Food Waste, Date Labels, and Risk Preferences: An Experimental Exploration

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Abstract:

With an experimental auction, this paper provides evidence that consumers adjust their food waste behavior by date labels. In the auction, participants provided a willingness to pay and expected consumption for spaghetti sauce and packaged deli meat. The experiment had a control condition of no date label and two date label treatments: "Best by" and "Use by." Participants revealed their preferences in terms of loss aversion and risk aversion via a series of binding gambles. For the willingness to pay, both date labels lowered the valuations of participants of deli meat, but the date labels did not affect spaghetti sauce. For the premeditated waste, the date labels had differential effects: increasing the premeditated waste for deli meat with "Use by" and lowering the premeditated waste for spaghetti sauce with "Use by." The "Best by" caused less premeditated waste than the "Use by" label for both products. However, the lowered premeditated waste is no different from the no date label condition. The statistically significant coefficients of the date label and loss aversion parameter interactions suggest heterogeneity in response to the date labels. As suggested by the differential response to date labels readily seen on foods, these results confirm that consumers experience confusion about the meaning of date labels. However, changing date labels may not lower food waste relative to no label at all.

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Introduction

If food waste is upwards of 40% of the food produced, why do we waste so much? (cf Bellemare et al. 2017, Buzby and Hyman 2012, Buzby et al. 2014m Codex Alimentarius Commission 2014, Leib et al. 2013, Leib et al. 2016, Qi and Roe 2016, WRAP 2011). One potential source of food waste is the influence of date labels printed on food packaging (e.g., "Best by," "Use by," "Best if enjoy by," and "Sell by") (ReFed 2016, 2017). A consensus regarding date labels is that consumers are likely confused by them, and this confusion causes consumers to discard food items that are edible (Neff et al. 2019; Wilson et al., 2017; Wilson et al. 2018; Broad Leib et al. 2013). Policymakers and commercial organizations in the United States have proposed to simplify food date labels into two categories: one for quality and one for safety. For instance, the Food Date Labeling Act of 2016 sponsored by U.S. Senator Richard Blumenthal and Congresswoman Chellie Pingree specified "Best if Used by" for quality and "Expires on" for safety.

However, the exact mechanism of how this confusion leads to waste is not evident. The research on investigating the effect of specific date labels on consumers' food waste behavior and how this effect may vary across different types of food is limited. For example, does the confusion around date labels lead to a perception that the date label represents an increased risk of a bad experience with the product (e.g., foodborne illness or poor quality in terms of taste, texture, color, and smell)? If so, consumers waste some of the product, such that the lost value is like an actuarially-fair insurance premium. However, if consumers are confused by the labels, they may dispose of products mistakenly believing that the product will cause harm. Lastly, food

waste may result from a cognitive bias of overweighting small probabilities of adverse events given a loss of utility from a reference point.

The purpose of this study is threefold 1) to provide a theoretical justification of risk and loss aversion in food waste, 2) to estimate the treatment effect of quality and safety date labels on willingness to pay and premeditated waste, and 3) to assess the mediation of treatment effects of date labels from risk parameters. The findings of this work provide evidence that at the point of purchase, participants expected to waste product (premeditated waste) given a posted shelf life commonly found in grocery stores. The quality ("Best by") and safety ("Use by") date labels lowered the willingness to pay for deli meat but had no statistical effect on spaghetti sauce.[1] The quality date label lowered the premeditated waste for spaghetti sauce, but the "Use by" date label increased the premeditated waste for the deli meat. Loss aversion correlates with higher premeditated waste regardless of date label and product. At higher levels of loss aversion, participants were indifferent to date labels for deli meat. For spaghetti sauce, more loss-averse participants reported lower premeditated waste by date labels relative to no date label. Given that the product remained constant except for the change in date labels, the results support the finding of consumer confusion around date labels. Behavioral biases like loss aversion predict food waste, and regulating date labels will have differential effects on food waste behaviors.

Literature Review

The closest study to the present one is by Wilson et al. (2017), who employed between-subject experiments where participants saw one of four different date labels for different products of varying sizes and dates. However, other researchers found that date labels can shape behavior

[1] To avoid deception in the experiment, we choose to use "Best by" and "Use by" because we found these date labels on the products in grocery stores in both locations of the experiments. The "Best if Used by" and "Expires on" were not available in both markets for both goods.

and perceptions (Theotokis et al. 2012, Tsiros and Heilman 2005, Wansink and Wright, 2006). The literature on date labels reports that consumers are confused about date labels. By confusion, the previous researchers suggest that participants have a belief that the labels have a meaning, when in fact they do not, or that they perceive that date labels represent different attributes for different foods (Leib et al. 2016, Leib et al. 2015, Neff et al. 2019, Neff, 2014, Newsome et al. 2014, Wilson et al. 2017, WRAP 2012, Wilson et al. 2018, Wilson et al. 2019).

Implicit in the previous literature is that consumers waste products to mitigate the chance of a bad experience, e.g., a food-borne illness or consuming a lower quality product. However, the extant literature has not considered the role of risk in influencing food waste behaviors. Further, this literature has not considered the potential of behavioral bias, such as loss aversion in influencing food waste behaviors. This gap is important because the policy implications or potential interventions to address food waste will have differential effects, given the underlying behavioral biases (Wilson et al. 2017). The present paper attempts to fill this gap.

Conceptual framework

To fix ideas, we consider a stylized conceptual framework based on prospect theory to analyze the influences of risk preferences and date labels on food waste. Expected utility theory, the main workhorse of analyzing decision-making under risk, has long been criticized for failing to predict observed behaviors (Kahneman and Tversky, 1979; Thaler, 2016). Among the critiques, prospect theory has emerged as an alternative to expected utility theory in the past four decades (see Barberis (2013) for a comprehensive review). Instead of focusing on utility obtained from an absolute amount of wealth or consumption as expected utility theory does, prospect theory focuses on changes in utility caused by changes in wealth or consumption relative to a reference point. Any consumption levels higher than the reference point are considered as gains, whereas

consumption levels lower than the reference point are losses. Experimental evidence shows that people tend toward loss aversion (i.e., more sensitive to losses than to the same magnitude of gains). Figure 1 illustrates the key features of the value function in prospect theory. In it, the kink at the reference point reflects loss aversion. That is, in the loss domain (i.e., the left of reference point), the value curve is steeper than that in the gain domain (i.e., the right of the reference point). The concavity of the value function in the gain domain and the convexity in the loss domain indicate risk aversion for gains and risk-loving for losses. A critical feature of prospect theory is that it uses probability weighting functions to map objective probabilities onto subjective probabilities on which agents base their decisions. Further, agents tend to overestimate the probability of rare events but underestimate the probability of likely events.

Consider a representative consumer making decisions whether to consume a food item (Note the experiments described below that the participants reported the percentage of a food item they would consume given different date labels). The utility she obtains from the consumption depends on the quality of the food item. In this model, quality may indicate any hedonic and health benefits of consumption. For simplicity, the quality of the item takes only two possible values: $g > 0$ and $b < 0$, where 'g' indicates good quality, whereas 'b' indicates bad quality. Let the probabilities of values g and b occurring to be p and q, respectively, where $p + q = 1$ and $p, q \geq 0$. Following Tanaka, Camerer, and Nguyen (2010) and Liu (2013), the utility function is as follows:

$$U(g, p; b, q) = w(p)v(g) + w(q)v(b), \tag{1}$$

where the value function $v(\cdot)$ is

$$v(x) = \begin{cases} x^{1-\sigma} & \text{for } x > 0 \\ -\lambda(-x)^{1-\sigma} & \text{for } x < 0 \end{cases}; \tag{2}$$

moreover, the probability weighting function $w(\cdot)$ is

$$w(p) = \exp[-(-\ln p)^{\alpha}]. \tag{3}$$

Figure 1 depicts the value function with the reference point set to 0. In this experiment, this reference point represents the utility of consumption without knowledge of the date label. The parameter σ, which is the risk parameter, governs the curvature of the value function, with $\sigma = 0$ indicating risk neutrality, $\sigma < 0$ risk-loving, and $\sigma \in (0,1)$ risk aversion. Parameter $\lambda > 0$ reflects an individual's loss preferences. The larger the value of λ, the more loss averse an individual is. When $\lambda > 1$, the individual is loss averse; when $0 < \lambda < 1$, the individual is loss-loving; and when $\lambda = 1$, the individual is loss neutral. The parameter α in the probability weighting function (i.e., equation (3)) governs the shape of the function. When $\alpha \in (0,1)$ then the probability weighting function is inverse S-shaped (see Figure 2), which reflects experimental findings that people tend to overweight low probability events but underweight high probability events. When $\alpha = 1$ then $w(p) = p$, implying no distortion of the objective probability, p.

Because $g > 0$ and $b < 0$, based upon equations (1) to (3) we can write the value from consuming a food item with quality vector $(g, p; b, q)$ as

$$U(g, p; b, q) = e^{-(-\ln p)^{\alpha}} g^{1-\sigma} + e^{-(-\ln q)^{\alpha}} [-\lambda(-b)^{1-\sigma}]. \tag{4}$$

Comparative Statics of Loss Aversion, Risk Aversion, and Probability Weighting

An increase in loss aversion (i.e., an increase in λ) will decrease the value of $U(g, p; b, q)$ $\partial U(g, p; b, q)/\partial \lambda = -e^{-(-\ln q)^{\alpha}}(-b)^{1-\sigma} < 0$. As λ increases, the utility curve shifts down in the loss domain (See the dashed curve in Figure 1), indicating more disutility from the consumption of a bad food item.

On the other hand, the ambiguous sign of the derivative,

$\partial U(g, p; b, q) / \partial \sigma = e^{-(-\ln p)^{\alpha}} g^{1-\sigma}(-\ln g) + e^{-(-\ln q)^{\alpha}}[\lambda(-b)^{1-\sigma}]\ln(-b)$, is determined by the values of *g*, *b*, and other parameters, which leaves the impact of the risk aversion parameter, σ, an empirical question. The probability weighting function parameter also has an ambiguous sign:

$\partial U(g, p; b, q) / \partial \alpha = -e^{-(-\ln p)^{\alpha}} g^{1-\sigma}(-\ln p)^{\alpha} \ln(-\ln p) + e^{-(-\ln q)^{\alpha}}[-\lambda(-b)^{1-\sigma}](-\ln q)^{\alpha} \ln(-\ln q).$

Linking Utility to Willingness to Pay and Waste

Lusk and Shogren (2007) derive a value function based on cumulative prospect theory (Tversky and Kahneman 1992) that has the risk parameters stated above. Embedded in the value function is the willingness to pay, which is the certainty equivalent of the utility of the product. Thus, in the experiment described below, the willingness to pay is the money-metric utility of the products given the market price (Lusk and Shogren 2007). Following this assertion, increases in loss aversion correlate with a decline of the willingness to pay. While the theory above suggests ambiguous signs for risk aversion and the probability weighting parameters, Lusk and Coble (2005), following the expected utility theory, find that increasing risk aversion correlates with a decreasing valuation (willingness to pay) for risky foods such as genetically modified foods.

While the willingness to pay is an important metric for this analysis, a key measure is food waste. An implicit assumption of the utility function is the consumption of the product. Loss of consumption, characterized as a failure to consume, is a diminution of utility because the product was a "good" or of good quality. However, if the product is a "bad" or of lower quality than at purchase, the consumer may lessen the decline in utility by the intentional disposal or wasting of a portion (or all) of the product. Thus, the waste, or as in the case below, the anticipation of waste, reflects a diminution in utility. With this assertion, the anticipated waste, termed premeditated waste, should increase with loss aversion. Given the ambiguous sign of the

risk aversion and probability weighting parameters from the utility theory, the sign of these parameters for premeditated waste is also ambiguous.

Impact of Date Labels

This characterization of risk parameters and utility as measured through outcome surrogates of the willingness to pay and premeditated waste provides a foundation to consider how information from date labels can alter utility and its surrogates. The impact of date labels on food waste depends on how the presence of a date label affects consumers' perceptions about the quality of the food item. Wilson, Miao, and Weis (2018) show that date labels alter consumers' perceptions over food attributes. They find that consumers are more likely to associate "Best by" with food quality or taste and to associate "Use by" with food safety. In the conceptual framework of the present paper, the term "quality" covers all attributes related to a food item, such as taste, freshness, and even safety. The higher the quality, the higher the value the food item will provide. Here, the conjecture is that when compared with no date labels, a date label such as "Best by" or "Use by" provides consumers with more information about the quality of a food item along the temporal dimension. For instance, when a consumer sees only a date "July 1st, 2019" printed on the food item without any date label (e.g., "Best by" or "Use by"), she thinks that consumption of the food item on July 1st, 2019 with probability p she will have quality g and with probability q she will have quality b, that is (g, p; b, q). If she sees a date label such as "Best by July 1st, 2019," then her belief regarding the quality of the food by July 1st, 2019 may change to $(g,1;b,0)$. That is the date label "Best by" guarantees the consumer state g by July 1st, 2019. If this is the case, then the presence of date labels, when compared with no date labels, will increase the overall value from consuming the food and hence reduce food waste.

However, date labels may affect consumers' perceptions of food in a much more complicated way. As Wilson, Miao, and Weis (2018) find, the effect of date labels on consumers' perceptions depends on the food item. For instance, a "use by" date label may sound a loud alarm on food safety issues and cause consumers to assign an unreasonably large probability to value *b*, which results in lower aggregate expected value from consumption and hence increase food waste. These examples suggest that the impact of date labels on food waste is an empirical question.

Experimental Design

The experiment is composed of two components: (*i*) a Becker–DeGroot–Marschak (BDM) auction of two food products and (*ii*) a solicitation of risk and loss preferences of each participant. A detailed survey follows the experiment to collect socioeconomic variables associated with the participants. The script for the experiment is available in the appendix.[2] The recruitment yielded 206 non-student participants for the experiment series, among which 104 were from Auburn, Alabama, and 102 from Ithaca, New York. The final dataset excludes information of six participants due to data incompleteness or reporting errors.

For the auction, participants faced a control condition with two treatments. In the control condition, the participants indicated their maximum willingness to pay (WTP) for a 24 oz (709.57 ml) of marinara sauce and a 10 oz (283.50 g) package of sliced turkey deli meat. The participants also indicated the percentage of the product that they expected to consume. For each product, the participants knew the date posted on the product, but the date label in the control case was not observable. In the two treatments, participants saw the same products with the date

[2] We followed the IRB protocol #14–514 EX 1411 approved by Auburn University and IRB protocol #1702016 approved by Tufts University.

labels ("Use by," a safety date label, and "Best by," a quality date label) over subsequent randomized rounds.

The second component of the experiment was the solicitation of the risk preferences of participants between rounds of the BDM auction. We followed solicitation methods of Tanaka et al. (2010) and Liu (2013). In these papers, participants received lists of outcomes of gambles (see Tables A1-A3 in the Appendix). For each list, we asked participants to select the row, if any, that they would switch from Option A to Option B. From the row, researchers determined the risk parameters based on formulas for each parameter.

Holt and Laury (2002) find that small payouts and hypothetical experiments contribute to biased parameter estimates. However, large payouts can quickly exceed research budgets. We closely follow Liu (2013), who worked in China with cotton producers and paid her participants in yuan. We used similar numeric values but paid our participants in US dollars. We did scale down the large payoff, which reached 850 yuan. Our largest possible payout was $160. While our payouts were not as large as the Holt and Laury (2002), our risk parameter estimates are consistent with previous research such as Liu (2013) and Tanaka et al. (2010).

Our solicitation method improved upon the traditional method in which participants make decisions on the switching row by evaluating the outcome table and stating the row of the switch. However, in preliminary testing, we found participants who had difficulty reading the sheet and understanding the gambles or the core decision. In response, we programmed Qualtrics to offer the gambles as a series of individual choice sets, which covered the range of possible outcomes. This solicitation method allowed participants to focus on each choice as oppose to evaluate an entire table of options.

The experiment involved real payments. Although each participant took part in both the BDM auction and risk preference solicitation, participants, through random assignment, earned their final payout from either the auction or the risk preference solicitation. Participants did not know their payout group assignment until they submitted all the bids and responses to all the series for risk preference solicitation. For participants assigned to the auction for the payout, we use the BDM mechanism to determine the sale of products. For incentive compatibility, the computer randomly selected the product, date label, and "market price" for the product with the date label. If the participant's bid were higher than or equal to the "market price," then the participant would purchase the product at the "market price." On the other hand, if the bid were lower than the "market price," then no purchase would occur.

For the participants assigned to the risk solicitation for the final payout, the computer would randomly select a row from the tables, representing the experimental series and relevant ball to determine the payout. For instance, if a selected row was "Option A: get $20 if balls 1-90, $15 if balls 91-100; Option B: get $28 if balls 1-70, $2.5 if balls 71-100" and if a participant's choice were Option A, then the computer would randomly draw a ball with a number between 1 and 100 to determine the payment based on Option A. For participants in Alabama, the initial participation pay was $20. For participants in Ithaca, New York, the initial participation pay was $30 per the requirement of the Lab for Experimental Economics and Decision Research (LEEDR) at Cornell University. For those in the auction, the average market price of the products was $4.00. Therefore, on average, participants in Alabama assigned in the auction received $20 ($30 in New York) in cash (if no purchase occurred) or $16 ($24 in New York) and a food product if the purchase occurred. For participants in the risk preference final payout, the

expected total payment was $31 in Alabama ($41 in New York), which is the initial payment plus expected payment from the risk preference series, $11.

Empirical Model

In the BDM auction, each participant provided twelve values, which are the willingness to pay and premeditated waste for deli meat and spaghetti sauce for the no date label (control), "Best by," and "Use by." A series of mixed-effects models evaluated treatment *m* {*m*=1,2} relative to the control. The three-level models assessed a random intercept (u_{0i}) for the *i*th participant and a random slope (u_{1j}) for the *j*th experiment session, and a random intercept (u_{1k}) for the *k*th food. Given the hierarchical structure of the experiment (200 participants in 16 sessions) and random differences across the foods, the mixed-effects models captured fixed (treatment, food, treatment and food interactions, and control variables) and random components (individuals in sessions over food products).

Additionally, the model adjusted the errors for heteroskedasticity based on the *n* experimental round {*n*=1,2,3}. The controls represent socioeconomic factors: race (non-white or white), gender (male or female), age, age squared, income tercile (low, middle, and high-income groups), site of the experiment (Alabama and New York), number of children under 18 years old, marital status (married/domestic partner or single), and educational attainment (college degree or not). The summary statistics are in Table 1. These covariates are the elements of the $\boldsymbol{X}$ matrices in Equations 5 and 6.

$$Y_{ijkmn} = \alpha_0 + \sum_{m=1}^{2} \alpha_m Treatment_{mn} + \alpha_3 Food_{kn} + \sum_{m=1}^{2} \alpha_{3+m}(Treatment_{mn} * Food_{kn}) + \sum_{i=1}^{10} \gamma_i X_i + u_{0i} + u_{1j} Session\ Number_j + u_{1k} Food_k + \epsilon_{ijkmn} \quad (5)$$

In this model, Y_{ijkmn} represents the willingness to pay or the premediated waste. $Treatment_{mn}$ is a categorical variable that represents the different date labels ("Best by" and "Use by") with a base of no date label. $Food_{kn}$ is the binary variable that presents the two food products with deli meat as the base. Equation 6 adds on base model (5) with the o {0=1,2,3, and 4} risk parameters (R_{ino}) and their interactions with the treatments. The estimated coefficients of these models are in Tables 2 and 3.

$$Y_{ijkmn} = \alpha_0 + \sum_{m=1}^{2} \alpha_j Treatment_{mn} + \alpha_3 Food_{kn} + \sum_{m=1}^{2} \alpha_{3+m}(Treatment_{mn} * Food_{kn}) + \beta_n R_{ino} + \sum_{m=1}^{2} \beta_{n+m}(Treatment_{mn} * R_{ino}) + \sum_{n=1}^{10} \gamma_n X_i + u_{0i} + u_{1j} Session\ Number_j + u_{1k} Food_{kn} + \epsilon_{ijkmno} \quad (6)$$

Hypotheses

The paper is an evaluation of the treatment effects of the date labels on the willingness to pay and the premeditated waste. Base on previous papers, we test the effect of the date labels on the two outcome variables. The control for the experiment is the no date label condition. The hypothesized effects of exposing the participants to the "Best by" and "Use by" are changes in

the willingness to pay and the premeditated waste. Drawing from the conceptual framework, when participants see the date labels, they will adjust their willingness to pay and premeditated waste because their opinion of the product shifts given their reference point. If the date label induces the participant to anticipate a loss of utility from consumption, the participant moves down the value function from the reference point of zero in Figure 1. This reduction in the value function is a decrease in willingness to pay or consumption, which is an increase in premeditated waste. However, if the date label induces an expectation of a more positive experience than the reference point, the participant will have a higher willingness to pay and consumption (lower premeditated waste). Given the conceptual framework and the empirical specification of Equations (5) and (6), we evaluate the following:

$$\frac{\partial Y_{ijkmn}}{\partial Treat_m} = \alpha_m + \alpha_{3+m} Food_k \neq 0; m = 1,2$$

The changes in the willingness to pay (premeditated waste) of the date label for deli meat ($Food_k = 0$) and spaghetti sauce ($Food_k = 1$) are α_m and $\alpha_m + \alpha_{3+m}$, respectively. The expected direction of the change based on findings of Wilson et al. (2017) is that the willingness to pay will fall, and the premeditated waste will rise under the two date labels.

Further, the effect of "Use by" will be more substantial in absolute value than "Best by." The imposition of interaction terms allows the mediation of the treatment effect through the food.

The treatment effects are from the derivative of Equation 6, given the risk parameters.

$$\frac{\partial Y_{ijkm}}{\partial Treat_m} = \alpha_m + \alpha_{3+m} Food_i + \beta_m R_{ino} \neq 0; m = 1,2$$

However, the theory discussed earlier suggests that risk and loss aversion may shape food waste. The inclusion of the risk parameters (risk, loss, and probability weighting) and their interactions

permit the investigation of the effects of risk parameters on the willingness to pay and the premeditated waste. In this paper, the hypothesis is that the risk parameters and food will mediate the treatment effect. The non-zero effect is not an indication of causality; instead, this result suggests a correlation between the risk parameters and the outcome variables. The hypothesized effects are that the risk parameters influence the outcome variables for each date label. Thus,

$$\frac{\partial Y_{ijkm}}{\partial R_n} = \beta_n + \sum_{m=1}^{2} \beta_{m+n} Treatment_{mn} \neq 0; m = 1,2$$

The derivative presents the summation of the effects for the two date labels. The individual treatment effects for each date label are discoverable by setting the treatment variables to zero or one.

The goal of this analysis is to understand if risk parameters mediate the effect of date labels on willingness to pay or premeditated waste. The change in the outcome variables given a change in the risk parameters is the second derivative of the willingness to pay (premeditated waste) for the treatment and the risk parameter. The hypothesized effects of the individual risk parameters of the change in the date labels are zero.

$$\frac{\partial^2 Y_{ijkm}}{\partial Treat_m \partial R_n} = \beta_{m+n} \neq 0$$

Thus, the interactions of the date labels with the risk parameters can indicate the mediation of the treatment effects through the risk parameters.

Results

Base Models

Table 1 and Figures 3 and 4 provide the summary statistics of willingness to pay and premeditated waste for products for each date label condition. Pairwise testing of the willingness

to pay indicates differences in deli meat under "Best by" (p=0.000) (mean= 2.339, 95% Confidence Interval (CI)=[2.096, 2.582]) and "Use by" (p=0.000) (mean=2.291, 95% CI=2.066, 2.517]) relative to no date label (mean=2.642, 95% CI=[2.388, 2.895]). The spaghetti sauce willingness to pay values are not statistically different under the treatments relative to the control.

The pairwise test for the premeditated waste of deli meat indicates a difference (p=0.0022) under "Use by" (mean=32.375, 95% CI=[27.286, 37.464]) and no date label (mean=29.13,). Pairwise testing of the premeditated waste indicates a difference in spaghetti sauce (p=0.031) under "Best by" (mean=14.45, 95% CI=[10.686, 18.214]) relative to no date label (mean 17.145, 95% CI= [13.145, 21.145]). This difference indicates a *reduction* in premeditated waste under "Best by" relative to no date label. For deli meat ("Best by") and spaghetti sauce ("Use by"), the other differences are similar to the control conditions for those products.

Tables 2 and 3 present the estimated coefficients from the analysis. As base models, they reveal the effects of the treatments by foods given the random parameters. For the willingness to pay, the estimated coefficients for date labels for "Best by" and "Use by" are -0.280 (p=0.000) and -0.331 (p=0.000). The coefficients are not different from each other (p=0.260). Thus, these date labels relative to no date label for deli meat lower the willingness to pay by $0.280 and $0.331. The coefficient on spaghetti sauce is -0.156 (p=0.136), which is the difference in the willingness to pay for spaghetti sauce over deli meat given no date label.

The interaction terms "Best by X Spaghetti Sauce" and "Use by X Spaghetti Sauce" reflect the change in willingness to pay from the date labels relative to no date label over the change in the willingness to pay for spaghetti sauce (p<0.0001) over deli meat (p<0.0001).

Hypotheses associated with the change in the willingness to pay (or premeditated waste) for each product is not central to the analysis. However, these interaction terms are necessary to estimate the difference in the relative effects of the date labels for spaghetti sauce. Based on these estimates, the changes in the willingness to pay for spaghetti sauce are not statistically different from zero: 0.0556 (p=0.276) for "Best by" and -0.0154 (p=0.760) for "Use by."

For the premeditated waste, the effect of "Best by" for deli meat is 1.309 (p=0.267), and for "Use by," the effect is 3.284 (p=0.0055). These values represent increases in the percent of premeditated waste over the no date label condition. The coefficients of the Treatment interacted with Food are -4.032 (p=0.016) and -3.738(p=0.025) for "Best by" and "Use by." For spaghetti sauce, the effect of "Best by" is -2.722 (p=0.0209) and -0.453 (p=0.701) for "Use by." The coefficient on spaghetti sauce 11.985 (p<0.0001) suggests that participants had a nearly 12 percentage point lower premeditated waste for spaghetti sauce than deli meat. These base models provide support to the hypotheses. The results show differential effects by date labels and products. The estimates of the base models are stable with the inclusion of the sociodemographic variables.

Full Models with Risk Parameters

Willingness to Pay

While the base models provide some evidence of the effects of date labels, the full models that include the risk parameters reveal the heterogeneity of treatment effects. For the willingness to pay, the estimated coefficients for "Best by" -0.348 (p=0.006) and "Use by" -0.427 (p=0.001). The coefficients of the Treatment interacted with Food are 0.312 (p=0.000) and 0.346 (p<0.0001) for "Best by" and "Use by." To assess the full effect of the date labels, the interaction of the Treatment with Food and the risk parameters need consideration.

The core hypotheses of this work focus on the treatment effect of the date labels relative to the control (i.e., no date label). Thus, the estimated treatment effect in Table 4 reflects the derivatives *i* of the willingness to pay by date label for the means of the four risk parameters. However, for deli meat, participants lowered their willingness to pay under "Best by" by \$0.292 (p=0.000), which is an 11.12% reduction in the willingness to pay given no date label (willingness to pay for deli meat under no date label is \$2.625). Under "Use by," the predicted decline in the willingness to pay relative to no date label is \$0.354 (p=0.000), which is a 13.40% reduction in the willingness to pay. The willingness to pay for spaghetti sauce did not change under the two date labels relative to the control condition (see Figure 5). The estimated differences of willingness to pay under "Best by" relative "Use by" is not statistically different for neither deli meat nor spaghetti sauce.

Premeditated Waste

For the full model of premeditated waste (Table 3), the coefficient for "Best by" is 6.875 (p=0.0016). For "Use by," the coefficient is 11.376 (p<0.0001). The estimated coefficients for "Use by" are nearly four times the value of the estimates for the models without the risk preference parameters). In the full model, the estimated coefficients for the interaction terms of Treatment and Food are -3.671 (p=0.035) and -4.489 (p=0.011) for "Best by" and "Use by" (See Table 3).

Following the treatment effects at the mean of the four risk parameters (Table 3), the estimated difference in percentage points of the premeditated waste of "Best by" relative to the control is -2.74 (p=0.026) for spaghetti sauce. This treatment effect represents a 16.87% reduction in the spaghetti sauce premeditated waste under "Best by" given the control premeditated waste (16.172%) of spaghetti sauce. The treatment effect of premeditated waste for

"Use by" relative to no date label is -1.06 (p=0.400) for spaghetti sauce. The difference in premediated waste for spaghetti sauce under "Best by" relative to "Use by" is -1.68 (p=0.081), which reflects a 10.74% reduction.

For deli meat, the treatment effect for the premeditated waste of the date label relative to the control is 3.43 (p=0.0057) for "Use by," which represents an 11.93% increase in the premeditated waste. The treatment effect of "Best by" to the control is 0.94 (p=0.45). The estimated difference of "Best by" relative to "Use by" is -2.50 (p=0.0095), which reflects a 7.79 % reduction in premeditated waste from "Use by" to "Best by" for deli meat.

Risk Parameters

While the core hypotheses are about the date labels, the statistical significance of the date label and risk parameters indicate that participants with different risk preferences report differences in the willingness to pay and premeditated waste. For the willingness to pay, the estimated coefficient for the Risk Aversion parameter is -0.727 (p=0.028) in the full model, which is the average marginal effect for no date label. The average marginal effects of Risk Aversion are -0.617 (p=0.057) for "Best by" and -0.573 (p=0.077) for "Use by." The marginal effect at the mean over the three treatment conditions is -0.639 (p=0.046). None of the other risk parameters (Loss Aversion or Probability Weighting) is statistically significant for willingness to pay. Thus, we find support only for Risk Aversion across the date labels and for each date label.

For premeditated waste in the full model, the Loss Aversion coefficient is 1.983 (p=0.038) (see Table 3), which is the marginal effect of Loss Aversion for the no date label condition. For the other date labels in the full model, the marginal effects are 1.399 (p=0.125) for "Best by" and 1.162 (p=0.201) for "Use by." Across the date labels, the average marginal effect of Loss Aversion is 1.515 (p= 0.090). None of the other risk parameters (Risk Aversion or

Probability Weighting) is statistically significant for premeditated waste. Thus, the results support Loss Aversion for the no date label condition and overall.

Treatment Effects Moderated by Risk Parameters

The central questions of this analysis are how participants adjust willingness to pay and premeditated waste by date labels and how aversion to risk or loss affect those responses. As noted in the discussion of the hypotheses, the coefficients on the interactions of the risk parameters and the date labels are the values of interest. For the willingness to pay models, none of the interactions are statistically significant. For premeditated waste, the Risk Aversion interactions are insignificant. Thus, the remaining discussion will focus on premeditated waste and loss aversion and probability weighting. In the full model of premeditated waste, the Loss Aversion and Treatment interaction coefficients are for "Best by" is -0.584 (p=0.188) and for "Use by" -0.820 (p=0.062). The Probability Weighting and Treatment interactions are for "Best by" -6.0367 (p=0.035) and "Use by" -6.499 (p=0.025).

"Use by" correlates with higher premeditated waste than no date label for deli meat while "Best by" correlates with lower premeditated waste for spaghetti sauce. The premeditated waste increases with loss aversion for both products. As indicated by the statistically significant interaction term, the Loss Aversion parameter moderates the treatment effect of the date labels. As Figure 7 indicates, Loss Loving and mildly Loss-Averse participants$(0 \leq \lambda \leq 3)$ in the study, reported a higher (p<0.05) premeditated waste under "Use by" than no date label for deli meat. The Loss Aversion parameters in the range of $(0 \leq \lambda \leq 3)$. This range of values represents 78% of the sample.

Over the range of loss aversion for spaghetti sauce, the treatment effect of "Best by" and for "Use by" relative to no date label for premeditated waste is negative (p<0.05). An important

caveat is that the participants with a negative treatment effect for spaghetti sauce represent 40% of the sample for "Best by" ($\lambda \geq 2$) and 7% of the sample for "Use by" ($\lambda \geq 5$). Thus, the waste reduction benefit of the date labels is relevant for a small share of participants.

The coefficient on Probability Weighting is insignificant in the premeditated waste full model. However, the interactions with the Treatment are statistically significant for "Best by" -6.037 (p=0.035) and for "Use by" -6.50 (p=0.025). For deli meat, the treatment effect over the Probability Weighting under "Best by" and "Use by" relative to no date label is positive (p<0.05) for participants that overweight small probabilities ($\alpha < 1$) and falls to zero as participants tend to underweight large probabilities ($\alpha > 1$). See Figure 9. For participants who tend to overweight small probabilities, the treatment effect of "Best by" and "Use by" is positive for premeditated waste. For spaghetti sauce, the treatment effect on premeditated waste is negative for participants who underweight large probabilities (α>1). However, the participants who underweight the large probabilities (α>1) represents less than 10% of the sample.

Control Variables

The control variables reflect some participant-specific variations in the willingness to pay and premediated waste. The income tercile variables are statistically significant and negative for the willingness to pay models. The findings suggest that the participants from the higher two income groups ($85,000 to $115,000, and greater than $115,000) had a $0.40 to $0.60 lower WTP than the lowest income group participants (less than $85,000). The State variable, indicating the location of the experiment, is negative and statistically significant. The New York participants had a $0.92 to $0.97 lower average willingness to pay than the participants in Alabama. A potential explanation for the differences in the willingness to pay is the differences in the number of zero bids by state. The participants in New York reported a wiliness to pay of $0.00 at a rate

of 18.90% of deli meat, while the Alabama participants reported $0.00 for 10.36% of deli meat (p=0.0032). The share of $0.00 willingness to pay did not differ significantly for spaghetti sauce. The difference in the share of $0.00 bids for deli meat helped drive down the willingness to pay. For non-zero bids, participants in Alabama had a higher willingness to pay for deli meat, with a difference of $0.55 (95% CI = [$0.28, $0.82]), and for spaghetti sauce, the difference was $1.08 (95% CI=[$0.84, $1.31]).

For the Waste models, the gender variable is statistically significant and positive, which suggests that women have premediated waste that is 9.70 percentage points (p=0.016) above men. The coefficient of "number of children below 18 years old" is -13.29 (p=0.007), and the interaction with marital status 10.24 (p=0.068) reveals that married/partnered status moderates the negative effect of number of children such that the premediated waste of single households with more kids fall precipitously while married or partnered families do not change their premeditated waste as the number of kids increases.

Random Parameters

Statistically significant random parameters reflect the hierarchical structure of the data in the two-level model. For the premediated waste model, the estimated standard error of the slope of the variance of the participants embedded in sessions is 651.18 (95% CI= 521.50, 813.11), and the estimate of the variance of the slope is 176.96 (95% CI= 84.38, 371.13). For the willingness to pay model, the estimated standard error of the slope of the variance of the participants embedded in sessions is 0.77 (95% CI= 0.61, 0.96), and the estimate of the variance of the slope is 1.32 (95% CI=0.99, 1.75). The likelihood ratio test of estimated models compared to an OLS model without the random parameters are statistically significant (p=0.000); this result held for both models. We adjusted the standard errors of the models by the round of the experiment to

adjust for heteroskedasticity. Over the three rounds, the adjusted standard errors for the premediated waste become smaller, with non-overlapping 95% confidence intervals. In the full model for premeditated waste, the estimated variances of the error term are for Round 1, 187.13 (95% CI=155.81, 224.74), Round 2, 113.15 (95% CI=91.04, 140.63), and Round 3, 51.27 (95% CI=34.99, 75.13). For the willingness to pay, the variances of the standard errors rise and fall over the three rounds: Round 1 0.34 (95% CI=0.27, 0.39), Round 2 0.14 (95% CI=0.098, 0.18), and Round 3 0.22 (95% CI=0.17, 0.27). Likelihood ratio tests support the use of heteroskedastic standard errors.

After Purchase

The experiment considers behavior at the point of purchase. While in a laboratory, we contextualized the experiment by providing images of the products on the shelf of a grocery store. We asked the participants to predict future behavior and evaluate the value of a product that they could eventually own. Since they did not own the product, we wondered if their prediction of waste would differ if they considered that the product was in their home.

Drawing from the work of a vignette analysis of Ellison and Lusk (2018), we asked participants in the survey portion of the experiment to determine the choice to consume or discard products (eggs, spaghetti sauce, and deli meat), which were one day past the posted data (See Wilson et al. 2019 for a detailed discussion). The structure of the question was a between-subject design, where we randomized participants into “Best by” and “Use by” treatments for eggs, deli meat, and spaghetti sauce priced at $3 and $4 per unit. Using a linear probability model (see Table 5), we evaluated the choice to waste with a series of variables and the experimental treatment of varying the label and the purchase price of the product. Unlike Wilson et al. 2019, we incorporated the risk parameters. As noted in Table 5, we found that the chances

of wasting eggs were greater with “Best by” relative to “Use by,” which is a surprising result. However, we found that for deli meat and spaghetti sauce, “Use by” led to a higher probability of waste than “Best by.” When we interacted with the risk parameters *i*th the date labels, only Loss Aversion had a statistically significant and positive effect on waste for “Use by.” As reported in Figure 10, increases in loss aversion correlate with increases in the probability of wasting the product. These findings further support the role of loss aversion in shaping waste behavior and indicates diverse responses to date labels.

Discussion

Participants adjusted their willingness to pay and premeditated wastes under the date label treatments. For the willingness to pay, both date labels lowered the valuations of participants of deli meat, but the date labels did not affect spaghetti sauce. For the premeditated waste, the date labels had differential effects: increasing the premeditated waste for deli meat with “Use by” and lowering the premeditated waste for spaghetti sauce with “Use by.” The “Best by” caused less premeditated waste than the “Use by” for both products. However, the lowered premeditated waste is no different from the no date label condition. The statistically significant coefficients of the date label and risk parameter interactions suggest heterogeneity in response to the date labels. As reflected by the differential response to date labels readily seen on foods, these results confirm that consumers experience confusion about the meaning of date labels. However, changing date labels may not lower food waste relative to no label at all.

The finding for deli meat implies that “Use by” leads to more substantial premeditated waste when the participants were not strongly loss averse, while strongly loss averse participants had similarly higher rates of premeditated waste. Thus, these participants made no distinction between no date label and “Use by” and predicted higher rates of waste. This finding supports

the hypothesis that participants who are loss averse expect to waste products to avoid or mitigate losses in utility. Interestingly, the "Best by" label does not confer a strong enough signal to encourage greater or less premeditated waste regardless of the loss aversion.

In contrast, the more loss averse participants reported lower premeditated waste for spaghetti sauce under "Best by" and "Use by" relative to no date label. This result suggests that participants have a different interpretation of the date labels for spaghetti sauce. Importantly, less than half of the participants are sufficiently loss averse for the lowered premeditated waste under "Best by" with less than 7% lowering premeditated waste under "Use by."

The role of probability weighting further supports the importance of loss aversion. Participants, who overweight small probabilities, have a higher premeditated waste for deli meat under both date labels. This finding indicates that these participants push down the value function in Figure 2. Thus, the perceived loss caused by the date labels for these participants is more substantial than for others. These participants react more strongly to the date labels. For spaghetti sauce, underweighting high probabilities raises the value function so that the perception of losses is less for these participants than others. They see a lower chance of a bad experience, and when the date label signals quality or safety, they reported a lower premeditated waste.

Participants reported a lower willingness to pay for greater risk aversion. This finding is consistent with Lusk and Coble (2007). However, the risk aversion does not mediate the treatment effects. While expected utility may fit for the bidding, loss aversion seems to describe food waste better. Coupled with the findings on loss aversion and probability weighting, participants predicted the waste of food that suggests a behavioral bias. Individuals who are loss averse and overweight small probabilities, wasting food avoids adverse events, at least for deli meat. Their behavior reflects the myopic loss averse who excessively spend on the purchase of

extended warranties for household goods (Rabin and Thaler 2001). However, a different response occurs for spaghetti sauce. For the higher than average loss averse participant, they appear to follow a more conventional interpretation of loss aversion; that is, they want to avoid the loss of product. The date labels, at least "Best by" confers assurance of quality (or safety). They predict lower food waste. Thus, policymakers will find that education about waste or changing date labels will not resolve the food waste, and in some cases, could exacerbate the problem.

Useful food waste interventions will help consumers understand the real risks to the safety or quality of the products. These policies need to address the heterogeneity of the public so that more loss-averse consumers can have enough information to correct their subjective probabilities. When information fails, behavioral nudges that counter the bias will have a role. Generic labels for large swaths of products will not address the differential response. The date labels used currently may have little benefit for many consumers. New technologies such as sensors that indicate the microbial count or temperature fluctuations may lead to more accurate food use.

Concluding Remarks

Our study shows that consumers adjust their food waste behavior by date labels. For the same product, different date labels can appear on the package; these labels may lead to confusion and encourage waste. In this experimental auction, participants gave bids for deli meat and spaghetti sauce under a no date label, "Best by," and "Use by" conditions. The participants also indicated the share the product that they expected their family to consume under each of the three conditions. Additionally, participants reveal their preferences in terms of loss aversion and risk aversion.

The treatment effects of the date labels were differential by food and heterogeneous by loss aversion. For deli meat, participants had a lower willingness to pay for both date labels, while the date labels did not affect spaghetti sauce. For the prediction of waste, participants anticipated lower waste for spaghetti sauce under “Best by” and higher waste for “Use by” for deli meat. Loss aversion mediates these results suggesting stronger responses for loss-averse participants. The findings of this paper challenge the idea that implementing quality and safety labels will address food waste. More fundamentally, participants anticipate wasting products with the date but no date label. Thus, date labels matter to food waste, but more foundational interventions addressing behavioral biases will have a more substantial effect on food waste.

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Table 1. Summary Statistics

	Mean/Percent	Standard Error	Min	Max
Income Groups				
Low income	33.14		0	1
Middle income	43.60		0	1
High income	23.26		0	1
Gender				
Female	68.60		0	1
Male	31.40		0	1
Race				
White	70.93		0	1
Other races	29.07		0	1
State				
Alabama	46.51		0	1
New York	53.49		0	1
Education				
No college degree	15.12		0	1
College degree	84.88		0	1
Marital Status				
Single	34.30		0	1
Married/Partnered	65.70		0	1
Number of Kids <18 y.	1.541	0.885	0	4
Loss Aversion	2.094	2.000	0.140	9.960
Probability Weighting	0.616	0.318	0.030	1.715
Risk Aversion	0.523	0.354	-0.820	0.890

N= 200 participants

Table 2. Mixed Effects Model of Willingness to Pay

	WTP Mixed Effects Base Model Coef./SE	WTP Mixed Effects Model Sociodemographic Coef./SE	WTP Mixed Effects Model Risk Aversion Coef./SE	WTP Mixed Effects Model Full Model Coef./SE
Treatment (Base: No Date Label)				
Best By	-0.280***	-0.269***	-0.336***	-0.320***
	0.051	0.071	0.076	0.091
Use By	-0.331***	-0.335***	-0.420***	-0.416***
	0.05	0.069	0.076	0.089
Food (Base: Deli Meat)				
Spaghetti Sauce	-0.156	-0.135	-0.144	-0.123
	0.104	0.113	0.104	0.112
Treatment X Food				
Best By # Spaghetti Sauce	0.336***	0.308***	0.337***	0.306***
	0.072	0.076	0.073	0.076
Use By # Spaghetti Sauce	0.316***	0.340***	0.317***	0.343***
	0.071	0.076	0.072	0.076
Risk			-0.571*	-0.751**
			0.307	0.314
Treatment X Risk				
Best By # Risk			0.104	0.123
			0.105	0.107
Use By # Risk			0.166	0.183*
			0.105	0.108
Round		-0.009		-0.018
		0.032		0.032
Income Tercile (Base: Low Income)				
Middle Income		-0.416*		-0.453*
		0.243		0.238
High Income		-0.585**		-0.531*

		0.296		0.291
Gender (Base: Male)				
Female		-0.129		-0.134
		0.235		0.231
Age		0.013		0.039
		0.056		0.055
Age X Age		0		0
		0.001		0.001
Race (Base: non-White)				
White		-0.333		-0.158
		0.248		0.248
State of Experiment (Base: Alabama)				
New York		-0.974***		-0.932***
		0.232		0.228
Education (Base: No College Degree)				
College Degree		-0.513*		-0.513*
		0.308		0.308
Relationship Status (Base: Single)				
Married/Partner		-0.187		-0.192
		0.284		0.278
Number of Children < 18y		0.223		0.187
		0.285		0.279
Relationship Status X Number of Children < 18y				
Married/Partner # QID210		-0.154		-0.145
		0.321		0.315
Constant	2.642***	4.018***	2.909***	3.815***
	0.119	1.136	0.202	1.125
Random-Effects Parameters				
Idividuals Nested in Sessions	0.273***	0.168**	0.251***	0.142*
	0.063	0.072	0.064	0.073
Foods	-0.133**	-0.117**	-0.148***	-0.136**

	0.055	0.058	0.055	0.059
Residual Heteroskadasticity Adjustment				
Round 1	-0.562***	-0.554***	-0.557***	-0.551***
	0.046	0.048	0.046	0.048
Round 2	-0.474***	-0.442***	-0.492***	-0.456***
	0.105	0.101	0.107	0.101
Round 3	-0.04	-0.195***	-0.05	-0.214***
	0.066	0.075	0.066	0.075
Wald	0.000	0.000	0.000	0.000
test	1200	1050	1182	1038

Table 3a. Mixed Effects Model of Premeditated Waste in Percentage Points

	Waste Mixed Effects Base Model Coef./SE	Waste Mixed Effects Model Sociodemographic Coef./SE	Waste Mixed Effects Model Loss Aversion Coef./SE	Waste Mixed Effects Model Full Model (Loss) Coef./SE
Treatment (Base: No Date Label)				
Best By	1.309	3.050*	2.764*	4.315**
	1.179	1.7	1.496	1.957
Use By	3.284***	5.378***	5.622***	7.248***
	1.183	1.67	1.497	1.928
Food (Base: Deli Meat)				
Spaghetti Sauce	-11.985***	-12.349***	-12.276***	-12.616***
	2.834	3.088	2.881	3.133
Treatment X Food				
Best By # Spaghetti Sauce	-4.032**	-3.674**	-4.070**	-3.677**
	1.667	1.732	1.69	1.752
Use By # Spaghetti Sauce	-3.738**	-4.389**	-3.840**	-4.492**
	1.673	1.748	1.696	1.77
Risk				
Treatment X Risk				
Best By # Risk				
Use By # Risk				
Loss			2.160**	1.993**
			0.967	0.952
Treatment X Loss				
Best By # Loss			-0.688	-0.623
			0.431	0.443

Use By # Loss		-1.096**	-0.895**
		0.43	0.439
Probability			
Treatment X Probability			
Best By # Probability			
Use By # Probability			
Round	-1.217*		-1.185*
	0.682		0.693
Income Tercile (Base: Low Income)			
Middle Income	-4.083		-4.231
	4.103		4.144
High Income	4.925		4.554
	5.002		5.023
Gender (Base: Male)			
Female	8.492**		9.233**
	3.978		4.001
Age	0.031		-0.062
	0.944		0.96
Age X Age	0.000		0.001
	0.011		0.011
Race (Base: non-White)			
White	-4.644		-6.041
	4.189		4.294
State of Experiment (Base: Alabama)			
New York	6.286		5.004
	3.92		3.978
Education (Base: No College Degree)			
College Degree	8.271		7.702

		5.21		5.343
Relationship Status (Base: Single)				
Married/Partner		-3.632		-3.019
		4.795		4.885
Number of Children < 18y		-14.707***		
		4.817		4.908
Relationship Status X Number of Children < 18y				
Married/Partner # QID210		11.580**		10.166*
		5.424		5.552
Constant	29.130***	22.281	25.209***	21.416
	2.361	19.237	3.122	19.619
Random-Effects Parameters				
Individuals Nested in Sessions	2.871***	2.612***	2.855***	2.594***
	0.116	0.179	0.12	0.187
Foods	3.216***	3.234***	3.224***	3.240***
	0.053	0.056	0.054	0.057
Residual Heteroskedasticity Adjustment				
Round 1	2.602***	2.626***	2.603***	2.629***
	0.045	0.046	0.046	0.046
Round 2	-0.266***	-0.270***	-0.258***	-0.265***
	0.076	0.071	0.077	0.071
Round 3	-0.364***	-0.667***	-0.359***	-0.665***
	0.085	0.117	0.086	0.119
Wald	0	0	0	0
test	1200	1050	1176	1032

Table 3b. Mixed Effects Model of Premeditated Waste in Percentage Points

	Waste Mixed Effects Model Probability Weighting Coef./SE	Waste Mixed Effects Model Full Model (Probability) Coef./SE
Treatment (Base: No Date Label)		
Best By	4.886**	6.542***
	2.061	2.44
Use By	6.908***	8.629***
	2.07	2.373
Food (Base: Deli Meat)		
Spaghetti Sauce	-12.208***	-12.538***
	2.867	3.114
Treatment X Food		
Best By # Spaghetti Sauce	-4.054**	-3.662**
	1.683	1.741
Use By # Spaghetti Sauce	-3.818**	-4.465**
	1.688	1.758
Risk		
Treatment X Risk		
Best By # Risk		
Use By # Risk		
Loss		
Treatment X Loss		
Best By # Loss		

Use By # Loss		
Probability	4.475	5.703
	6.206	6.085
Treatment X Probability		
Best By # Probability	-5.800**	-5.742**
	2.741	2.758
Use By # Probability	-5.836**	-5.277*
	2.747	2.775
Round		-1.197*
		0.693
Income Tercile (Base: Low Income)		
Middle Income		-3.863
		4.177
High Income		4.92
		5.047
Gender (Base: Male)		
Female		8.737**
		4.011
Age		-0.061
		0.954
Age X Age		0.001
		0.011
Race (Base: non-White)		
White		-5.214
		4.267
State of Experiment (Base: Alabama)		
New York		5.946
		3.963
Education (Base: No College Degree)		
College Degree		7.679

		5.345
Relationship Status (Base: Single)		
Married/Partner		-3.289
		4.853
Number of Children < 18y	-14.752***	
		4.857
Relationship Status X Number of Children < 18y		
Married/Partner # QID210		12.019**
		5.5
Constant	26.808***	21.415
	4.499	19.893
Random-Effects Parameters		
Individuals Nested in Sessions	2.870***	2.615***
	0.118	0.18
Foods	3.221***	3.238***
	0.054	0.056
Residual Heteroskedasticity Adjustment		
Round 1	2.601***	2.624***
	0.046	0.046
Round 2	-0.260***	-0.263***
	0.077	0.071
Round 3	-0.354***	-0.661***
	0.086	0.118
Wald	0	0
test	1182	1038

Table 4. Estimated Marginal Effects of Date Labels Relative No Date Labels on Willingness to Pay (Dollars) and Premeditated Waste (Percentage Points)

Date Labels	WTP	PW
	(*p*-value)	(*p*-value)
	Spaghetti Sauce	
Best by-No Date Label	0.0205	-0.635
	(0.588)	(0.713)
Use by-No Date Label	-0.0078	0.989
	(0.934)	(0.554)
Best by-Use by	0.0327	-1.614
	(0.489)	(0.0889)
	Deli Meat	
Best by-No Date Label	-0.269	3.0496
	(0.000)	(0.0728)
Use by-No Date Label	-0.335	5.378
	(0.000)	(0.0013)
Best by-Use by	0.0655	-2.328
	(0.146)	(0.0141)

Notes: explain how the numbers here are calculated to make the table stand-alone.

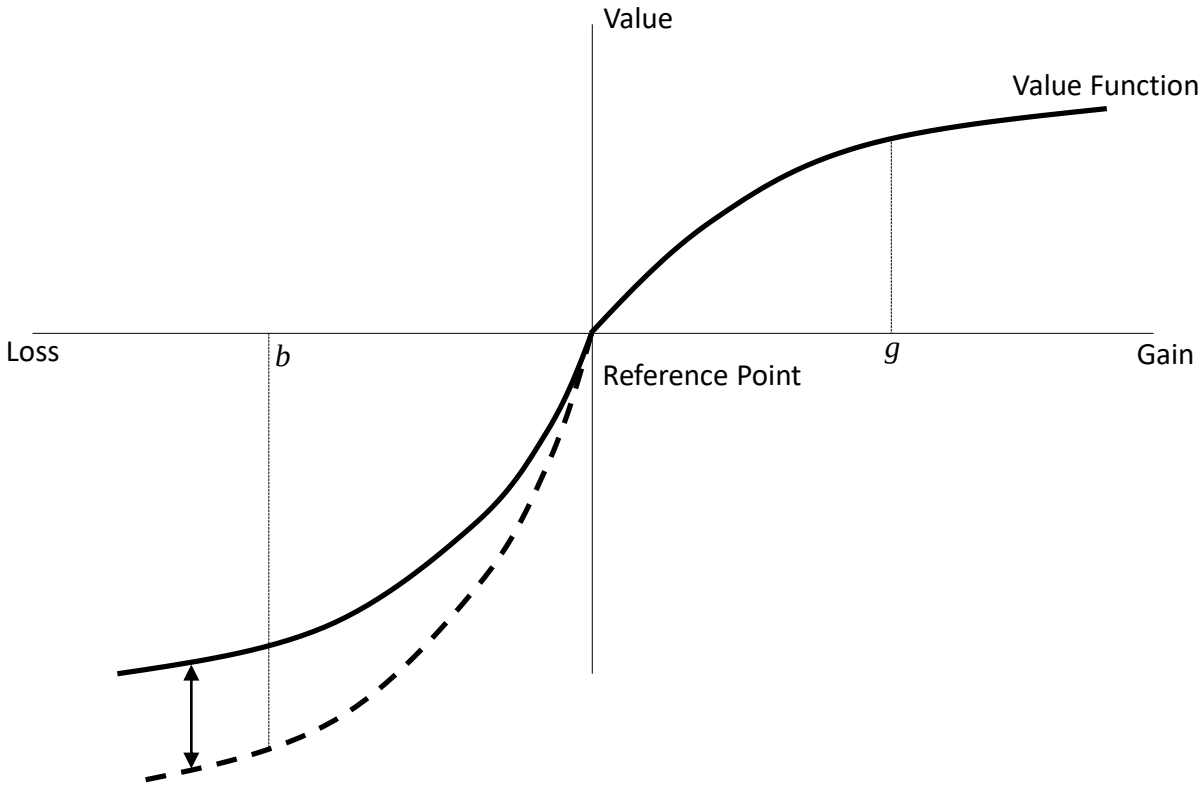
Table 5. Linear Probability Model of Anticipated Waste from Vignette Question of Product Use when the Product is One Day Past Posted Date Has a Date Label of Either "Best by" or "Use by" and a Price of Either $3 or $4

	Base Coef./SE	Loss Aversion Coef./SE	Probability Weighting Coef./SE	Risk Aversion Coef./SE
Treat (Base: Best by)				
Use	-0.061*	-0.098**	0.03	-0.068
	0.031	0.042	0.062	0.047
Food (Base: Eggs)				
Deli Meat	0.119***	0.140***	0.134***	0.135***
	0.044	0.043	0.043	0.043
Spaghetti Sauce	-0.029	-0.009	-0.014	-0.016
	0.032	0.029	0.029	0.029
Treat X Food				
Use by X Deli Meat	0.225***	0.200***	0.211***	0.207***
	0.069	0.068	0.068	0.069
Use by X Spaghetti Sauce	0.142***	0.115**	0.131***	0.130***
	0.051	0.049	0.049	0.05
Loss Aversion		-0.013		
		0.012		
Treatment X Loss Aversion				
Use by X Loss Aversion		0.028*		
		0.015		
Probability Weighting			0.005	
			0.082	
Treat X Probability Weighting				
Use by X Probability Weighting			-0.131	
			0.092	
Risk Aversion				0.069
				0.049
Treatment x Risk Aversion				
Use by X Risk Aversion				0.036
				0.066
Price (Base: $3)				
$4	-0.005	0.004	-0.004	0.002
	0.03	0.03	0.032	0.03
Income Tercile (Base: Low Income)				
Middle Income	-0.024	-0.019	-0.037	-0.029
	0.043	0.042	0.042	0.043
High Income	-0.048	-0.045	-0.056	-0.058
	0.045	0.044	0.047	0.045
Sex (Base: Male)				

Female	0.028	0.022	0.031	0.024
	0.04	0.038	0.04	0.039
Age	0.009	0.005	0.009	0.006
	0.01	0.01	0.01	0.01
Age X Age	0	0	0	0
	0	0	0	0
Race (Base: Other Races)				
White	-0.117**	-0.103**	-0.123**	-0.131***
	0.048	0.048	0.049	0.05
Location (Base: Alabama)				
New York	0.059*	0.073**	0.057*	0.059*
	0.035	0.034	0.035	0.034
Education (Base: Less than College)				
College Educated	0.008	-0.02	-0.002	0.001
	0.046	0.043	0.046	0.045
Marital Status (Base: Single)				
Married/Partner	-0.014	0.002	-0.026	-0.019
	0.043	0.04	0.044	0.043
Number of Children <18y.	0.014	-0.004	0.02	0.02
	0.046	0.041	0.046	0.045
Marital Status X Number of Children <18y.				
Married/Partner X Number of Children <18y.	0.012	0.038	0.014	0.011
	0.052	0.048	0.051	0.051
Constant	-0.078	0.004	-0.076	-0.06
	0.192	0.19	0.197	0.196
Wald p-value	0.000	0.000	0.000	0.000
Number of Observations	528	519	522	522

* p<0.10, ** p<0.05, *** p<0.010

Figure 1. The value function of prospect theory.



Note: The dashed line represents an increase in the loss parameter in the loss domain.

Figure 2. The probability weighting function of prospect theory (when $\alpha \in (0,1)$)

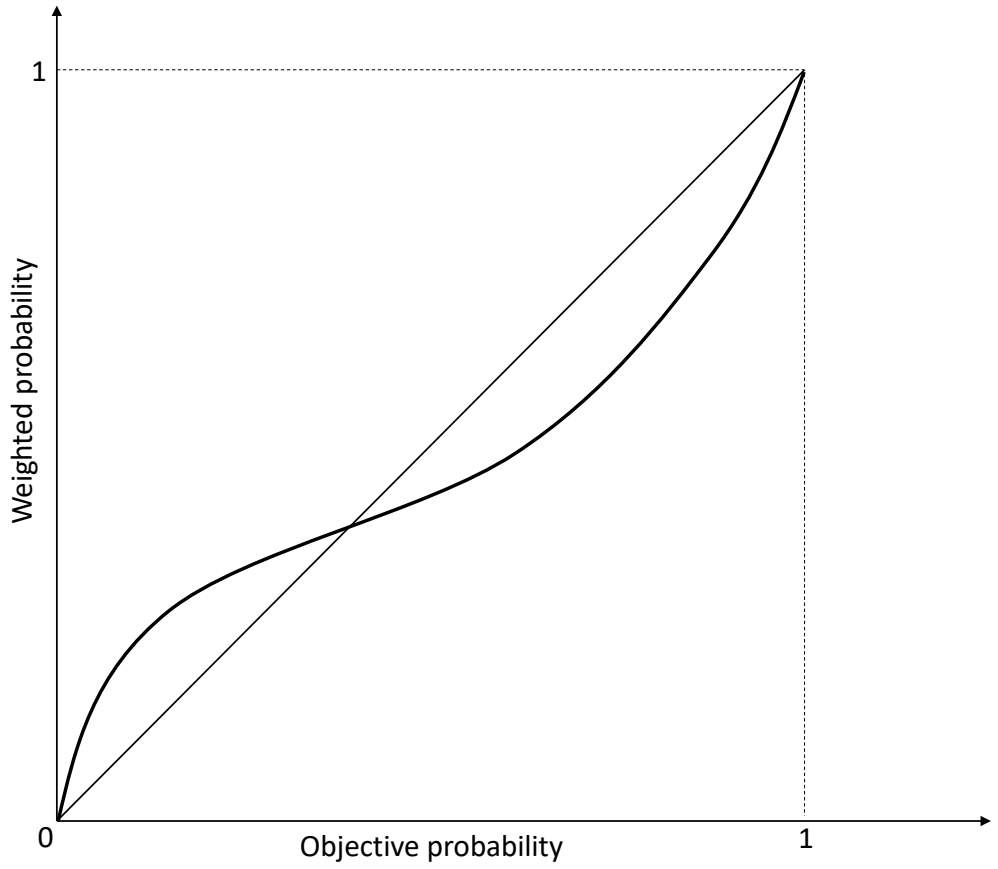
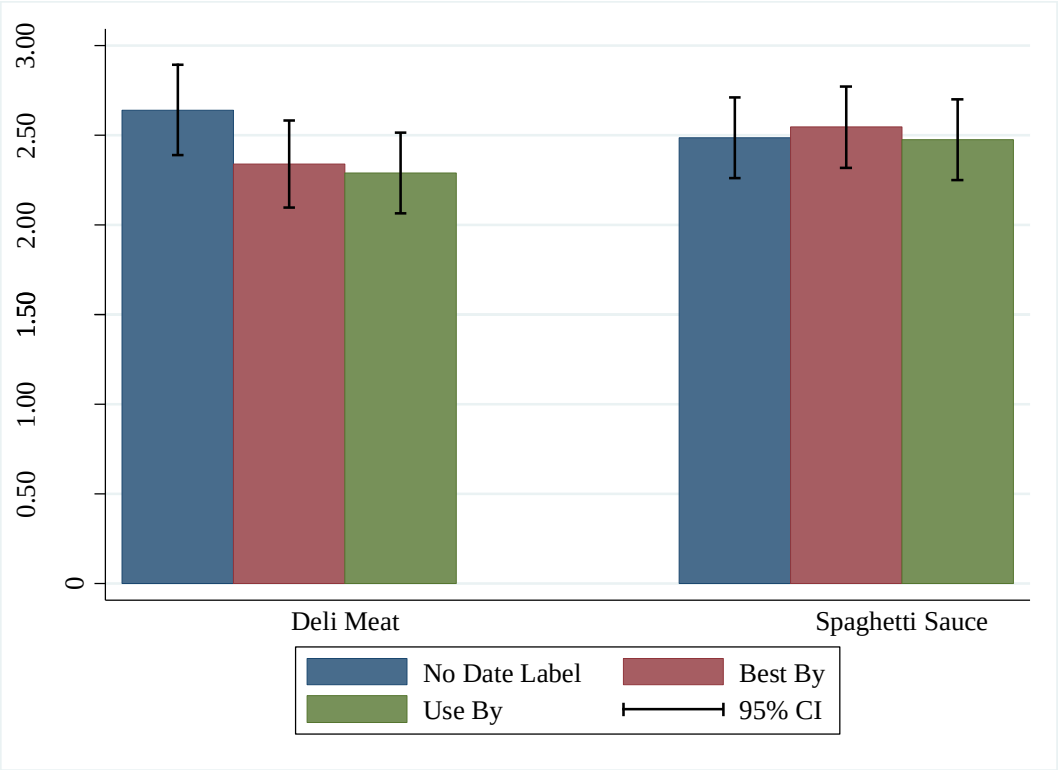
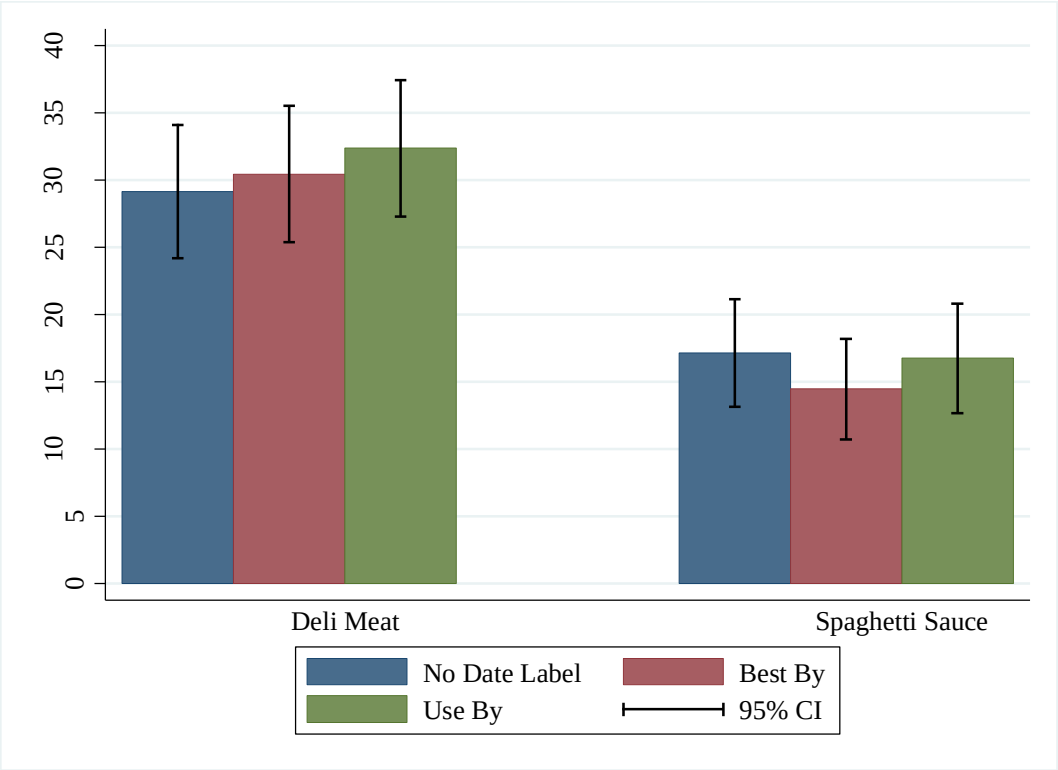


Figure 3. Willingness to Pay by Date Label and Product



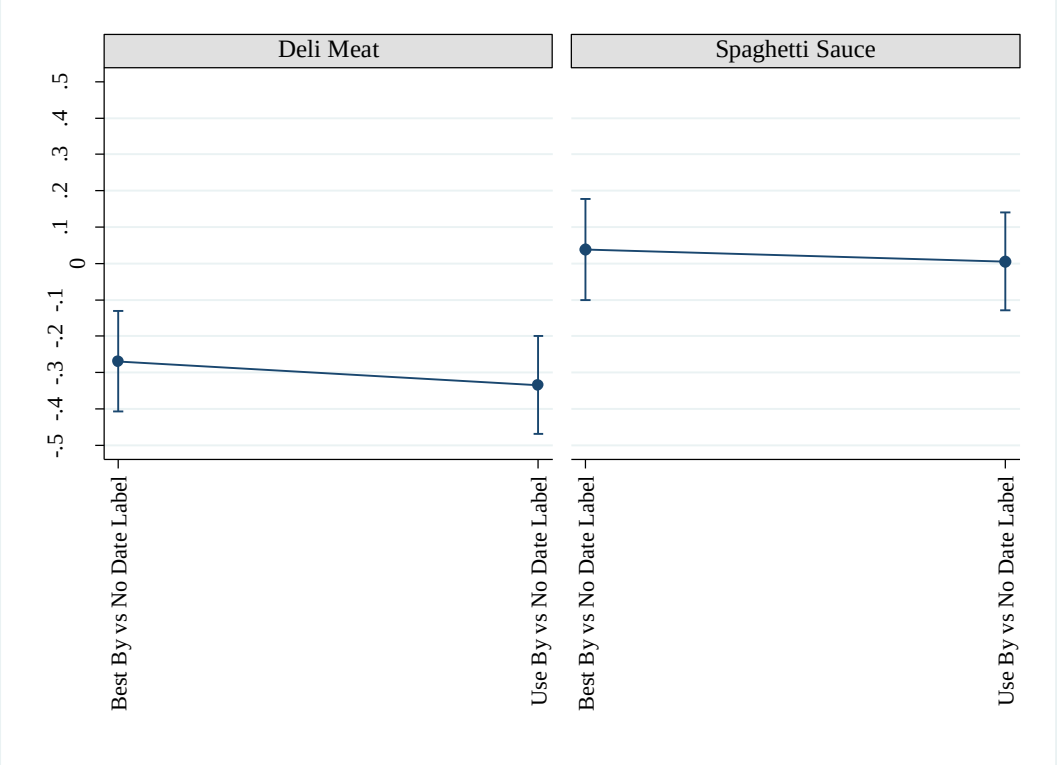
Note: N=200

Figure 4. Premeditated Waste



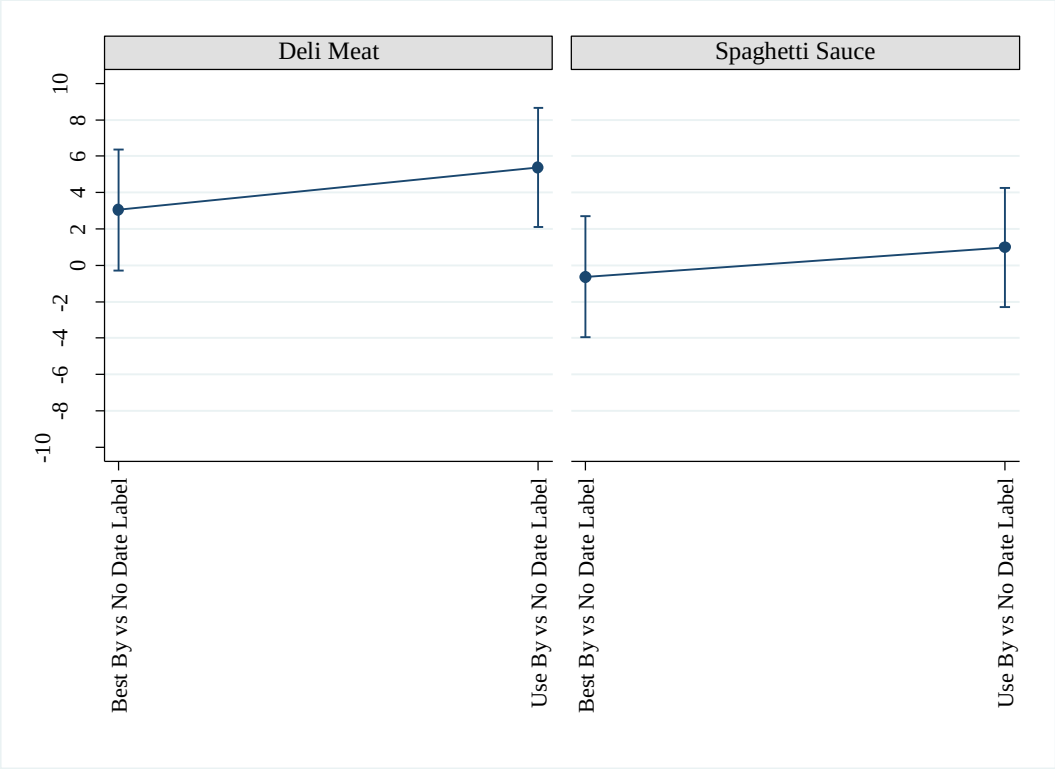
Note: N=200

Figure 5. The Treatment Effect of Willingness to Pay of Date Labels to No Date Label in Dollars



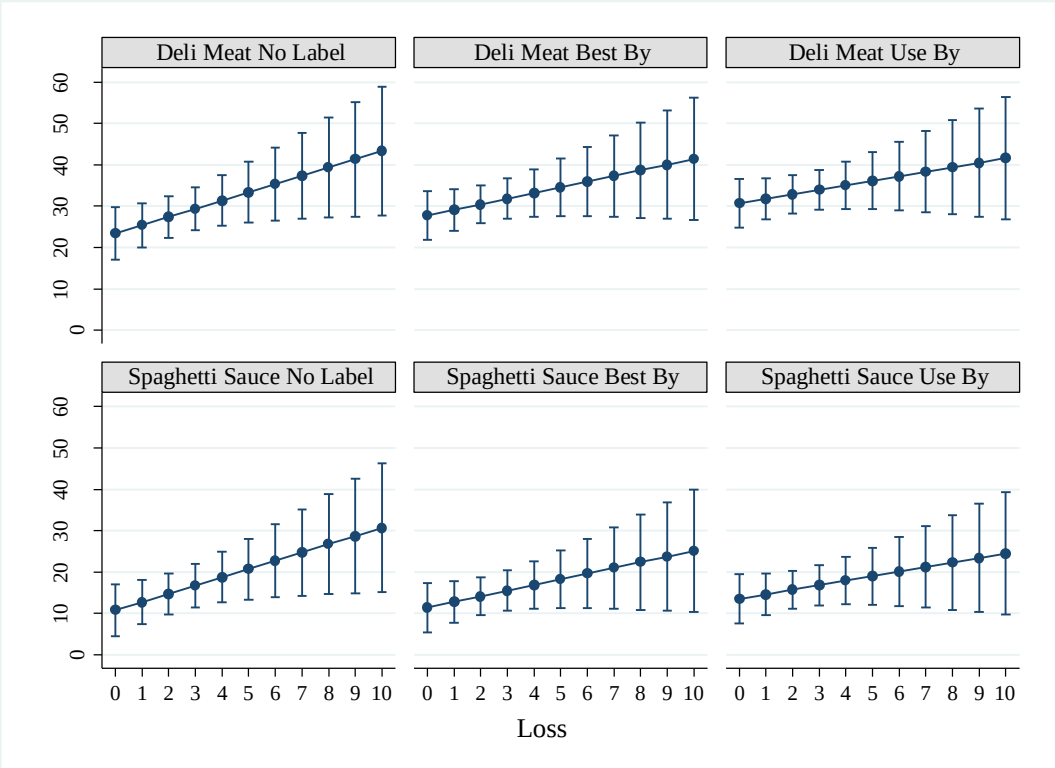
Note: The treatment effects are from the base model. The treatment effects are the estimated differences in date labels and the no date label willingness to pay (in dollars). From the regression model, the treatment effects estimated as contrasts in Stata is $\frac{\partial WTP_{ijkmn}}{\partial Treat_m} = \alpha_m + \alpha_{3+m} Food_k; m = 1,2.$

Figure 6. The Treatment Effect of Premeditated Waste for Date Labels Relative to No Date Label in Percentage Points



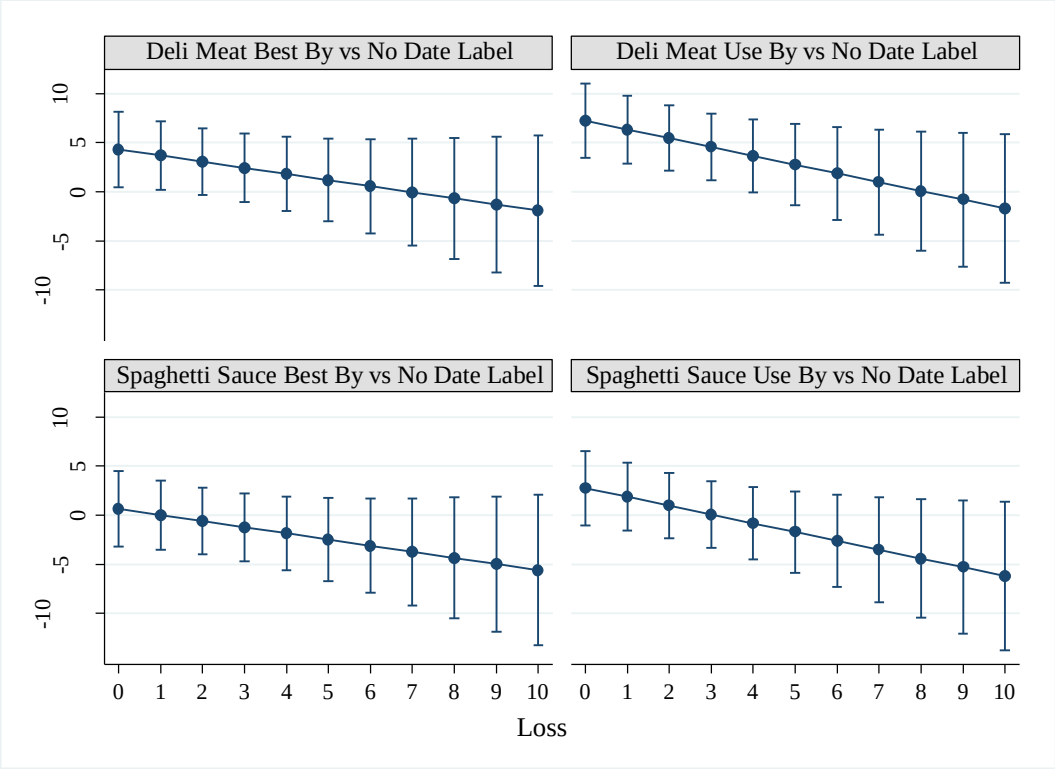
Note: The treatment effects are from the base model (Model 4). The treatment effects are the estimated differences in date labels and the no date label premeditated waste (in percentage points). From the regression model, the treatment effects estimated as contrasts in Stata is $\frac{\partial PW_{ijkmn}}{\partial Treat_m} = \alpha_m + \alpha_{3+m} Food_k; m = 1,2.$

Figure 7. Predicted Premeditated Waste over Loss Aversion Parameter



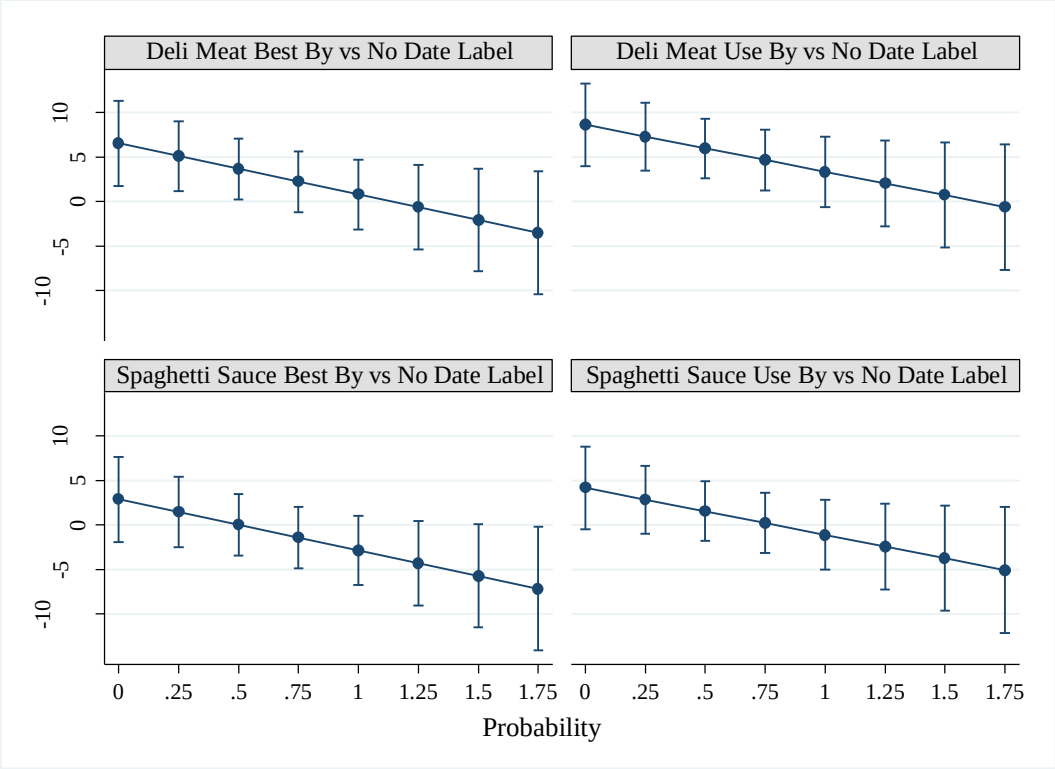
Note: These estimates are the predictions of the premeditated waste for each food and date label over the range of loss aversion at the mean of the other variables. The larger the value of λ, the more loss averse an individual is. When $\lambda > 1$, the individual is loss averse; when $0 < \lambda < 1$, the individual is loss-loving; and when $\lambda = 1$, the individual is loss neutral.

Figure 8. The Treatment Effect of Date Labels Relative No Date Label over Loss Parameter on Premeditated Waste in Percentage Points



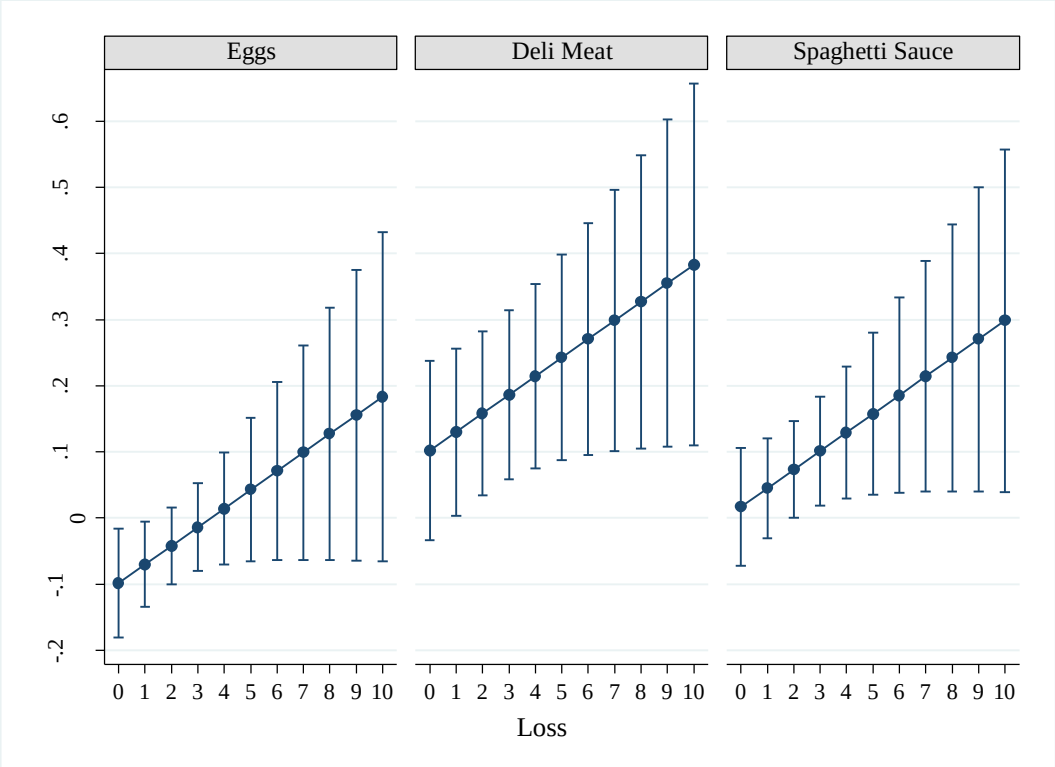
Note: The treatment effects are from the base model (Model 8), given the change in loss aversion. The treatment effects are the estimated differences in date labels and the no date label premeditated waste (in percentage points). The estimates are from the $\frac{\partial WTP_{ijkm}}{\partial Treat_m} = \alpha_m + \alpha_{3+m}Food_i + \beta_{4+n}Loss\ Aversion_{ijkmn}$. The larger the value of λ, the more loss averse an individual is. When $\lambda > 1$, the individual is loss averse; when $0 < \lambda < 1$, the individual is loss-loving; and when $\lambda = 1$, the individual is loss neutral.

Figure 9. The Contrast of Premeditated Waste by Date Level Relative to No Date Label over Probability Weighting Parameter in Percentage Points



Note: The treatment effects are from the base model (Model 8), given the change in probability weighting. The treatment effects are the estimated differences in date labels and the no date label premeditated waste (in percentage points). The estimates are from the $\frac{\partial WTP_{ijkm}}{\partial Treat_m} = \alpha_m + \alpha_{3+m}Food_i + \beta_{4+n}Probability\ Weighting_{ijkmn}$. The parameter α in the probability weighting function (i.e., equation (3)) governs the shape of the function. When $\alpha \in (0,1)$ then the probability weighting function is inverse S-shaped (see Figure 2), which reflects experimental findings that people tend to overweight low probability events but underweight high probability events. When $\alpha = 1$ then $w(p) = p$, implying no distortion of the objective probability, p. Larger values suggest that the individual underweights large probabilities.

Figure 10. The Contrasts of the Probability of Wasting Products (Best by vs. Use by) based on Between-Subject Survey Question



Note: The contrasts reflect the difference in the predicted probability of wasting products for "Best by" versus "Use by." We based the analysis on a between-subject design survey of the participants. In the survey question, participants responded to their expected use of a product that was one day after the posted date. The randomization gave participants either "Best by" or "Use by" as the date label and either $3 or $4 as the value of the product.

Table A1. Loss Aversion Series

Row	Option A	Option B	ID
1	Lose: $5 if balls 1-5; $0 if balls 6-100	Lose: $5 if your decision color; $0 if not	1
2	Lose: $5 if balls 1-10; $0 if balls 11-100	Lose: $5 if your decision color; $0 if not	2
3	Lose: $5 if balls 1-15; $0 if balls 16-100	Lose: $5 if your decision color; $0 if not	3
4	Lose: $5 if balls 1-20; $0 if balls 21-100	Lose: $5 if your decision color; $0 if not	4
5	Lose: $5 if balls 1-25; $0 if balls 26-100	Lose: $5 if your decision color; $0 if not	5
6	Lose: $5 if balls 1-30; $0 if balls 31-100	Lose: $5 if your decision color; $0 if not	6
7	Lose: $5 if balls 1-35; $0 if balls 36-100	Lose: $5 if your decision color; $0 if not	7
8	Lose: $5 if balls 1-40; $0 if balls 41-100	Lose: $5 if your decision color; $0 if not	8
9	Lose: $5 if balls 1-45; $0 if balls 46-100	Lose: $5 if your decision color; $0 if not	9
10	Lose: $5 if balls 1-50; $0 if balls 51-100	Lose: $5 if your decision color; $0 if not	10
11	Lose: $5 if balls 1-55; $0 if balls 56-100	Lose: $5 if your decision color; $0 if not	11
12	Lose: $5 if balls 1-60; $0 if balls 61-100	Lose: $5 if your decision color; $0 if not	12
13	Lose: $5 if balls 1-65; $0 if balls 66-100	Lose: $5 if your decision color; $0 if not	13
14	Lose: $5 if balls 1-70; $0 if balls 71-100	Lose: $5 if your decision color; $0 if not	14

15	Lose: $5 if balls 1-75; $0 if balls 76-100	Lose: $5 if your decision color; $0 if not	15
16	Lose: $5 if balls 1-80; $0 if balls 81-100	Lose: $5 if your decision color; $0 if not	16
17	Lose: $5 if balls 1-85; $0 if balls 86-100	Lose: $5 if your decision color; $0 if not	17
18	Lose: $5 if balls 1-90; $0 if balls 91-100	Lose: $5 if your decision color; $0 if not	18
19	Lose: $5 if balls 1-95; $0 if balls 96-100	Lose: $5 if your decision color; $0 if not	19

Table A2. Risk Aversion Series

Row	Option A	Option B	ID
1	Get: $20 if balls 1-30; $0 if balls 31-100	Get: $30 if balls 1-10; $2.5 if balls 11-100	20
2	Get: $20 if balls 1-30; $0 if balls 31-100	Get: $34 if balls 1-10; $2.5 if balls 11-100	21
3	Get: $20 if balls 1-30; $0 if balls 31-100	Get: $37.5 if balls 1-10; $2.5 if balls 11-100	22
4	Get: $20 if balls 1-30; $0 if balls 31-100	Get: $41.5 if balls 1-10; $2.5 if balls 11-100	23
5	Get: $20 if balls 1-30; $0 if balls 31-100	Get: $46 if balls 1-10; $2.5 if balls 11-100	24
6	Get: $20 if balls 1-30; $0 if balls 31-100	Get: $53 if balls 1-10; $2.5 if balls 11-100	25
7	Get: $20 if balls 1-30; $0 if balls 31-100	Get: $62.5 if balls 1-10; $2.5 if balls 11-100	26
8	Get: $20 if balls 1-30; $0 if balls 31-100	Get: $75 if balls 1-10; $2.5 if balls 11-100	27
9	Get: $20 if balls 1-30; $0 if balls 31-100	Get: $92.5 if balls 1-10; $2.5 if balls 11-100	28
10	Get: $20 if balls 1-30; $0 if balls 31-100	Get: $110 if balls 1-10; $2.5 if balls 11-100	29
11	Get: $20 if balls 1-30; $0 if balls 31-100	Get: $130 if balls 1-10; $2.5 if balls 11-100	30
12	Get: $20 if balls 1-30; $0 if balls 31-100	Get: $160 if balls 1-10; $2.5 if balls 11-100	31
13	Get: $20 if balls 1-30; $0 if balls 31-100	Get: $295 if balls 1-10; $2.5 if balls 11-100	32
14	Get: $20 if balls 1-30; $0 if balls 31-100	Get: $235 if balls 1-10; $2.5 if balls 11-100	33

15	Get: $20 if balls 1-30; $0 if balls 31-100	Get: $280 if balls 1-10; $2.5 if balls 11-100	34

Table A3. Loss Aversion Series

Row	Option A	Option B	ID
1	Get: $20 if balls 1-90; $15 if balls 91-100	Get: $25 if balls 1-70; $2.5 if balls 71-100	35
2	Get: $20 if balls 1-90; $15 if balls 91-100	Get: $27 if balls 1-70; $2.5 if balls 71-100	36
3	Get: $20 if balls 1-90; $15 if balls 91-100	Get: $28 if balls 1-70; $2.5 if balls 71-100	37
4	Get: $20 if balls 1-90; $15 if balls 91-100	Get: $29 if balls 1-70; $2.5 if balls 71-100	38
5	Get: $20 if balls 1-90; $15 if balls 91-100	Get: $30 if balls 1-70; $2.5 if balls 71-100	39
6	Get: $20 if balls 1-90; $15 if balls 91-100	Get: $31 if balls 1-70; $2.5 if balls 71-100	40
7	Get: $20 if balls 1-90; $15 if balls 91-100	Get: $32.5 if balls 1-70; $2.5 if balls 71-100	41
8	Get: $20 if balls 1-90; $15 if balls 91-100	Get: $34 if balls 1-70; $2.5 if balls 71-100	42
9	Get: $20 if balls 1-90; $15 if balls 91-100	Get: $36 if balls 1-70; $2.5 if balls 71-100	43
10	Get: $20 if balls 1-90; $15 if balls 91-100	Get: $38.5 if balls 1-70; $2.5 if balls 71-100	44
11	Get: $20 if balls 1-90; $15 if balls 91-100	Get: $41.5 if balls 1-70; $2.5 if balls 71-100	45
12	Get: $20 if balls 1-90; $15 if balls 91-100	Get: $45 if balls 1-70; $2.5 if balls 71-100	46
13	Get: $20 if balls 1-90; $15 if balls 91-100	Get: $50 if balls 1-70; $2.5 if balls 71-100	47
14	Get: $20 if balls 1-90; $15 if balls 91-100	Get: $55 if balls 1-70; $2.5 if balls 71-100	48

15	Get: $20 if balls 1-90; $15 if balls 91-100	Get: $65 if balls 1-70; $2.5 if balls 71-100	49

Script

Thank you for your presence. As you are settling at your computer, please do not use the computer in front of you until we ask and do not use your cell phones during the activities. Once we begin, please refrain from talking to your neighbors. While we wait to get started, read the information sheet at your computer.

<<Pause until all people take their seat, and the door of the laboratory is closed. >>

Again, thank you for your participation. Welcome to the Auburn University Experimental Economics Laboratory. Your thoughtful effort will help inform policies and understanding about food. Therefore, we need your careful consideration of the activities today. Taking part in this study is voluntary, and you are free to withdraw at any time.

Today, we will go through a series of activities on food and investment choices, followed by a brief survey. Please remember that we are not collecting any identifying information, so we cannot connect your responses to you.

CLICK

Today's Experiment

Over the activities, the average payout is $25 either in cash or in cash and a food product. You may receive more or less than this average payout, depending on your auction and investment results. Everyone will begin with $20 as compensation for your time spent with us today. Therefore, this $20 is NOT free money. You have earned this money with your presence. Any purchases or losses will be taken from this $20. Any gains will be added to the $20. Please note all employees and students of Auburn University are to receive their payment through checks that the university will mail to you. You have forms at your desks. If you receive a large payout today, the university asks that you complete a W-9. I will only hand that out in the event of the large payout.

We have two food products that will be included in a series of computerized auctions.

CLICK

We will present a different version of the products. Both items are national brands commonly found in a range of grocery stores across the U.S.; no product is organic. We will not taste the foods in this experiment.

We also have a series of investment activities, but I will describe them later.

Before we start the actual experimental activities, I would like to walk you through each type of activity through practice sessions. Note: The outcome of the practice sessions will not affect your final payments.

CLICK

Experimental Auction of Food Choice and Consumption

I will begin with the instructions on the food auction.

On each auction screen, we will present a "version" of the food item. You are to evaluate each version of the food item based on the information we give you.

CLICK

For each auction, we will ask you to submit a bid of your Maximum Willingness to Pay (WTP) for the item. Then to the right of your bid, you will use the slider to answer the question **"From 0% to 100%, what percentage of the product do you predict your household will consume after you purchase it?" Please answer this question, given the posted information.**

CLICK

Your job is to enter bids for all versions of the food item only as numbers and the dot or decimal place.

You must enter a value for the willingness to pay and the expected consumption percentage. Even if your willingness to pay is zero, you will need to enter that number in the box. To move forward, you must register an expected consumption percentage.

CLICK

After you submit your bids and the percentage of the food items you expect to consume, the computer will randomly draw the "market price" around the average retail price of the item.

For the selected item, if the randomly drawn "market price" is less than or equal to your bid, you will buy the item for the randomly drawn "market price."

If the "market price" is greater than your bid, you will not purchase the item.

CLICK

Consider the graphic; the number of bids is arranged from lowest to highest bid. If the value of the market prices is between the value of Bid #2 and Bid #1, the market price is less than the value of Bid #1, #4, #7 and #5. That is, the person who submitted, for example, Bid #4 has a maximum willingness to pay that is greater than the randomly drawn market price. This person will purchase the product. The people who offered Bid #2, #6 and #3 do not purchase the product because the market price is greater than their bids.

CLICK

CLICK

You cannot influence the randomly drawn market price with your bid, nor do we control the selection of the price. The computer randomly draws the market price. While this is an auction, you do not bid against each other. Rather your bid should reflect your actual maximum willingness to pay for the product.

CLICK

Based on this market price and your bid, you will buy, at most, ***one food*** item today (and some of you will likely not buy a food item today). Even though you will have multiple bids on different versions of the product, the computer will randomly select only one item for sale today. **CLICK**

Please listen carefully: If you submit a bid that is higher than your actual maximum willingness to pay, you may have to pay that higher price.

CLICK

If you submit a bid that is lower than what you are willing to pay, you may be disappointed and lose the auctioned item at a great price.

CLICK

So, bidding your actual maximum willingness is to your benefit.

Before we begin the hypothetical auction, are there any questions?

As we are ready to begin, please type in the password "**food**." All lower case "f-o-o-d."

CLICK

You have to click "Next" to proceed. Now please enter your computer number. That number is on the screen in front of you. Please click next to proceed.

CLICK

The next password is "**grow**."

CLICK

Practice Series 1

You should now see the Practice Series 1. Potato Chips with a date of November 30, 2016. Please enter your maximum willingness to pay for a 10 oz bag of potato chips given the date of November 30, 2016. When you enter your willingness to pay, please enter only numbers in the format of "dollars dot cents."

Now, use the slider on the right and move it to answer the question: "From 0% to 100%, what percentage of the product do you predict your household will consume after you purchase it?**"** Please answer this question, given the posted information. You must move the slider to register an answer. Please note that you can change the number by typing over the number that appears once you move the slider.

After you have checked your answers, please click "Next."

CLICK

Investment Activity

The second activity today is an investment activity. In this activity, you will make decisions on the investment opportunity you prefer. As it is an investment, you have a chance to gain or lose

money. Also, like any investment, you are to choose the investment product based on the chances of earning or losing money.

CLICK

Yes, we will exchange money. The average payoff of the investment activities is a gain of $10. However, you have a chance that you can gain much more or you can lose some money. Please note that you cannot lose more money than your basic participation pay.

CLICK

For many of the investment activities, you will know the chances of gaining or losing money for each option. However, in one series, you know the chances of gaining or losing money for one option, but not for the other. It is even unknown to us.

CLICK

After you have completed the series, we will have a random draw that will indicate which series is the series that will determine your payment. At that point, you will know if your choices lead to more or less money.

CLICK

Please understand that we do not control the outcomes. Like a real investment, the chance is part of the outcome, but you get to choose which chances you like best.

CLICK

Please listen carefully: *Your choices will determine your financial outcome.*

CLICK

Please indicate your true preferences for the options because the options will eventually determine your payout.

Before we begin the hypothetical investment activity, are there any questions?

CLICK

You may now enter the new password "**ring**, r-i-n-g."

Practice Series 2

For the Investment series, please imagine that we have a bucket with 100 ping-pong balls, which are numbered from 1 to 100. The computer will randomly select a ball to indicate your outcome.

Your job is to choose between the options that you prefer.

With Option A, if the ball randomly picked up by the computer has a number from 1 to 40, you will receive $1.50, but if it has a number from 41 to 100, then you lose $2. Thus you have a 40% chance to gain $1.50 and a 60% chance to lose $2.

CLICK

With Option B, if the ball randomly selected by the computer has a number from 1 to 40, then you will receive $12. However, you will lose $7 if the ball has a number from 41 to 100. In other words, you have a 40% chance to gain $12 and 60% to lose $7. Please note that the shaded areas in the graphs represent the chances of the gain or the loss for each option.

Your job is to choose either Option A or Option B. If the options are equally preferred, that is, you are indifferent between the options, then select "No Preference."

Please make your selection and click next. Please note that you may receive a request to select between another pair of options. The dollar amounts will change in this set, but the chances remain the same.

CLICK

Practice Series 3

For this last practice series, consider a bucket with 100 balls numbered 1 to 100. Now, we have one change. We consider an additional bucket that has 100 colored balls with an unknown mix of orange and red balls.

CLICK

Now enter the password "**word**."

Click next, and you will choose your decision color. We will use this ball color to determine the outcome of an activity if your decision color matches or does not match the randomly drawn color. As stated, we do not know the mix of red and orange, so choose a color that you like (or do not like).

CLICK

Please enter the password "**seed**."

With Option A, you have 100 balls, numbered 1 through 100. If a ball is randomly chosen that has a value from 1 to 50 you will lose $6. If, however, the randomly chosen ball has a number from 51 to 100 you lose no money. Thus you have a 50% chance to lose $6 and a 50% chance to lose $0. (click pause click)

With Option B, the computer will select a ball from the bucket of colored balls we just added. If the computer randomly selects a ball that matches your decision color, then you lose $6, but if the color ball does not match your decision color, then you lose no money. Please note that we do not know the chance of selecting an orange or red ball. (click pause click)

Choose either Option A or Option B. If you are indifferent between the options, then select "No Preference." Depending on your choice, you may see a different set of choices that reflect different chances. As this is a practice round, the decision will not affect your outcome from today.

Now make your selection and click next.

CLICK

Payout Round

This is just for practice; no bids will result in a sale for the practice item.

Please enter the password, "**tall**."

We will now show the result of your choices. In the actual activity, you will see the outcome at the end of the survey. You should see the randomly selected market price on the screen. Please select this and click next.

CLICK

Now you should see a payout screen that shows you information to determine your outcome. If your WTP is equal to or larger than the market price, you will purchase the potato chips at the market price. However, if your WTP is lower than the market price you would not purchase the product. Please note this is a practice round, so we will not exchange any bags of potato chips. Also note that the market price is different for each person; your choices do not affect the market price nor do they affect the outcome of others—you are not bidding against each other.

CLICK

On the following screens, you will see information to determine your outcome. For Investment Practice Series, the computer will translate your choices into a "switching row" for each series. I will explain the switching rows later. You will then randomly draw a row number and a ball number that correspond to the options presented in the activity questions.

Now type in the password "**rock.**"

Click "next" to see your switching row results for the Investment Practice Series.

CLICK

Allow me to explain the switching rows. Please note that the example on your screen will look different, so please look at my screen for this explanation. When you were making choices between Option A and B in each series you were making decisions of which option you preferred as presented in the two tables. For each row in the table, the highlighted options are the ones that you preferred. If you were indifferent between Option A and B in a row, the computer kept Option B for recording simplicity. As you decided between options, the computer evaluated when you would switch from preferring Option A to preferring Option B. Looking at the rows in

the table from top to bottom, the row where you first preferred Option B to Option A is the switching row of that table.

Your switching rows for the practice investment series are on your screen. Your decision color and the switching row for the practice series appears above the table of the practice series.

Consider this example; the randomly selected row is row two. Because row two is the relevant row, we consider row two. Given the selection between the options, the relevant option for row 2 is Option A, which is in green. The ball number is 68. Thus, the payout for this example is lose $0. Consider another possibility had the randomly selected row been row three, what would have been the relevant option? Yes, option B would have been the relevant option. In that case, we would look at the ball color. Since the randomly chosen ball color is orange and the decision color is orange, what would the payout have been? That is right; the outcome would have been lose $6.

At this time, please click the boxes above the table for two practice series.

CLICK

We will only go through the award process for the second investment practice series, as this process is very similar for both series.

Enter the password "**date.**"

Click "next" to draw your ball number. Please enter the number of the ball. Now you draw the row number. Enter that number in the box. If you make an error, the computer will ask you to do it again, but the computer may choose a different number. Lastly, the computer randomly selects the ball color. You should now see the decision screen. You should see a line that states your decision color. Click on the circle acknowledging your decision color and click next. Now you should see all of the results.

In the real activity, you would document all of this information on your sheet provided.

After the food auctions and the investment activities but before the outcome session, we will direct you to a survey that includes questions about you and your consumption habits. You must submit a completed survey to receive your compensation.

All of your answers are confidential.

Are there any questions? If no, we will now begin.

Please enter the password "**find**."

Auction: Spaghetti Sauce

CLICK

Now enter the password "shoe."

Our first food item is a 24 oz jar of spaghetti sauce. The date is November 16, 2017. Please note that we have different brands of marinara or meatless spaghetti sauce dated November 16, 2017. Please type in your maximum willingness to pay for this item, and use the slider to answer the question**: "From 0% to 100%, what percentage of the product do you predict your household will consume after you purchase it?" Please answer this question**, given the date. Before clicking next, please make sure that your answers reflect your true willingness to pay and expected consumption.

CLICK

Auction Sliced Deli Meat

Our next food item is an 8 oz container of deli turkey meat. The date is November 30, 2016. Please type in your maximum willingness to pay for this item, and use the slider to answer the question**: "From 0% to 100%, what percentage of the product do you predict your household will consume after you purchase it?" Please answer this question**, given the posted information. Before clicking next, please make sure that your answers reflect your true willingness to pay and expected consumption. When you are ready, please click next.

CLICK

Now that everyone is ready, please enter the password "**mark**."

First Investment Series

Here is our first investment series. In this series, choose either Option A or Option B, no ball color is involved. If the options are equally preferred, that is, you are indifferent between the options, select "No Preference."

Now that everyone is finished, please enter the password "**down**."

CLICK

Now the new password is "**lift**."

Now we have a 24 oz jar of spaghetti sauce that says Use by November 16, 2017. Please indicate your maximum willingness to pay and use the slider to answer the question**: "From 0% to 100%, what percentage of the product do you predict your household will consume after you purchase it?"** Please answer this question, given the Use by date. The posted date on the product is no earlier than Use by November 16, 2017. When you have checked your answers, please click next.

Now we have an 8 oz package of sliced turkey meat that says Use by November 23, 2017. Please indicate your maximum willingness to pay and use the slider to answer the question**: "From 0% to 100%, what percentage of the product do you predict your household will consume after**

you purchase it?" Please answer this question, given the Use by date. The posted date on the product is no earlier than Use by November 30, 2016. When you have checked your answers, please click next.

CLICK

Now that you all have done this set, please enter the password "**book**."

In this series, you are to indicate your preferences between two options. If the options are equally preferred, that is, you are indifferent between the options, then select "No Preference."

Now that everyone is ready.

CLICK

You now have a new investment series. Select the options that best reflect your investment choices.

CLICK

Now that you all have done this set, please enter the password "**fill.**"

CLICK

In this series, you are to indicate your preferences between two options. If the options are equally preferred, that is, you are indifferent between the options, then select "No Preference."

For one of the options presented throughout this series, you will need to choose one of two decision colors. There are balls of each color (Orange and Red) in a set of 100 balls, but the number of orange and red balls is unknown.

You must select a decision color. Then click next.

Choose either Option A or Option B. If the options are equally preferred, that is, you are indifferent between the options, then select "No Preference." When you are ready, click next. You may see multiple sets of options. Keep moving forward until you arrive at a password.

Now that everyone is ready.

Now that you all have completed this series, please enter the password "**move.**"

Now we have a 24 oz jar of spaghetti sauce that says Use by November 16, 2017. Please indicate your maximum willingness to pay and use the slider to answer the question**: "From 0% to 100%, what percentage of the product do you predict your household will consume after you purchase it?" Please answer this question**, given the Use by date. The posted date on the product is no earlier than Use by November 16, 2017. When you have checked your answers, please click next.

Now we have an 8 oz package of sliced turkey meat that says Use by November 30, 2016. Please indicate your maximum willingness to pay and use the slider to answer the question**: "From 0% to 100%, what percentage of the product do you predict your household will consume after you purchase it?" Please answer this question**, given the Best by date of November 30, 2016. The posted date on the product is no earlier than Use by November 30, 2016. When you have checked your answers, please click next.

You have ended the series.

Survey

We have completed the auction and investment series!

At this point, we ask you to complete a survey. Please carefully consider each response. The analysis depends on thoughtful responses to these questions.

The survey does not affect the outcome. We do not connect your answers to you. If you prefer not to answer a question select, "prefer not to answer." Please follow the instructions on your screen and answer all the questions in the survey. Please note that you can only move forward in the survey. Wave us over if any of the survey questions are not clear. Once you successfully submit the survey, you will see a page that states

"On the next screen, you will be randomly assigned an award protocol based on your Computer Number."

Please wait there.

To enter the survey portion, please enter the password "**wire**."

CLICK

Outcome

Now that you have completed the survey, we are ready for the decision.

CLICK

The password to proceed is "**talk.**"

CLICK

You will see, "Your award protocol is:" On the payout, sheet write down the words next to the selection button. When you have done this, please check the button and select next.

Now click each box to register your tables. You may click each table to see your choices. Please put the switch rows in the four boxes that corresponded to the text above each table. The switch row information is above each series table.

At this point, some of you will have different outcomes. If your award protocol is an auction, you will participate in the food auction. If you have risk analysis, please wait patiently for your instructions.

If you are in the auction, you will not receive a payment or loss from the investment activity.

You will now see your reported Willingness to Pay for the item under one of the three date label treatments from the survey. The computer will select the product version at random.

You will then draw the market price for the given item. If the reported Willingness to Pay for the item is greater than or equal to the market price, then you will purchase the item. If the reported Willingness to Pay is less than the market price, then you will not purchase the item.

Please enter the password "**card**."

You will see a randomly selected product. Please select and now click next for the date label. Please select and click next.

You will see the award page with the product, date label, and your willingness to pay. Click next. You should now see the market price. Please select it and click next. You will now see all of the information. Please note on the Payout sheet the product, WTP, and the market price.

When you have completed your payout sheet, type in the password "done." Please see Dr. Miao for your payout. Thank you for your participation.

For the risk analysis group. Once you have checked your four switching row tables, you will enter the password "**part**."

The computer has randomly selected a ball number. Put that value in the box provided. Click next so that the computer will generate the row number. Enter that number in the box on the screen and the payment slip.

Now you will see the row number. Please note that the row number corresponds with ID. If the row number is a number from 1 to 19 and your choice is Option B then you will have to consider the ball color; otherwise, the ball color does not matter and is not provided.

You will see the ball number and the row. Select the series and row number. The row number corresponds with the ID number on the right column. The option in green for that row is the one that you are to consider. Based on the ball number for that option, you will see your payout. Click next. Write down the following computer number, row number, ball number, and switch row on the payment sheet.

At this point, you need to enter "**done**." When you are finished, please come to me for your payout.