

Fostering a More Sustainable World through Reduce, Reuse, and Recycle:  
The Role of Perceived Value in a Circular Economy

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**ABSTRACT**

The last few decades have seen an explosion in population growth and along with this growth we have also witnessed an increase in demand for products. Although our resources are limited, consumers' needs know no bounds. It is not surprising that we are also increasingly demanding more from our environment. It is therefore imperative that we make better use of our resources and reassess how we construe a product's lifecycle. Instead of a linear perspective, which typically follows a product's lifecycle from mining of raw materials to manufacturing, but then stops when products are trashed, we need to use a circular perspective, where we focus on the entire lifecycle of products, from not just manufacturing to usage, but also from usage to creation of new products through recycling. The focus of this dissertation is on understanding two important processes in the circular economy: that of usage and disposal. I focus on the role that consumers' product valuations play in these processes. In essay 1, I show that consumers value products made from recycled materials more than comparable regular products. I also document why this happens and demonstrate how this affects usage. In essay 2, I investigate the relationship between reuse and product disposal. The circular economy is based on what is now referred to as the 3R approach: reduce, reuse, and recycle. However, I show that consumers are more (vs. less) likely to trash products that they have used extensively (vs. rarely). This then leads to a conundrum: if we encourage consumers to reuse products extensively, it appears that they are more likely to trash them. It is therefore imperative that we understand this relationship better and find interventions to mitigate this negative relationship.

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**GENERAL AUDIENCE ABSTRACT**

The last few decades have seen an explosion in population growth and along with this growth we have also witnessed an increase in demand for products. To create a more sustainable world, it is imperative that we move towards a more circular economy, where we not only minimize waste, but also find ways to extract more use from our resources. One way to do this is to find ways to reuse products after they have reached the end of their lifecycle. The focus of this dissertation is on understanding two important processes in the circular economy: that of usage and disposal (essentially addressing questions about what to do with products that we no longer have a need for). I primarily focus on the role that consumers' product valuations play in influencing these processes.

In essay 1, I study how consumers feel about products made from recycled materials. I find that consumers are willing to pay more for products made from recycled materials compared with products made from regular raw materials. The higher willingness to pay emerges because consumers value the process that transforms the recycled materials into brand new products. I also show that this valuation impacts use: consumers use products made from recycled materials more judiciously.

In essay 2, I investigate the relationship between product usage and disposal. I find that when consumers use a product more extensively, they are more likely to trash the product compared with other forms of reuse, such as, disposing in the recycling bin, giving it to others, or reselling it. This effect emerges because when consumers use a product more frequently, they believe that the product has less value remaining for others, and a product that confers lower value to others should be trashed.

## **DEDICATION**

*To everyone*

*who have inspired, guided, and supported me throughout the journey.*

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## **ATTRIBUTION**

This dissertation consists of two essays: a manuscript based on Chapter 2 is currently in the review process. I am currently preparing a manuscript based on Chapter 3. Rajesh Bagchi is a co-author on both manuscripts. I was responsible for ideation and conceptualization. I collected and analyzed all the data. I also authored the first drafts of all documents. Rajesh Bagchi supported in conceptualization and writing of both manuscripts.

## **CHAPTER 1: INTRODUCTION**

The world is facing many environmental challenges. These range from various kinds of pollution, explosive population growth and along with it, a meteoric rise in demand for resources, to climate change. The sustainability of the entire world is at stake. It is imperative to find solutions for these critical problems. From a consumption perspective, it is critical to encourage consumers to engage in more sustainable consumption and take actions to support pro-environmental initiatives. One way to support more sustainable consumption is to examine the dynamics in consumer behavior and understand barriers that prevent consumers from engaging in more sustainable consumption. Viewing consumption from the lens of a circular economy, this dissertation studies the role of perceived value in influencing purchase decisions as well as disposal decisions.

### **CIRCULAR ECONOMY**

Traditionally, we treat product production and consumption using a linear perspective, where we take resources from the natural environment, convert them into products, use these products, and then dispose them after usage. However, in recent times, there has been a big push to move towards a circular economy, where we “reuse what you can, recycle what cannot be reused, repair what is broken, [and] remanufacture what cannot be repaired (Stahel 2016, p. 435).” By turning products that are at the end of their lifecycle into something else we give them a new lease of life. This also allows us to

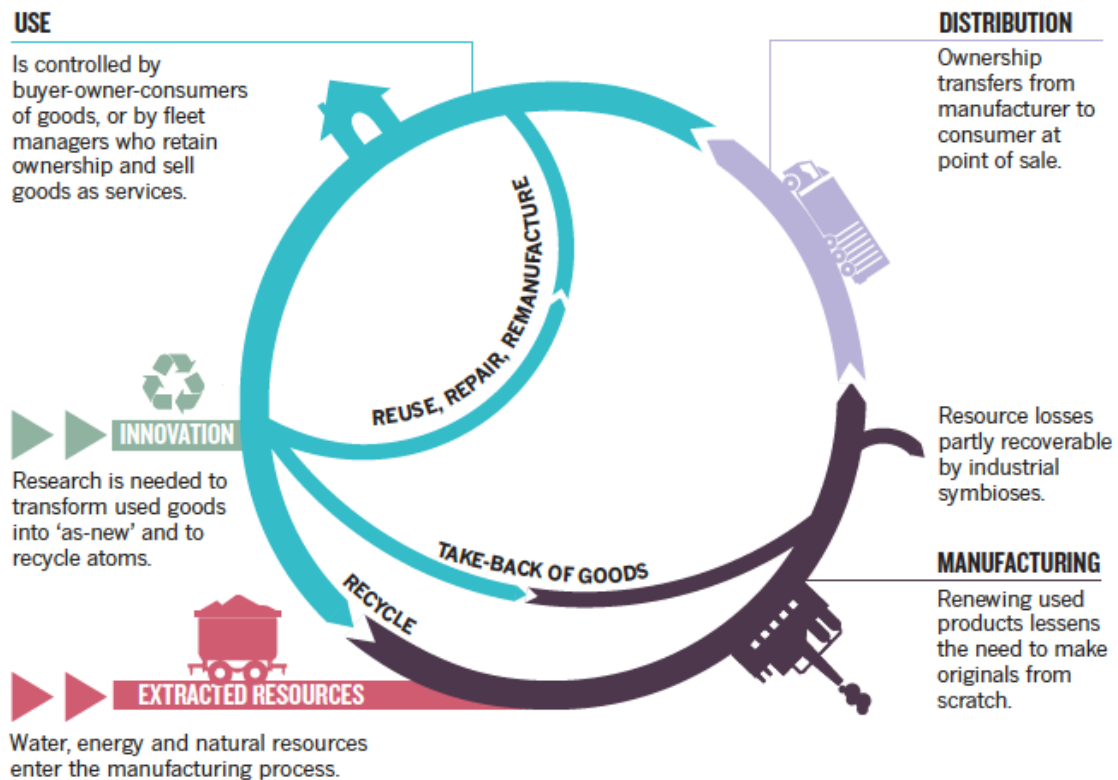
close the loop in the ecosystem and minimize waste (see figure 1). I propose that product valuation plays a critical role in the circular economy. I focus on two consumption processes integral to the circular economy: that of usage and disposal. I study how consumers value products made from recycled materials and how value impacts post-product-usage disposal choice.

**FIGURE 1**

**CLOSING LOOPS IN A CIRCULAR ECONOMY**

**CLOSING LOOPS**

Using resources for the longest time possible could cut some nations' emissions by up to 70%, increase their workforces by 4% and greatly lessen waste.



NOTE. Taken from Stahel (2016); reused with permission from Springer Nature.

## **THE VALUE OF RECYCLED MATERIALS**

In chapter 2, the first essay of this dissertation, I study consumers' perceptions and usage of products made from recycled materials. I find that consumers value products made from recycled materials more than they value comparable regular products. Using a framework that corresponds more closely to a product's production and marketing process, I decompose product costs into different elements, ranging from raw materials to product transformation, and from delivery to marketing. I find that consumers value recycled products more because of their perceptions that the use of recycled materials requires higher costs in the transformation process. I document this effect in market exchange contexts as well as in non-market exchange contexts. While in market exchange contexts, higher valuation leads to higher willingness to pay and higher likelihood of buying, a seemingly paradoxical reversal emerges in usage contexts—higher valuation leads to more judicious product usage.

## **VALUE AND PRODUCT USAGE LEVEL**

In chapter 3, the second essay of this dissertation, I examine how product usage level influences consumers' choice of disposal options. I find that consumers are more likely to trash a product that they have used extensively compared with one that they have used rarely. I demonstrate the effect across multiple product categories (clothing, plastic water bottle, and planner book). I further identify consumers' perceptions of how much value the product confers to others as an important underlying mechanism driving

the effect of usage level on disposal choice. When consumers use a product more extensively, they believe that they have extracted more value from the product, but they perceive the value that others can derive from this to be less. It is the value to others that underlies consumers' decision to trash the product rather than use other methods of disposal that would still allow extraction of some value from the product.

## **CHAPTER 2: HEIGHTENED CONSUMER VALUE PERCEPTIONS OF PRODUCTS MADE FROM RECYCLED MATERIALS**

Our planet has limited resources, yet consumers' needs know no bounds. The more they have, the more they want to have (Piff et al. 2012; Wang, Jetten, and Steffens 2020). With pressing needs from the world's ever-growing population, we need to make better use of our resources for a more sustainable economy. One way to achieve this is via recycling. Fortunately, recycling is being encouraged worldwide, and consumers are responding favorably. According to the Organization for Economic Co-operation and Development (OECD), on average, 25% of municipal waste was recycled in 2019 for its member states (OECD 2019). In concert, companies have also increased the use of post-consumer recycled materials in their manufacturing process. Yet, we have limited understanding of consumers' attitudes towards products made from recycled materials. How do consumers perceive and use products made with recycled materials?

Many have expressed concerns about the hesitancy from consumers to adopt products made from recycled materials owing to a host of issues, ranging from hygiene and inauthenticity to reticence to own previously owned materials. However, contradicting popular beliefs, we propose that consumers value products made from recycled materials more than they value comparable regular products. We document where this value increment arises from. We consider aspects ranging from product manufacturing to the retailing cycle. While previous research shows how certain factors such as form (physical vs. digital [Atasoy and Morewedge 2018; Leung et al. 2021]), one's own labor (Norton, Mochon, and Ariely 2012), and uniqueness (Keinan and Kivetz

2011; Reich, Kupor, and Smith 2018) can induce additional valuation from consumers, we propose and use a framework that corresponds more closely to a product's production and marketing process. We decompose product costs into different elements, ranging from raw materials to product transformation, and from delivery to marketing. We find that consumers value recycled products more because of their perceptions that the use of recycled materials requires higher costs in the transformation process. We document this effect in market exchange contexts as well as in non-market exchange contexts. While in market exchange contexts, higher valuation leads to higher willingness to pay and higher likelihood of buying, a seemingly paradoxical reversal emerges in usage contexts—higher valuation leads to more judicious product usage.

Our findings make important contributions to the area of sustainability. We specifically contribute to the growing literature on consumer recycling. While past research focuses on different antecedents of consumers' recycling behaviors (Sun and Trudel 2017; Trudel and Argo 2013; Trudel, Argo, and Meng 2016; Winterich, Nenkov, and Gonzales 2019), we extend this by studying downstream effects, and provide an understanding of consumers' perceptions and use of products made from recycled materials.

We also contribute to the literature on consumers' perceptions and usage of sustainable products. While previous literature has studied sustainable products and documents findings suggesting that people hold both positive and negative perceptions towards sustainable products (Griskevicius, Tybur, and Van den Bergh 2010; Lin and Chang 2012; Luchs et al. 2010; Tezer and Bodur 2020), we expand our understanding of products made from recycled materials. While products made from recycled materials

also aid in sustainability, they are different from products that are typically characterized as sustainable products. For example, one type of widely available sustainable products is biodegradable and can be naturally decomposed post-consumer usage. In contrast, by definition, products made from recycled materials comprise of materials that are not biodegradable (e.g., plastic and metal).

Our findings contribute to corporate social responsibility (“CSR”) and to environmental, social, and governance (“ESG”). Habel and colleagues (2016) find that consumers might have negative reactions towards a company’s CSR initiatives if they believe such engagement leads to price mark-ups. However, we find the opposite when it comes to products made with recycled materials. Consumers have positive valuations towards products made from recycled materials even though the value increment might support a price mark-up for such products relative to regular products.

Our findings also have practical implications for managers and policy makers. Highlighting that their products contain recycled materials is likely to be beneficial for managers when valuation is salient, for example, at the point of sale or on platforms where consumers provide reviews. However, highlighting this during usage could lower product usage. From a policy makers perspective, however, emphasizing the ingredients of recycled products is likely to lower usage and help aid in conservation efforts and increase consumer savings. However, because we document how people value products made from recyclable materials and show where this value increment arises from, our contribution extends well beyond marketing into various areas of manufacturing and from product engineering to environmental engineering. For example, based on our

findings, we believe manufacturers will be better advised to use more recycled raw materials into their products and communicate such usage to consumers.

## **THEORETICAL BACKGROUND**

The emphasis on recycling has only increased in recent times, and understandably so. We hear consistent messages from policy makers, from manufacturers, and even from consumers. While most recognize the importance of recycling, consumer research in this area is still nascent. Much of the extant research has focused on studying the factors that influence consumers' recycling behaviors. For example, aspects related to the product, such as its form and size has been shown to impact recycling (Trudel and Argo 2013). Beyond just the product, even the identity linkages that consumers establish with products affect behaviors (Trudel et al. 2016). Research also documents the importance of message framing in influencing recycling (White and Simpson 2013; Winterich et al. 2019). While the primary focus of this stream is on understanding the decision to recycle, the literature does not yet provide an understanding of the downstream consequences of consumers' decision to recycle. In other words, after being converted into new products, how are products made from recycled materials judged by consumers? How do consumers evaluate such products, and ultimately, how do they use them?

It would be wholly inaccurate to say that researchers have not studied how consumers perceive and use sustainable products. Researchers have studied the effects of green consumption and found both positive and negative effects. On the positive side, Tezer and Bodur (2020) found that merely using a green product increases consumers'

feeling of being valued by society, which evokes a warm glow, and consequently consumers derive greater enjoyment from their consumption experiences. Relatedly, green consumption provides a way to satisfy status motives, as those consuming green products are judged more positively (Griskevicius et al. 2010). On the flip side, researchers find green products to be inferior to regular products. For example, Luchs and colleagues (2010) find that consumers usually associate sustainable products with gentleness, lower potency, and efficacy. Consequently, to compensate, consumers often increase the amount of green products they use (Lin and Chang 2012). While these studies do indeed shed light on sustainable consumption, the authors do not investigate assessments of products made from recycled materials.

While products made from recycled materials share many of the features of green products, they are also different. Broadly, green products are considered as products that are more sustainable or environmentally friendly (Lin and Chang 2012; Luchs et al. 2010). Based on this definition, one may also consider recycled products to be green. However, there are also key differences. Products made from recyclables share the social good to help protect the environment, but they also have many inherent characteristics that differentiate them from other green products. While green products rely on sustainable processes (e.g., are an outcrop of organic farming) or have sustainable outcomes (e.g., are biodegradable), recycled products are simply made from products that have been previously owned and used by others. They may contain harmful chemical ingredients, and there is no a priori reason to expect products made from recycled material to be gentle or be less potent. Our focus, thus, is on products made from recycled

materials: we focus on perceptions, evaluations, and usage of products made from recycled materials.

There are many reasons why one might credibly expect recycled products to be undervalued. First, from a theoretical perspective, classic judgment and decision-making literature provides one explanation. The endowment effect (Kahneman, Knetsch, and Thaler 2011; Thaler 1980) shows that buyers value the same products less than the sellers. One explanation for this discrepancy relies on loss aversion. Sellers experience feelings of attachment owing to ownership, an effect that is an outcrop of psychological ownership (Morewedge and Giblin 2015). However, it is not clear how this might apply to products made from recycled materials. A fundamental feature of recycled products is that they are made from materials that have been previously owned and used by others. If this aspect of pre-ownership becomes salient in the evaluation process, then consumers may not feel the same sense of attachment associated with full ownership and may undervalue products made from recycled materials. Second, consumers may learn from their everyday observations. Secondhand products usually are sold at much lower prices. For example, people sell things that they do not need any more at yard sales. Therefore, people might perceive products made from recycled materials as being made from unwanted materials. As a result, consumers might undervalue products made from recycled materials. Finally, consumers may also use the inference that a product built from poorer quality materials will be poor in quality. Indeed, the U.S. Environmental Protection Agency (EPA) defines recycling as “the process of collecting and processing materials that would otherwise be thrown away as trash” (EPA n.d.), which suggests that the product is made from trash.

We, on the contrary, propose that consumers will impute higher values to products made from recycled materials relative to comparable products made from regular raw materials. A natural follow-up question may be which aspect of the recycling process contributes to this value increment. Costs can be broadly divided into costs involved in the product production process, and costs to package, deliver, and market the product. We discuss each of these costs. Our focus, however, is on consumer perceptions of these costs—because it is these perceptions that elicit increments in consumer valuations.

From a consumer's perspective, two aspects of the production process may contribute to the value increment: (1) cost of the raw manufacturing materials; and (2) cost of transformation that turns raw materials into new products. The latter cost encompasses costs involved in preparing the raw material for manufacturing as well as the costs involved in the process of making the product.

The cost of the raw materials involved in the product is obviously a critical factor that determines product costs. However, we do not believe that this can consistently explain the higher valuation imputed to products made with recycled materials. This is because the price of recycled materials is likely to differ contingent on the material type—in some cases, the recycled material may be more expensive than non-recycled material, while in other cases the reverse may be true. For example, in the case of metal, recycled metal costs less than newly mined raw metal. With other raw materials the relationship may be even more nebulous. For example, consider plastic. Because plastic is a by-product of the crude oil refining process, the cost of fresh plastic fluctuates based on gas price. Consequently, fresh plastic may at times be cheaper than recycled plastic,

while at other times, it may be more expensive. Therefore, normatively, it is not possible to conclusively conclude whether recycled materials will cost more or cost less than non-recycled raw materials. However, we do acknowledge that consumer beliefs do not always track normative facts, and that is why we consider the role of cost of recycled materials in our empirical studies.

We conjecture that the value increments derive specifically from the transformation process that turns recycled materials, which have been previously used, into new products. In other words, the costs involved in preparing the recycled raw material for the purposes of manufacturing and the actual production process that turns the *used* materials to *new* products is what underlies the higher valuation. The recycling process transforms what would otherwise have been trashed into new products. While consumers will appreciate the use of recycled materials in the product, these recycled materials were originally manufactured to serve a different purpose, which might lead to the inference that additional costs will be incurred in preparing these materials so that they are conducive for recycling, and the actual transformation process would also be more expensive. In contrast, regular raw materials are materials typically used in the production process, so one may not expect them to require more extensive preparation. Furthermore, consumers may also erroneously believe that the transformation costs involved in converting regular raw materials into products would be lower. These arguments relate well with previous research, which suggests that transformation salience can inspire consumers to engage more in recycling behaviors (Winterich et al. 2019), but do not automatically emerge from it. This is because if consumers believe the transformation process to be relatively more expensive when recycled materials serve as

raw materials then it might deter them from recycling. While our focus is not on antecedents of recycling, this suggests that transformation costs may not be salient during recycling but become more salient when consumers evaluate products made from recycled materials.

While we believe that the value increment derives from the transformation process highlighted above, we would be remiss not to consider the packaging, marketing, and logistics costs. Consumers might also believe that products made from recycled materials engender greater marketing costs (Shiv, Carmon, and Ariely 2005) owing to branding and signage, which might be cheaper for products made with regular raw materials. This might be a contributing factor, but companies vary in terms of the costs they devote to marketing their products. Some companies spend more while others do not and prefer a more low-profile approach where they do not extensively include such messages in their marketing and advertising. Therefore, the extra cost of marketing will not hold in instances where consumers learn that similar branding effort is involved for both products made from recycled as well as those made from regular raw materials. Nonetheless, we consider costs involved with (3) packaging of the finished products; (4) delivery process of the products; and (5) marketing of the products.

Thus, we propose that the value increments derive specifically from the transformation process that turns recycled materials into new products. Thus, the costs involved in preparing the recycled raw material for the purposes of manufacturing and the actual production process that turns used materials to new products are what underlies the higher valuation.

In market exchange contexts, this valuation may be reflected in consumers' willingness to pay or in their beliefs about how this product should be priced in the retail sector. In fixed price contexts, greater valuation should elicit higher willingness to buy. But what might be the outcrop of consumer valuation in non-market exchange contexts such as during usage. Consumers are often reticent to use things they value and like to hold on to them. Although these behaviors have not been explicitly studied in product usage contexts, there is ample support in other literature. At the extreme end of this spectrum lies hoarding disorders, where people have difficulty discarding things, because they value everything highly (Frost and Hartl 1996; Woody, Kellman-McFarlane, and Welsted 2014). But such behaviors have also been noticed in other contexts. For example, consumers are hesitant to use aesthetically pleasing products because they value these products (Wu et al. 2017). Relatedly, people often delay consumption of an affective experience because they want to "save the best for last," which could also explain consumers' preference for improving sequences of affective experiences (Andrade and Hackenberg 2012; O'Brien and Ellsworth 2012; Yip and Löckenhoff 2018). Extending this to product usage contexts, we expect consumers to use products made from recycled materials more judiciously. At the outset our arguments may appear to contradict the previously identified *licensing* account of product usage, which suggests that when a recycling bin is provided consumers use (and waste) more of the product (Catlin and Wang 2013). However, it is important to recognize that this overuse of regular products might be largely related to guilt reduction associated with wasting behaviors. Our focus is on post-recycling behaviors and relates to valuation of products made from recycled materials and is thus not directly related to this research.

In summary, we propose that people tend to value products made from recycled materials more than comparable regular products. In other words, consumers will have higher willingness to pay and expect the retail price to be higher for products made from recycled materials. In fixed price contexts they will be more willing to buy such products. The value increment derives from consumers' belief that the cost of transformation that turns raw materials into new products is higher for recycled materials compared with regular raw materials. More specifically, the costs involved in preparing the recycled raw material for the purposes of manufacturing and the actual production process that turns used materials into new products are what underlies the higher valuation. In non-market exchange contexts these heightened value perceptions will be reflected in usage: consumers will use products made from recycled materials more judiciously.

## **STUDY OVERVIEW**

We tested our hypotheses in eight studies with 2,075 respondents. Studies 1-3 establish the robustness of the basic effect that products made from recycled materials are more valuable. Study 3 also replicates the effect using an incentive compatible design. Studies 4 and 5 provide process support and demonstrate that these effects emerge because consumers believe that the cost of transformation is higher for recycled materials. Studies 6A-6C show how valuation impacts product usage in different real-life contexts.

We predetermined the sample size for all studies. For studies using online respondents, we targeted at least 130 participants per condition (based on a moderate

effect size of Cohen's  $d = .35$  and 80% power). Detailed sampling plan can be found in the preregistration for preregistered studies as indicated in each study. For studies using undergraduate students, we predetermined the number of slots considering all the studies in the same lab session, but we had no control over students' show-up and completion rates. Data were collected under a protocol approved by the Institutional Review Board ("IRB") at the authors' institution(s). All study material can be found in appendix A. All data and analysis syntax are archived at the Open Science Framework repository and is made available to reviewers during the review process. This link will be shared publicly after publication. Data were analyzed using SPSS version 27. We also conducted a  $p$ -curve analysis (Simonsohn, Nelson, and Simmons 2014) and the results indicated that the set of studies contain evidential value (details included in appendix B).

## STUDY 1

In this study, we show that consumers value the products made from recycled materials more than they do products made from regular materials. We directly measure value perception through participants' willingness to pay for a new product. We also test if our effect still holds when consumers jointly evaluate a product made from recycled materials with a non-recycled counterpart.

### Method

We recruited 400 Amazon Mechanical Turk ("MTurk") workers (47.5% female, 1 identified as other gender, and 3 preferred not to say;  $M_{\text{age}} = 40.85$ ,  $SD = 12.83$ ). We

randomly assigned participants to one of three conditions (separate evaluation: recycled vs. separate evaluation: control vs. joint evaluation: recycled and control).

We followed the previous research designs investigating separate and joint evaluations (Hsee 1996). We told participants that they were considering buying a water bottle for everyday use. They planned to spend between \$10 and \$50 for the bottle. In the two separate evaluation conditions, respondents evaluated the same plastic water bottle. We told participants that they found a nice-looking durable plastic water bottle and presented them with a picture of a reusable plastic water bottle. While participants in the recycled material condition learned that the water bottle was made from recycled plastic, in the control condition, we told participants that the water bottle was made from non-recycled plastic. After viewing the stimuli, we asked participants to indicate how much they were willing to pay for the water bottle using an open-ended text box to capture free responses.

In the joint evaluation condition, we showed participants the same stimuli that was shown in the separate conditions except this time the two identical water bottles were shown jointly but were labeled as bottle “A” and “B”. We further told participants that water bottle A was made from non-recycled plastic while water bottled B was made from recycled plastic. Participants then indicated their willingness to pay (“WTP”) for both water bottles.

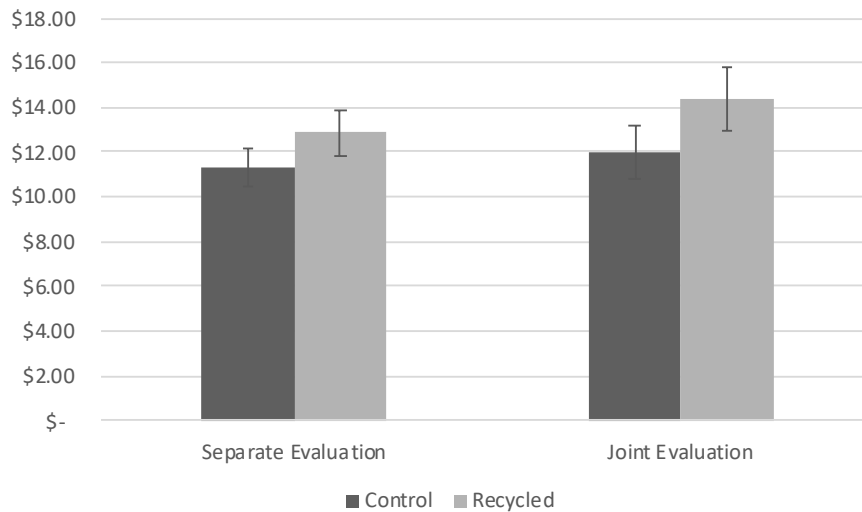
## Results and Discussion

We analyzed the results for the separate and joint evaluation conditions separately (see summary results in figure 2). We first compared the two separate evaluation conditions. Participants in the recycled material condition ( $M_{\text{separate-recycled}} = \$12.87$ ,  $SD = 6.10$ ) indicated a higher WTP for the water bottle than those in the control condition ( $M_{\text{separate-control}} = \$11.30$ ,  $SD = 5.01$ ; Welch's  $t(256.22) = 2.30$ ,  $p = .023$ , Cohen's  $d = .28$ ). To account for normality violation ( $\text{Skewness}_{\text{separate}} = .66$ ,  $SE = .15$ ;  $\text{Kurtosis}_{\text{separate}} = .78$ ,  $SE = .30$ ), we also conducted a non-parametric test on WTP (Field 2018; Lenhard and Lenhard 2017) and elicited a similar pattern of effect even though it was marginally significant ( $Mdn_{\text{separate-recycled}} = \$12.00$  vs.  $Mdn_{\text{separate-control}} = \$10.00$ ; Mann-Whitney  $U(N_{\text{separate-recycled}} = 134, N_{\text{separate-control}} = 134) = 7870.00$ ,  $z = -1.79$ ,  $p = .074$ , Cohen's  $d = .22$ ).

We then compared the within-participants response in the joint evaluation condition. Participants indicated higher WTP for the water bottle made from recycled materials than that made from non-recycled materials ( $M_{\text{joint-recycled}} = \$14.38$ ,  $SD = 8.30$  vs.  $M_{\text{joint-control}} = \$11.99$ ,  $SD = 6.95$ ;  $t(131) = 4.50$ ,  $p < .001$ , Cohen's  $d = .39$ ). There were also normality violations in the joint evaluation condition ( $\text{Skewness}_{\text{joint-recycled}} = 1.29$ ,  $SE = .21$ ,  $\text{Kurtosis}_{\text{joint-recycled}} = 3.04$ ,  $SE = .42$ ;  $\text{Skewness}_{\text{joint-control}} = 1.60$ ,  $SE = .211$ ,  $\text{Kurtosis}_{\text{joint-recycled}} = 5.97$ ,  $SE = .42$ ). A non-parametric test replicated the same effect ( $Mdn_{\text{joint-recycled}} = \$12.00$  vs.  $Mdn_{\text{joint-control}} = \$10.00$ ; Wilcoxon  $T = 3313.50$ ,  $z = -5.12$ ,  $p < .001$ , Cohen's  $d = .66$ ).

**FIGURE 2**

**MEANS OF WTP ACROSS CONDITIONS (STUDY 1)**



NOTE. Error bars represent 95% confidence interval.

In this study, we use WTP to document consumers' positive valuation of products made from recycled materials. We also demonstrate robustness by using both separate and joint evaluations. The relative effect size was slightly larger in the joint evaluation context. This may be because when comparing with regular products, the benefits of products made from recycled materials become more distinct and pronounced. As consumers often encounter multiple different product options in their product evaluation and purchase process, the between-participants design of our other studies is a more conservative test of our effect.

## STUDY 2

We used WTP to measure participants' valuation of products in study 1. While WTP provides a measure of valuation, it is subjective and may be influenced by consumers' idiosyncratic preferences of the target products. For instance, consumers may have no desire to purchase certain products. In such cases, we will not find differences in their WTP. Therefore, in study 2, we use another measure of participants' valuation by asking them to provide a suggested retail price. A suggested retail price reflects participants' anticipated price for marketplace transaction and thus should be a clear reflection of participants' valuation of the product. Further, because sometimes products may vary on signage (e.g., because of branding or because recycled products sometimes carry additional signage) we controlled for that by including similar signage on packaging of both products.

### Method

We recruited 303 MTurk workers (44.9% female, 2 identified as other gender and 1 preferred not to say;  $M_{\text{age}} = 42.21$ ,  $SD = 13.41$ ). We randomly assigned participants to one of two conditions (evaluation target: recycled materials vs. control).

We told participants that Breeze (a fictitious brand) is planning to launch paper towels. The products have two versions, "Breeze Original" and "Breeze Recycled". We further informed participants that Breeze Original was made from 100% original wood pulp while Breeze Recycled was made from 100% recycled materials. We presented

participants with a picture of both products. We also included comparable logos with each of the products (see appendix for the stimuli) to ensure that they were judged similarly and that these differences were not responsible for our effects.

In the recycled materials condition, we informed participants that based on market research, Breeze set the suggested retail price for Breeze Original at \$20.99 per pack (8 rolls of paper towels per pack). We then asked participants to indicate how much should Breeze set the retail price for Breeze Recycled. In the control condition, we provided the same information, except we informed participants that, based on market research, Breeze set the suggested retail price for Breeze Recycled at \$20.99, and asked participants to indicate what the retail price should be for Breeze Original. We excluded one participant (Final  $N = 302$ ) who provided a suggested price of \$499 (more than 25 times the mean response). The significance of a non-parametric test was robust to the inclusion or exclusion of this participant.

## Results and Discussion

As expected, participants suggested a higher retail price for Breeze Recycled ( $M_{\text{recycled}} = \$18.87$ ,  $SD = 5.56$ ) than for Breeze Original ( $M_{\text{control}} = \$16.79$ ,  $SD = 5.82$ ;  $t(300) = 3.17$ ,  $p = .002$ , Cohen's  $d = .37$ )<sup>1</sup>. There were strong violations of normality (Skewness = 16.33, SE = .140; Kurtosis = 278.06, SE = .28). However, the effect still

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<sup>1</sup> However, it may be important to note that, regardless of condition, participants suggested a lower price ( $M_{\text{recycled}} = \$18.87$ ;  $M_{\text{control}} = \$16.79$ ) than that provided in the scenario (\$20.99). Post-hoc we recognized that this discrepancy may have occurred because the suggested price (\$20.99) may have been higher than the reference price that respondents hold for such products. Even if we inadvertently used a higher suggested price, the results document the robustness of these effects: participants are still willing to pay more for paper towels made from recycled materials (vs. control).

held when we conducted a non-parametric test ( $Mdn_{\text{recycled}} = \$19.99$  vs.  $Mdn_{\text{control}} = \$16.00$ ; Mann-Whitney  $U$  ( $N_{\text{recycled}} = 152$ ,  $N_{\text{control}} = 150$ ) = 9005.50,  $z = -3.16$ ,  $p = .002$ , Cohen's  $d = .37$ ).

Thus, we replicated consumers' heightened valuation for products made from recycled materials using another different dependent variable. Participants expected the retail price for a product made from recycled materials to be higher than an otherwise identical product made from non-recycled materials.

### STUDY 3

In study 3, we attempt to replicate our main finding using an incentive compatible design. We ask participants to estimate the average amount that customers are willing to pay and incentivize them for accuracy (adapted from Monnier and Thomas 2022). We preregistered our sample size, hypothesis, and analysis plan for this study ([https://aspredicted.org/DSK\\_35D](https://aspredicted.org/DSK_35D)).

#### Method

We recruited 300 U.S. Prolific workers (62.3% female, 5 identified as other gender;  $M_{\text{age}} = 33.70$ ,  $SD = 11.89$ ) to participate in this study in exchange for a small monetary compensation and a chance to win an additional compensation. We randomly assigned participants to one of two conditions (raw material: recycled vs. control).

Participants first read the procedures for the incentive compatible price elicitation method. Participants were asked to estimate the average amount of dollars that customers are willing to pay for a new pair of running shorts in a retail store. We told participants that the respondent whose estimate was the closest to the average estimate in the study would win a \$10 prize. Next, we presented participants with a picture of a new pair of men's running shorts. In the recycled condition, we further informed participants that the shorts were made from 55% recycled polyester. In the control condition, we informed them that the shorts were made from polyester. The picture was from an actual product that was made from 55% recycled polyester, but we shaded the brand logo. We also told participants that this type of shorts was usually priced between \$10 and \$60. After reading the stimuli, participants provided their best estimate of the average amount that people would be willing to pay for the shorts (in USD) in an open textbox. As indicated in our preregistration, we checked participants' estimates to assess if responses were between \$10 and \$60. Because all responses were in the range, we included all responses in our final analysis.

After the study was completed, we selected a winner for each condition. The participant whose estimate was closest to the average of all the responses in that condition was selected as the winner. We paid the two selected participants \$10 each through Prolific.

## Results and Discussion

A one-way ANOVA on participants' WTP estimates revealed a significant effect ( $F(1, 298) = 10.67, p = .001, \eta_p^2 = .035$ ). As expected, participants in the recycled material condition ( $M_{\text{recycled}} = \$28.66, SD = 9.13$ ) estimated the average amount that customers were willing to pay to be higher than those in the control condition ( $M_{\text{control}} = \$25.36, SD = 8.34, \text{Cohen's } d = .38$ ). There were violations of normality (Skewness = .38, SE = .14; Kurtosis = -.08, SE = .28). As indicated in our preregistration, we conducted a non-parametric test and the effect held ( $Mdn_{\text{recycled}} = \$26.84$  vs.  $Mdn_{\text{control}} = \$25.00$ ; Mann-Whitney  $U$  ( $N_{\text{recycled}} = 150, N_{\text{control}} = 150$ ) = 9049.50,  $z = -2.94, p = .003$ , Cohen's  $d = .34$ ).

We replicated our main finding in this study. Participants estimated the average amount that people were willing to pay to be higher for products made from recycled materials. More importantly, the effect held when we incentivized participants for accuracy in their estimates. Taken together, studies 1-3 demonstrated a robust effect that consumers have heightened valuations for products made from recycled materials across different elicitation methods and evaluation modes. Next, we turn to explore the underlying process for the effect.

## STUDY 4

In study 4, we test our proposed process: we hypothesized that the incremental value consumers place on products made from recycled materials derives from their belief that the cost of transformation process is higher for recycled materials compared with regular raw materials. We ask participants to directly estimate the cost of

manufacturing products. We preregistered our sample size, hypothesis, and analysis plan for this study ([https://aspredicted.org/T54\\_M4X](https://aspredicted.org/T54_M4X)).

## Method

We recruited 300 U.S. Prolific workers (63.7% female, 6 identified as other gender;  $M_{\text{age}} = 33.20$ ,  $SD = 12.22$ ) to participate in this study in exchange for a small monetary compensation. We randomly assigned participants to one of two conditions (raw material: recycled vs. control).

We told participants that they were looking to buy a clear phone case. We then showed them a picture of a plastic phone case and informed them that the retail price of the phone case was \$20. In the recycled material condition, we provided additional information that the phone case was made from recycled materials. No such information was provided in the control condition. After viewing the phone case, we asked participants to indicate their likelihood of buying the phone case (1 = not likely at all, 7 = very likely). On the next screen, we asked participants to indicate their best estimate of the cost to transform the input materials into the phone case in an open textbox. Per our preregistration, we excluded three participants who reported estimates larger than \$20, that is, more than the total cost of the phone case (Final  $N = 297$ ).

## Results and Discussion

A one-way ANOVA on participants' willingness to buy was marginally significant ( $F(1, 295) = 2.95, p = .087, \eta_p^2 = .010$ ). Participants in the recycled material condition ( $M_{\text{recycled}} = 3.77, SD = 1.85$ ) were more likely to buy the phone case than those in the control condition ( $M_{\text{control}} = 3.40, SD = 1.91, \text{Cohen's } d = .20$ ).

A one-way ANOVA on participants' estimates of the cost for the transformation process revealed a significant effect ( $F(1, 295) = 13.97, p < .001, \eta_p^2 = .045$ ). Participants in the recycled material condition ( $M_{\text{recycled}} = \$6.64, SD = 4.13$ ) estimated the cost for the transformation process to be higher than those in the control condition ( $M_{\text{control}} = \$4.91, SD = 3.82, \text{Cohen's } d = .43$ ). There were violations of normality (Skewness = .89, SE = .14; Kurtosis = .15, SE = .28). Following our preregistration, we conducted a non-parametric test as robustness check and the effect held ( $Mdn_{\text{recycled}} = \$5.00$  vs.  $Mdn_{\text{control}} = \$4.00$ ; Mann-Whitney  $U$  ( $N_{\text{recycled}} = 148, N_{\text{control}} = 149$ ) = 8130.50,  $z = -3.95, p < .001, \text{Cohen's } d = .47$ ).

Last, we conducted a mediation analysis using Process (version 3.5) Model 4 (Hayes 2018). The indirect effect through cost estimates for the transformation process was significant ( $ab = .15, SE = .06, 95\% \text{ CI } [.048, .274], \text{bootstrap: } 5,000 \text{ times}$ ).

We replicated the positive valuation of products made from recycled materials (vs. control) in this study through participants' willingness to buy given a fixed retail price. We also measured consumers' perceptions of the cost of the transformation process that turns raw materials into new products. We showed that participants estimated the cost of transformation when using recycled materials to be higher than their regular counterparts. These perceptions were responsible for the enhanced valuation of products made from recycled materials.

## STUDY 5

We found that the higher valuation of products made from recycled materials was driven by consumers' belief that the cost of transformation is higher for recycled materials than for regular raw materials. It is possible that our effects in study 4 may have emerged because respondents were not considering other costs involved in producing and marketing products. Therefore, in study 5, we include all the costs involved in the product manufacturing and retailing cycle to assess where consumers perceive the extra value. We preregistered our sample size, hypotheses, and analysis plan for this study ([https://aspredicted.org/45Q\\_FH6](https://aspredicted.org/45Q_FH6)).

### Method

We recruited 150 MTurk workers (48.0% female, 1 identified as other gender and 3 preferred not to say;  $M_{\text{age}} = 40.59$ ,  $SD = 12.36$ ) to participate in this single factor within-subjects study (recycled materials vs. control) in exchange for a small monetary compensation.

We showed participants two different versions of plastic coffee capsules that are used in coffee machines. The two versions looked identical. However, we told participants that Version A was made from authentic plastic while Version B was made from 80% recycled plastic. After viewing the information, we asked participants how much they expected the company to price Version A compared with other typical coffee

capsules in the market (1 = cheaper than those in the market, 4 = similar to those in the market, 7 = more expensive than those in the market). We then repeated this question for Version B.

We then asked participants to compare the costs for each of the two versions separately with other typical coffee capsules in the market (1 = costs less than other typical products in the market, 4 = costs similarly to other typical products in the market, 7 = costs more than other typical products in the market). Participants rated the costs for the following 5 manufacturing and retailing processes: (1) cost of the raw manufacturing materials; (2) transformation process that turns the input materials into coffee capsules; (3) packaging of the finished products; (4) delivery process of the products; and (5) marketing of the products. We hypothesized that participants would believe the cost of transformation to be higher for products made from recycled materials. We did not make specific predictions for other cost elements.

## Results and Discussion

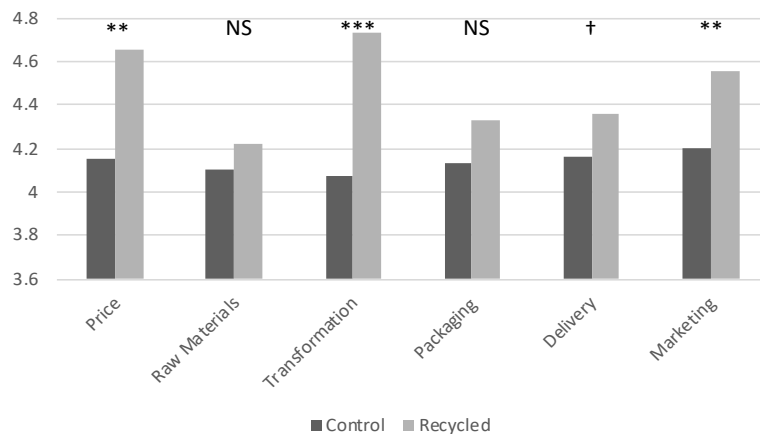
We first compared participants' expectations of the price for the two versions of coffee capsules. Participants believed that the coffee capsules made from 80% recycled materials should be priced higher ( $M_{\text{recycled-price}} = 4.65$ ,  $SD = 1.45$  vs.  $M_{\text{control-price}} = 4.15$ ,  $SD = 1.16$ , Cohen's  $d = .24$ ;  $F(1, 149) = 8.93$ ,  $p = .003$ ,  $\eta_p^2 = .057$ ).

Next, we conducted a 2 (recycled materials vs. control) x 5 (costs) repeated measures ANOVA on the perceptions of costs for the five steps involved in the manufacturing and retailing process. As expected, we found a significant interaction ( $F(4,$

596) = 6.08,  $p < .001$ ,  $\eta_p^2 = .039$ ), indicating that participants' perceptions for costs differed across the five steps (see figure 3). We then conducted separate contrasts for the cost perceptions of each step. Consistent with our findings in study 3, participants believed that the cost of transformation would be higher for capsules made with 80% recycled materials ( $M_{\text{recycled-transformation}} = 4.73$ ,  $SD = 1.31$  vs.  $M_{\text{control-transformation}} = 4.07$ ,  $SD = 1.07$ ,  $t(149) = 4.50$ ,  $p < .001$ , Cohen's  $d = .37$ ). Participants also believed the cost of marketing to be higher for capsules made with 80% recycled materials ( $M_{\text{recycled-marketing}} = 4.55$ ,  $SD = 1.10$  vs.  $M_{\text{control-marketing}} = 4.20$ ,  $SD = 1.00$ ,  $t(149) = 2.83$ ,  $p = .005$ , Cohen's  $d = .23$ ). There were marginal differences on perceptions of logistic cost ( $M_{\text{recycled-delivery}} = 4.36$ ,  $SD = 1.01$  vs.  $M_{\text{control-delivery}} = 4.16$ ,  $SD = .91$ ,  $t(149) = 1.81$ ,  $p = .072$ , Cohen's  $d = .15$ ). The cost perceptions for raw materials and packaging did not differ ( $ts < 1.55$ ,  $ps > .123$ , Cohen's  $ds < .13$ ).

**FIGURE 3**

PARTICIPANTS' PERCEPTIONS OF PRODUCT PRICES & COSTS IN EACH STEP OF THE MANUFACTURING AND RETAILING PROCESS (STUDY 5)

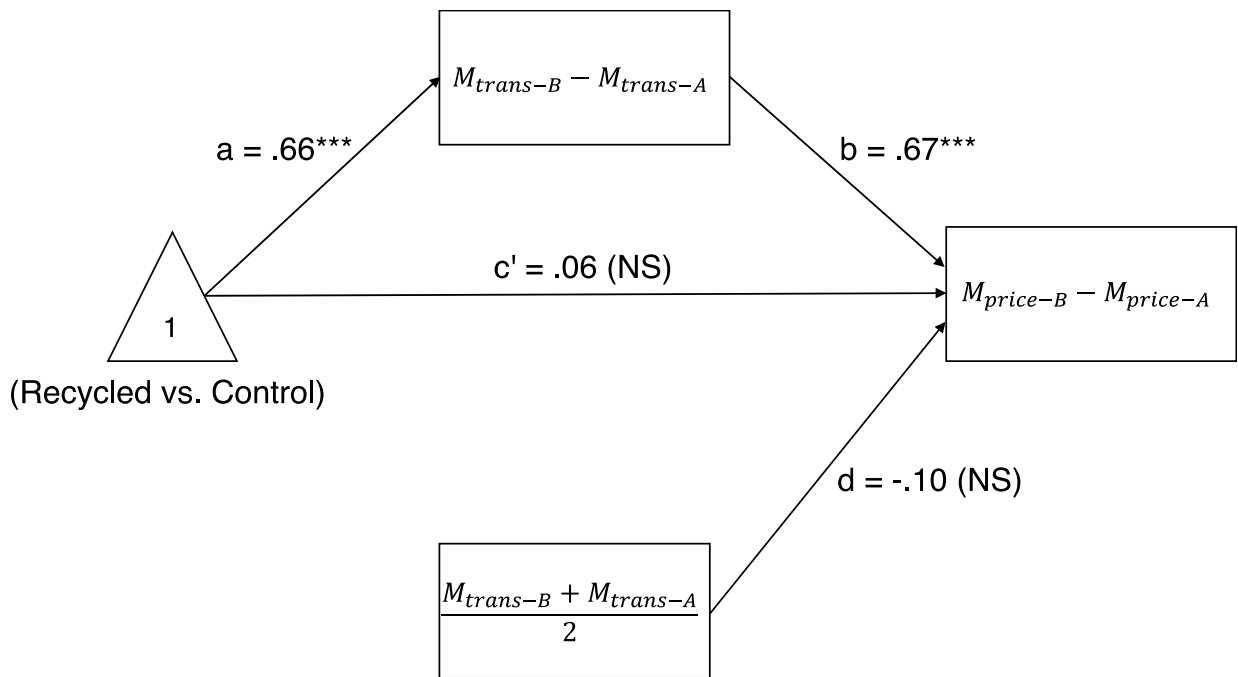


NOTE. †  $p < .1$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

We conducted a within-participants mediation analysis through the MEMORE macro (version 2.1) in SPSS (Montoya and Hayes 2017). Consistent with our hypothesis, the indirect effect of recycled materials (vs. control) on expected price through cost of transformation was significant ( $ab = .44$ ,  $SE = .11$ , 95% CI [.228, .676], bootstrap: 5,000 times; see figure 4).

**FIGURE 4**

WITHIN-PARTICIPANTS MEDIATION ANALYSIS (STUDY 5)



NOTE. \*\*\*  $p < .001$ . trans = transformation.

Though not part of our preregistered analysis plan, we conducted another parallel mediation analysis where we included all five cost elements as potential mediators. The indirect effects through both cost of transformation and marketing were significant

( $ab_{\text{transformation}} = .15$ , 95% CI [.005, .333];  $ab_{\text{marketing}} = .14$ , 95% CI [.023, .286]; bootstrap: 5,000 times). The two indirect effects did not differ in size ( $ab_{\text{difference}} = .01$ , 95% CI [-.193, .230], bootstrap: 5,000 times). All other indirect effects were not significant.

We replicated our effect of positive valuation on products made from recycled materials. Further, participants believed that the value increment occurred during the transformation process, that is, the process that turns the input materials into the final products. An interesting point to note is that consumers also believe the marketing of products made from recycled materials costs higher. This might be due to the ubiquitous advertising and extra signages that are attached to firms' use of recycled materials. The perceived increases in marketing costs partially contributed to the higher expected price for products made from recycled materials. Future research might explore how perceived increments on marketing cost impact consumers' evaluation towards firms' sustainability initiatives. We elaborate more on this in the general discussion section.

## **STUDY 6A**

In previous studies, we document valuation from a market transaction perspective: we show that people are not only willing to pay more for products made from recycled versus regular materials, but they also believe these products should be priced higher. Furthermore, for identically priced products, people are more likely to buy products that are made from recycled materials. We also provide nuanced process support documenting where the value increments derive from. We show that consumers' beliefs that the transformation process that turns raw materials into new products costs higher for

recycled materials than regular raw materials is what underlies these effects. We expand on these findings by documenting valuation in non-market transaction contexts. More specifically, we consider product usage and argue that consumers' valuation of the product can also be inferred from product usage. Because consumers are less likely to use products that they value more, we expect them to use products made from recycled materials more judiciously. Consequently, consumers will use products made from recycled materials to a lesser extent. In studies 6A-6C, we document consumers' product conservation in different product use contexts that consumers encounter daily.

## Method

We recruited 180 undergraduate students (39.3% female,  $M_{\text{age}} = 20.92$ ,  $SD = 1.98$ ) from a large U.S. university to participate in this single factor between-subjects experiment (recycled paper vs. control).

We asked the participants to imagine that they were taking a statistics final exam, where they were not allowed to bring a calculator or other electronic devices. Instead, the instructor would provide them with as much draft paper as they need to do their rough work. We then showed them a picture of the paper. In the recycled paper condition, we informed participants that the draft paper was made from recycled paper, and we included a "paper from responsible sources" logo. We did not provide any information about the draft paper's manufacturing source in the control condition. After reading the scenario, we asked participants to indicate how many pieces of draft paper they thought they would

use during this one-hour exam (open ended). Participants reported their demographic information before exiting the study.

## Results and Discussion

We log transformed the number of pieces of paper that participants said they would use due to skewness of the responses (skewness = 1.49,  $SE = .18$ ). We conducted a one-way ANOVA on the log transformed dependent variable. Supporting our hypothesis, participants in the recycled paper condition ( $M_{\text{recycled-paper}} = 2.47$ ,  $SD = 1.30$ ; raw means and standard deviations reported for the ease of interpretation) reported they would use less paper than those in the control condition ( $M_{\text{control}} = 2.77$ ,  $SD = 1.45$ , Cohen's  $d = .22$ ;  $F(1, 178) = 3.11$ ,  $p = .079$ ,  $\eta_p^2 = .017$ ).

## STUDY 6B

### Method

We recruited 228 undergraduate students (52.2% Female,  $M_{\text{age}} = 20.89$ ,  $SD = 1.08$ ) from a large U.S. university to participate in the single factor between-subjects experiment (recycled paper vs. control).

We asked participants to imagine that they visited a coffee shop for a quick breakfast. While enjoying the breakfast, they accidentally spilled coffee all over their documents (adapted from Wu et al. 2017). However, they found a stack of napkins at the

shop. We also presented a picture of the napkins. In the recycled paper condition, we placed a recycle logo on the napkins. We did not mention about the manufacturing source of the napkins in the control condition. We then asked participants how many napkins they would use to clean up the spill (1 = none at all, 7 = a lot).

## Results and Discussion

A one-way ANOVA on the usage level revealed a significant effect ( $F(1, 226) = 8.63, p = .004, \eta_p^2 = .037$ ). Participants in the recycled paper condition ( $M_{\text{recycled-paper}} = 5.25, SD = 1.42$ ) reported that they would use less napkins than those in the control condition ( $M_{\text{control}} = 5.80, SD = 1.38, \text{Cohen's } d = .39$ ).

## STUDY 6C

### Method

We recruited 214 undergraduate students (40.7% Female,  $M_{\text{age}} = 20.80, SD = 1.87$ ) from a large U.S. university to participate in the single factor between-subjects experiment (recycled paper vs. control).

We asked participants to imagine that they were in their kitchen and accidentally spilled a lot of water on the counter. They quickly looked around and found some paper towels. We then presented them a picture of paper towels. In the recycled paper condition, we informed participants that the paper towels were made from recycled paper.

We also added a “paper from responsible sources” logo to the picture shown in the recycled paper condition. After reading the scenario, we asked participants how many paper towels they would use to clean up the spill (1 = a few, 7 = a lot).

## Results and Discussion

A one-way ANOVA on usage level revealed a significant effect ( $F(1, 212) = 5.07$ ,  $p = .025$ ,  $\eta_p^2 = .023$ ). Participants in the recycled paper condition ( $M_{\text{recycled-paper}} = 3.92$ ,  $SD = 1.59$ ) reported that they would use less of the paper towels than those in the control condition ( $M_{\text{control}} = 4.40$ ,  $SD = 1.57$ , Cohen’s  $d = .31$ ).

In studies 6A-6C, we used different daily scenarios, both in public and private spaces, to show that consumers use products made from recycled materials more judiciously. Thus, in non-market transaction contexts, consumers’ valuation can be inferred from product usage.

## GENERAL DISCUSSION

Governments, firms, and even consumers are beginning to recognize the importance of recycling. While we strive to enhance recycling rates for a more sustainable world, it is also vital to understand the downstream consequences of using recycled materials in products. We take the first step to understand how people perceive, evaluate, and use products made from recycled materials. Through eight studies, we uncovered a novel and previously undocumented effect. While most undervalue

previously used and owned products, consumers value products made from recycled materials more than comparable regular products. These effects emerge because consumers believe that the transformation process that turns raw materials into new products cost more when the raw materials are recycled. Because of the increased valuation imputed to such products, consumers also use these resources more judiciously.

The positive valuations of products made from recycled materials are robust across different types of products (paper products, phone cases, water bottles, and coffee capsules), different types of recycled materials (e.g., paper, plastic, and polyester), different measures of value (WTP, suggested retail price, and willingness to buy), different evaluation modes (separate and joint evaluations), different comparisons of baseline conditions (no source information and framing the raw materials as authentic or non-recycled), and the presence of sub-branding for both recycled and regular raw materials. The effect also holds with an incentive compatible price elicitation method. More importantly, we explore and identify the key processes in the manufacturing and retailing cycle where consumers derive the value increments. While there is heterogeneity in cost perceptions of raw materials for different material types (e.g., plastic), consumers perceive that the extra value of recycled materials is derived from the transformation process that turns the recycled materials into new products. Additionally, we also find that consumers believe the marketing of recycled materials costs more than non-recycled materials. This might be because of additional promotion and signage expenditures associated with advertising of products with recycled materials.

Theoretical Contributions

We make several important contributions to the understanding of sustainability in consumption. First, our work extends the nascent literature on understanding consumer recycling (Sun and Trudel 2017; Trudel and Argo 2013; Trudel et al. 2016; Winterich et al. 2019). Previous studies focus on studying different antecedents of recycling behaviors, which mostly fall into two large categories: product-relevant characteristics (e.g., product size and form) and consumer-relevant characteristics (e.g., consumers' self-identity). These studies contribute to our understanding of consumer recycling and helps us identify ways to increase recycling rates. Previous findings also suggest that consumers have a lay belief that recycling reflects “good behavior,” which might encourage overinclusive recycling, where consumers incorrectly “recycle” non-recyclables (Catlin et al. 2021). Our focus, however, is on the right side of the equation—while consumers judge recycling positively, how do they evaluate products made from recycled materials? We take a step towards understanding consumers' perceptions, valuations, and usage of products made from recycled materials. We find that consumers have a positive valuation for such products. We further document the underlying process: consumers derive the value increments from their belief that the transformation process that turns recycled materials into new products costs higher for recycled materials than for regular raw materials.

Second, our findings also provide nuanced understanding of consumers' evaluations and usage of sustainable products. We studied products made from recyclable materials and find effects that are by and large different from sustainable products. Previous research has identified that sustainable products have both *positive* and *negative*

ramifications. While the use of sustainable products can be associated with higher social status (Griskevicius et al. 2010) and elicits more enjoyable consumption experiences (Tezer and Bodur 2020), consumers perceive sustainable products to be of lower potency (Luchs et al. 2010) and consequently increase the amount of usage to make up for the perceived inferiority (Lin and Chang 2012). We demonstrate that recycled materials have a *positive* effect on product valuations. Consequently, consumers prioritize saving such products and reduce their usage. Our *resource conservation* account of product usage might appear to directly contradict the previously identified *licensing* account of product usage, where consumers increase product usage after a recycling bin is provided (Catlin and Wang 2013). It may be important to note that in their context, consumers might experience less guilt to waste regular products if they can recycle them after usage. However, over usage of regular products when a recycling bin is available does not speak to consumers' valuation of products made from recycled materials.

Third, we contribute to the study of product valuation by providing a framework to understand the sources of value increments in the product manufacturing and retailing cycle. While previous literature has identified several factors that contribute to the consumer valuation process, they have not considered all aspects of the product manufacturing and recycling process. For example, findings suggest that consumers value physical products more than digital products (Atasoy and Morewedge 2018) or that they value their own labor as evidenced in valuation of do-it-yourself products (Norton et al. 2012). Likewise, consumers are willing to pay more for unique products, such as products made by mistake (Reich et al. 2018) or for novel experiences (Keinan and Kivetz 2011). We use a broader framework to assess consumers' value perceptions that

comprises of the entire product manufacturing and retailing cycle. We find that the value increments for products made from recycled materials come from the transformation process that turns raw materials into new products.

Last, we contribute to the emerging literatures on consumers' perceptions of and reactions to firms' corporate social responsibility ("CSR") initiatives and environmental, social, and governance ("ESG"). While firms' engagement with CSR activities tend to increase firm value and returns (Buchanan, Cao, and Chen 2018; Flammer 2015; Servaes and Tamayo 2013), consumers' reaction to such initiatives has mixed results. Consumers have *positive* reactions when the firms' CSR contributions are in-kind but *negative* when the contributions are monetary (Hildebrand et al. 2017) and when consumers perceive high skepticism from firms' egoistic and stakeholder-driven motives (Skarmeas and Leonidou 2013). In particular, consumers will have negative price fairness perceptions and consequently lower WTP when they believe CSR engagement leads to higher price mark-ups (Habel et al. 2016). However, we identify consumers' *positive* evaluations towards the use of recycled materials, which elicits increases in WTP, suggested retail prices, and willingness to buy. We also find that consumers' beliefs of higher marketing costs also contribute to the higher expected price for products made from recycled materials. Given consumers' higher willingness to pay for such products, it appears that consumers may not view marketing costs of products that use recycled materials negatively.

## Practical Implications

Our findings also have practical implications for managers and policy makers. While consumers perceive more value from products made from recycled materials, they also use these products judiciously. Managers could carefully leverage these findings at different stages of the consumption cycle. Highlighting that their products contain recycled materials is likely to be beneficial for managers when valuation is salient, for example, at the point of sale or on platforms where consumers provide reviews. Managers could use recycled materials to establish a brand that commands premium pricing. It may be beneficial to use highly visible signages for recycled materials on product packaging. However, highlighting recycled materials during the consumption stage could lower product usage, which in the longer term, might decrease product sales.

From a policy maker's perspective, however, emphasizing the recycled materials in products is likely to lower usage. The adoption and promotion of products from recycled materials at public spaces could help aid in conservation efforts. Education campaigns on consumer welfare could also promote the purchase of such products and thus increase consumer savings by reduced usage.

### Limitations and Future Research

Although our studies, taken together, provide convergent and robust support for our main effect, there are several opportunities for future research. First, our studies focus on consumers' valuation of products made from recycled materials in a self-evaluation and usage context. Previous research suggests that consumers often display what is known as self-other disparity where they fail to predict others' valuation of the same

product (Kurt and Inman 2013), believe others' money has less purchasing power than their own (Polman, Effron, and Thomas 2018), and choose products with higher feasibility and more variability for others than for themselves (Baskin et al. 2014; Choi et al. 2006). Future research might explore whether the evaluation of products made from recycled materials would show a similar effect where consumers may be less likely to gift products made from recycled materials.

Second, we identify that consumers' valuation premium for products made from recycled materials derives from their belief that the cost of the transformation process is higher for such products. We attempt to nail down the process by examining consumers' perceptions of different stages in the product manufacturing and retailing cycle. Future research could further study the various stages and explore potential boundary conditions based on the nature of the product (e.g., hedonic vs. utilitarian products) or usage (e.g., products designed for single-episode usage vs. extended period usage). One noteworthy point is that we find consumers perceive the cost of marketing to be higher for products made from recycled materials. It may be interesting to assess if making this salient might influence valuation negatively.

Finally, we argue that products made from recycled materials have distinctive features from other sustainable products. While we focus our study on recycled materials that has been previously owned and used, it may be instructive to consider other kinds of sustainable products.

## **CHAPTER 3: HOW PRODUCT USAGE LEVEL INFLUENCES DISPOSAL DECISIONS**

A society in which consumption has to be artificially stimulated in order to keep production going is a society founded on trash and waste, and such a society is a house built upon sand.

—Dorothy L. Sayers

In a consumerist society, generation of waste is but expected. While one might expect automation and efficient use of resources to lower waste, unfortunately, waste production is increasing at an exponential rate. Recent statistics suggest that the generation of municipal solid waste in the U.S. has risen by 7 percent from 2010 to 2017 (U.S. Environmental Protection Agency [EPA] n.d.). Unless we actively engage in activities that lower waste production, it is unlikely that it will occur on its own. Although many factors contribute to waste generation, one significant factor is trashing of products that can still be reused. Indeed, many products that can be recycled, regifted, or resold are being trashed.

Consider one common alternative to trashing—recycling. While one may assume that only one factor should contribute to recycling—whether or not the product is recyclable or not—sadly, this is not always the case. We often trash products that we should have recycled or reused in another way. For example, while we all know that plastic bottles can and should be recycled, it is not surprising to see many amongst us throw these into trash cans. Likewise, other products can be regifted (or donated for a

charitable cause or to a consignment store) or even resold (to a consignment store or on other used product marketplaces such as Craigslist or eBay). Yet many different types of products, such as items of clothing, bottles, paper, notebooks, and so on, make their way into our trash cans and landfills. Many of these products can be reused—recycled, regifted, or resold, but are instead trashed.

Why might consumers trash products that can be reused in other ways? Consider the decision to trash when one could have recycled the product instead. One reason could be convenience-based: recycling bins were not available or accessible (Robertson and Walkington 2009). Another reason could be knowledge-based: consumers are not fully sure if a particular product is recyclable or not (Pieters 1991). Admittedly, while convenience and knowledge-based factors obviously impact trashing decisions, in many situations, consumers may have access to other disposal options and may also be aware that a product is recyclable, and yet, they may trash the product.

If consumers understand the importance of reusing products and also realize that these products are reusable (can be recycled, regifted, or resold), then why might they still trash these products. We identify one product-related characteristic, product usage level, that we believe can explain why people sometimes trash products that can be reused.

We propose that level of usage will influence consumers disposal decisions. That is, consumers are more (vs. less) likely to trash products that they have used extensively (vs. rarely). That is, when assessing whether to trash a product or use other forms of disposal that involves some reuse—such as recycling, regifting, or reselling—consumers will be more likely to trash products that they have used more extensively.

This presents a conundrum—this is because one way to make the world more sustainable is to ask consumers to use products extensively. If consumers use products more extensively, then it will not only lower exploitation of raw materials but will also lower production of waste. However, if extensive usage increases trashing, then that defeats the purpose of reuse. We provide evidence of this negative effect of product usage on disposal, and document why this effect emerges. We argue that product valuation underlies this effect. When consumers use a product more extensively, they extract greater value from the product. However, when the user extracts more value from the product, less value remains for other people to extract. The assessment of how much value that others can extract is an important driver of consumers' choice of disposal outlets. If a product is perceived to have less value to others, consumers are more likely to trash the product.

Our findings make important contributions to many different literature streams. First, while much is known about how product valuation drives purchase behaviors (Brough and Chernev 2012; Palmeira and Srivastava 2013; Raghurir and Srivastava 2002), not much is known about the linkage between product valuation and disposal. This is an important omission because product valuation has been shown to be a primary driver of product purchase and usage. Closing the loop between valuation and usage will help us understand how factors that drive purchase and usage impact disposal. Second, while the literature generally compares trashing with recycling (Catlin et al. 2021; Trudel and Argo 2013; Winterich et al. 2019), we broaden the discussion by also considering other forms of reuse, such as regifting and reselling. Indeed, in many product disposal

contexts, consumers do not simply compare trashing with recycling, but also consider if the product can be regifted or resold.

Perhaps the most important implication of this work is in policy and governance. Government and non-profit organizations strive to create a more sustainable society by encouraging consumers to reduce their waste through the 3R principle, “reduce, reuse, and recycle.” However, as we show, more extensive use of a product might increase consumers’ likelihood of trashing the product. These findings also have other implications. While governmental agencies spend considerable resources to provide recycling opportunities (e.g., by making recycling bins available) and on education campaigns (by extolling the virtues of recycling or by explaining categories of products that can be recycled), we document an important factor that underlies decision to trash—amount of usage. We believe that campaigns that educate consumers about how extensively used products also have value can lower trashing likelihood and increase reuse likelihood.

## **THEORETICAL BACKGROUND**

### **Consumer Disposal Behavior**

While much work documents pre-purchase behaviors, much less is known about post-purchase behaviors (Gardial et al. 1994). In recent times, however, a burgeoning stream of literature has been trying to understand consumer disposal behavior. The focus has, in particular, been on comparing trashing with recycling (Geiger et al. 2019). While

one might expect recycling decisions to be simply based on the recyclability of a product, this is far from the truth. We often find many recyclable products in trash cans and ultimately these end up in landfills, breathing their last.

A natural question might be why do we trash products that could be recycled? A review of the literature provides important insights and identifies key drivers of consumers' recycling behavior across multiple domains. Expectedly, factors endogenous to the consumer, such as demographics and individual differences, including social identities and habit formation impacts decisions. Unsurprisingly, factors that increase the ease of recycling also increase recycling. Similarly, message framing can also influence recycling decisions. Finally, factors endogenous to the product also impact recycling.

Consumer demographics and social identity plays an important role in influencing recycling behavior. Two studies conducted almost 30 years apart finds consistent support for the relationship between income and recycling—higher the income, higher is the recycling rate (Oskamp et al. 1991; Seacat and Boileau 2018). Furthermore, other individual difference variables, such as political ideology also play a role. In general, democrats are more supportive of pro-environmental initiatives than republicans (Feinberg and Willer 2013). However, a recent study, based on actual municipal-level recycling data, documents a different pattern of results: as the percentage of registered republicans in the community increases, so does the recycling rate; and, as the percentage of registered democrats increases, the recycling rate decreases (Seacat and Boileau 2018). Other research provides deeper insights into the relationship between political ideology and recycling (Kidwell, Farmer, and Hardesty 2013). These researchers argue that individuals with different political ideologies embrace different kinds of moral

appeals, which impacts message efficacy differentially. Binding moral values will increase recycling for conservatives but individualizing moral values will have a positive impact on liberals.

Beyond political identity, social identity also impacts recycling. When consumers perceive their identity as similar to the “identity of typical recyclers,” they show higher intentions to recycle (Mannetti, Pierro, and Livi 2004). On the other hand, social comparison with others who outperform the consumers’ in-group encourages recycling (White, Simpson, and Argo 2014). These behaviors can also be learned. Providing rewards (Diamond and Loewy 1991; Iyer and Kashyap 2007; Schultz and Oskamp 1996) and reducing barriers to encourage and reinforce good habits can aid recycling (Brothers, Krantz, and McClannahan 1994; Gamba and Oskamp 1994; Ludwig, Gray, and Rowell 1998; Robertson and Walkington 2009).

How can barriers to recycling be lowered? Simple actions like increasing accessibility of recycling bins increases ease of recycling. Not surprisingly, providing desktop recycling containers in the office also dramatically increases the recycling rate for paper from under 30% to over 80% (Brothers et al. 1994). Likewise, rewarding recycling (e.g., via lotteries) can encourage recycling (Diamond and Loewy 1991). However, such incentive-induced pro-environmental behaviors are usually short-lived (Geller 2002).

Message framing can also induce situational influences on recycling behavior. Messages that enhance the salience of product transformation inspires consumers to recycle more (Winterich et al. 2019). It may also be beneficial to frame recycling messages conditional on consumers’ self-construal. More specifically, injunctive (i.e.,

what other people think one should do) and descriptive (i.e., what others are doing) messages are more effective when the collective-self is activated but self-benefit messages are more effective when the individual-self is activated (White and Simpson 2013). But certain messages can also backfire. For example, labeling garbage receptacles as “Landfill” instead of “Trash” does indeed make the negative consequences of trashing more salient, however, it also has a boomerang effect. It unintentionally leads to “overinclusive” recycling where consumers incorrectly recycle items that are not recyclable (Catlin et al. 2021).

Previous research also suggests that product related characteristics such as sizes and forms and identity-relevance influences recycling behavior. When a product is distorted from its original form or reduced from its original size, consumers are more likely to trash it (Trudel and Argo 2013). However, when a product is more relevant to one’s identity (e.g., has one’s name), consumers are less likely to trash it (Trudel et al. 2016). Next, we discuss disposal options.

## Disposal Options

Consumers have many different ways to dispose their possessions. These options, however, are associated with different kinds of feelings. Trashing is associated with negative feelings—consumers feel bad after trashing a product (Catlin et al. 2021; Elgaaied 2012). It can also evoke feelings of threat. For example, trashing products that are closely associated with one’s identity induces feelings of self-threat (Trudel et al.

2016). Recycling or regifting, on the other hand, are associated with positive feelings (Donnelly et al. 2017; Sun and Trudel 2017).

A natural question may be where do the negative connotations associated with trashing come from? The etymology of trash can provide insights. The term originates from a Scandinavian source and may derive from the old Norse word “tros” which refers to “rubbish, fallen leaves and twigs.” In Swedish the word is “trasa” which refers to “rags, tatters” (“Trash” n.d.). The Merriam-Webster (n.d.) defines trash as “something worth little or nothing such as things no longer useful or wanted and that have been thrown away.” Indeed, consumers will be more likely to trash a product if they believe a product is of no use any more (Trudel and Argo 2013). Taken together, we propose that when a product is trashed, consumers infer that the product has little or no value. However, if a product is disposed via other forms of disposal, that has the potential of reuse (e.g., recycling, regifting, and reselling), then the product is perceived as containing value to others, as the transfer of product ownership or usage rights can convey value to others who can still use the product.

#### Product Usage Level and Disposal

Building on the meaning of disposal outlets, we propose that when consumers use a product extensively (vs. rarely), they are more likely to trash the product compared with others forms of disposal that involves some forms of reuse, such as recycling, regifting, or reselling. We propose that this effect emerges because consumers believe that if they have used the product extensively, then it is of little use to others—that is, the product

confers little value to others. While trashing marks the end of a product's lifespan, recycling allows the product to live on, albeit as part of a new product after it is processed. Therefore, products being recycled must contain some remaining value, which is then transferred to the new product. For other forms of reuse, the remaining value of the product is then transferred to another person through the change of ownership or the right to use.

One way to understand the concept of value in a product's lifecycle is to construe it in terms of battery life. When a product is purchased from a store, about 100% of the product's value is available for use. This would correspond to a 0% usage from a customer's perspective. After consumers start using the products, the percentage of their usage increases, while the percentage of value left decreases. After a product is used extensively, consumers may believe that there is little value left to be used. The more consumers use a product, the less value is left that others can use. When there is little value left, consumers believe that the product should be trashed. However, if it still has some residual value left then they believe it can be recycled, regifted, or resold.

One could conceivably argue that high product usage might increase a product's perceived value via the endowment effect (Kahneman et al., 1990). However, such value is derived via the interaction between the product and the owner and is thus more likely to materialize when the product is exchanged with others in a transactional market. This value to self is less likely to impact a broader range of disposal behaviors including recycling and giving products to other people. One could also argue that higher product usage may lead to more identity attachment with the focal product. However, this would lead to a different pattern of results, as previous research (Trudel et al., 2016) shows that

consumers are less (instead of more) likely to trash an identity-relevant product. We believe that our value-to-others account is more salient under high product usage level occasions and will lead to our predicted pattern of results, that is, to a higher intention to trash the product relative to other forms of disposal that involves reusing the product to some extent. Nonetheless, our empirical investigation does allow us to test and rule out these alternate explanations.

In summary, we hypothesize that consumers are more likely to trash a product that they have used extensively compared with that they have used rarely. When consumers use a product more extensively, they believe that they have extracted more value from the product and that the product has less value to others. The lower perceived value to others is a critical determinant of consumers' decision to trash the product relative to using other forms of disposal options that involve further reuse of the product to some extent.

## **STUDY OVERVIEW**

We tested our hypotheses in six studies with 1,786 respondents. Study 1 shows that consumers impute different values to the same product conditional on the disposal outlet. Studies 2-4 establish the robustness of the basic effect by documenting that consumers are more (vs. less) likely to trash a product relative to using other forms of reuse when disposing a product that has been used extensively (vs. rarely). Studies 5A and 5B provide support for our proposed underlying mechanism. These studies demonstrate that the effect of product usage level on disposal choice emerges because

consumers believe that when they use a product extensively (vs. rarely), they perceive that the product has less (vs. more) value remaining for others. Study 5B also rules out the effect of identity relevance on product recycling (Trudel et al. 2016) in our context.

We predetermined the sample size for all studies. For studies using online respondents, we targeted at least 130 participants per condition (based on a moderate effect size of Cohen's  $d = .35$  and 80% power). For studies using undergraduate students, we predetermined the number of slots considering all the studies in the same lab session, but we had no control over students' show-up and completion rates. Data were collected under a protocol approved by the Institutional Review Board ("IRB") at the authors' institution(s). We reported all conditions, and all measures. We only excluded respondents based on attention checks and report details in the studies. All study material can be found in appendix C. Data were analyzed using SPSS version 27. We also conducted a  $p$ -curve analysis (Simonsohn et al. 2014) and the results indicated that the set of studies contain evidential value (details included in appendix D).

## **STUDY 1**

The aim of the first study is to establish the linkage between consumer's perceived value and choice of disposal outlet. We test if consumers believe that a product disposed in a recycling bin contains more value than one disposed in a trash can.

Method

We recruited 334 undergraduate students (63.8% Female,  $M_{age} = 20.62$ ,  $SD = 1.09$ ) from a large U.S. university to participate in a single factor between-participants experiment in exchange for course credit. We randomly assigned participants to one of two conditions (disposal outlet: trash can vs. recycling bin).

We told participants that a garbologist was interested in looking at things that people do not need any more. After searching in the *trash can* (or *recycling bin* depending on the assigned condition), the garbologist found a backpack. Following the scenario, we presented a picture of a tattered backpack. The backpack was the same in both conditions. We then asked them to indicate how much value they thought the backpack had (1 = a little, 7 = a lot).

Next, participants answered an attention check question regarding where the garbologist found the backpack (options: a trash can, a recycling bin, or I don't know). We excluded 100 participants who failed the attention check from our final analysis (Final  $N = 234$ ).

## Results and Discussion

Supporting our key hypothesis, a one-way ANOVA on participants' perceived value revealed a significant effect ( $F(1, 232) = 7.33$ ,  $p = .007$ ,  $\eta_p^2 = .031$ ). Participants believed that the backpack retrieved from the recycling bin ( $M_{recycling-bin} = 2.90$ ,  $SD = 1.37$ ) had higher value than the one retrieved from the trash can ( $M_{trash-can} = 2.44$ ,  $SD = 1.20$ , Cohen's  $d = .36$ ). This finding suggests that consumers believe products disposed in recycling bins contain higher value than those disposed in trash cans.

## STUDY 2

In study 2, we directly test if different levels of usage will impact consumers' disposal outlets. We asked participants to explicitly choose how they would dispose their possessions.

### Method

We recruited 301 Amazon Mechanical Turk (“MTurk”) workers (46.2% female, 2 identified as other gender, and 4 preferred not to say;  $M_{\text{age}} = 40.91$ ,  $SD = 12.03$ ) among CloudResearch-approved participants (Litman, Robinson, and Abberbock 2017). We randomly assigned participants to one of two conditions (product usage level: low vs. high).

In the low usage condition, we asked the participants to think of a product that they had purchased in the past year but had rarely used. In the high usage condition, we asked participants to think of a product that they had purchased in the past year, but one that they had used very often. We first asked them to write the name of the product and then describe the product. On the next screen, we told participants to imagine that they did not need this product anymore and then asked them what they would like to do with it. Participants chose one from four options: trash it, give it to someone else, resell it, or recycle it.

## Results and Discussion

We first assessed if the disposal choice distributions were different across the two conditions. A Pearson's chi-square test revealed a significant difference on the choice distributions between the two conditions,  $\chi^2(3) = 8.29, p = .040$ .

We then analyzed whether participants were more likely to trash their possessions when they used them more often so we re-coded participants' disposal choice into a binary variable: trashing versus non-trashing. An independent-samples proportion test showed that participants were more likely to trash their possessions when they used them more often compared with when they used them rarely (18.8% vs. 7.8%;  $z = 2.76, p = .006$ ).

Finally, we conducted a multinomial logistic regression with usage frequency (low usage = 0, high usage = 1) as the predictor and participants' disposal choice (trashing as the reference category) as the outcome variable (see table 1). While our theory predicts disposal choice between trashing and reuse conditional on usage levels, it is agnostic about choice distribution among different reuse options. Therefore, in our regression analysis we use trashing as the baseline reference choice; this allows us to compare our results with trashing. As expected, in comparison to trashing the possession, higher (vs. lower) usage levels decreased the likelihood of giving their possession to someone else ( $b = -.98, \text{Wald } \chi^2(1) = 6.28, p = .012, OR = .38, 95\% \text{ CI } [.176, .808]$ ) and reselling their possession ( $b = -1.12, \text{Wald } \chi^2(1) = 7.34, p = .007, OR = .33, 95\% \text{ CI } [.146, .734]$ ). Though the coefficient was not statistically significant for recycling the possession ( $p = .136$ ), the direction of the effect was consistent with our expectations and

patterns observed for the other disposal options. Because we asked participants to freely write about one of their possessions, it is possible that the products consumers wrote about were not always recyclable products, which could have led to lower recycling. Another possibility is that because consumers were asked to think about products that they use extensively versus rarely, there could be systematic differences in these two categories of products. For example, it may be that the products consumers imagined using rarely were not recyclable. We address these concerns in study 3.

**TABLE 1**

RESULTS OF MULTINOMIAL LOGISTIC REGRESSION (STUDY 2)

|  | <i>b</i> | <i>SE</i> | <i>OR</i> | 95% CI for <i>OR</i> |       |
|--|----------|-----------|-----------|----------------------|-------|
|  |          |           |           | Lower                | Upper |
| <b>Giving to Someone Else vs. Trashing</b> |          |           |           |                      |       |
| Intercept                                  | 1.88***  | .32       |           |                      |       |
| Condition                                  | -.98*    | .39       | .38       | .176                 | .808  |
| <b>Reselling vs. Trashing</b>              |          |           |           |                      |       |
| Intercept                                  | 1.43***  | .34       |           |                      |       |
| Condition                                  | -1.12**  | .41       | .33       | .146                 | .734  |
| <b>Recycling vs. Trashing</b>              |          |           |           |                      |       |
| Intercept                                  | .09      | .42       |           |                      |       |
| Condition                                  | -.78     | .52       | .46       | .164                 | 1.279 |

NOTE.  $R^2 = .03$  (Cox & Snell),  $.03$  (Nagelkerke). Model  $\chi^2(3) = 8.60, p = .035$ .

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

### STUDY 3

It is possible that the types of products consumers wrote about in the extensive and rare usage conditions of study 2 were systematically different from each other, which could explain the differences in disposal choice. Therefore, in study 3, we ask

participants to write about their possessions in one specific category: clothing. We also increased the sample size to obtain higher power in detecting effects in a multinomial logistic regression.

## Method

We recruited 502 U.S. Prolific workers (45.0% female, 3 identified as other gender, and 2 preferred not to say;  $M_{\text{age}} = 38.34$ ,  $SD = 13.55$ ) to participate in this study in exchange for a small monetary compensation. We randomly assigned participants to one of two conditions (product usage level: low vs. high).

In the low usage condition, we asked participants to think of a piece of clothing that they had bought in the past year but had rarely worn. In the high usage condition, we asked participants to think of a piece of clothing that they had bought in the past year, but one that they had worn very often. We then asked them to describe the item. We chose clothing for two reasons: first, clothes are everyday items that people are familiar with; second, for most clothing items, many different disposal options are available. On the next screen, as in study 2, we told participants that they did not need the clothing item anymore and then asked them to choose a disposal option from one of the four options.

## Results and Discussion

We followed the same analysis strategies used in study 2. A Pearson's chi-square test revealed a significant difference on the choice distributions between the two

conditions,  $\chi^2(3) = 39.83, p < .001$ . We then re-coded participants' choices of disposal options into a binary variable: trashing versus non-trashing. An independent-samples proportion test showed that participants were more likely to trash their possessions when they used them more often compared with when they used them rarely (14.6% vs. 4.4%;  $z = 3.86, p < .001$ ).

Finally, we conducted a multinomial logistic regression with usage frequency (low usage = 0, high usage = 1) as the predictor and participants' disposal choice (trashing as the reference category) as the outcome variable (see table 2). In comparison to trashing the clothing item, high (vs. low) usage lowered consumers' likelihood of regifting ( $b = -1.19, \text{Wald } \chi^2(1) = 10.48, p = .001, OR = .31, 95\% \text{ CI } [.148, .626]$ ), and reselling ( $b = -2.06, \text{Wald } \chi^2(1) = 26.93, p < .001, OR = .13, 95\% \text{ CI } [.059, .277]$ ), and marginally lowered likelihood of recycling their clothing items ( $b = -.68, \text{Wald } \chi^2(1) = 2.78, p = .095, OR = .51, 95\% \text{ CI } [.231, 1.125]$ ).

**TABLE 2**  
RESULTS OF MULTINOMIAL LOGISTIC REGRESSION (STUDY 3)

|  | <i>b</i> | <i>SE</i> | <i>OR</i> | 95% CI for <i>OR</i> |       |
|--|----------|-----------|-----------|----------------------|-------|
|  |          |           |           | Lower                | Upper |
| <b>Giving to Someone Else vs. Trashing</b> |          |           |           |                      |       |
| Intercept                                  | 2.373*** | .32       |           |                      |       |
| Condition                                  | -1.19**  | .37       | .31       | .148                 | .626  |
| <b>Reselling vs. Trashing</b>              |          |           |           |                      |       |
| Intercept                                  | 2.03***  | .32       |           |                      |       |
| Condition                                  | -2.06*** | .40       | .13       | .059                 | .277  |
| <b>Recycling vs. Trashing</b>              |          |           |           |                      |       |
| Intercept                                  | 1.16***  | .35       |           |                      |       |
| Condition                                  | -.67†    | .40       | .51       | .231                 | 1.125 |

NOTE.  $R^2 = .08$  (Cox & Snell),  $.09$  (Nagelkerke). Model  $\chi^2(3) = 41.24, p < .001$ .

†  $p < .1$ , \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

## STUDY 4

Although we used the same category, clothing, in study 3, we still allowed consumers to describe a product that they purchased. While the study design provided greater control, there is still the possibility that the product described was different in the two conditions, which could have accounted for the observed differences. In study 4, we aim to have greater control over the product item. We used a reusable plastic water bottle, for which either trashing or recycling is a common disposal choice. We also document robustness and replicability by using an alternative dependent variable: recycling intentions.

### Method

We recruited 180 undergraduate students (40.0% Female,  $M_{\text{age}} = 20.92$ ,  $SD = 1.98$ ) from a large U.S. university to participate in this single factor between-participants experiment in exchange for course credit. We randomly assigned participants to one of two conditions (product usage level: low vs. high).

We presented participants with a picture of a reusable plastic water bottle and asked them to imagine that they bought the water bottle a year ago. In the low usage condition, we told our participants that they had rarely used the water bottle in the past year while in the high usage condition, we told them that they had used the water bottle a lot and had brought it to many important occasions. We then told our participants that they did not need the water bottle any longer and needed to decide what to do with it.

Participants reported their intention to trash/recycle the water bottle on 4 items (Would you prefer to trash the bottle or to recycle it, 1 = definitely trash, 7 = definitely recycle; How likely/willing/motivated are you to recycle the bottle, 1 = not at all, 7 = very much; adapted from Winterich et al. 2019). We averaged the 4 items (Cronbach's  $\alpha = .93$ ) to form our key dependent variable reflecting participants' recycling intentions.

## Results and Discussion

We conducted a one-way ANOVA with participants' recycling intentions as the dependent variable and product usage level as the independent variable. A marginally significant main effect of usage level emerged ( $F(1, 178) = 3.69, p = .057, \eta_p^2 = .020$ ). Participants in the high usage level condition were less likely to recycle the water bottle compared with those in the low usage level condition ( $M_{\text{high-usage}} = 5.31, SD = 1.64$  vs.  $M_{\text{low-usage}} = 5.73, SD = 1.26$ , Cohen's  $d = -.29$ ). Using a more controlled scenario and an alternative dependent variable, this study replicates our basic effect: when a product has been extensively used, consumers are more likely to trash than to recycle the product when they no longer need the product.

## STUDY 5A

Although findings from study 4 document that products that have been extensively used are more likely to be trashed rather than recycled, it is possible that our effects could have emerged because some people did not fully understand what recycling

meant. While the meaning associated with trashing is quite clear, it is possible that some individuals may have a broader definition of recycling than others. For example, for some consumers recycling may be synonymous with disposing a product in a recycling bin, while for others, it may be broader, and may encompass regifting. The goal of study 5A is to show robustness and document that even when consumers are explicitly informed that recycling could encompass a broad range of disposal options (beyond just discarding a product in the recycling bin), the effects persist. The second goal of this study is to test the underlying psychological process. We hypothesize that when consumers use a product more extensively, they believe they obtained more value from the product but that the product has less value left for others. Furthermore, the lower perceived value to others is what increases trashing likelihood.

## Method

We recruited 301 MTurk workers (51.2% female, 2 identified as other gender, and 1 preferred not to say;  $M_{\text{age}} = 44.50$ ,  $SD = 13.55$ ) from CloudResearch-approved participants (Litman et al. 2017). We randomly assigned participants to one of two conditions (product usage level: low vs. high).

We presented participants with a picture of a T-shirt with some usage signs (e.g., wrinkles) and asked them to imagine they had bought this T-shirt one year ago. In the low usage condition, participants had rarely worn the T-shirt and had just decided that they did not need it anymore. In the high usage condition, participants had worn it a lot but also just decided that they did not need it anymore. We then asked the participants to

decide what they would do with the T-shirt. We then measured participants' recycling intentions using the same 4 items used in study 4 (Would you prefer to trash the T-shirt or to recycle it, 1 = definitely trash, 7 = definitely recycle; How likely/willing/motivated are you to recycle the T-shirt, 1 = not at all, 7 = very much; adapted from Winterich et al. 2019), which we averaged (Cronbach's  $\alpha = .95$ ) to form our key dependent variable. However, in order to make sure that all respondents interpreted recycling in the same manner, we explicitly informed participants that recycling included putting the product in the recycling bin, giving it to someone else, reselling it, as well as other forms of reuse. This also made our study much more conservative, as recycling included any form of reuse (from recycling to reselling).

On the next screen, we asked participants two additional questions. Participants indicated how much value they thought the T-shirt had for them now and how much value it might have for others (1 = a little, 7 = a lot). Participants then completed the manipulation check ("How frequently did you wear the T-shirt in the past year?"; 1 = rarely, 7 = a lot) and demographics questions.

## Results and Discussion

*Manipulation Check.* A one-way ANOVA confirmed that our manipulation was successful. Participants in the high usage condition ( $M_{\text{high-usage}} = 6.38, SD = 1.08$ ) indicated that they wore the T-shirt more often than those in the low usage condition ( $M_{\text{low-usage}} = 1.95, SD = 1.76, \text{Cohen's } d = 3.04; F(1, 299) = 693.01, p < .001, \eta_p^2 = .699$ ).

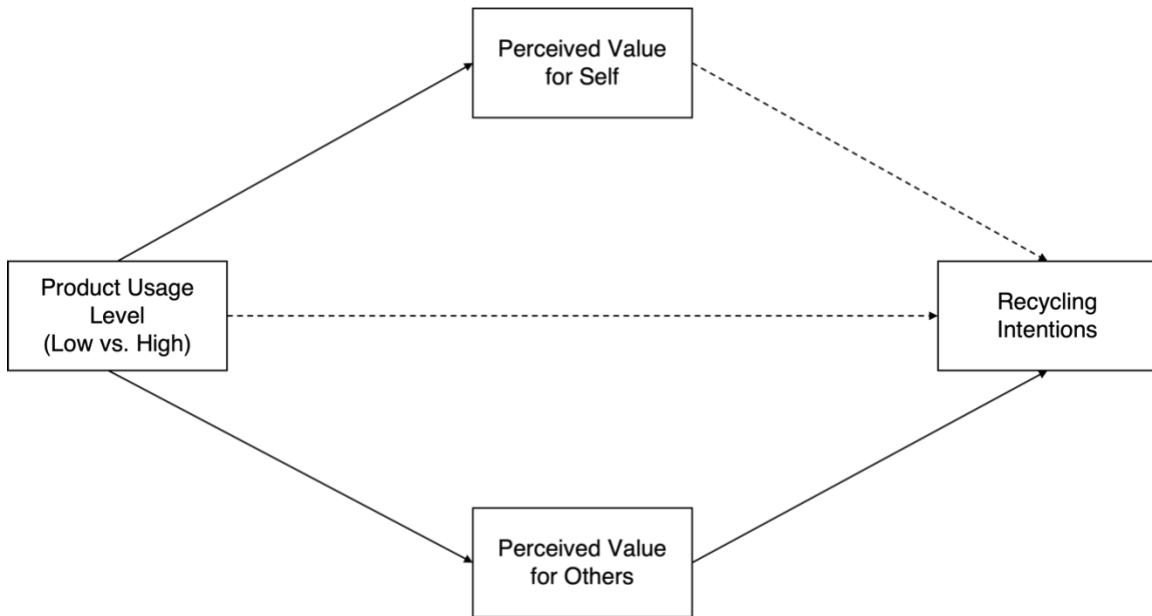
*Recycling Intentions.* We conducted a one-way ANOVA with participants' recycling intentions as the dependent variable and product usage level as the independent variable. When they wore the T-shirt more frequently, the participants were less likely to recycle it ( $M_{\text{high-usage}} = 5.76$ ,  $SD = 1.48$  vs.  $M_{\text{low-usage}} = 6.11$ ,  $SD = 1.39$ , Cohen's  $d = -.25$ ;  $F(1, 299) = 4.54$ ,  $p = .034$ ,  $\eta_p^2 = .015$ ).

*Value Perceptions.* Consistent with our hypotheses, we found that participants in the high (vs. low) usage condition believed that the T-shirt had higher value to themselves ( $M_{\text{high-usage}} = 3.07$ ,  $SD = 1.64$  vs.  $M_{\text{low-usage}} = 2.32$ ,  $SD = 1.26$ , Cohen's  $d = .51$ ;  $F(1, 299) = 19.58$ ,  $p < .001$ ,  $\eta_p^2 = .061$ ) but had lower value for others ( $M_{\text{high-usage}} = 4.44$ ,  $SD = 1.64$  vs.  $M_{\text{low-usage}} = 4.83$ ,  $SD = 1.55$ , Cohen's  $d = -.25$ ;  $F(1, 299) = 4.62$ ,  $p = .032$ ,  $\eta_p^2 = .015$ ).

*Mediation Analysis.* We conducted a mediation analysis with participants' perceived value for self and for others as parallel mediators (see figure 5). We bootstrapped 95% bias-corrected confidence intervals for the indirect effect with 5,000 re-samples (Process Model 4; Hayes 2018). The results showed a significant and positive indirect effect for the path, product usage  $\rightarrow$  perceived value for others  $\rightarrow$  recycling intentions ( $ab = -.18$ ,  $SE = .09$ , 95% CI  $[-.369, -.023]$ , bootstrap: 5,000 times; see table 3 for detailed results). However, the indirect effect through perceived value for self was not significant ( $ab = -.05$ ,  $SE = .04$ , 95% CI  $[-.148, .013]$ , bootstrap: 5,000 times). Thus, perceived value for others drove respondents' disposal choice.

**FIGURE 5**

**PARALLEL MEDIATION MODEL (STUDY 5A)**



**TABLE 3**

**RESULTS FOR MEDIATION ANALYSIS (STUDY 5A)**

| Variable        | Mediator 1:<br>Value to Self |           | Mediator 2:<br>Value to Others |           | Outcome:<br>Recycling Intentions |           |
|-----------------|------------------------------|-----------|--------------------------------|-----------|----------------------------------|-----------|
|                 | <i>b</i>                     | <i>SE</i> | <i>b</i>                       | <i>SE</i> | <i>b</i>                         | <i>SE</i> |
| Intercept       | 2.32***                      | .12       | 4.83***                        | .13       | 4.04***                          | .25       |
| Condition       | .75***                       | .17       | -.40*                          | .18       | -.12                             | .15       |
| Value to Self   | --                           | --        | --                             | --        | -.07                             | .05       |
| Value to Others | --                           | --        | --                             | --        | .46***                           | .05       |
| R <sup>2</sup>  | 24.8%                        | --        | 12.3%                          | --        | 51.6%                            | --        |

NOTE. Condition is coded as Low Usage = 0, High Usage = 1.

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

## STUDY 5B

In study 5B, we replicate the test of our underlying mechanism using a different product, a weekly planner book. We also aim to rule out the effect of identity relevance on product recycling (Trudel et al. 2016) in our context.

### Method

We recruited 268 undergraduate students (43.3% Female,  $M_{\text{age}} = 20.82$ ,  $SD = 1.10$ ) from a large U.S. university to participate in this single factor between-participants experiment in exchange for course credit. We randomly assigned participant to one of two conditions (product usage level: low vs. high).

We first presented a picture of a weekly planner to our participants. We then asked them to imagine that they had bought a similar weekly planner a year ago. In the low usage condition, we told participants that they had used the planner rarely while in the high usage condition, they had used it very extensively. Next, we told participants that they were going to move to a new place. While packing, they found that they could not bring the planner with them and needed to decide what to do with it. Participants then answered the same recycling intention questions as in studies 4 and 5A. We averaged the 4 items (Cronbach's  $\alpha = .93$ ) to serve as our key dependent variable reflecting recycling intentions. Next, participants answered three questions intended to capture their perceptions of the planner's value to themselves ("How much value do you think the planner has for you now?", 1 = a little, 7 = a lot), value to other people ("How much

value do you think the planner might have for others now?”, 1 = a little, 7 = a lot), and identity relevance (“To what extent do you think the planner reflects part of your identity?”, 1 = a little, 7 = a lot). Lastly, participants answered the manipulation check on usage level (“How frequently did you use the planner in the past year?”, 1 = rarely, 7 = a lot) and some demographics questions.

## Results and Discussion

*Manipulation Check.* We first confirmed that our manipulation was successful. Participants in the high usage condition ( $M_{\text{high-usage}} = 4.59$ ,  $SD = 2.14$ ) perceived that they had used the planner more often in the past year than those in the low usage condition ( $M_{\text{low-usage}} = 2.60$ ,  $SD = 1.99$ , Cohen’s  $d = .96$ ;  $F(1, 266) = 61.80$ ,  $p < .001$ ,  $\eta_p^2 = .189$ ).

*Recycling Intentions.* Consistent with our primary hypothesis, a one-way ANOVA showed that high (vs. low) usage level decreased participants’ recycling intentions ( $M_{\text{high-usage}} = 5.13$ ,  $SD = 1.69$  vs.  $M_{\text{low-usage}} = 5.56$ ,  $SD = 1.46$ , Cohen’s  $d = -.27$ ;  $F(1, 266) = 4.81$ ,  $p = .029$ ,  $\eta_p^2 = .018$ ).

*Perceived Value.* Participants in the high (vs. low) usage condition believed that the planner had higher value to themselves ( $M_{\text{high-usage}} = 3.36$ ,  $SD = 1.82$  vs.  $M_{\text{low-usage}} = 2.72$ ,  $SD = 1.75$ , Cohen’s  $d = .36$ ;  $F(1, 266) = 8.48$ ,  $p = .004$ ,  $\eta_p^2 = .031$ ) but had marginally lower value for others ( $M_{\text{high-usage}} = 3.03$ ,  $SD = 1.85$  vs.  $M_{\text{low-usage}} = 3.45$ ,  $SD = 1.87$ , Cohen’s  $d = -.22$ ;  $F(1, 266) = 3.37$ ,  $p = .067$ ,  $\eta_p^2 = .013$ ).

*Identity Relevance.* Participants in the high (vs. low) usage condition believed that the planner reflected their identity to a greater extent ( $M_{\text{high-usage}} = 3.87$ ,  $SD = 1.78$  vs.  $M_{\text{low-usage}} = 2.62$ ,  $SD = 1.79$ , Cohen's  $d = .70$ ;  $F(1, 266) = 32.94$ ,  $p < .001$ ,  $\eta_p^2 = .110$ ).

*Mediation Analysis.* As with study 5A, we conducted a parallel mediation analysis but added identity relevance as a potential mediator in addition to perceived value for self and value for others. We bootstrapped 95% bias-corrected confidence intervals for the indirect effect with 5,000 re-samples (Process Model 4; Hayes 2018). As predicted, the results showed a significant and positive indirect effect for the path, product usage  $\rightarrow$  perceived value for others  $\rightarrow$  recycling intentions ( $ab = -.06$ ,  $SE = .04$ , 95% CI [-.186, -.002], bootstrap: 5,000 times; see table 4 for detailed results). However, the indirect effect through perceived value for self was not significant ( $ab = .006$ ,  $SE = .05$ , 95% CI [-.095, .104], bootstrap: 5,000 times). Further, the indirect effect through identity relevance was not significant ( $ab = .05$ ,  $SE = .08$ , 95% CI [-.110, .216], bootstrap: 5,000 times). While high product usage level increased the value for self and identity relevance, they were not driving participants' disposal choice. The underlying mechanism was purely driven by perceived value for others.

**TABLE 4**  
RESULTS FOR MEDIATION ANALYSIS (STUDY 5B)

| Variable              | Mediator 1:<br>Value to Self |           | Mediator 2:<br>Value to Others |           | Mediator 3:<br>Identity<br>Relevance |           | Outcome:<br>Recycling<br>Intentions |           |
|-----------------------|------------------------------|-----------|--------------------------------|-----------|--------------------------------------|-----------|-------------------------------------|-----------|
|                       | <i>b</i>                     | <i>SE</i> | <i>B</i>                       | <i>SE</i> | <i>B</i>                             | <i>SE</i> | <i>b</i>                            | <i>SE</i> |
| Intercept             | 2.72***                      | .15       | 3.45***                        | .16       | 2.62***                              | .15       | 4.94***                             | .24       |
| Condition             | .63**                        | .22       | -.42†                          | .23       | 1.25***                              | .22       | -.42*                               | .20       |
| Value to Self         | --                           | --        | --                             | --        | --                                   | --        | .01                                 | .07       |
| Value to Others       | --                           | --        | --                             | --        | --                                   | --        | .14*                                | .06       |
| Identity<br>Relevance | --                           | --        | --                             | --        | --                                   | --        | .04                                 | .06       |
| R <sup>2</sup>        | 17.6%                        | --        | 11.2%                          | --        | 33.2%                                | --        | 22.9%                               | --        |

NOTE. Condition is coded as Low Usage = 0, High Usage = 1.

†  $p < .1$ , \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

## GENERAL DISCUSSION

The resources on our planet are not unlimited. However, our needs know no bounds. As the population keeps increasing at an exponential rate, consumers' needs and wants have also seen a meteoric rise. It is therefore imperative that we understand how best to make use of our resources in a more sustainable manner. One key factor that will impact sustainability is how much waste that we generate. It is therefore vital to reduce the amount of trash we produce every day by encouraging other forms of product disposal through reuse. Through six studies, we document an important barrier, product usage level, on consumers' choices to not trash their possessions. Consumers are more likely to trash a product that they have used extensively compared with that they have used rarely. We demonstrate the effect across different manipulations of usage level (free recall, category-specific free recall, and a fixed product), different ways of measuring

disposal (multinomial choices and interval scales), and using multiple product categories (clothing, water bottle, and planner book).

We further identify consumers' perceptions of value that the product confers to others as an important underlying mechanism driving the effect of usage level on disposal choice. When consumers use a product more extensively, they believe that they have obtained more value from the product but that the product has less value to offer others. While the value derived does not affect inferences, how much value remains is a critical determinant of consumers' decision to trash products as opposed to use other forms of disposal. We delineate a robust effect, which documents that level of product usage influences inferences about the value that others can derive, which then impacts disposal choice. This is a general effect that is not contingent on other inferences. However, if usage level is used to infer product liking, then a different pattern of effects could emerge. For example, if heavy usage signals deep affection towards a product, then consumers may decide to hold on to the item and not discard it. In our studies, we only consider contexts where consumers have decided to discard the product—what we study is the mode of disposal. Therefore, such kinds of usage-based liking inferences will not impact our findings (as we only consider contexts where consumers have decided to discard the product). Having said this, usage-based liking inferences that lead to storage (as opposed to disposal) do not characterize the vast majority of items that we own. If such were the case, then instead of mindless consumerism and materialism, we would all reuse our beloved old products. Instead, what we observe is rampant wastage.

## Theoretical Contributions

Our findings make important theoretical contributions and have implications for the society at large: they can be used to foster a better and more sustainable world. First, we expand our understanding of consumers' disposal choices. While many believe that it is important to understand disposal behaviors, the current literature is still nascent. Past research primarily studies drivers of recycling versus trashing, and provides an understanding of the role of individual differences and demographics (Oskamp et al. 1991; Seacat and Boileau 2018), social identities (Kidwell et al. 2013; Mannetti et al. 2004; White et al. 2014), habit formation (Brothers et al. 1994; Ludwig et al. 1998), message framing (White and Simpson 2013; Winterich et al. 2019), and product characteristics (Trudel and Argo 2013; Trudel et al. 2016). We contribute to the literature by demonstrating that product usage level, a consumption-relevant characteristic, also influences consumers' disposal choices. Further, we expand the conceptualization of "non-trashing disposal options" from mere recycling (which entails discarding products in a provided recycling bin) to a broader array of options, that includes gifting and reselling.

Second, our research sheds light on how consumers make inferences about disposal outlets. While prior literature primarily asserts that trash has negative connotations, for example, that trash is useless (Trudel and Argo 2013), we identify where these "useless" perceptions arise from. We argue product valuation underlies these effects—when consumers believe that a product confers little value to others, they are more likely to trash it instead of choosing other forms of disposal actions. Compared to trashing a product, other forms of disposal involve reusing the products to some extent

(e.g., recycling, gifting, or reselling), and are therefore associated with delivering value to others.

Finally, our work adds to the literature on consumers' post-purchase behaviors. While we know significantly more about consumers' pre-purchase decisions, much less is known about post-purchase behaviors (Gardial et al. 1994). In recent times, however, researchers are beginning to provide deeper insights on post-purchase behaviors, including the effect of consumption experiences (Tezer and Bodur 2020) and how these experiences influence word-of-mouth behaviors (Berger, Rocklage, and Packard 2022; Brandes and Dover 2022). We link two important post-purchase behaviors: product usage level and disposal choice.

### Practical Implications

Our findings also have important practical implications. "Reduce, reuse, and recycle," the 3R principle, has largely been promoted to increase recycling rate to enhance the sustainability of our society (EPA n.d.). While it is aimed at reducing trashing through the encouragement of reusing and recycling, it also creates a conundrum: reusing a product more extensively might increase trashing likelihood. Policymakers and non-profit organizations might need to reassess the strategies they use in their communication.

Furthermore, in marketing/education campaigns, consumers are often told about the importance of recycling as well as are taught about the different categories of products that can be recycled. However, as we find, an important factor that underlies the

decision to trash is amount of usage. It may be important to educate consumers about the value that extensively used products confer to others, and this could lower trashing likelihood and increase reuse likelihood.

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## APPENDIX A: STIMULI AND MATERIALS FOR STUDIES IN CHAPTER 2

### Study 1

The weather starts getting hotter. You want to buy a water bottle that you can bring with you to school every day. **You plan to spend between \$10 and \$50 on it.** You are searching the Internet for options.

#### [Separate Evaluation – Recycled Condition]

You find this plastic water bottle looking nice and durable.



Made from recycled plastic

(Image used under Fair Use Law)

#### [Separate Evaluation – Control Condition]

You find this plastic water bottle looking nice and durable.



Made from non-recycled  
plastic

(Image used under Fair Use Law)

**[Joint Evaluation – Recycled and Control Condition]**

You find two similar plastic water bottles looking nice and durable.



A  
Made from non-recycled  
plastic

B  
Made from recycled plastic

(Image used under Fair Use Law)

**Measure**

**[The Two Separate Evaluation Conditions]**

How much are you willing to pay for the water bottle (in USD)?

(Please enter numbers below)

\$

**[Joint Evaluation Condition]**

How much are you willing to pay for the water bottle A (in USD)?

(Please enter numbers below)

\$

How much are you willing to pay for the water bottle B (in USD)?

(Please enter numbers below)

\$

## Study 2

### [Recycled Condition]

Breeze is a new brand launching their paper towels products. Breeze offers two versions of paper towels, Breeze Original and Breeze Recycled.



(Image used under Fair Use Law)

### [Control Condition]

Breeze is a new brand launching their paper towels products. Breeze offers two versions of paper towels, Breeze Original and Breeze Recycled.



(Image used under Fair Use Law)

## Measure

Breeze has conducted market research and set the suggested retail price for **Breeze Original [Breeze Recycled] at around \$20.99 per pack.**

How much do you think Breeze should set the retail price for the **Breeze Recycled [Breeze Original]** paper towels (per pack in USD)?

(Please enter numbers below)

\$

## Study 3

In this study, we are going to ask you to provide your **estimate of the amount of dollars that customers are willing to pay for a new pair of running shorts** in a retail store.

You will see a new pair of running shorts. Your task is to estimate the average amount people would be willing to pay for the shorts.

We will collect estimates from over hundred respondents and then we will compute the average value of all estimates. The respondent whose estimate is the closest to the average estimate will **win a \$10 prize** that will be granted as a bonus.

The procedure for this study is as follows.

- 1 – You will see the new pair of running shorts.
- 2 – You will indicate the average amount that people would be willing to pay for the running shorts in a retail store by entering an amount between \$10 and \$60.
- 3 - After the survey is completed, we will compute the average of all estimates. The respondent whose estimate is the closest to the average of all estimates will win a \$10 prize. If more than one respondent is able to correctly estimate the average response, then we will select the winner using a random draw.

### **[Recycled Condition]**

The following is a new pair of men's running shorts. **It is made from 55% recycled polyester.** This type of shorts is usually priced between \$10 and \$60 in the market.

### **[Control Condition]**

The following is a new pair of men's running shorts. **It is made from polyester.** This type of shorts is usually priced between \$10 and \$60 in the market.



(Image used under Fair Use Law)

### **Measure**

Please provide your best estimate of the average amount that people are willing to pay for the shorts (in USD).

(Please enter numbers below)

\$

### **Study 4**

#### **[Recycled Condition]**

The following is a new plastic phone case product that is designed to protect your phone from scratches. **It is made from recycled materials.**

The retail price of the phone case is \$20.

#### **[Control Condition]**

The following is a new plastic phone case product that is designed to protect your phone from scratches.

The retail price of the phone case is \$20.



(Image used under Fair Use Law)

### Measure

How likely are you to buy this phone case? (1 = Not likely at all, 7 = Very likely)

---

What is your best estimate of the cost for the transformation process that turns the input materials into this phone case (in USD)? Remember the total price is \$20.

(Please enter numbers below)

\$

### Study 5

The following are two different versions of coffee capsules for coffee machines. **Version A** is made from authentic plastic while **Version B** is made from 80% recycled plastic.



**Version A**  
Made from authentic plastic



**Version B**  
Made from 80% recycled plastic

(Image used under Fair Use Law)

## **Measure**

How much do you expect the company to price **Version A** compared with **other typical coffee capsules** in the market? (1 = Cheaper than those in the market, 4 = Similar to those in the market, 7 = More expensive than those in the market)

How much do you expect the company to price **Version B** compared with **other typical coffee capsules** in the market? (1 = Cheaper than those in the market, 4 = Similar to those in the market, 7 = More expensive than those in the market)

---

Manufacturing and selling a coffee capsule involve multiple costs. We would like to know your perception of the costs involved during each step.

The costs are:

- Cost of raw manufacturing materials
- Transformation process that turns the input materials into coffee capsules
- Packaging of the finished products
- Delivery process of the products
- Marketing of the products

How much do you think it costs to manufacture and sell **Version A** compared with **other typical coffee capsules** in the market? (1 = Costs less than other typical products in the market, 4 = Costs similarly to other typical products in the market, 7 = Costs more than other typical products in the market)

- Cost of raw manufacturing materials
- Transformation process that turns the input materials into coffee capsules
- Packaging of the finished products
- Delivery process of the products
- Marketing of the products

How much do you think it costs to manufacture and sell **Version B** compared with **other typical coffee capsules** in the market? (1 = Costs less than other typical products in the market, 4 = Costs similarly to other typical products in the market, 7 = Costs more than other typical products in the market)

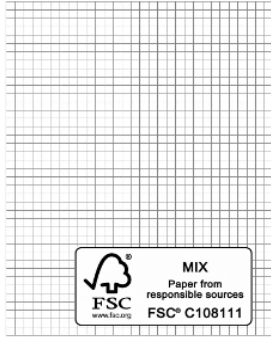
- Cost of raw manufacturing materials
- Transformation process that turns the input materials into coffee capsules
- Packaging of the finished products
- Delivery process of the products
- Marketing of the products

## Study 6A

### [Recycled Condition]

Imagine that you are taking a statistics final. You are not allowed to bring any calculator or electronic devices to the exam. However, the instructor will provide you with as much draft paper as you need. It is made from recycled paper.

After arriving at the exam, the instructor shows you the following draft paper.

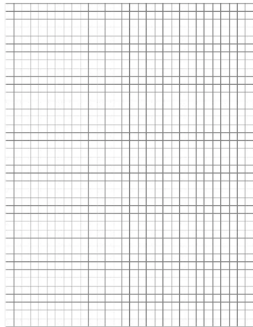


(Image used under Fair Use Law)

### [Control Condition]

Imagine that you are taking a statistics final. You are not allowed to bring any calculator or electronic devices to the exam. However, the instructor will provide you with as much draft paper as you need.

After arriving at the exam, the instructor shows you the following draft paper.



(Image used under Fair Use Law)

### Measure

You have one hour to complete the exam. How many pieces of draft paper do you think you will use? (Please enter a number below)

## Study 6B

Imagine that you're trying to find a place where you could get some work done while having a quick breakfast, and so you decide to stop by this local bakery.



(Image used under Fair Use Law)

As soon as you step inside, you are greeted by the aroma of freshly brewed coffee and you see a wide selection of cakes, sweets, and pastries.



(Image used under Fair Use Law)

Imagine that after checking out the display case, you decide to order a breakfast sandwich and a cup of coffee. After paying, you bring your food to the seating area, take a seat at an empty table, and begin taking out some work to do while you eat.



(Image used under Fair Use Law)

Unfortunately, you accidentally spill a bunch of coffee all over your documents.



(Image used under Fair Use Law)

You panic, looking toward the cream and sugar counter for napkins with which to clean up the spill. Fortunately, you see a stack of these napkins at the counter.

**[Recycled Condition]**



(Image used under Fair Use Law)

**[Control Condition]**



(Image used under Fair Use Law)

### **Measure**

How many napkins would you use to clean up the spill? (1 = None at all, 7 = A lot)

### **Study 6C**

Imagine that you are in your kitchen, and you accidentally spill a lot of water on the counter.



(Image used under Fair Use Law)

### **[Recycled Condition]**

You quickly look around and found some paper towels. They are made from recycled paper.



(Image used under Fair Use Law)

**[Control Condition]**

You quickly look around and found some paper towels.



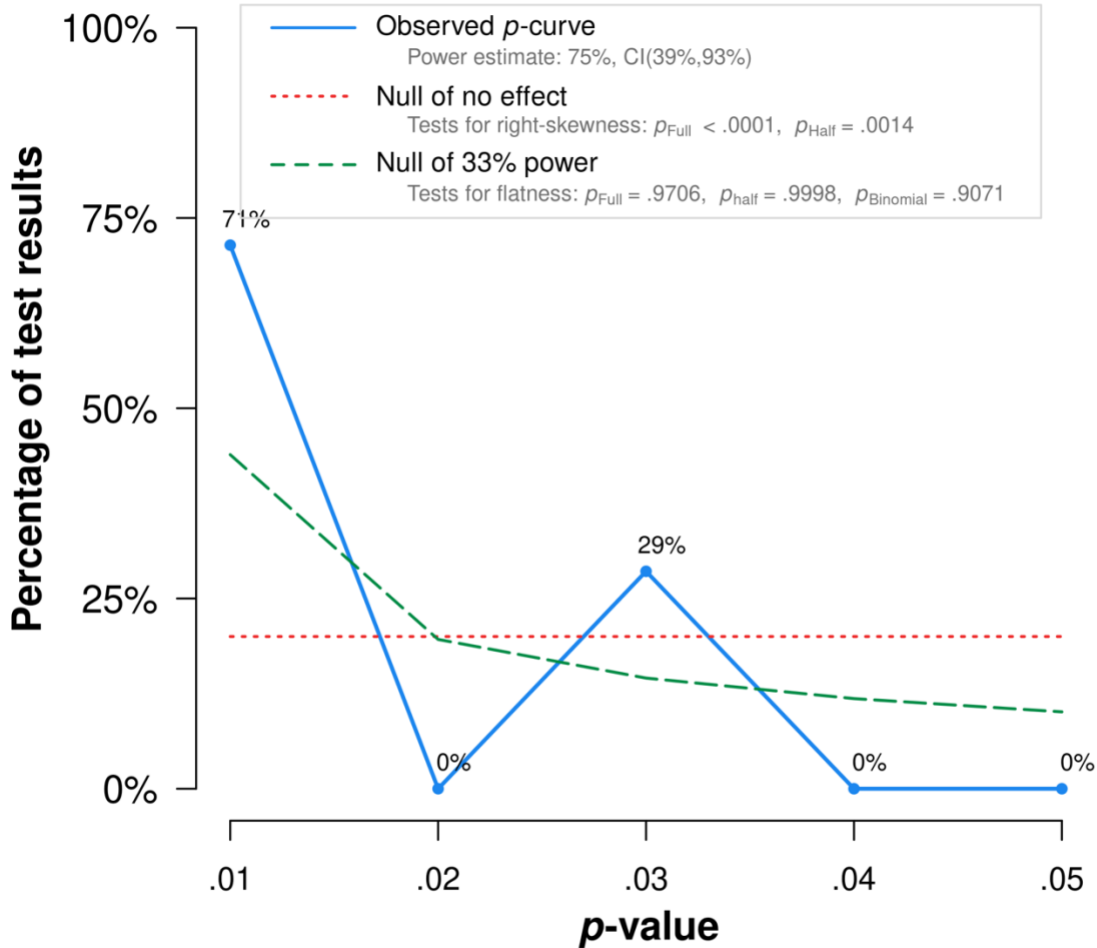
(Image used under Fair Use Law)

**Measure**

How many paper towels would you use to clean up the spill? (1 = A few, 7 = A lot)

## APPENDIX B: P-CURVE ANALYSIS FOR CHAPTER 2

We conducted a  $p$ -curve analysis to examine the evidential value for our studies. We included the statistics for our key dependent variable from each study: the valuation of products through willingness to pay, suggested retail price, willingness to buy, and usage. For study 1, we included the statistics for both the separate evaluation and the joint evaluation.



Note: The observed  $p$ -curve includes 7 statistically significant ( $p < .05$ ) results, of which 6 are  $p < .025$ . There were 2 additional results entered but excluded from  $p$ -curve because they were  $p > .05$ .

(Image used under Fair Use Law)

|  | Binomial Test   | Continuous Test                    |                                     |
|--|---|------------------------------------|-------------------------------------|
|  | (Share of results $p < .025$ )                        | Full p-curve<br>( $p$ 's $< .05$ ) | Half p-curve<br>( $p$ 's $< .025$ ) |
| 1) Studies contain evidential value.<br>(Right skew)                             | $p = .0625$   | $Z = -3.9, p < .0001$              | $Z = -3, p = .0014$                 |
| 2) Studies' evidential value, if any, is inadequate.<br>(Flatter than 33% power) | $p = .9071$   | $Z = 1.89, p = .9706$              | $Z = 3.53, p = .9998$               |
|  | <b>Statistical Power</b>                              |                                    |                                     |
| Power of tests included in p-curve<br>(correcting for selective reporting)       | Estimate: 75%<br>90% Confidence interval: (39% , 93%) |                                    |                                     |

(Image used under Fair Use Law)

### Interpretation:

P-Curve analysis combines the half and full p-curve to make inferences about evidential value. In particular, if the half p-curve test is right-skewed with  $p < .05$  or both the half and full test are right-skewed with  $p < .1$ , then p-curve analysis indicates the presence of evidential value. This combination test, introduced in Simonsohn, Simmons and Nelson (2015 [.pdf](#)) 'Better P-Curves' paper, is much more robust to ambitious p-hacking than the simple full p-curve test is.

Here both conditions are met, indicating evidential value.

Similarly, p-curve analysis indicates that evidential value is inadequate or absent if the 33% power test is  $p < .05$  for the full p-curve or both the half p-curve and binomial 33% power test are  $p < .1$ . Here neither condition is met; so p-curve does not indicate evidential value is inadequate nor absent.

As with all p-values, these cutoffs are just benchmarks; the lower the p-values are, the less consistent the data are with the respective null hypotheses. A  $p = .049$  is essentially the same as a  $p = .051$ , while a  $p = .0001$  is much more compelling than either.

To appreciate the advantage of these combination tests in relation to the previously used full p-curve tests, see [Figure 2](#) and pages 1149-1151 in the 'Better P-Curves' paper ([.pdf](#)) and check out its Supplement 2 ([.pdf](#))

## APPENDIX C: STIMULI AND MATERIALS FOR STUDIES IN CHAPTER 3

### Study 1

#### [Trash Can Condition]

A garbologist is interested in looking at things that people do not need any more. After searching in the trash can, he found a backpack as shown in the picture below.

#### [Recycling Bin Condition]

A garbologist is interested in looking at things that people do not need any more. After searching in the recycle bin, he found a backpack as shown in the picture below.

#### Measure

How much value do you think the backpack has? (1 = A little, 7 = A lot)

---

Where did the garbologist find the backpack? (A trash can, A recycle bin, I don't know)

### Study 2

#### [Low Usage Condition]

Please think of a product that you bought in the past year, but you rarely use it.

Please write down the name of the product.

Please write a bit more to describe this product.

#### [High Usage Condition]

Please think of a product that you bought in the past year, and you use it very often.

Please write down the name of the product.

Please write a bit more to describe this product.

#### Measure

Now imagine that you do not need [the name of the product written by the product] (the product you wrote about in the previous screen) anymore.

What are you likely to do with it? (Trash it, Give it to someone else, Re-sell it, Recycle it)

### Study 3

#### [Low Usage Condition]

Please think of a piece of clothing that you bought in the past year, but you rarely wear it.

Please write a few sentences about the clothing item.

#### [High Usage Condition]

Please think of a piece of clothing that you bought in the past year, and you wear it very often.

Please write a few sentences about the clothing item.

#### Measure

Now imagine that you do not need the clothing item (you wrote about in the previous screen) anymore.

What are you likely to do with it? (Trash it, Give it to someone else, Re-sell it, Recycle it)

### Study 4

#### [Low Usage Condition]

Imagine that you bought a water bottle one year ago. You rarely use it and just found that you do not need it anymore.

Now you need to decide what to do with it.

#### [High Usage Condition]

Imagine that you bought a water bottle one year ago. You have been using it a lot and brought it with you for many important occasions. However, you just found that you do not need it any more.

Now you need to decide what to do with it.



(Image used under Fair Use Law)

## **Measure**

Would you prefer to trash the bottle or to recycle it? (1 = Definitely trash, 7 = Definitely recycle)

How likely are you to recycle the bottle? (1 =Not at all, 7 = Very much)

How willing are you to recycle the bottle? (1 =Not at all, 7 = Very much)

How motivated are you to recycle the bottle? (1 =Not at all, 7 = Very much)

## **Study 5A**

### **[Low Usage Condition]**

Imagine that you bought a T-shirt one year ago. You rarely wear it and just found that you do not need it anymore.

Now you need to decide what to do with it.

### **[High Usage Condition]**

Imagine that you bought a T-shirt one year ago. You have been wearing it a lot. However, you just found that you do not need it any more.

Now you need to decide what to do with it.



(Image used under Fair Use Law)

## **Measure**

Would you prefer to trash the bottle or to recycle it? (1 = Definitely trash, 7 = Definitely recycle)

Recycling includes putting it in the recycling bin, giving it to someone else, re-selling it, and other forms of re-using it.

How likely are you to recycle the bottle? (1 = Not at all, 7 = Very much)

How willing are you to recycle the bottle? (1 = Not at all, 7 = Very much)

How motivated are you to recycle the bottle? (1 = Not at all, 7 = Very much)

---

How much value do you think the T-shirt have for you now? (1 = A little, 7 = A lot)

How much value do you think the T-shirt might have for others now? (1 = A little, 7 = A lot)

---

How frequently did you wear the T-shirt in the past year? (1 = Rarely, 7 = A lot)

## **Study 5B**

### **[Low Usage Condition]**

Imagine that you bought a weekly planner one year ago. You rarely wear it.

You are going to move to a new place. While packing your stuff, you just found you could not bring the planner with you. Now you need to decide what to do with it.

### **[High Usage Condition]**

Imagine that you bought a weekly planner one year ago. You have been using it a lot and brought it with you for many important occasions in the past year.

You are going to move to a new place. While packing your stuff, you just found you could not bring the planner with you. Now you need to decide what to do with it.

## **Measure**

Would you prefer to trash the planner or to recycle it? (1 = Definitely trash, 7 = Definitely recycle)

How likely are you to recycle the planner? (1 =Not at all, 7 = Very much)

How willing are you to recycle the planner? (1 =Not at all, 7 = Very much)

How motivated are you to recycle the planner? (1 =Not at all, 7 = Very much)

---

How much value do you think the T-shirt have for you now? (1 = A little, 7 = A lot)

How much value do you think the T-shirt might have for others now? (1 = A little, 7 = A lot)

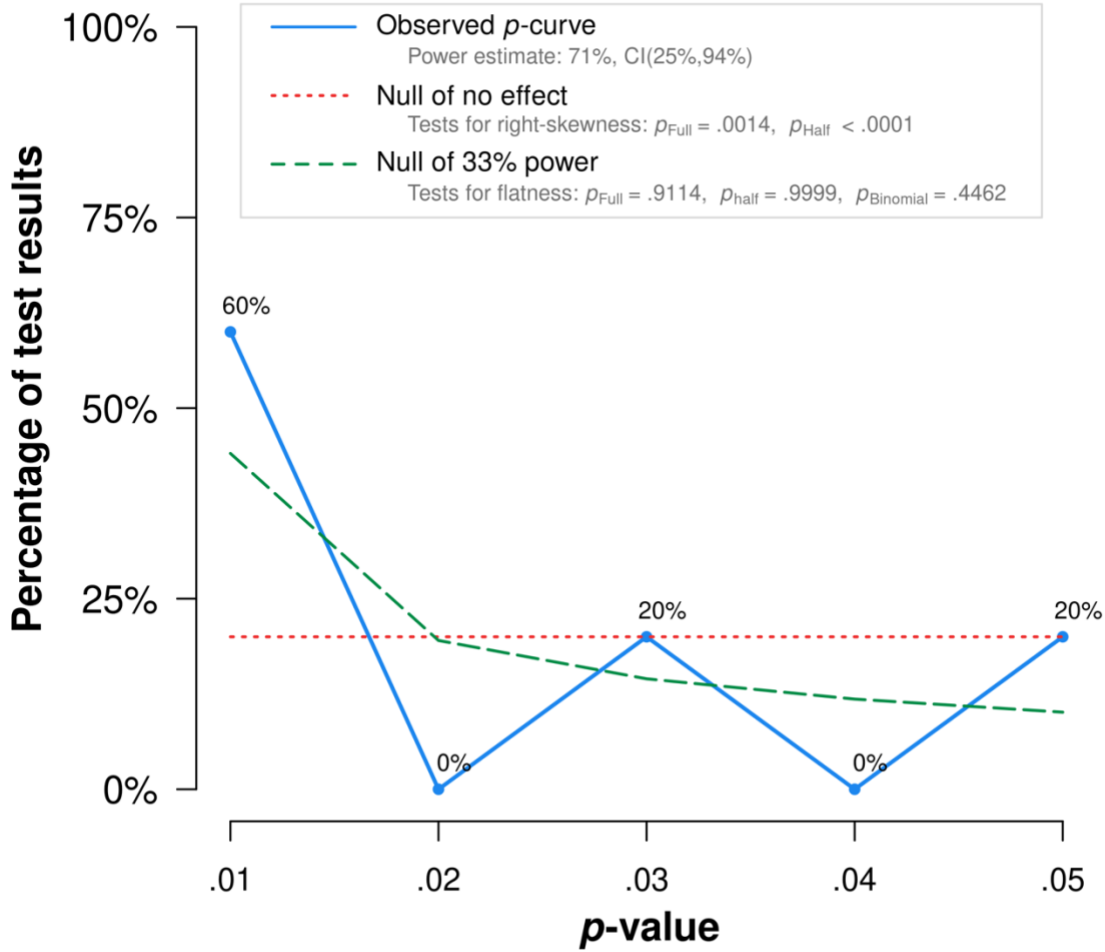
To what extent do you think the planner reflect part of your identity? (1 = A little, 7 = A lot)

---

How frequently did you use the planner in the past year? (1 = Rarely, 7 = A lot)

### APPENDIX D: P-CURVE ANALYSIS FOR CHAPTER 3

We conducted a  $p$ -curve analysis to examine the evidential value for our studies. We included the statistics for our key dependent variable from each study.



Note: The observed  $p$ -curve includes 5 statistically significant ( $p < .05$ ) results, of which 3 are  $p < .025$ . There was one additional result entered but excluded from  $p$ -curve because it was  $p > .05$ .

(Image used under Fair Use Law)

|  | Binomial Test                  | Continuous Test                      |                                     |
|--|--------------------------------|--------------------------------------|-------------------------------------|
|  | (Share of results $p < .025$ ) | (Aggregate with Stouffer Method)     |                                     |
|  |                                | Full p-curve<br>( $p$ 's $< .05$ )   | Half p-curve<br>( $p$ 's $< .025$ ) |
| 1) Studies contain evidential value.<br>(Right skew)                             | $p = .5$                       | $Z = -2.99, p = .0014$               | $Z = -3.91, p < .0001$              |
| 2) Studies' evidential value, if any, is inadequate.<br>(Flatter than 33% power) | $p = .4462$                    | $Z = 1.35, p = .9114$                | $Z = 3.65, p = .9999$               |
|  |                                | Statistical Power                    |                                     |
| Power of tests included in p-curve<br>(correcting for selective reporting)       |                                | Estimate: 71%                        |                                     |
|  |                                | 90% Confidence interval: (25% , 94%) |                                     |

(Image used under Fair Use Law)

### Interpretation:

P-Curve analysis combines the half and full p-curve to make inferences about evidential value. In particular, if the half p-curve test is right-skewed with  $p < .05$  or both the half and full test are right-skewed with  $p < .1$ , then p-curve analysis indicates the presence of evidential value. This combination test, introduced in Simonsohn, Simmons and Nelson (2015 [.pdf](#)) 'Better P-Curves' paper, is much more robust to ambitious p-hacking than the simple full p-curve test is.

Here both conditions are met, indicating evidential value.

Similarly, p-curve analysis indicates that evidential value is inadequate or absent if the 33% power test is  $p < .05$  for the full p-curve or both the half p-curve and binomial 33% power test are  $p < .1$ . Here neither condition is met; so p-curve does not indicate evidential value is inadequate nor absent.

As with all p-values, these cutoffs are just benchmarks; the lower the p-values are, the less consistent the data are with the respective null hypotheses. A  $p = .049$  is essentially the same as a  $p = .051$ , while a  $p = .0001$  is much more compelling than either.

To appreciate the advantage of these combination tests in relation to the previously used full p-curve tests, see [Figure 2](#) and pages 1149-1151 in the 'Better P-Curves' paper ([.pdf](#)) and check out its Supplement 2 ([.pdf](#))