cockroach water, (2) of those that do display a strong reaction, this stigma response is not always permanent, (3) stigma can be mitigated through treatment such as water filtration. (JEL C91, D81)

1. Introduction

Would you drink a glass of water that had a dead sterilized cockroach dipped into it? What if you were paid $30 or even $30,000? What if you knew that the sterilized cockroach was as safe as a sterile medical instrument? Research in psychology on stigma and disgust (see for example, Fallon et al. 1984, Rozin et al. 1985, Rozin et al. 1986) suggests that participants will avoid water that has been touched by a dead sterile cockroach, but does not explore the effect of monetary compensation on this decision. While it has been recognized that compensation may affect people's responses (Nemeroff and Rozin, 1994), how this impacts individuals' willingness-to-pay (WTP) and willingness-to-accept (WTA) has not been well explored.

Given the potentially large monetary implications for individuals, corporations and governments, understanding the behavioral response to stigma is critical. Common examples of stigma include the shunning of lean finely textured beef (pink slime) or the use of recycled water as part of the public drinking water supply. The costs of stigmatization can be massive. For example, when eight people died of cyanide poisoning as a result of contaminated Tylenol bottles in 1982, Johnson and Johnson lost over $2 billion (Mitchell 1989) despite the company's quick response of triple protection on their bottles. Similarly, large financial losses have been observed in the real estate market in communities neighboring Superfund sites despite extensive cleanup that have cost hundreds of millions of dollars to remediate situations the pose low human health risks (Messer et al. 2006).

The fact that some people shun some products, even when perfectly safe, provides the basis for this study of the human response to stigma. Several definitions of stigma have been provided.

Fischhoff (2001) states:

> *"Stigma is demonstrated by principled refusal to engage in an act that would otherwise be acceptable. It happens when an individual feels that an act is just not done. In this view, stigma is a dichotomous variable. A stigmatized act is unacceptable whatever its associated benefits. If deciding what-to-do involves any cost-benefit calculus, then the resulting choice is not stigma driven*."

Alternatively, Walker (2001) states,

> "*the normal use of the word 'stigma' entails ... an unwarranted level of avoidance behavior. Stigma represents a misconception, a misperception of risk, an overreaction to some thing.*"

According to Walker, then, stigma is not binary but continuous, a disproportionate function of compensation. Traditionally economics considers risk continuous and proportional depending on individual risk attitude. Hence, economists may favor Walker's viewpoint on stigma and might argue that, when participatory risk becomes very large, a significant number of consumers are likely to find that the optimum is a corner solution where the act is avoided altogether.

Different authors have different definitions of the sources and breadth of stigma that leads to avoidance behavior (see Flynn et al. 2001). Schulze and Wansink (2012) produce a model integrating both binary and continuity aspects of stigma. Based on the dual-process model introduced by Loewensteins and O'Donoghue (2007), the authors show that for some people

stigmatization may results in a binary choice while for others it depends on the amount of money involved in the decision.

To better understand stigma, our experiments involved 160 students and university staff members and use a method developed by Rozin et al. (1986), where a dead sterilized cockroach is dipped into a glass of spring water. The key difference, however, is that our results provide measures of WTA this potentially stigmatized water and WTP to avoid this water. Using these measures allows us to move away from a hypothetical approach to explore stigma when individuals are faced with incentive-based decision-making. We show that some participants are subject to stigma even in the presence of monetary incentive, i.e. some participants required larger compensation to drink cockroach contaminated water compared to the non-contaminated spring water while others simply refused to drink the cockroach contaminated water at any price. Procedures to attempt reduce this stigma response, by treating the contaminated water with a filter used for camping, show that stigma can be partially removed. However, some participants still choose to avoid consumption after treatment. In particular we show the development of an inverted V-shape of average WTP and WTA—wherein participants require relatively low compensation to drink spring water; high compensation to drink cockroach water; and finally relatively lower compensation to drink filtered cockroach water. As the cockroach, used to contaminate the spring water, was sterile and therefore did not pose any heath risks, disgust was the driving force that resulted in the stigmatizing responses. Understanding the economic impacts of the behavioral responses to zero-risk situations is important because they can be substantial. Our experiments provide a first insight into these types of behavior from an economic perspective.

2. Literature

Goffman (1963) attributes the term stigma to the Greeks who used the term to refer to markings on a person's body such as cuts and burns to signify that the person was blemished and ritually polluted. Today, rather than referring to a marked person, the term stigma refers to attributes associated with a person, place, technology, or product (Kasperson et al. 2001). Rozin (2001) points out that stigma may be unique to adult humans and that the contamination of humans as Goffman describes can also be observed with food. Previous experiments have frequently used potential biological contaminants to invoke stigma. For example, Rozin et al. (1986) asked adults to rank their response to certain situations from "dislike extremely" to "like extremely" on a 200-point scale. Participants were given glasses of juice that would then have a dry sterilized cockroach dipped into them for about five seconds. The difference in mean likeability of the drinking of the juice that had been "cockroached" from that of the neutral juice fell by 102 points.

Fallon et al. (1984) asked participants to imagine that certain items, such as food items, poison or feces, had fallen individually into a glass of a beverage that they loved. The results suggest that in hypothetical situations, once individuals claim that the idea of drinking the juice is unacceptable, 92% of them continue to reject the beverage even after all distaste and danger were removed. Additionally, Rozin et al. (1995) asked participants how they would feel if a Q-tip that had been in contact with a sterilized cockroach before being cleaned made contact with different parts of their bodies. As anticipated, the response to the cockroached Q-tip ranked lower than a plain Q-tip for every body part, seeing as much as a 35% drop. These hypothetical scenarios

created by Rozin el al. point to stigma not being confined to fearful and dangerous situations, as would be the case with a non-sterilized cockroach, but also extends to disgust as no health-threats are added by an autoclaved cockroach (See Rozin et al. 2000 for a more thorough summarization of the history, description, and theory of disgust and Haidt et al. 1994, for a disgust scale).

Chemical and physical contaminates have also been subjected to study. For example, Rozin et al. (1986) showed that participants preferred a bottle labeled "Table Sugar" over a bottle with the label "Sodium Cyanide" with a red poison sticker despite the fact that both bottles had never been previously used and both labels had never been on any other bottle. Hejmadi et al. (2004) asked participants to image that a tack had fallen into lemonade and then removed without a trace. Participants were asked to indicate if they considered the lemonade unsafe to drink. Contrary to the results of most previous research, which had shown that stigma increased with age, in response to the tack, as age increased, the rejection of the lemonade after the tack had been removed decreased. This may suggest that there exist difference in the reaction to a threat arising from a physical rather than a chemical or biological threat.

Although most of the stigma research has been published in psychology journals, some contributions have been made in economics, as well. (see for example O'flaherty and Sethi 2008, Furuya 2002, Vishwanath 1989). Moffitt (1983) argue that for low-income populations certain social stigma arise resulting in a violation of one of the basic assumptions of behavior – monotonicity. More specifically, some individuals eligible for welfare benefits or the Food Stamps Program simply did not claim these benefits foregoing an increase in income, suggesting,

that some individuals generate disutility from participating in welfare programs (see also Horan and Austin 1974). Kanter et al. (2009) look at the stigmatizing effects product labeling may have on consumer behavior. They show that despite the fact that the food and drug administration regards the use of recombinant bovine somatotropin (rBST) in dairy products safe for human consumption, many consumers, nonetheless, become stigmatized and view the introduction of rBST as a contagion. The authors show experimentally that labels of rBST-free milk have adverse effects on consumers' willingness to pay for conventional milk that does not have any labeling. Similarly, one may imagine a new or relabeled product with a relatively small market causing considerable financial damage to much larger and perhaps long-standing markets, despite the lack of scientific evidence of the stigmatized product's harmful effects. Hoffmann et al. (2014) showed that over 40% of participants in an experiment were unwilling to use a broom that had been produced by a HIV-positive person and over 50% were unwilling to eat groundnuts that had been packaged by a HIV-positive person, regardless of the amount of offered compensation, suggesting that for some, stigma may be binary. This was previously indicated by Fallon et al. (1984), albeit, in hypothetical form.

In many of the above-mentioned papers, treatments were undertaken to remove or reduce stigma (see for example Rozin et al. 1985 or Nemeroff and Rozin 1994). However, as Rozin (2001) points out, stigma reduction may be difficult. For example, he shows that participants still refused to drink juice that had been in contact with a sterilized cockroach even if it had been frozen for one year, suggesting that some stigma may be permanent. Also, reductions in the duration of time the cockroach was in contact with the juice did little to remove the stigma suggesting that stigma is insensitive to dose. Messer et al. (2006) show that stigma removal may

also be time-sensitive. More specifically, the authors show that when cleanup of superfund sites does not occur in a timely fashion, it may not matter if the cleanup happens at all as homes in surrounded communities have become "contaminated" leading to a shunning of homes and severe impacts on property value (see also Dale et al. 1999). Akerlof et al. (1996) found that other forms of social stigma may decrease over time, such as stigma related to societal changes, e.g. the stigma attached to out-of wedlock child births of which todays society is more acceptant than society of only a few decades ago. In Fallon et al. (1984) participants were asked to imagine that a foreign object had contaminated a glass of their favorite juice. Stigma mitigation steps included emptying the glass then filling it again or emptying the glass followed by washing the glass and again filling it with the juice. The results of their hypothetical experiment suggest that as participants' age increased it took more purification steps to retrieve the uncontaminated state. In some extreme cases, such as contaminating the juice with a grasshopper, poison or feces, it required more cleanup efforts to return to the uncontaminated state.

In the following experiment we use an incentive compatible design to generate data on individual WTP to avoid drinking a glass of cockroached spring water and WTA for drinking a glass of cockroached spring water. We also compare the collected data from the cockroached spring water to just spring water (base line) and treated cockroached spring water (stigma reduction attempt), which results in an inverted V-shaped of average values, suggesting that stigma exists in the presence of monetary incentives and stigma reduction is, at least for some participants possible.

3. Experimental Design

In order to generate data with preference revealing properties, we use a form of the Becker-DeGroot-Marshak Mechanism (DBM) (Becker et al. 1964) wherein participants were supplied with an initial monetary balance (*E*) and asked to place a bid[1] (*B*) to avoid performing a specific task. After the bid has been placed, a price (*R*) is randomly drawn from a distribution known to participants. If a participant's bid is greater than or equal to the randomly drawn price, the participant avoids the task and keeps the initial balance. If the bid is less than the randomly drawn price, the participant receives the randomly drawn price and performs the task. Thus, individuals have an incentive to bid their true value rendering the BDM incentive-compatible (see Boyce et al. 1992, Irwin et al. 1998, Messer et al. 2010). As seen in Irwin et al. (1998), assuming participants want to maximize expected utility (*EU*), they will choose such a *B* that will maximize the following objective function:

$$(1)\ \max_{B} EU = \int_0^B p(R)U(Y^0 + E + V - R)dR + \int_B^E p(R)U(Y^0 + E)dR$$

where *V* represents the true value of the task, *p(R)* is the probability that the price (*R*) is randomly selected, Y^0 is the initial income and *U(Y)* a function of income and the value of avoiding the task. Maximizing (1) and setting the first partial derivative with respect to *bid* equal to zero gives:

$$(2)\ \partial EU/\partial B = p(B)[U(Y^0 + E + V - B) - U(Y^0 + E)] = 0$$

The first order condition equals zero and maximizes the objective function when the bid *(B)* equals the true value *(V)* of avoiding the task, suggesting that it is optimal for participants to bid their true value. Decisions in the experiment were made in either groups of one (private good) or

[1] Depending on the treatment, participants would either ask to be paid money for performing a task (WTA) or offer money from a fixed upfront payment to avoid performing the task (WTP) – the "bid" represents either asking price or offer price. The following mathematical proof is calculated using WTP, though analogous for WTA.

[2] Due to the sequential presentation (first: group size one, second: group size three) no order effects should be

in groups of three (public good). This present paper presents the results from the private good treatments[2]. For the analysis of the public good treatments see Kerley Keisner et al. (2013).

The experiments consisted of two parts, Part A and Part B, where Part A trained participants in 14 low incentive rounds to use the BDM. Experiments were further divided into student and staff sessions. In each round, participants were asked to bid on a program that contained a personal loss amount of $6, $15, or $24. All of the experiments were conducted in an experimental economics laboratory of an Ivy League university in the northeast of the United States. The university's institutional review broad approved the experimental designs. The experiments lasted approximately an hour and a half with average earnings of $40 (students experiments). For the experiments involving staff, an additional $10 time compensation was added, thereby making the average earnings $50. Participants were randomly assigned to individual computer terminals equipped with privacy shields. Computers used Excel spreadsheets programmed with Visual Basic for Application to collect the participants' decisions. After the instructions were read, an oral PowerPoint presentation was given to summarize the instructions. Participants were then encouraged to ask questions, which were addressed on a one-on-one basis by the administrators. At no point, during the experiment, were participants able to communication with one another (WTA and WTP instructions can be found in Reviewer Appendix A and Reviewer Appendix B).

Student Experiments. Experiments were conducted with 89 participants recruited from undergraduate economics courses. The average age of the students was 19.4 years. The WTA

[2] Due to the sequential presentation (first: group size one, second: group size three) no order effects should be expected.

sessions were run with 42 participants and the WTP sessions were run with 47 participants. Each participant had a glass of Poland Spring water their desk and was given as much additional water as they desired to ensure that by the second part of the experiment the marginal value of an additional incremental amount of water would be negligible. Likewise, participants were given an opportunity to go to the bathroom between the parts of the experiment.

For the WTA sessions, in each training round, participants were given an initial balance of 10 experimental dollars, where an exchange rate of 33 experimental dollars to one U.S. dollar was applied. Participants were then shown their personal loss amount and instructed to offer the *minimum amount of money they would be willing to accept* and still vote in favor of the program. The offer could be any amount between $0.00 and $30.00. After all offers were submitted, a random compensation between $0.00 and $29.99 was randomly drawn. Hence, a maximum WTA of $30.00 indicates that a person is willing to accept no amount of money available in the experiment session, thus this response is treated as a corner solution. The program was *implemented* if the offer was less than or equal to the determined compensation. In this case, the participants received their initial balance minus their personal loss amount plus the randomly determined compensation. If the offer was greater than the randomly selected compensation, the program was *not implemented* and the participants earned just their initial balance.

For the WTP sessions, in each training round, participants were given an initial balance of 30 experimental dollars, where an exchange rate of forty-seven experimental dollars to one U.S. dollar was applied. Participants were instructed to offer the maximum amount of money they would be willing to pay to avoid paying their personal loss amount. After all the bids were

submitted, a random cost between $0.00 and $29.99 was randomly drawn. The program was *implemented* if the bid was greater than or equal to the randomly determined compensation. In this case, the participants received their initial balance minus the randomly determined cost. If the bid turned out to be less than the randomly selected cost, the program was *not implemented* and the participants received their initial balance minus their personal loss amount. Again, bidding $30.00 indicates a corner solution.

Before the beginning of the second part of the experiment, the administrators collected all glasses of water and placed two three-ounce plastic cups on each desk. In the front of the room three labeled clear empty glass jars were placed on a table. As the oral instructions described the protocols for this part of the experiment, participants observed three different "modifications" to the empty glass jars:

> *Spring Water* – A jar labeled "SW" was filled with the same Poland Spring water that they were drinking during the first part of the experiment. Participants were told that according to the manufacturer, "Poland Spring® Natural Spring Water comes from protected sources deep in the woods of Maine."
>
> *Cockroach Water* – A jar labeled "CW" was first filled with Poland Spring Water. Then a dead autoclaved cockroach was placed into a brine shrimp net, dipped into the water and removed. The water was then stirred. Participants were told that according to the autoclave's manufacturer, "Getinge's steam sterilizers represent the most comprehensive range of general purpose, high performance sterilizers available. They are designed for

sterilizing a broad spectrum of materials involved in industrial processing, research and development, and quality control." Thus, they could expect the cockroach to be as sterile as a surgical instrument.

Filter Cockroach Water – A glass jar was first filled with Poland Spring Water and had a dead autoclaved cockroach dipped into it as described above. This was then was poured through a Sweetwater Microfilter, commonly used for camping, into another jar labeled "FW". Participants were told that according to the manufacturer, "The Sweetwater Microfilter eliminates over 99.9999% of all waterborne bacteria and 99.9% of common protozoan parasites such as Giardia and Cryptosporidium."

In the WTA sessions, participants were advised to offer the minimum amount of compensation they would need in order to drink three-ounces of the modified water. In the WTP sessions, participants were advised to bid the maximum amount of money they would be willing to pay to avoid drinking the water. In this part of the experiment, however, the exchange rate was one US dollar for one experimental dollar, with initial balances still at $10 (WTA) and $30 (WTP). In each design, participants made three decisions before they learned of the compensation or cost that would be used to determine their earnings and whether they had to drink the modified water. Participants submitted their offers (or bids) for each of the modifications of water. Participants were informed that only one of the treatments would actually end up being implemented. This treatment was selected by having a volunteer participant draw a poker chip out of a bag that corresponded to the respective treatment. To control for potential order effects, the choices were presented in different orders in different experiment sessions.

In the WTA sessions, if an offer was *greater than* the random compensation, the participants would receive their initial balance of $10 and would just have to drink the unmodified spring water poured directly from the original bottle into the three-ounce cup. If the offer was *less than or equal to* the compensation, the participants would receive the random compensation in addition to their initial balance, but they would have to drink the modified water. Likewise, in the WTP case, if the bid was *less than* the random cost, the participants would keep their entire initial balance of $30 and have to drink the modified water. If the bid was *greater than or equal to* the cost, the participant would have to pay the cost out of their initial balance, but would only have to drink a three-once cup of spring water poured directly from the original bottle. This design ensured that everyone would have to have to drink a glass of water at the same time, to control for the potential embarrassment (or reward) of having to drink the cockroached water

Staff Experiments. As a follow-up to the initial experiments involving students, a series of experiments were conducted with 72 staff members who were recruited via e-mail through the staff newspaper. Participants were screened to ensure that they did not participate in the experiment more than once or had heard about the experiment previously. The average age of the staff was 37.4 years. The use of staff members was chosen to test if different populations have different reactions to stigma. All sessions were conducted in the evening to avoid selection bias due to work conflicts. WTA sessions were chosen since they provide the highest average values and therefore suggest the greater response to stigma. These sessions used the same protocols and instructions described previously, i.e. spring water (SW), cockroach water (CW), and filtered cockroach water (FW), where the order of the treatments on the spreadsheets was varied to

control for potential order effects. Staff experiments followed the same setup and procedure as the student experiments.

4. Experiment Results

Student Experiments. The results suggest that some participants were indeed concerned about the introduction of the sterilized cockroach into their water. Using a paired t-test (two-tailed), we find, the mean WTA and WTP for cockroached water to rise significantly from $1.82 to $7.28 and from $1.57 to $4.61, respectively (Table 1a and b). Given these significant differences between SW and CW, and depending on the underlying definition of stigma, some participants exhibit a rather strong response to a threat that approached zero, that is, they become stigmatized. There is no evidence that would suggest an increase in risk (health threat) with the dipping of the sterilized cockroach, yet, participants, on average, demand significantly more money to drink cockroached water as compared to drinking spring water. Specifically, participants demanded $5.46 more in the WTA treatment and $3.04 more in the WTP treatment to drink a glass of cockroached water.

These results differ dramatically from some of the psychology literature, where in hypothetical questions, up to 90.5% of the participants said they would not drink liquids after a sterilized cockroach was dipped in them (Hejmadi et al. 2004). In contrast, in our experiments, 54 (60.6%) of the participants submitted a WTA or WTP value of zero for CW, while five (5.6%) of the participants submitted a value larger than $29.99 signaling their unwillingness to rink the water at any amount in the interval [0,29.99]. Additionally, cleanup appeared to have been partially effective as the mean WTA and WTP for filtered cockroach water are $3.33 and $2.69,

respectively. This is higher than the mean WTA and WTP for SW, but significantly lower than for CW. Interestingly, females appear to be much more susceptible to stigma. We found the female mean offer for CW to be $10.70 compared to only $4.17 for the males in the WTA sessions. Similar results are generated for the WTP sessions, where the female mean bids were $7.56 compared to $0.53 for the males. The difference between the genders is still quite pronounced for FW as well with average female WTA ($5.05) being larger than average male WTA ($1.76). Average female WTP for FW ($3.17) is also larger than the average male WTP ($0.79). Also, females show a higher baseline (SW) in the WTA treatment (female: $2.75 versus male: $0.98) while this difference is reversed in the WTP treatments (female: $1.31 versus male: $1.58).

Staff Experiments. The mean WTA for staff for the SW, CW, and FW are $3.41, $7.55, and $5.15, respectively (Table 1c), indicating that staff exhibits the same ordering of offers as the student sample (Figure 1). The difference in mean WTA offers between the student and staff samples for the SW, CW, and FW are $1.59, $0.27, and $1.82, respectively. The difference in the means for cockroached water using a t-test, and assuming unequal variances, is not significant at the 0.10 level, indicating that the amount of stigma appears to be constant across the two different aggregated population segments. Similar to the student sample the results for average female WTA for CW ($9.03) is much higher than that of the males ($2.04). The difference is almost as strong for FW, where average female WTA ($6.16) is substantially larger than the male WTA ($1.37). Also similar to the student sessions is that female staff participants display higher average WTA in the baseline (SW) treatment ($4.05) compared to the male average ($1.00). Combining all student and staff sessions, we show that for all water types

females place a higher average value. This difference is particularly strong for CW, where the average female value ($9.47) is substantially larger than the value placed by males ($2.81).

Combined Analysis. Using cumulative distributions, we were able design supply and demand curves with WTA or WTP (in percent) as a function of price (Figure 2). The supply curve reads as follows: The higher the price, the more willing participants are to drink either water, though, some participants may refuse to drink at any price or at least any price we would pay. The demand curve can be interpreted as follows, the higher the price, the less willing participants are to drink either water. Recall, WTP asks how much participants are willing to pay to avoid drinking the water. Therefore, the higher the price, the less money participants get to keep. The majority of the offers and bids for all three waters were between $0 and $5. For both the SW and the FW, the distributions are skewed towards zero, with ten WTA offers and three WTP bids between $24 and $30. In contrast, 16% of participants submitted WTA offers for CW in the highest range between $24-$30, while 11% did so in the WTP treatments, indicating that some participants experience a rather strong reaction towards CW.[3]

In order to obtain WTA and WTP estimates, the offers and bids were truncated at $0 and $30. We use a two-limit Tobit model to estimate values. Since each participant submitted three offers or bids, i.e. one offer or bid for each type of water, we used a random effects model with the dependent variable being each bid or offer, combined in the term Value *(V)*. We used dummy variables to indicate the specific water type (CW, FW, SW), with the SW variable omitted. We

[3] One individual who offered $30 for the CW stated in the follow-up questionnaire that their offer would have been $1,000 if they had been allowed to do so. Interestingly, this individual offered $0 for the SW, and after the filtering process, offered $0 for the FW, further suggesting that the stigma exists for some people and can be removed by some type of mitigation efforts.

also used dummy variables to indicate the gender of the participant, females coded as a one; whether the participant was a student or staff, with students being coded as one. Additionally, we used a dummy variable for WTP and WTA, where WTP is coded as one. This yields the following model for person *i*:

(3) $V_{ij} = \alpha + \beta_1 * CW_{ij} + \beta_2 * FW_{ij} + \beta_3 * Female_{ij} + \beta_4 * Student_{ij} + \beta_5 * WTP_{ij} + \mu_i + \varepsilon_{ij}$

where $\mu_i \sim \mathrm{N}(0, \sigma_\mu^2)$ and $\varepsilon_{ij} \sim \mathrm{N}(0, \sigma^2)$.

The estimation results are given in Table 2 (N=408). Bids and offers are significantly greater for both CW and FW in comparison to the SW, where the coefficient on CW is greater than the coefficient on FW, indicating that stigma exists in this experiment and can be partially reduced. A chi-square statistic indicates that both CW and FW coefficients are statistically different from one another at the 1% level. The coefficient for females is positive and significant; this suggests that women are more likely to be affected by stigma than men. The student variable does not have a significant effect, meaning there are no significant differences between students and staff with respect to WTA/WTP.

The coefficient for WTP was negative but not significant at the 10% level, which was somewhat surprising, as we did not find strong evidence for the commonly found endowment effect (Kahneman and Tversky 1979). This is an interesting result and deserves some further exploration. We find that our experiment does not appear to exhibit the typical doubling of WTA

when compared to WTP. The average WTA offer is always higher than the average WTP bid, though, smaller than perhaps expected. Recall, participants took part in either the WTA or WTP design, not both. In the attempt to understand why we did not find a significant endowment effect, we went back to the data and removed two participants that exhibited unusual behavior, i.e. they placed higher value on CW and FW than on SW. Given that CW and FW are manipulated SW, that is, they were SW first, we saw no obvious reason (for example environmental concerns for drinking water from a plastic bottle if CW and FW had been retrieved from alternate sources) why SW would receive a lower value. Table 2 (N=402) shows the altered two-limit Tobit regression results. Excluding the aforementioned two participants, we can now show that there exists an endowment effect with significantly differences between values places by WTA and WTP participants. This result needs to be considered carefully as dropping data cannot be a desirable solution to generating anticipated results, however, given that all other regression results remain unchanged, we felt inclined to include these findings.

5. Conclusion

People can display strong emotional reactions and shunning behaviors to potentially stigmatized products and technologies, such as lean finely textured beef (pink slime) or the use of recycled water as part of the public drinking water supply. This response can persist even after it has been determined that no threat exists. Responding to stigma poses significant policy challenges as finding ethically, politically and economically acceptable ways to mitigate stigma can be difficult and costly.

Results from this research involving 160 students and university staff members are different than those reported in the psychology literature. Our experiments show that monetary incentives can lead to participants drinking water contaminated by a cockroach—for a price. In fact, most individuals are willing to drink cockroach contaminated water, albeit, on average at a higher price. Furthermore, filtering cockroach contaminated water reduces stigma as indicated by the lower average WTP or WTA values compared to the values for non-filtered cockroach water. However, for some, even filtering does not reduce stigma. The results are shown in both supply and demand curves. Finally, results from a regression of the WTA/WTP values suggest that females are much more susceptible to stigma than their male counterparts and that there does appear to be a modest endowment effect between WTA and WTP. Our results shed light onto the behavioral response to zero-risk situations. As the cockroach, used to contaminate the spring water, was sterile and therefore did not pose a heath risk, disgust was the driving force that resulted in the larger WTA and WTP values. It is important to understand the economic impacts these visceral responses can have and how to reduce the stigma response once it occurs. Our experiments provide a first insight into these types of behavior from an economic perspective.

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Table 1: Paired T-tests Spring Water - Cockroach Water - Filtered Cockroach Water Comparison.

a. Willingness to Accept Means – Students (N = 42)			
Treatment	Mean WTA	Difference from SW	Difference from CW
Spring Water	$1.82	---	---
Cockroach Water	$7.28	$5.46***	---
Filtered Cockroach Water	$3.33	$1.51*	-$3.95***
b. Willingness to Pay Means – Students (N = 47)			
Spring Water	$1.57	---	---
Cockroach Water	$4.61	$3.04**	---
Filtered Cockroach Water	$2.69	$1.12	-$1.91**
c. Willingness to Accept Means – Staff (N = 71)			
Spring Water	$3.41	---	---
Cockroach Water	$7.55	$4.14***	---
Filtered Cockroach Water	$5.15	$1.74**	-$2.41***

Notes:
Paired T-tests (two-tailed)
*** < 0.01 significance; ** < 0.05 significance; * <0.10 significance

Table 2: Two-Limit Random Effects Tobit Results, Dependent Variable-Value Willingness-to-Pay and Willingness-to-Pay.

	N=408	N=402
Cockroach Water	11.857***	12.775***
	(1.473)	(1.451)
Filtered Water	5.343***	6.033***
	(1.464)	(1.436)
Female	15.249***	16.594***
	(4.261)	(4.294)
Student	2.797	3.586
	(4.289)	(4.235)
WTP	-8.354	-11.639**
	(5.833)	(6.029)
Constant	-23.997***	-25.899***
	(4.713)	(4.736)

Notes:
N = 408: 3 WTP bids – 45 students and 3 WTA offers – 42 students and 71 staff.
N = 402: 3 WTP bids – 44 students and 3 WTA offers – 42 students and 70 staff (2 observations dropped for unusual behavior).
Standard errors in parentheses.
***<0.01 significance; ** <0.05 significance; * <0.10 significance.

Figure 1: Average Private Willingness-to-Accept (WTA) and Willingness-to-Pay (WTP) from Students and Staff, by Treatment.

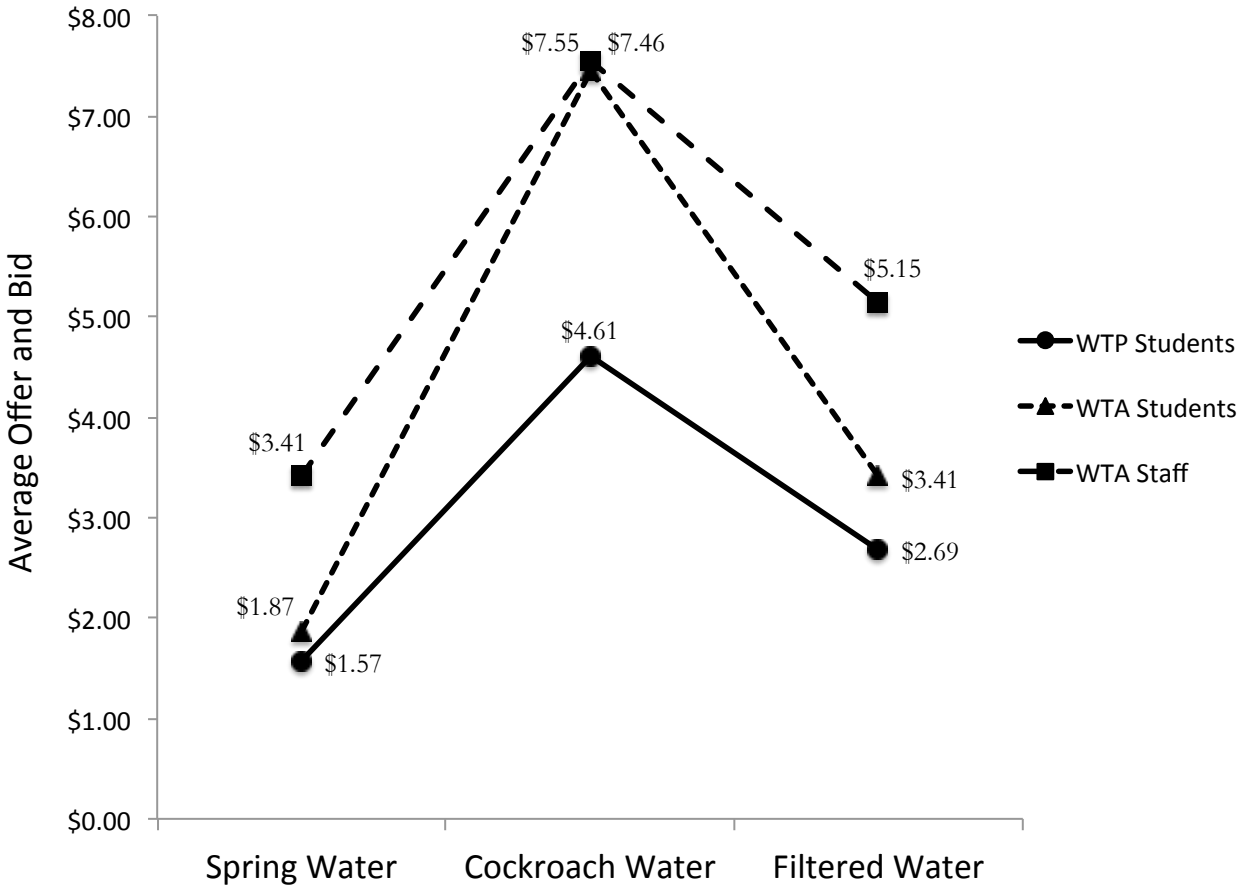
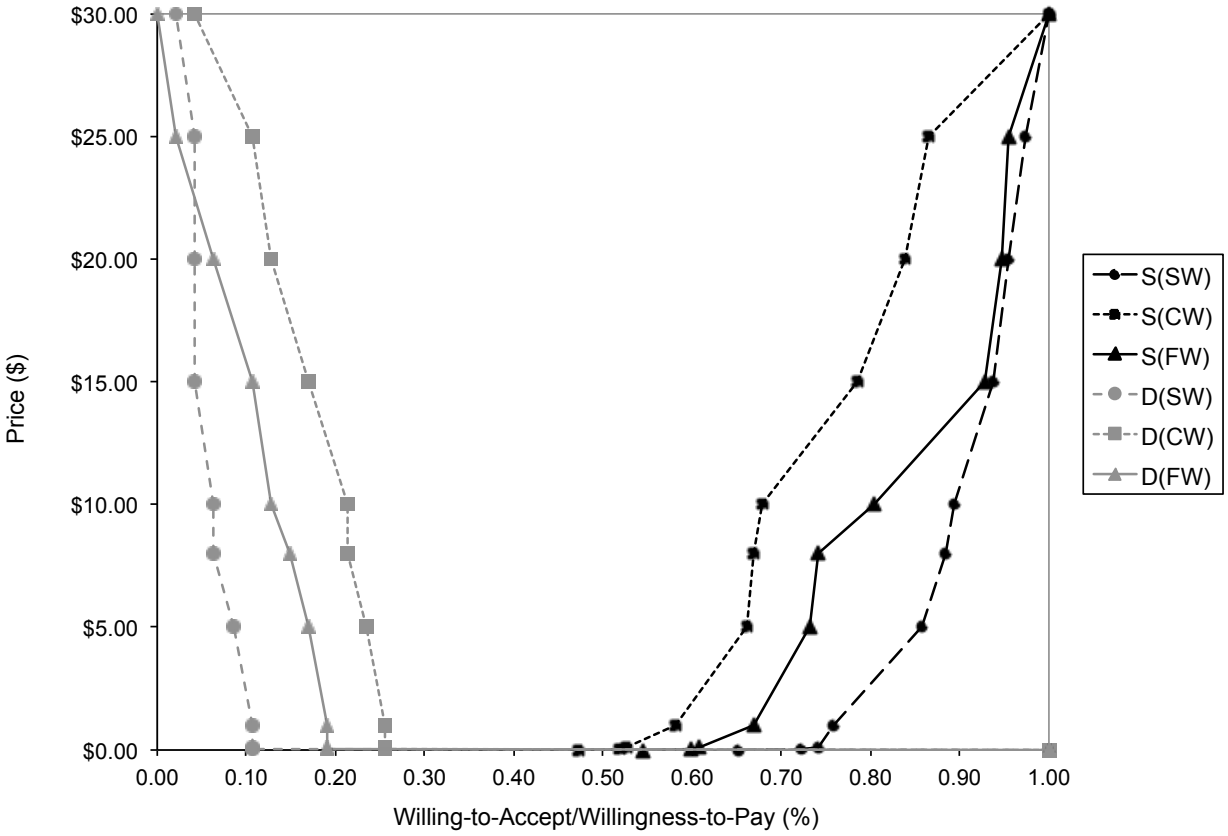


Figure 2: Supply (S) and Demand (D) Curves Generated from WTA and WTP Data.



Notes: SW = spring water; CW = cockroach water; FW = filtered cockroach water