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This article proposes a utilitarian model in which recycling could reduce consumers' negative emotions from wasting resources (i.e., taking more resources than what is being consumed) and increase consumers' positive emotions from disposing of consumed resources. The authors provide evidence for each component of the utility function using a series of choice problems and formulate hypotheses on the basis of a parsimonious utilitarian model. Experiments with real disposal behavior support the model hypotheses. The findings suggest that the positive emotions associated with recycling can overpower the negative emotions associated with wasting. As a result, consumers could use a larger amount of resources when recycling is an option, and more strikingly, this amount could go beyond the point at which their marginal consumption utility becomes zero. The authors extend the theoretical model and introduce acquisition utility and the moderating effect of the costs of recycling (financial, physical, and mental). From a policy perspective, this research argues for a better understanding of consumers' disposal behavior to increase the effectiveness of environmental policies and campaigns.

Keywords: behavioral economics, sustainability, recycling, disposal, self-conscious emotions

The Effect of Recycling Versus Trashing on Consumption: Theory and Experimental Evidence

> Just as the third graders believed that their litter run was helping the planet, Americans have embraced recycling as a transcendental experience, an act of moral redemption.
>
> — John Tierney (1996)

The U.S. Environmental Protection Agency (EPA) keeps close tabs on how much Americans recycle and trash. Although they are recycling more than ever, they also generate much more waste. The EPA statistics show that from 1960 to 2012, the amount of waste generated in the United States increased from 2.68 to 4.38 pounds per person per day, an increase of more than 60%. In 2012, Americans recycled 34.5% of this waste, or 1.51 pounds of the 4.38 pounds generated by each person daily (EPA 2012). Given the significant amount of waste being generated, the EPA has followed a hierarchal approach to waste management—"Reduce, Reuse, Recycle"—to identify program priorities for sustainability. As a result, the government continues to spend a significant portion of taxpayers' money in advertising and promoting this approach to the general public. For example, recycling contests are organized and prizes are awarded to communities and organizations that recycle the most. Given the substantive effort to promote waste management as an actionable means to save our planet, a better understanding of the psychology behind consumer decisions to trash versus recycle is an important endeavor.

Consequently, scholars have begun to investigate factors that influence waste reducing, reusing, and recycling with the objective of developing actionable insights for policy makers (Goldstein, Cialdini, and Griskevicius 2008; Lord 1994; McCarty and Shrum 2001; Trudel and Argo 2013; Trudel, Argo, and Meng 2015, 2016; White, MacDonnell, and Dahl 2011). For example, Fullerton and Kinnaman (1996) investigate

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municipal recycling and trashing rates and find that municipalities are able to reduce the number of trash bags collected and increase recycling rates when they charge consumers for each bag of trash collected, though the fee for disposal may also have contributed to illegal dumping and increased recycling sorting fees. Schultz et al. (2007) show that using descriptive normative messages that enable consumers to compare their energy consumption rates with those of their neighbors effectively reduces energy consumption. Building on Schultz et al., Goldstein, Cialdini, and Griskevicius (2008) find that hotel guests are most likely to reuse their towels when signage describes behavior that occurs in a setting that most closely matches their situational circumstances. Mazar and Zhong (2010) find that while exposure to green products promotes altruistic behavior, the purchase of such products may reduce altruism. As a final example, Trudel and Argo (2013) report that the extent to which a product is distorted during consumption determines whether it is trashed or recycled. Consumers are far more likely to trash paper that has been cut into pieces or aluminum cans that have been dented compared with paper and cans that remain whole and undistorted.

The insights gained from this literature can go a long way in helping policy makers and marketing managers educate and persuade consumers as well as design products and packaging to increase recycling rates. The underlying assumption motivating these research studies is that recycling is good for the society, and the more that people recycle, the better. However, recycling is only good if it does not lead consumers to use significantly more resources (Catlin and Wang 2013) and therefore, it is important to understand the psychology behind how disposal behavior may affect consumption.

While there exist several descriptive models of decision making that inform how consumers make consumption choices (e.g., Bettman, Luce, and Payne 1998; Hoch and Loewenstein 1991; Kahneman and Tversky 1979), little is known about how consumers make disposal choices and, in particular, why they trash versus recycle a product. Motivated by an effort to improve environmental regulations, scholars have advanced macro-level theoretical models of waste control (Keeler, Spence, and Zeckhauser 1971; Plourde 1972) and recycling. Smith (1972), for example, investigates how taxes and fees are used to motivate firms to reduce waste and increase recycling. In his model, recycling enters household utility functions simply as a negative cost term, reflecting the additional effort that the household has to incur to recycle used resources. In a similar spirit, Lusky (1976) develops a social planning model in which the goal is to optimally allocate a given amount of labor between recycling, disposal, and production. Similar to what we propose in this article, Lusky allows recycling to have a positive effect on consumers' utility. The trade-off between recycling and disposal in his study, however, comes from the difference in the labor productivity in performing these two tasks. In summary, prior theories of recycling have largely focused on macro-level resource allocation and not on consumers' psychological processes in making recycling decisions.

In our baseline model, we abstract away from the costs of disposal and highlight the trade-off between positive and negative emotions associated with disposing of material in the trash versus recycling. More specifically, we focus on positive and negative self-conscious emotions (e.g., pride, guilt) to provide support for our model and illustrate our point throughout the article. While we acknowledge that more basic emotions (e.g., sadness, happiness) may also influence disposal behavior and consumption, the model is not intended to provide an exhaustive list of the many emotions that could be associated with recycling and disposal behavior and their differential effects. Rather, our goal is to build a parsimonious and tractable model that uses a small number of parameters to yield useful predictions for a variety of real-world scenarios involving recycling. In our theorizing, we focus on self-conscious emotions because they have been found to have a profound influence in regulating people's moral, prosocial, and proenvironmental thoughts and behavior (Baumeister, Stillwell, and Heatherton 1994; Tracy and Robins 2004; Tracy, Robins, and Tangney 2007). As common examples of self-conscious emotions, pride and guilt are anticipated or evoked through self-evaluations of one's moral conduct or behavior relative to personal or social standards (Lewis 1997; Tracy and Robins 2004).

In most consumer research, the decision to trash versus recycle is investigated as an isolated, one-shot decision (e.g., Kidwell, Farmer, and Hardesty 2013; Trudel and Argo 2013; White, MacDonnell, and Dahl 2011). However, in our model we approach the decision to trash versus recycle a product as the result of a series of decisions in which one choice follows another. For instance, we consider the possibility that the decision of how much of a resource to use is the result of whether a consumer believes (s)he would trash versus recycle the resource after (s)he is finished with it.

Our research shares similarities with work investigating licensing effects (Effron, Miller, and Monin 2012; Kahn and Dhar 2006; Mazar and Zhong 2010; Merritt, Effron, and Monin 2010). In the domain of consumer behavior, the licensing effect has been shown to act similarly to other guilt-reducing mechanisms, such that prior virtuous acts can boost people's self-concepts and therefore license them to choose an option that would usually have negative self-attributions (Kahn and Dhar 2006). The initial boost in self-concept decreases the guilt associated with the negative choice. Our model makes a variety of predictions of consumption patterns on the basis of whether consumers believe they would trash or recycle the resource afterward, with the opportunity to recycle predicting that consumers may consume more of a resource. Importantly, we do not model consumption and disposal as isolated decisions but rather propose that people use anticipated emotions to guide their disposal decisions in much the same way that we observe in the licensing literature. Our predictions are based on anticipated emotions associated with disposal and, in particular, the effects of recycling to moderate negative emotions associated with wasting and to induce positive emotions associated with disposing used resources. In the section that follows, we construct our theoretical model of recycling and develop testable hypotheses that we explore subsequently.

Standard economic models have typically ignored or trivialized the role of emotions on people's behavior and make the standard assumption of rationality (Arrow 1987). Behavioral economists and decision-making researchers have challenged this assumption and identified different emotional influences on behavior (Camerer, Loewenstein, and Rabin 2011; Loewenstein and Lerner 2003; Sanfey et al. 2003). Sanfey et al. (2003), for example, show that people use both cognitive and emotional processes to evaluate the fairness of proposals from

ultimatum game partners. In other work, incidental mood has been shown to influence risk perceptions. Johnson and Tversky (1983) induced positive or negative moods in research participants by asking them to read newspaper stories and then having them estimate fatality frequencies for a variety of events. Those who were induced with a negative mood had more pessimistic estimates of fatalities. Other research has shown that integral emotions can lead to biased decision making, even in the presence of cognitive information suggesting alternative courses of action (Gigerenzer 2004; Loewenstein 1996; Loewenstein et al. 2001). Undeniably, emotions are drivers in many of the decisions that people make (Lerner et al. 2015), including the decision to trash versus recycle a product.

A THEORETICAL MODEL OF RECYCLING

The effect of recycling on consumption in our model is twofold. We know from prior literature that people are strongly averse to creating waste (e.g., Arkes 1996; Bolton and Alba 2012). Therefore, there are reasons to believe that consumers avoid waste whenever they can. Conceptually, we propose that consumers are waste averse in general and experience negative emotions when taking more resources than what they actually use. We build a utility-reducing component in our model to capture the array of negative self-conscious emotions that are associated with wasting resources. On the one hand, when waste occurs, recycling could help reduce the extent of negative emotions that a consumer would experience. On the other hand, when the consumer disposes used resources, we posit that the usage of a resource could, to some degree, justify trashing. As the negative emotions are mitigated, recycling in this case induces an array of positive emotions that we capture with a utility-enhancing component in our theoretical model. We use a series of experiments to establish these different effects of recycling. Our focus is on the existence and trade-off between the negative and positive emotions associated with the consumer's disposal behavior, which generates meaningful predictions for various recycling scenarios.

Formulation of the Model

Next, we offer a utilitarian framework to highlight consumers' trade-offs in deciding how much of a resource to consume when they have the option to recycle versus trash. To begin, consider a conscientious consumer who thinks carefully about his or her disposal choices. There are several important quantities in the decision process. For example, when out for dinner, (s)he might take five napkins for a meal, use two of them, and then put all five napkins, used and unused, into the trash. In this case, the amount of resource taken is $q^t = 5$, the total amount of resource used is $q^c = 2$, the amount of wasted resource is $q^t - q^c = 3$, and the proportion of recycled resource is 1.

To build the foundations of our model, we first construct choice problems that reveal the general preference not to waste. Consider the following choice problems:

Choice Problem 1

> Imagine that you are at a party and the host has plastic cups available for beverages. You have six of the same drinks that night (i.e., 6 servings of Coca-Cola). There are plenty of cups and you can either choose a new cup for each drink or reuse the same cup throughout the evening.
>
> Which would you prefer to do?
>
> A. Use 1 cup
> B. Use 6 cups

Indeed, when we asked 68 participants on Amazon Mechanical Turk (MTurk) to choose between using one cup or six cups, 96%[1] of respondents chose to use one cup.

Choice Problem 2

> Imagine that you are at your favorite take-out restaurant. You take 5 napkins but you only use 3. You have no other use for the other 2 napkins, i.e., you will not use them. Now imagine the same scenario but you take 3 napkins and use all 3.
>
> Which would you prefer to do?
>
> A. I would prefer to take 5 napkins and only use 3
> B. I would prefer to take 3 napkins and use all 3

Eighty-six MTurk participants were asked to make this choice; 77% chose not to waste and selected to take three napkins and use all three.

Choice Problem 3

> Imagine that you need to mail a gift. The gift measures 4 inches high × 4 inches long × 3 inches wide. You have the following two boxes at home which you can use to put to the gift in and mail it.
>
> A. 5 inches × 5 inches × 5 inches
> B. 10 inches × 10 inches × 10 inches
>
> The package is not fragile, and you do not need extra packing to keep it safe. It will cost the same to mail the package, regardless of the size of the box. Which box would you choose to mail your package in?

Consumers once again demonstrated waste aversion, with 97% of MTurk participants (N = 59) choosing the smaller box. The findings from these choice problems clearly show that people are averse to wasting resources in a variety of consumption contexts. The results are consistent with prior work demonstrating waste aversion (e.g., Arkes 1996). More importantly, our results suggest that people are aware of waste and that they feel negative self-conscious emotions (e.g., guilt, shame, embarrassment; Lewis 1997, Tracy and Robins 2004) about creating waste. Negative self-conscious emotions such as guilt are evoked or anticipated after a self-evaluative reflection of behavior and are the result of failing to adhere to personal or social standards (Lewis 1997). Being wasteful is in conflict with personal and social standards, but it is sometimes unavoidable.

When waste occurs, people may try to recycle the wasted material to alleviate the negative emotions that come with being wasteful. Because recycling is consistent with personal and social standards (Abbott, Nandeibam, and O'Shea 2013; Cialdini, Reno, and Kallgren 1990), we believe that it may attenuate the negative emotions from wasting resources. A standard choice problem and a between-subjects experiment serves to confirm our intuition by measuring self-conscious emotions from trashing versus recycling. In the problems that follow, to measure emotions we had participants respond to

[1] All of the choice problems are statistically significant at $p < .01$, unless otherwise noted.

randomized items capturing both positive ("proud," "good," "happy," and "pleased with myself") and negative ("guilty," "bad," "ashamed," and "embarrassed") emotions on seven-point scales (1 = "not at all," and 7 = "very much").[2]

Choice Problem 4a

> Imagine that you are at your favorite take-out restaurant. You order your food, and on the way out, you take 5 napkins. You go home and eat but only use 3 of the napkins. Your recycling and trash are side by side. Which would you prefer to do?
>
> A. Recycle the 2 napkins you did not use
> B. Trash the 2 napkins you did not use

Indeed, when asked to choose between recycling and trashing unused napkins, 78% (N = 74) of consumers preferred to recycle. To examine the role of emotions and building on Choice Problem 4a, we asked 114 MTurk participants to imagine this scenario. Participants were grouped into a between-subjects disposal condition (recycle or trash) and randomly assigned to answer one of two possible dependent variable questions: (1) "How would you feel about *taking* the five napkins if you trash (recycle) the two unused napkins?" (2) "How would you feel about the *act* of trashing (recycling) the two unused napkins?"

Overall, the results suggest that creating waste indeed activates negative emotions in consumers, whereas recycling the wasted resource can significantly mitigate these emotions. When examining how participants (N = 60) felt about taking the five napkins in the first place, we find a significant main effect of disposal condition ($F(1, 58) = 9.52$, $p < .01$) such that participants' negative emotions are significantly stronger as a result of taking the five napkins when the two unused napkins are trashed (M = 2.68) versus recycled (M = 1.53). Next, we analyzed how people (N = 54) felt about the act of disposal (dependent variable question 2) and also find significant differences in the negative emotions elicited by trashing (M = 3.56) versus recycling (M = 1.30; $F(1, 52) = 42.87$, $p < .001$). To demonstrate the robustness of these effects to other product domains, we presented 118 MTurk participants with another scenario.

Choice Problem 4b

> Imagine that you are at the public library working on your taxes. You need some scrap paper, so you take 10 pieces of paper from a stack on the counter. You do your calculations and in the end you only use 6 pieces of paper. Four pieces of paper are not needed and go unused. The recycle and trash bins are side by side.

Participants were randomly assigned to a between-subjects disposal condition (recycle or trash) and, consistent with Choice Problem 4a, responded to one of the two dependent variable questions: (1) "How would you feel about taking the ten pieces of paper if you trash (recycle) the four unused pieces of paper?" and (2) "How would you feel about the act of trashing (recycling) the four unused pieces of paper?" Consistent with our previous analyses, we first analyzed how participants (N = 60) felt about taking the ten pieces of paper. The results again reveal a significant main effect of disposal condition ($F(1, 58) = 12.73$, $p < .001$) such that participants' negative emotions are significantly stronger as a result of taking the ten pieces of paper when the four unused pieces of paper are trashed (M = 4.10) versus recycled (M = 2.36). Analysis of dependent variable question 2 also reveals significant differences in the negative emotions elicited by the act of trashing (M = 3.91) versus recycling (M = 1.54; $F(1, 56) = 38.56$, $p < .001$).

From these observations, we build a component in the consumer's utility function to capture the variety of negative self-conscious emotions experienced, $G(q^t - q^c)$, which measures the reduction in utility as a result of wasting resources of the amount $q^t - q^c$.[3] To capture the notion that consumers' negative emotions intensify as the amount of wasted resources increases, we assume that $G(0) = 0$ and $G' > 0$. Furthermore, we assume that these negative emotions are moderated by recycling so that the consumer actually experiences utility reduction of $f(\alpha) \times G(q^t - q^c)$, where $\alpha \in [0, 1]$ is the proportion of waste that is being recycled, $f \geq 0$ so that waste is always perceived negatively, and $f' < 0$ so that the negative emotions are alleviated as a larger proportion of the waste is recycled. Without loss of generality, we assume that $f(0) = 1$ so that the consumer experiences the negative emotions in full intensity when none of the wasted resource is recycled. However, we allow $f(1)$ to be strictly positive, so that the consumer could still feel negative emotions even when all wasted resources are recycled.

Next, we consider consumers' emotions associated with disposing used resources. As mentioned previously, consumers may experience positive emotions when recycling used resources. To test this possibility, consider the following choice problem.

Choice Problem 5

> Imagine that you are at your favorite take-out restaurant. You order your food and on the way out you take 3 napkins. You go home and eat. You use all 3 of the napkins. You take 3 napkins and use 3 napkins. Your recycling and trash are side by side. Which would you prefer to do?
>
> A. Recycle the 3 napkins you used
> B. Trash the 3 napkins you used

Eighty-six MTurk participants chose between recycling and trashing the napkins that they used, and the majority chose to recycle (60%, $\chi^2(1) = 3.77$, $p = .052$). To further investigate the emotions associated with disposal, we conducted a second single-factorial between-subjects experiment with 196 MTurk participants. Participants were given the same scenario as in Choice Problem 5 and then randomly assigned to either a trash or a recycle condition. We then measured their emotional reactions using the same eight emotion items and similar dependent variable questions as the ones employed previously ("How would you feel about *taking* the three napkins if you trash (recycle) the three used napkins?" and "How would you feel about the *act* of trashing (recycling) the three used napkins?") Participants were randomly assigned to answer

[2] "Proud," "pleased with self," "guilty," "ashamed," and "embarrassed" are self-conscious emotions (Tracy and Robins 2004).

[3] It is important to acknowledge that consumers may not always be able to eliminate negative emotions by using all the resources they acquire. That is, they could still feel negatively when the amount of resources they consume is higher than a benchmark quantity such as what is typical among other consumers or what maximizes their consumption utility. In such situations, we expect overconsumption to be less severe.

one of the dependent variable questions. The analysis reveals that there is no difference in negative emotions from taking the three used napkins whether they are trashed (M = 2.03) or recycled (M = 1.75; F(1, 96) = .92, p = .34). There is, however, a significant difference in positive emotions. Participants felt stronger positive emotions from taking the three napkins when they were recycled (M = 3.94) than when the napkins were trashed (M = 1.75; F(1, 96) = 58.12, $p < .001$). When examining the act of disposal dependent variable, we again find no difference in negative emotions from disposing of the three used napkins in the trash (M = 2.20) versus the recycling bin (M = 2.01; F(1, 96) = .42, p = .52) but find significant differences in positive emotions. That is, participants felt stronger positive emotions from the act of recycling the three napkins (M = 3.53) than they did from trashing the three napkins (M = 1.90; F(1, 96) = 34.14, $p < .001$).

From these observations, we build a utility-enhancing component into the utility function to capture the array of positive emotions that the consumer derives from recycling used resources, $R(q^c) \geq 0$. This component captures the utility that a consumer derives from recycling a total amount, q^c, of used resources and is a key force that drives overconsumption in the presence of recycling. We assume that $R' > 0$ so that the consumers' positive emotions become stronger as the amount of recycled resources increases. To provide supporting evidence for this assumptions, we conduct the following 2 (disposal type: recycle vs. trash) × 2 (used resources: four vs. ten) between-subjects experiment with 160 MTurk participants.

Choice Problem 6

> Imagine that you are at the public library working on your taxes. You need some scrap paper so you take (4) 10 pieces of paper from a stack on the counter. You do your calculations and in the end, you use all (4) 10 pieces of paper. You take 4 (10) and use 4 (10). The recycle and trash bins are side by side.

Participants are randomly assigned to a between-subjects disposal condition (recycle or trash) and respond to the four positive emotion items ("proud," "good," "happy," and "pleased with myself"). The 2 × 2 analysis of variance (ANOVA) on positive emotions reveals a significant main effect of disposal type (F(1, 156) = 223.36, $p < .001$) and a significant disposal type × used resources interaction (F(1, 156) = 5.57, $p < .05$). As our model suggests, planned comparisons confirm that people feel stronger positive emotions from recycling ten pieces of scrap paper (M = 4.66) than they feel when recycling four pieces of scrap paper (M = 4.01; F(1, 156) = 6.20, $p < .05$).

In considering the different emotions together, we propose that a consumer derives the following utility when consuming and disposing a particular resource:

$$U(q^c) - f(\alpha) \times G(q^t - q^c) + \gamma \times R(q^c),$$

where $U(q^c)$ is the consumption utility that the consumer derives from consuming q^c amount of resources, α is the proportion of the wasted resources that is recycled, and γ is the proportion of used resources that is recycled.[4] Throughout the article, we assume that the consumption utility is continuous and concave ($U'' < 0$) and that the consumer's utility is always maximized at an interior consumption quantity that is defined by the first-order conditions. The major difference between our utility function and the typical utility function from the economics literature is that we consider the consumer's disposal choice explicitly. The utility function reflects our general belief that consumers experience negative emotions from wasting resources and prefer recycling resources over trashing them.

Predictions of the Model

The consumer chooses the two quantities, q^c and q^t, as well as how to dispose the resources to maximize his or her total utility. To minimize the negative emotions, (s)he would always choose $q^t = q^c$ when possible, rendering the disposal of wasted resources irrelevant.[5] If recycling is costless, the consumer in our model would always prefer recycling to trashing. Needless to say, recycling often does come at significant cost to both the consumer (e.g., sorting trash and using multiple bins, having to walk some distance to recycle) and society (e.g., facility and energy costs), but we abstract away from these considerations for now to focus on the key psychological impact of recycling on consumption.[6]

To confirm the intuition that recycling may lead to wasteful consumption given the positive emotions it creates, we construct several scenarios to test the model predictions. First, consider scenarios in which the consumer is provided with no option to recycle or the resource is not recyclable in nature (e.g., ceramics). In this case, $\alpha = \gamma = 0$, and the consumer maximizes $U(q^c) - G(q^t - q^c)$, subject to $q^c \leq q^t$. Given that $G' > 0$, the consumer takes only what (s)he consumes to avoid creating waste: $q^{tT} = q^{cT}$, where t denotes "total," c denotes "consumed," and T denotes "trash." The optimal amount of consumption in this case simply maximizes the consumer's consumption utility and is determined by

$$U'(q^{cT}) = 0. \quad (1)$$

Next, consider the other type of scenarios in which the consumer does have the option to either trash or recycle resources. In this case, his or her utility becomes

$$U(q^c) - f(\alpha) \times G(q^t - q^c) + \gamma \times R(q^c),$$

subject to $q^c \leq q^t$. To minimize the negative emotions, as before, (s)he would set the total amount of resources taken to be the same as the amount that (s)he consumes. Therefore, (s)he simply needs to maximize $U(q^c) + \gamma \times R(q^c)$. If the resource cannot be recycled after it is used (e.g., medical waste such as tubing), $\alpha > 0$ but $\gamma = 0$. The consumer in this case cannot derive positive emotions from recycling used resources and always chooses to consume the amount that maximizes his or her consumption utility.

If used resources can be recycled, given the positive emotions associated with recycling, the consumer would recycle all used resources. In this case, (s)he maximizes $U(q^c) + R(q^c)$, and the optimal amount of consumption is determined by

[4]For simplicity, we assume that this utility-enhancing term increases linearly with the proportion of used resources recycled. The linearity assumption does not qualitatively change main predictions of the model.

[5]Consumers may acquire more resources than needed for practical reasons, which we discuss in a subsequent section.

[6]We revisit the cost of recycling and incorporate it into the model in a subsequent section.

$$U'(q^{cR}) = -R'(q^{cR}), \quad (2)$$

where R denotes "recycle." Because $R' > 0$ and $U'' < 0$, Equations 1 and 2 suggest that $q^{cT} < q^{cR}$, which leads to our first hypothesis.

H_1: A consumer uses more resources when the option of recycling is present.

H_1 suggests that the option to recycle may lead to an increase in the total amount of resources consumed. Intuitively, because the consumer feels positive emotions when recycling used resources, (s)he consumes more than when (s)he cannot recycle the resource. Support for H_1 would thus confirm the positive emotions associated with recycling. If a consumer does not feel positive emotions when recycling used resources, (s)he would be maximizing his or her consumption utility regardless of how the used resources are disposed. As a result, (s)he would consume the same quantity of resources with and without the recycling option, which contradicts H_1.

From a policy perspective, because the number of new recycling bins increases with the U.S. government's continual efforts to promote recycling, H_1 suggests that the unexpected end result may be more waste. There is some existing evidence that this may be true: while EPA data suggest that greater access to recycling has been successful in increasing recycling, they also show that Americans produce more waste. Next, we present experiments with real disposal behavior to investigate whether consumers actually use more resources when the option to recycle is available.

EXPERIMENT 1: JUICE SAMPLING WITH PLASTIC CUPS

In Experiment 1, we ask consumers to sample four juices using recyclable cups. We manipulate the type of disposal bins between subjects. In line with H_1, we predict that when a recycling bin is present, consumers will use more cups than when a trash bin is present.

Design and Procedure

We recruited 49 undergraduate participants (53% female) from a private Northeastern U.S. university in exchange for course credit. Participants entered the lab and completed a battery of individual difference measures. Embedded in the measurement tool is a green behavior scale (Haws, Winterich, and Naylor 2014) consisting of six items used to measure consumers' attitudes toward green/sustainable behaviors. Participants were then randomly assigned to one of two between-subjects disposal conditions, trash only or recycle only.

In each condition and under the guise of a juice evaluation study, participants were asked to sample four different fruit juices at an unmanned sampling station. One by one, participants were instructed to sample the juices on their own. Two hundred small plastic cups (5 oz.) were stacked behind four unlabeled juice containers. No other instructions were given to the participants. In the trash-only condition (N = 24), a trash bin was placed next to the sampling station. In the recycle-only condition (N = 25), a recycling bin was placed next to the sampling station. Unbeknownst to participants, a research assistant noted the number of cups they used to sample the juices. The number of cups a participant used is our dependent variable.

Results and Discussion

Because there was no other option, all participants assigned to the recycle-only (trash-only) disposal condition tossed their used cups in the recycling (trash) bin. No participant left the lab with cups. The 49 participants, on average, used 3.10 plastic cups in the sampling task (median = 4, SD = 1.311). The minimum number of cups used is one (12 participants, 24.5% of the sample) and the maximum number used is four (32 participants, 65.3% of the sample).

Regression analyses do not reveal any main effects of gender or the green scale on the number of cups used. In addition, gender and the green scale do not interact with disposal condition to reveal any significant interaction effects (all Fs < 2.07) and are therefore not discussed further. An ANOVA reveals a main effect of disposal condition on the number of cups consumed in the juice-sampling task. Consistent with H_1, participants assigned to the trash-only disposal condition (M = 2.71, SD = 1.46) used significantly fewer cups in the sampling task than participants in the recycle-only condition (M = 3.48, SD = 1.05; $F(1, 47) = 4.56$, $p < .05$).

EXPERIMENT 2: GIFT WRAPPING WITH PAPER

To find further support for H_1 and to generalize the results to another product category (paper), in Experiment 2 we asked consumers to gift wrap $6'' \times 6''$ square boxes. In line with our theory, we predict that when a recycling bin is present (vs. when the option to recycle is not available), consumers will use more paper to wrap the same box.

Design and Procedure

We recruited 60 undergraduate participants (38% female) from a private Northeastern U.S. university in exchange for course credit. One at a time, participants were taken into a room. In this room, there was a large roll of paper ($30'' \times 765'$), a table, adhesive tape, scissors, and a tape measure. Our experimental design has two between-subjects disposal conditions to which participants were randomly assigned: a trash-only condition and a recycle/trash condition. In the trash-only condition (N = 30), next to the roll of paper was a large trash bin. In the recycle/trash condition (N = 30), next to the roll of paper were a large trash bin and a large recycling bin.

Participants were given a $6'' \times 6''$ box and a study booklet with the following instructions:

> For this study, you have to wrap a gift. Tasks such as this are informative in terms of evaluating students' creativity, involvement, and attention to detail. Do the BEST job that you can wrapping this gift. Please take as much wrapping paper as you feel will be necessary to do a great job wrapping this gift box. Measure the amount of paper you cut to start.
>
> *Length*: _____
>
> *Width*: _____

Because we did not mention the presence of trash/recycling bins in the instructions, the participants' knowledge of the disposal methods came entirely from their own observation of the environment. After measuring the amount of paper they cut to wrap the gift box, participants wrapped the gift. After they finished wrapping the gift, participants answered three gift-wrapping questions to measure involvement: (1) "I took my

time wrapping the gift box," (2) "I was careful wrapping the gift box," and (3) "I am satisfied with my effort wrapping the gift box" (1 = "strongly disagree," and 7 = "strongly agree"). The dependent variable is real consumption behavior: the amount of paper taken as calculated by the measured length × width.

Results and Discussion

The 60 participants, on average, used 677.02 square inches of paper in the wrapping task (median = 677.50, SD = 222.36). The minimum amount used is 288 square inches (one participant; 1.7% of the sample) and the maximum amount used is 1,404 square inches (one participant; 1.7% of the sample). Participants in the trash-only disposal condition disposed of all their scraps from wrapping in the trash. Consistent with our prediction that people would recycle, rather than trash, used resources when given the option, we observed that participants in the recycle/trash condition disposed all their scraps of paper from wrapping the box in the recycling bin.

An ANOVA does not reveal any significant differences on the three gift-wrapping involvement questions (Fs < 2.15). Involvement was not different across conditions, and we do not discuss it further. The analysis does reveal a significant effect of disposal condition on the amount of paper used: participants assigned to the trash-only disposal condition (M = 618.17, SD = 195.37) used significantly less paper in the gift-wrapping task than participants in the recycle/trash disposal condition (M = 735.86, SD = 235.08; F(1, 58) = 4.45, $p < .05$).

In summary, these two experiments support H_1 and the tenets of our theoretical model. As a result of the different emotions associated with recycling, consumers use more resources when the option to recycle is present and less resources when they only have the option to trash.

RECYCLING PACKAGING MATERIALS

In many situations, the wasted resources do not consist of only consumable products. For example, packing materials such as boxes and other types of containers that do not have consumption utility in themselves are often recycled. Given its practical relevance, it is important to understand how consumers feel about disposing of the packaging materials and whether the disposal method may turn out to have a significant effect on consumption.

If we conceptualize these packaging materials as "waste" to begin with because of their lack of consumption utility, our framework would then suggest that consumers feel negatively about using these packaging materials and would choose to recycle them whenever possible to reduce the negative emotions evoked by wasting. We confirm this intuition using MTurk participants and two choice problems.

Choice Problem 7

> Imagine that you need to mail a gift. The gift measures 4 inches high × 4 inches long × 3 inches wide. You have the following two boxes at home which you can use to put to the gift in and mail it.
>
> A. 5 inches × 5 inches × 5 inches
> B. 10 inches × 10 inches × 10 inches
>
> The package is not fragile, and you do not need extra packing to keep it safe. It will cost the same to mail the package, regardless of the size of the box. Which box would you choose to mail your package in?

Choice Problem 8

> Imagine the following: You purchase an item from Amazon to be mailed to your home. The item measures 4 inches × 4 inches × 3 inches. Amazon ships the item in a small box measuring 5 inches × 5 inches × 5 inches. Which would you prefer to do?
>
> A. Recycle the box
> B. Trash the box

Consistent with our prior waste aversion results, 57 of 59 participants (97%) chose the smaller box in Choice Problem 7. As we expected, in Choice Problem 8, when asked to choose between recycling and trashing a shipping box, 86% of consumers (82 of 95) chose to recycle the box. Overall, our findings from the juice-sampling and gift-wrapping studies support H_1.

From a modeling perspective, suppose the quantity of consumption is proportional to the amount of recyclable packaging. The consumer's utility function becomes $U(q^c) - f(\alpha) \times G(\beta \times q^c)$, where β is the ratio of the amount of packaging material to the amount of consumption. The optimal consumption quantity in this case is then determined by

$$U'(q^*) = \beta \times f(\alpha) \times G'(\beta \times q^*). \tag{3}$$

One can obtain by the envelope theorem that the optimal consumption quantity increases with α. Intuitively, when a larger fraction of the packaging materials can be recycled, the consumer's negative emotions from throwing away the packaging material become less severe and (s)he increases consumption of the focal product.

H_2: When the amount of consumption is proportional to the amount of packaging materials, the consumer increases consumption when packaging is recycled than when it is trashed.

EXPERIMENT 3: DISPOSAL OF PACKAGING

In Experiment 3, we investigate the disposal of packaging materials. The design employs a between-subjects design in which participants have only one option: either to recycle or to trash the packaging. We focus on how many free pens a subject takes when each pen is wrapped in a substantial amount of packaging.

Design and Procedure

Eighty undergraduate students (41.3% female) from a private Northeastern U.S. university participate in this study in exchange for course credit. Participants entered the lab and completed a series of behavioral experiments unrelated to this experiment. After completing the lab studies, the participants were permitted to leave. The studies were staggered such that participants were dismissed one at a time. After leaving the lab, participants were approached by a research assistant and offered some free pens. Prior studies have shown that research participants typically take only one item when it is free (Ariely, Gneezy, and Haruvy 2006; Shampanier, Mazar, and Ariely 2007), making this a conservative test of our theory. Pens were packaged in a plastic box inside a cardboard sleeve. The

research assistant instructed the participants to "take as many pens as you like as long as you dispose of the packaging here."

Participants in the recycle condition had two recycling bins (one for plastic and one for paper) placed next to a bag of pens. The bag held 50 pens, and the research assistant ensured that the bag was full at all times. Participants in the trash condition had a garbage bin placed next to the bag of pens. This manipulation was between-subjects, and participants had only one possible disposal option, either to recycle or to trash the pens' packaging. Unknown to participants, the research assistant noted their gender and how many pens they took. Real consumption behavior served as our dependent variable.

Results and Discussion

All participants assigned to the recycle-only disposal condition tossed the packaging materials in the recycling bins provided, and all participants in the trash-only disposal condition tossed their packaging in the trash bin. No participants took the packaging materials with them. Regression analyses do not reveal any main effects of gender ($F < 1$). In addition, gender does not interact with disposal condition to reveal any significant interaction effects ($F < 1$). The descriptive statistics show that across conditions, the majority of participants took one pen (56/80; 70%). We observed that 10 participants (12.5%) chose not to take any pens, 12 participants took two pens (15%), and 2 participants took three pens (2.5%). We used an ANOVA to investigate differences in the mean number of pens taken across disposal conditions. The results reveal a main effect of disposal condition on the number of pens taken. Despite the additional effort in removing the packaging from the pens, sorting, and recycling, participants in the recycle-only disposal condition ($M = 1.23$, $SD = .57$) took significantly more pens than participants assigned to the trash-only disposal condition ($M = .93$, $SD = .62$; $F(1, 79) = 5.06$, $p < .05$). This finding supports H_2 and suggests that as long as consumers feel negatively about creating packaging waste that is associated with their consumption, they consume less than what optimizes their consumption utility.

RECYCLING USED VERSUS UNUSED RESOURCES

Resources can be wasted for unforeseeable and exogenous reasons. For example, students are sometimes given a certain number of pages of scrap paper when taking an exam, and they may not use all of them. When people are faced with a "quota" of resources that is allocated to them for a given task, how would disposal of the remaining resources affect their consumption?

To answer this question and further separate the two effects of recycling, in this section we consider two scenarios in which we fix the total amount of a resource taken to be a large fixed number, $q^t = Q$, referred to as the "quota." In the first scenario, suppose that after the consumer uses a certain portion of the quota, the remainder is trashed. In the second scenario, the remainder is recycled. We use the model to predict how disposal of the remaining resources in the presence of a quota affects consumption and use a real-behavior-based experiment to validate the predictions.

We find that implementing the quota and making it clear that the remainder is recycled rather than trashed, among all possible scenarios, leads to the lowest amount of consumption. This scenario not only exists in the real world but also can be simulated when there is no explicit "quota" in place. We can prime the concept of a quota, for example, by emphasizing the fixed total amount of a particular resource on earth. If we also emphasize the recyclable or reusable nature of resources that are left over from consumption, we would be simulating an environment that is similar to the second scenario.

Next, consider the consumer's utility maximization problem. In the first scenario, his or her utility becomes $U(q^c) - f(\alpha) \times G(Q - q^c) + \gamma \times R(q^c)$. Because the remainder of the quota is trashed, $\alpha = 0$ and $f(\alpha) = 1$. Because the consumer is unaware of how the used materials are disposed in our experiment, his or her utility becomes $U(q^c) - G(Q - q^c)$. Therefore, the optimal quantity of consumption is determined by

$$U'\left(q_Q^{cT}\right) = -G'\left(Q - q_Q^{cT}\right), \tag{4}$$

where Q stands for quota. However, when the remainder is recycled, the consumer's utility becomes $U(q^c) - f(1) \times G(Q - q^c)$, and the optimal quantity of consumption is determined by

$$U'\left(q_Q^{cR}\right) = -f(1) \times G'\left(Q - q_Q^{cR}\right). \tag{5}$$

Suppose that the objective function is concave so that the maximization problem is well defined. Then, Conditions 4 and 5, combined with the assumption that $f(1) < 1$, would imply that $q_Q^{cT} > q_Q^{cR}$, which leads to our next hypothesis.

H_3: When a fixed amount of resource is allocated to a consumer, (s)he consumes less resource when the remainder is recycled than when it is trashed.

Whereas H_1 is driven by the positive emotions induced by recycling used resources, H_3 is driven by the negative emotions mitigated by recycling wasted resources. In particular, when the remainder is trashed, the consumer feels more negatively about the waste than when it is recycled. As a result, (s)he tries to eliminate the negative emotions in the former case by reducing the amount of waste and increasing the amount of consumption. If the consumer does not feel negatively about wasting or if recycling does not make him or her feel less negatively, then the amount consumed should remain the same across the two scenarios.

EXPERIMENT 4: RECYCLING USED VERSUS UNUSED SCRAP PAPER

In Experiment 4, we use a mathematical aptitude paradigm and scrap paper to test our hypotheses jointly in an effort to find further support for our theoretical framework. We present the procedure and results next.

Design and Procedure

Three hundred fifty-two undergraduate students (52% female) from a private Northeastern U.S. university participated in this study in exchange for course credit. Participants entered the lab and were randomly assigned to the conditions of a 2 (disposal: trash vs. recycle) × 2 (frame: used vs. unused) × 2 (quota: small vs. large) between-subjects design.

All participants received the following instructions:

> Many Americans admit that there have been times that they've found themselves saying they can't do math and have had difficulty figuring out the sale discount at a store or calculating the waiter's tip at a restaurant. In fact, the

> overwhelming majority of Americans believe that the lack of emphasis on developing good math skills will have a negative impact on the future of our economy. In this study, we are interested in students' abilities to do some basic math calculations. Please answer these questions as best you can.
>
> *All of participants who achieve a score of 80%* or better will be entered in a draw for $25.
>
> *Please use the scrap paper provided to solve the problems. Use as much paper as you need.*
>
> *You* CAN*NOT* *use calculators.*

Consistent with our previous studies, participants were randomly assigned to disposal conditions of trash (N = 170) or recycle (N = 182). Unlike our previous studies, however, we manipulate two other factors.

First, we manipulate the frame condition. Participants assigned to the used frame (N = 184) were told that the paper that they use will be either trashed or recycled (depending on their assigned disposal conditions), whereas those in the unused frame (N = 168) were told that the paper that is left unused will be either trashed or recycled.

Second, we manipulate the quota (i.e., the amount of scrap paper available to solve math problems in our task). Those in the small quota condition (N = 173) were provided with 5 sheets of scrap paper, whereas those in the large quota (N = 179) condition were provided with 20 sheets of scrap paper. In both conditions, the scrap paper measured 5.5 × 8.5 inches. Prior to this study, we conducted a pretest with 53 participants on the amount of paper typically used during the task to ensure that five sheets was enough paper to complete the task. For the pretest, participants answered the same math questions without any information about whether the paper would be recycled or trashed. The paper used was the same size as in the experiment. Pretest results show that participants used 1.91 pieces of paper on average (median = 2). Only two participants used more than three pieces of paper: one participant used four pieces, and one participant used six pieces.

Participants then completed 20 math problems of medium difficulty (e.g., 27% of 159; $12\times(4 + 15) - 1,125 \div 25$; problems are available from authors upon request). After they finished the math problems, participants were instructed, "Please count how many pieces of paper you used and fill in that amount below." This self-report of real behavior serves as the dependent variable. Next, participants responded to items asking for their gender and age. They were then asked to answer an open-ended question as to what they thought the purpose of the study was. None of the participants were able to guess any of our hypotheses or identify the purpose of the study. Finally, they were given the option to enter the drawing for $25, which the majority opted to do.

Results and Discussion

The 352 participants, on average, used 1.88 pieces of paper (median = 2, SD = .912). The minimum number used was zero (two participants; .5% of the sample) and the maximum number used was six (one participant; .3% of the sample).

A 2 × 2 × 2 ANOVA reveals significant main effects of disposal ($F(1, 344) = 4.90$, $p < .05$) and frame conditions ($F(1, 344) = 6.58$, $p = .01$). A significant disposal × frame interaction is also revealed ($F(1, 344) = 31.15$, $p < .001$). All main and interaction effects with quota, however, prove not to be reliable (Fs < 1). For this reason, we collapse across quota conditions and reanalyze the data using a 2 (disposal) × 2 (frame) ANOVA. This reveals significant main effects of frame ($F(1, 348) = 7.11$, $p < .01$) and disposal conditions ($F(1, 348) = 4.02$, $p < .05$). Consistent with H_1, planned comparisons reveal that participants used significantly more paper when they were told that the used paper would be recycled (M = 2.34, SD = .97) versus trashed (M = 1.63, SD = .85; $F(1, 348) = 31.56$, $p = .001$). Consistent with H_3, participants used significantly more paper when they were told that the unused paper would be trashed (M = 1.91, SD = .85) versus recycled (M = 1.57, SD = .74; $F(1, 348) = 6.75$, $p = .01$). Consistent with both H_1 and H_3, the analyses uncover the predicted disposal × frame interaction ($F(1, 348) = 33.18$, $p < .001$; see Figure 1).

Planned comparisons also reveal significant differences between the two trash conditions. Participants used significantly more paper when they were told that the *unused* paper would be trashed (M = 1.91, SD = .85) compared with when they were told that the *used* paper would be trashed (M = 1.63, SD = .85; $F(1, 348) = 4.63$, $p < .05$).

The ranking of average consumption quantities across the four scenarios (2 [disposal] × 2 [frame]) in the scrap paper experiment suggests that $q^{cR} > q_Q^{cT} > q_Q^{cR} = q^{cT} = q^{U}$ in our modeling framework (Figure 2). Notably, $q_Q^{cR} = q^{cT}$, suggesting that in the case of a quota, recycling the remainder appears to almost fully eliminate the participants' negative emotions toward creating waste. This ranking has striking implications for government agencies and nonprofit organizations that aim to protect the environment by promoting recycling. Most importantly, the ranking suggests that consumption could exceed what maximizes the consumption utility when the consumer takes into account how the used and unused resources are eventually disposed. This finding contradicts the intuitive expectation that a conscientious consumer would prioritize saving resources above all other options, which is consistent with the EPA's "Reduce, Reuse,

Figure 1
THE AMOUNT OF MATERIAL USED BY DISPOSAL OPTION AND FRAMING

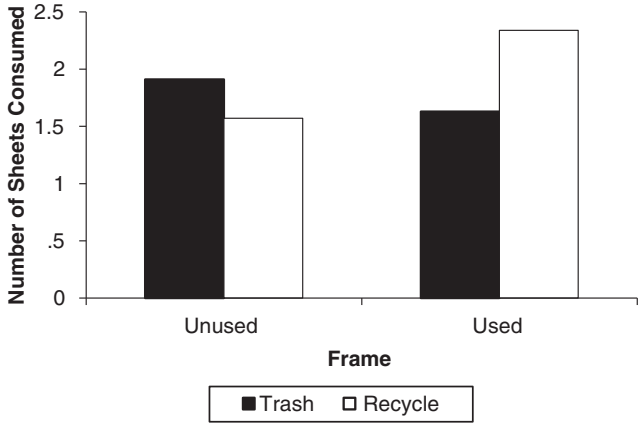
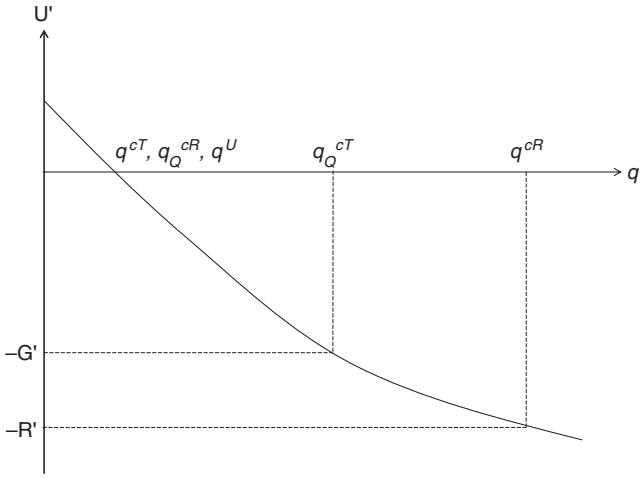


Figure 2
RANKING OF THE FOUR AVERAGE CONSUMPTION QUANTITIES



Notes: The two quantities q^{CT} and q_Q^{CR} are equal and defined by $U' = 0$ in this figure, and $f(1) = 0$.

Recycle" hierarchy, such that reducing one's consumption is the most cost-effective and sustainable option when compared with reusing and recycling. Our findings suggest that the consumers do not internalize this priority: they derive so much positive emotion from recycling used resources that they keep using more resources even after the marginal consumption utility becomes zero. As a result, the option to recycle used resources leads to an ultimate waste of resources.

In particular, in comparing the "Used, Recycle" bar (q^{cR}; M = 2.34, SD = .97) and the "Unused, Trash" bar (q_Q^{cT}; M = 1.91, SD = .85; F(1, 348) = 9.68, p = .002) in Figure 1, we find that consumers' marginal utility gain from recycling used resources (R') seems to dominate their marginal utility loss (G') from wasting unused resources, at least for a large initial range of quantity. In other words, although consumers feel negatively about taking an unnecessary napkin, the positive emotions they derive from recycling that napkin after using it can dominate the negative emotions. In other words, the positive emotions associated with recycling can lead to wasteful consumption.

In comparing the "Used, Trash" bar (q^{cT}; M = 1.63) and the "Unused, Recycle" bar (q_Q^{cR}; M = 1.57), we also find that these two quantities are not statistically different ($F < 1$, p = .62). Given our model predictions, this suggests that $f(1) = 0$ for scratch paper among the participants in this experiment. In other words, as long as the unused paper can be recycled, the participants do not seem to feel negatively about leaving more paper unused.

EXTENSIONS OF THE MODEL

To make the model most useful, we have intentionally kept it as parsimonious as possible. For this purpose, we have abstracted away from certain aspects of recycling behavior that occur in the real world that are well controlled for in our choice problems and behavioral studies. In this section, we discuss how some of these aspects can potentially be incorporated into the model. This is not meant to capture all of the different possibilities but rather to highlight how the model can be extended to predict consumption and recycling behavior in more complex real-world scenarios.

Acquisition Utility

Although people are generally averse to waste, we often still observe waste in reality. People may acquire more resources than they need for practical reasons. They may prefer to acquire a large amount of resources, such as to avoid the mental cost of estimating the amount of resources needed and the potential physical cost of making a second acquisition in case they need more resources. To incorporate the endogenous preference of overacquisition into the model, suppose that consumers derive "acquisition utility" $A(q^t)$, and their utility is

$$A(q^t) + U(q^c) - f(\alpha) \times G(q^t - q^c) + \gamma \times R(q^c),$$

Furthermore, suppose that $A' \geq 0$ and $A'' < 0$ so that the consumer generally prefers to acquire more resources, while the marginal return of acquisition decreases as the total amount of acquired resources increases. As before, the consumer's utility is maximized at an interior solution that is determined by the first-order conditions.

To illustrate the impact of acquisition utility, start by considering what happens when there is no option to recycle. In this case, again, $\alpha = \gamma = 0$, and the consumer maximizes $A(q^t) + U(q^c) - G(q^t - q^c)$. The total amounts acquired and used are now jointly determined by the system of equations:

$$(6) \quad A'(q^t) - G'(q^t - q^c) = 0 \text{ and } U'(q^c) + G'(q^t - q^c) = 0.$$

The optimal amount acquired is obtained when the marginal utility from acquiring more equals the marginal disutility of wasting that comes from the negative emotions. Given that $G' > 0$, we know that at the optimal q^c we have $U' < 0$. That is, the consumer overacquires resources to prevent future mental and physical costs and consumes more than what would maximize his or her consumption utility to avoid the negative emotions from wasting.

When the consumer recycles all the resources, $\alpha = \gamma = 1$. In the simple case in which recycling completely eliminates the consumer's negative emotions from wasting, the consumer maximizes $A(q^t) + U(q^c) + R(q^c)$. The optimal consumption amount is determined by $U' + R' = 0$ and is the same as in our main model. Once again, the consumer uses more resources until the marginal utility gain from recycling the used resource equals the marginal disutility from consumption. However, the optimal acquisition amount is now determined by $A' = 0$, higher than that with no recycling. This is because recycling eliminates the negative emotions from wasting, and the consumer acquires more resources for convenience and other practical reasons.

Cost of Recycling

The cost of recycling can affect consumption through multiple channels. Consumers may experience stronger emotions, for example, when recycling is associated with higher cost or effort. Intuitively, recycling may lead to stronger emotions when it is associated with higher financial cost (e.g., purchasing of expensive recycling equipment or recycling depot fees), physical cost (e.g., traveling to a specialty recycling station), and mental cost (e.g., classifying materials into different types of recycling bins). To incorporate these considerations, one could think of the

emotions as being moderated by the cost of recycling, so that the utility function can be rewritten as

$$U(q^c) - f(\alpha, e) \times G(q^t - q^c) + m(e) \times \gamma \times R(q^c) - e,$$

where e is the consumer's cost of recycling. Suppose that $f(\alpha, e)$ decreases with e so that a higher recycling cost makes recycling more effective in reducing the negative emotions associated with wasting, and $m(e) \in [0, 1]$ increases with e so that a higher recycling cost enhances the positive emotions from recycling used resources.

To understand how a change in the cost of recycling may change the optimal consumption, consider the representative case in which the consumer could recycle all resources ($\alpha = \gamma = 1$) and recycling can fully eliminate the negative emotions from wasting. In this case, the consumer's utility becomes $U(q^c) + m(e)R(q^c) - e$. Optimal consumption is determined by $U' + mR' = 0$. As e increases, m increases, and the optimal amount of consumption increases as well. Intuitively, the stronger positive emotions from recycling in this case exacerbates overconsumption.

If the cost of recycling increases with the amount being recycled, e then becomes a function of the amount recycled, and $e' \geq 0$. Given that $\alpha = \gamma = 1$, the consumer's utility is now $U(q^c) + m[e(q^c)] \times R(q^c) - e(q^c)$, and optimal consumption is determined by

$$U' + mR' = e'(1 - m'R).$$

Relative to the case in which the cost of recycling is fixed ($U' + mR' = 0$), the optimal consumption quantity decreases if $m'R < 1$. That is, if the moderating effect of higher recycling cost on positive emotions is weaker than the direct effect (e.g., higher monetary, mental, and physical costs), the consumer would decrease his or her consumption. Otherwise, (s)he would increase consumption.

Other Extensions

The extensions of the model described in this section demonstrate its potential to predict consumption and recycling behavior in different situations. There are other boundary conditions and limitations that point to worthwhile directions for further research. For example, the consumption utility in our experiments is comparable in magnitude to the felt negative and positive emotions associated with disposal. In some situations, the consumption utility can be much more dominant: some customers truly enjoy wearing new clothes, whereas others may love drinking beer. In these situations, the effect of recycling used clothes or beer cans on the amount of consumption can be either smaller because of the inelasticity of demand or larger because recycling more effectively reduces the negative emotions associated with being wasteful. It may be useful to investigate how the impact of the recycling option changes across different consumption categories and how closely each of these categories reflects the consumer's self-identity.

We intentionally exclude social influence in our experiments by separating the participants so that they do not observe each other's consumption quantity. It would be worthwhile to see how the results would change when consumers are explicitly aware that others are observing them. While the increased social presence could enhance people's negative emotions from wasteful consumption, it may either strengthen or weaken the pleasure derived from recycling. As a result, consumption could either increase or decrease. Further research investigating the role of social influence and social norms on disposal has the potential to be particularly fruitful.

In our model, we focus on the trade-off between integral emotions arising from disposal choices—that is, the positive and negative emotions associated with disposing of material in the trash versus recycling. However, incidental emotions have also been shown to influence decision making in a variety of areas (Lerner et al. 2015). Incidental emotions are emotions that carry over from one situation to the next but are unrelated to the choice itself. It would be useful to see whether a more general investigation into incidental emotions and disposal behavior would reveal some notable behavioral insights related to the present work.

IMPLICATIONS FOR POLICY AND CONSUMER BEHAVIOR

One interpretation of our findings is that current promotions of recycling may not emphasize the cost of recycling enough. Although modern technologies have considerably lowered the cost to recycle, the labor and equipment involved in this task are still substantial. When these costs are ignored or underestimated, the positive emotions that result from recycling could completely override the negative emotions from wasting. As a result, people might pursue recycling even at the cost of using more resources than needed. Future promotions of recycling should, therefore, emphasize the significant cost of recycling and make a conscious effort to prioritize "reduce" over "recycle."

Another important implication of our results stems from significant differences in consumption between the two recycling conditions. Of the four conditions in our problem-solving experiment, participants used the most paper when they were told that the used paper would be recycled ($M = 2.34$, $SD = .97$) and the least paper when told that the unused paper would be recycled ($M = 1.57$, $SD = .74$; $F(1, 348) = 36.74$, $p < .001$). This result on framing has profound impact for policy makers: the shift of emphasis from used resources to remaining resources could greatly reduce consumption quantity. Intuitively, while recycling used resources could encourage consumption by generating pleasure, recycling leftover resources could promote savings by creating a trade-off between usage and the positive emotions derived from recycling. As a result, when promoting recycling programs, government agencies and nonprofit organizations should think carefully about ways to remind people that resources are limited by nature and that even small leftover amounts of a particular resource can still be reused or recycled.

Other Sustainable Behaviors

In a final exploratory study, we demonstrate the potential applicability of our model to other sustainable behaviors. In this study, we ask a sample of consumers to forecast how many miles a day they would drive a new car.

Design and Procedure

One hundred eighty-six U.S. consumers (34% female) aged 19–75 years ($M = 34.09$ years) participated in this study. Participants were recruited from MTurk and randomly assigned to either a hybrid car condition or a gas car condition. In both conditions, the cars were equally efficient (i.e., they

have the same fuel efficiency). Participants in the hybrid car condition received the following instructions:

> Imagine the following scenario —
>
> You have just purchased a new HYBRID car — the Toyota Corolla HYBRID. It has excellent gas mileage averaging 41 mpg.
>
> On average, how many miles a day would you drive the hybrid vehicle?

Participants in the gas car condition received the following instructions:

> Imagine the following scenario —
>
> You have just purchased a new car — the Toyota Corolla. It has excellent gas mileage averaging 41 mpg.
>
> On average, how many miles a day would you drive the vehicle?

Participants responded on a slider scale (0–1,000 miles) to forecast how many miles a day they would drive the car. Finally, participants responded to the demographic questions of gender and age, were provided a completion code, and were paid for their participation.

Results and Discussion

Two participants did not respond on the slider scale, and five others were removed from the data set as outliers (more than three standard deviations from the mean), leaving 179 valid observations. An ANOVA reveals a marginally significant effect of car condition on the forecasted amount of driving each day. Participants assigned to the hybrid car condition ($M = 81.29$, $SD = 122.58$) predicted that they would drive the hybrid car more than participants assigned to the gas car condition ($M = 53.46$, $SD = 73.52$; $F(1, 177) = 3.40$, $p = .067$). The results are consistent with our recycling data and may even be more striking given that participants were not actually feeling the associated emotions but instead were only forecasting those emotions (Loewenstein and Schkade 1999; Mellers and McGraw 2001). The results suggest that, similar to what we find in the recycling studies, the pleasure of "being a good citizen" from driving a hybrid car may in fact lead people to drive more.

CONCLUSION

In this research, we explore consumers' underlying emotions when they decide how much of a resource to use when there is an option to recycle. We propose an evidence-based theoretical framework in which recycling can reduce consumers' negative emotions from wasting resources and increase their positive emotions from disposing used resources in the recycling bin. We then generate testable predictions on the basis of the theoretical framework that can help guide policy making and test these predictions in experiments with real consumption and disposal behavior. In general, we find strong evidence for both aforementioned effects of recycling. As a result, people may use more resources than they need when the option to recycle is present. That is, the positive emotions that recycling can induce could dominate consumers' negative emotions from wasting.

Finally, we hope that our theoretical model of recycling and this research stimulates a dialogue that leads to a better understanding of consumers' disposal decision making. Over the years, scholars have built up a tremendous amount of knowledge regarding consumption behavior, but we know very little about disposal behavior. It is our hope that this nascent area of research gains momentum and reaches its full potential.

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