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Research Report

Recycling gone bad: When the option to recycle increases resource consumption☆

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Abstract

In this study, we propose that the ability to recycle may lead to increased resource usage compared to when a recycling option is not available. Supporting this hypothesis, our first experiment shows that consumers used more paper while evaluating a pair of scissors when the option to recycle was provided (vs. not provided). In a follow-up field experiment, we find that the per person restroom paper hand towel usage increased after the introduction of a recycling bin compared to when a recycling option was not available. We conclude by discussing implications for research and policy.

Keywords: Sustainability; Recycling; Consumption; Field experiment

Introduction

Recycling has been long regarded as an effective way to conserve energy and natural resources. The term recycling refers to "minimizing waste generation by recovering and reprocessing usable products that might otherwise become waste (i.e., recycling aluminum cans, paper, and bottles, etc.)" (U.S. Environmental Protection Agency, 1997). In 2010, approximately 34.0% of all municipal solid waste was recycled, including 71.6 percent of all office-type paper (U.S. Environmental Protection Agency, 2011). Millions of curbside recycling facilities, in addition to recycling bins in offices and other areas, have been set up to enhance the availability of recycling, all of which are consistent with the generally held notion that simply making recycling options as widespread as possible is the best course of action. The basic premise of this policy is intuitively appealing: when recycling options are more widely available, people should be more inclined to recycle versus when recycling is less widely available or inconvenient (McCarty & Shrum, 1994, 2001).

However, this policy may be suboptimal unless consumers' consumption levels are independent of the availability of the option to recycle, an assumption which may not hold in many situations. In this project, we consider the possibility that the ability to recycle can have an impact on a consumer's consumption level and propose that there may be unintended adverse effects of focusing exclusively on making recycling convenient and widespread. More specifically, we examine the effects of recycling availability on resource usage through both lab and field experiments. Our results support this proposition and show that when the recycling option is available, consumers increase usage of products that are free or where the cost is borne indirectly (e.g., office paper, bathroom paper towels, etc.). The target products used in our studies represent

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an important subset of products as a substantial portion of the resources each year are used in the workplace or other environments where consumers do not directly pay for the materials they consume. In fact, the average office worker uses 10,000 pieces of copy paper per year (Cullen, 2007).

Conceptual Background and Hypothesis

A number of factors have been shown to be determinants of environmentally friendly behavior such as recycling (Alwitt & Pitts, 1996; Peattie, 2010). For instance, consumers have been shown to exhibit a general opposition to being wasteful (Bolton & Alba, 2012), and the desire to avoid waste has also been shown to influence recycling behaviors (Bagozzi & Dabholkar, 1994). Several studies have also shown that the anticipation of consumption pleasures and guilt play a central role in determining consumption levels (e.g., Wansink & Chandon, 2006; Wertenbroch, 1998).

Integrating these findings, it might be imagined that disposing of a product in a non-environmentally friendly (or more wasteful) way may be accompanied by some level of guilt or other negative emotion (e.g., due to the knowledge that the thrown away product will end up in a landfill) (Bamberg & Möser, 2007). Therefore, the ability to recycle can be thought of as a means to allay the negative affect, such as guilt, associated with wasteful consuming and disposing of a product. Consumers may view the ability to recycle a product as a "get out of jail free card" that makes consumption more acceptable (Bolton, Cohen, & Bloom, 2006), thus leading to higher consumption levels. Put differently, the ability to recycle a product may also serve as a way to *justify* increased consumption (e.g., Mukhopadhyay & Johar, 2009).

This proposed increase in consumption can be connected to the "rebound effect" identified in the economics literature, which postulates that the reduced costs accompanying technological improvements in efficiency may have the unintended consequence of increasing consumer demand. For example, the environmental benefits of technological advances decreasing the per mile cost to drive may be offset by the increased number of miles driven in response to the cost decrease (Small & Van Dender, 2007). Similar effects have been identified for household energy use, including heating and air conditioning (Sorrell, Dimitropoulos, & Sommerville, 2009). However, the major focus of these economic studies has been on the increased demand due to decreased costs faced by the consumer. Instead, we consider consumption changes resulting from non-price factors as the participants in our studies consume products for which consumers typically do not incur direct monetary costs for usage (e.g., office paper and restroom paper towels).

In addition, our study can also be compared to the notions of positive and negative "spillover" in environmentally responsible behavior (Thøgersen & Crompton, 2009). Positive spillover occurs when environmentally responsible behavior in one domain leads to additional pro-environmental behavior in another domain. Negative spillover is akin to the "licensing" effect (Khan & Dhar, 2006; Mazar & Zhong, 2010; Mukhopadhyay & Johar, 2009), whereby a prior environmentally responsible choice can license less environmentally responsible behavior in a subsequent choice. For example, an individual who begins participating in a neighborhood recycling program may feel more entitled to make less environmentally responsible decisions later (e.g., using a higher pollution mode of transportation). In our framework, it is the ability to recycle the product currently being used, rather than a prior choice or action, that contemporaneously "licenses" the increased consumption. For example, suppose a person has just finished washing his/her hands and now has to decide the quantity of paper towels to use to dry his/her hands. With a recycling bin close by, this person may be more likely to use additional towels because he/she knows they will be recycled. At the margin, in the absence of a recycling bin, one may be more inclined to conserve the towels, possibly due to negative affect (e.g., guilt) that could arise from using more towels than absolutely necessary. More generally, making recycling readily available at all times could actually boomerang such that in some cases people consume more than they otherwise would.

In contrast, the presence of a recycling bin could actually prime consumers to be environmentally friendly and lead to lower consumption levels of the product. However, research suggests that many consumers focus on the positive aspects of recycling as a way to protect the environment, and are unaware of the relatively hidden costs of the recycling process itself in terms of water, energy usage, transportation, sorting, etc. (Benjamin, 2010). As a result, we believe that the recycling option is more likely to function as a "get out of jail free card" (Bolton et al., 2006), which may instead signal to consumers that it is acceptable to consume as long as they recycle the used product.

In this paper we test the hypothesis that the availability of the option to recycle (vs. no recycling option) will increase usage of certain types of products, such as office paper and bathroom paper towels, which are often provided "free" (i.e., there are no direct per unit costs associated with usage) to consumers. In experiment one, participants consumed more paper while evaluating a pair of scissors when a recycling bin was present (vs. absent). In the second experiment, we replicate the results from the first experiment in a field setting and different context by showing that individuals used more bathroom paper hand towels when the option to recycle was available (vs. not available).

Experiment 1

The goal of our first experiment was to see if the option to recycle has an effect on consumption in a controlled lab experiment measuring actual behavior.

Method

Experiment one employed a two factor, between-subjects design with participants assigned to conditions featuring either a trash can alone or a recycling bin and trash can.

Materials and Procedure

The cover story for this experiment described it as a product evaluation task. Participants were told that they would be evaluating a new brand of scissors and that part of the evaluation process involved testing the performance of the scissors by cutting a series of common shapes out of paper. Participants in this study were 44 undergraduate students (mean age = 20.6; 73% female) receiving course credit for participation. Upon arrival to the lab, participants were guided to small, private rooms with roughly half of the participants randomly assigned to each of the experimental conditions. Each room featured a small desk, chair, desktop computer, and either a recycling bin and trash can or a trash can alone. A stack of approximately 1000 g of plain, white paper (about 200 sheets) was placed on the desk along with a pair of eight inch scissors. The experimental instructions and questionnaire were administered in electronic format using the computer in each room. The product evaluation tasks were completed using the scissors and paper provided. Participants were asked to evaluate the scissors by cutting several different shapes out of the paper (e.g., triangles, squares, etc.). Information about the sizes of the shapes or the amount of paper that should be used in the task was purposely left unspecified. Participants were also asked to dispose of any scraps in the receptacle(s) provided in the room. To ensure that participants were aware of the type of receptacle(s) provided in the room prior to using the scissors, participants were asked to complete a checklist making sure that they had the proper materials to complete the evaluation: computer and mouse, paper, scissors, and the receptacle(s) to dispose of the scrap paper. To help minimize suspicion by reinforcing the product evaluation component of the task, participants were informed that they would be rating the scissors on a variety of dimensions using seven-point semantic differential scales (with endpoints such as: bad/good, inferior/superior, would not buy/buy, dislike/like, dull/sharp) both before and after the cutting task. After cutting out several shapes, participants were asked to spend about five minutes evaluating the scissors in any way they deemed appropriate (e.g., cutting more shapes, looking more closely at the materials used in production, etc.). Participants then answered manipulation check measures related to recall of the presence of recycling/trash receptacles and completed a six item green attitude scale ($\alpha = .90$; Haws, Winterich, & Naylor, 2012). The green attitude measure asked participants to indicate to what extent (endpoints: 1 = not at all; 7 = very much) each of a series of six statements described their beliefs and behaviors about the environment (e.g., "I consider the potential environmental impact of my actions when making many of my decisions."; see Table 1 for the full list of items). Finally, participants completed a suspicion question and provided demographic information. Debriefing was performed via email after data collection was complete. The main dependent measure was the amount of paper used (by weight) during the product evaluation task. None of the participants correctly guessed the true purpose of the experiment and so this measure is not discussed further in the analysis.

Table 1
Green attitude scale items.

Green attitude scale items
1. It is important to me that the products I use do not harm the environment.
2. I consider the potential environmental impact of my actions when making many of my decisions.
3. My purchase habits are affected by my concern for our environment.
4. I am concerned about wasting the resources of our planet.
5. I would describe myself as environmentally responsible.
6. I am willing to be inconvenienced in order to take actions that are more environmentally friendly.

Note: These items were adapted from Haws et al. (2012). Endpoints of 1 = Not at all; 7 = Very much.

Results

Manipulation Check

In the recycling bin condition, all of the participants recalled the availability of both the recycling bin and trash bin. In the trash bin condition, all of the participants recalled the trash bin disposal option, and none of the participants mistakenly recalled the presence of a recycling bin. Thus, participants in the trash can only condition were aware that this receptacle was in fact a trash can and that the recycling option was not available.

Paper Usage

In each condition, data were screened for the presence of outliers (values identified as three or more standard deviations from the group mean), resulting in the removal of one observation from the recycling condition. A preliminary ANCOVA with the weight of paper used as the dependent variable and independent factors representing the experimental condition, participant gender, and the summed score of the green attitude items as a continuous covariate revealed that neither participant gender nor the green attitude scale had a significant impact on the amount of paper used ($F(1, 39) = .88$, $p = .354$ and $F(1, 39) = 1.10$, $p = .300$, respectively). Thus, participant gender and the green attitude measure are excluded from further analysis. An independent samples, unequal variance t-test revealed that the mean weight of paper used by participants in the recycling option condition ($M = 27.90$ g) was significantly higher than in the trash can only condition ($M = 9.45$ g, $t(21) = 2.34$, $p = .029$, $\eta^2 = .207$). This result supports our hypothesis that the option to recycle can increase consumption compared to when the option to recycle is not available.

Discussion

Using measures of actual behavior, experiment one shows that participants used more paper while evaluating a pair of scissors when the recycling option was available (versus not available). This suggests that the addition of a recycling option can lead to increased resource usage. In this case, the starting amount of paper provided to participants was 1000 g (or about 200 sheets) and so the average amounts used in each condition represent a somewhat small shift from a fairly large initial supply of paper. However, in relative terms, the mean amount

used in the recycling condition (M=27.90 g) was almost three times the amount used in the trash can only condition (M=9.45 g). It should also be reiterated that the analysis omits the outlier from the recycling condition who used a far larger amount of paper (note: results are robust to the inclusion/exclusion of the outlier).

Additionally, a result that readers may find surprising is the lack of significance of the green attitude measure, which is actually consistent with many other studies (for a meta-analysis, see Hines, Hungerford, & Tomera, 1987). In addition, this outcome may be partially explained in research by Cornelissen, Pandelaere, Warlop, and Dewitte (2008), who find that more frequently occurring environmentally friendly behaviors are less diagnostic of green attitudes. Therefore, if paper product recycling is thought to be performed by a large number of people, perhaps a wider range of consumers, not just those with higher green attitudes are sensitive to the presence of a recycling bin in terms of consumption level. Further, although this experiment demonstrates the hypothesized effect of recycling availability on consumption, this result was observed in a controlled laboratory setting during a task that may have seemed somewhat foreign to participants. In experiment two, we extend the findings to a more realistic field setting with a more familiar context.

Experiment 2

Method

We conducted a two factor (disposal option: recycling bin available, not available), before and after field experiment to test the specific hypothesis that the option to recycle bathroom paper hand towels will result in increased paper towel usage compared to when the option to recycle is not provided.

Procedure

A men's restroom located on the second floor of a university building in the western United States was identified as the setting for this field study. This restroom was chosen due to its relatively consistent usage pattern and diversity of users, including university students, faculty, and staff. Data on the daily amount of paper hand towels used were collected for 15 business days without any intervention (i.e., only the usual trash receptacles for disposal of paper hand towels were present). A second set of usage measurements were then obtained from the same restroom for 15 business days after the introduction of a large recycling bin near the sinks with simple signs indicating that certain campus restrooms were participating in a paper hand towel recycling program and that any used hand towels placed in the bin would be recycled.[1] For both conditions, the weight of the unused, plain white paper towels (in grams) in the restroom dispensers was measured at 7:30 am each morning and again at 10:30 pm each night, with the difference in weight between the morning and the night measures for a particular day serving as the daily usage amount.[2] In an effort to control for any potential bias due to variations in the level of restroom traffic, a small counting device (model EPC-IRD1, available from www.idtelectronics.com) was unobtrusively installed above the inside of the door to monitor the number of restroom door swings each day during the course of the study. Using an infrared beam, the counting device registered twice every time the door was opened to enter or exit the restroom (i.e., the counter registered a "hit" once as the person door opened and once on the way back as the door automatically closed behind the person). For the purposes of the analysis, a "restroom user" was defined as four door swings (two swings upon entering and two upon leaving; Overall M=99.33 restroom users per day).

Paper Towel Usage

A measure of the per person paper towel usage per day was computed by dividing each daily paper towel usage weight by the number of restroom users that day. A screening of the data for the presence of outliers (defined as three or more standard deviations from the group mean, consistent with Study 1) did not reveal any extreme values and therefore the full data are retained for the analysis. An independent samples, unequal variance t-test revealed that the mean weight of daily paper towels used per person was greater when the option to recycle was available (M=7.13 g) than when the recycling option was not available (M=6.12 g, $t(20)=2.01$, $p=.029$, $\eta^2=.168$ (one-tailed)).

Discussion

In this experiment, we replicated the main result of experiment one in a field setting involving actual restroom paper towel usage. Specifically, consistent with our hypothesis, the average daily restroom paper towel usage per person increased after the introduction of a recycling bin. Also, because it was ensured that the paper towel dispensers in the restroom were sufficiently full each day, this experiment is similar to the first experiment in that it is likely that any given amount used by an individual restroom user represented a relatively small shift in the total supply of paper towels available in the dispenser (a single 9 inch by 9 inch white paper towel in the dispenser weighed approximately 2 g). However, in contrast to the first experiment, the restroom users could not

[1] The addition of a sign was deemed necessary since a recycling bin alone may not have properly conveyed the potential for the paper hand towels to be recycled. This intervention is consistent with a number of programs currently underway in private companies (http://www.sierranevada.com/environment/recycling.html) and universities (http://library.wwu.edu/news/10401) that recycle and/or compost restroom paper towels.

[2] The measurement time frame was chosen in coordination with facilities management staff because it represented the main hours of building usage and also did not overlap with janitorial services which typically occur in the very early morning. Additionally, in order to avoid the possibility of biased weight measurements due to varied levels of the liquid saturation of used paper towels, we measured the dry weight of the unused paper towels in the dispenser instead of the weight of the towels after being used and discarded in the recycling bin/trash can.

readily observe the total quantity available because the dispensers were mounted in the wall in a recessed fashion with nontransparent covers. Thus, the result holds even when participants cannot easily see the total supply available. Lastly, it is acknowledged that the increase in paper towel usage observed after the introduction of the recycling bin (an average of roughly 0.5 paper towels per person) may seem somewhat small in magnitude. However, if one considers that the restroom used in this experiment had an average of almost 100 users per day and multiplies this by 250 business days per year, the potential magnitude of the increase usage becomes increasingly substantial at about 12,500 paper hand towels annually in this restroom alone.

General Discussion

The general focus on increasing recycling options and convenience as the best course of action to help the environment is based on a key assumption that a consumer's consumption level is independent of the availability of the option to recycle. Our results cast doubt on this assumption. In two experiments involving actual behavior in both a lab and field setting, we found that the availability of a recycling option can actually increase resource usage of products for which the consumer faces no direct cost to consume (e.g., office paper and bathroom paper towels).

Implications for Researchers

Our study contributes to the existing literature in several ways and provides a foundation for future research. First, our work contributes to the (typically cost-focused) literature on rebound effects (e.g., Small & Van Dender, 2007; Sorrell et al., 2009) by showing that non-cost (potentially affective) factors can also lead to increased consumption. Moreover, studies of spillover (Thøgersen & Crompton, 2009) and licensing effects (Khan & Dhar, 2006; Mazar & Zhong, 2010) focus on how virtuous behavior at one point in time or in one domain can subsequently be followed by less virtuous behavior at a later time or in a different domain. Rather than prior decisions guiding subsequent choices, we find evidence that the disposal option available (recycling available vs. not available) for the product currently being used that can "license" the amount consumed.

Although we demonstrate the hypothesized effect of recycling availability on consumption, our results do not provide any direct process insight as to why this may occur. A number of plausible mechanisms can be advanced for consideration in future research. For example, the option to recycle may function as a means of reducing the guilt associated with consuming and disposing of a product, which therefore increases consumption through mitigation of guilt associated with (over) consumption. A slightly different account may be that the availability of the recycling option serves as a justification cue, where recycling the used product can be used to justify consumer's wasting behavior (e.g., Mukhopadhyay & Johar, 2009; Shafir, Simonson, & Tversky, 1993). The role of positive emotions may also be important as well. For instance, it would be interesting to examine the role of positive emotions, such as pride associated with reducing one's consumption/forgoing consumption for the good of the environment, in addition to how these positive emotions could interact with the negative emotions discussed previously (e.g., Patrick, Chun, & MacInnis, 2009). In this case, a mixed emotional framework (e.g., Williams & Aaker, 2002) may prove useful to understand the more complex factors influencing consumption decisions. Future research focusing on the underlying process that drives the current results will not only improve understanding of how environmentally friendly options can influence consumption behavior, but may also reveal more specific ways to attenuate or reverse the effect.

Additionally, in our experiments it is unclear whether participants understood their behavior to be observable by others. Given previous research illustrating the importance of social influences on environmentally responsible behavior (e.g., Griskevicius, Tybur, & Van den Bergh, 2010), it would be interesting to see how results would differ in situations where participants are explicitly aware of the conspicuousness of their behavior. Further, prior research has differentiated between injunctive norms (what most people believe to be acceptable/unacceptable) and descriptive norms (what most people do), finding that behavior is influenced by whichever type of norm is most salient (Cialdini, Reno, & Kallgren, 1990). In our first experiment, individuals were presumably influenced by injunctive norms (i.e., most people would expect white paper to be recycled vs. thrown in the trash). However, it is unclear how paper recycling norms may have been applied to restroom paper hand towels in our second study. Future work may investigate how consumption may change in environments with different injunctive norms as well as situations in which descriptive norms can be inferred from observing the behavior of others.

Lastly, some important limitations of our studies may be worthy of future investigation. First, we focus only on situations involving paper products where consumers incur no cost to consume additional units. Though a sizeable amount of consumption occurs in these types of situations (e.g., office paper or restroom paper towels in the workplace) (Cullen, 2007), future research should examine the effect of the option to recycle in alternative situations involving different product categories and where consumers must pay for the products consumed or where consumption is bounded by other constraints. Second, the current research applies only for situations where the used product itself is being recycled. Future research may investigate the possibility of changes in consumption quantity in situations where only part of the product may be recycled (e.g., the packaging can be recycled, but not the product itself (or vice versa)). It may also be fruitful to investigate how the presence of a recycling option may impact product attitudes and/or evaluations. For instance, would consumers evaluate products more favorably/enjoy them more when the recycling option is present and they are less concerned with wasting?[3]

[3] We thank the anonymous reviewers for suggesting these two research directions.

Implications for Policy

Agencies such as the Environmental Protection Agency expend a great deal of effort in promoting recycling involvement, including creating specific guidelines on how to recycle materials and implementing recycling programs. These efforts have been very successful considering the current widespread distribution of recycling facilities and the popularity of consumer recycling practices. However, our findings indicate that merely emphasizing the positive aspects of recycling and enhancing the availability of recycling options may not be sufficient to save natural resources, or at least does not always yield the maximum environmental benefit. The increase in consumption found in our study may be partially due to the fact that consumers are well informed that recycling is beneficial to the environment; however, the environmental costs of recycling (e.g., water, energy, etc. used in recycling facilities) are less salient. As such, consumers may focus only on the positive aspects of recycling and see it as a means to assuage negative emotions such as guilt that may be associated with wasting resources and/or as a way to justify increased consumption. Therefore, an important issue would be to identify ways to nudge consumers toward recycling while also making them aware that recycling is not a perfect solution and that reducing overall consumption is desirable as well.

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