



# **BYOB: How Bringing your Own Shopping Bags Leads to Treating Yourself, and the Environment**

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## WORKING PAPER

### **BYOB: How Bringing your Own Shopping Bags Leads to Treating Yourself, and the Environment**

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As concerns about pollution and climate change have become more central in public discourse, shopping with reusable grocery bags has been strongly promoted as environmentally and socially conscious. In parallel, firms have joined policy makers in using a variety of initiatives to reduce the use of plastic bags. However, little is known about how these initiatives might alter consumers' in-store behavior. Using scanner panel data from a single California location of a major grocery chain, and completely controlling for consumer heterogeneity, we demonstrate that bringing your own bags simultaneously increases purchases of environmentally friendly as well as indulgent (hedonic) items. We use experimental methods to further demonstrate causality and to consider the effects of potential moderators. These findings have implications for decisions related to product pricing, placement and assortment, store layout, and the choice of strategies to increase the use of reusable bags.

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Attention to environmental concerns has been steadily increasing in the popular sphere, along with education about environmental issues and policies designed to encourage “green” behaviors. In particular, significant efforts have been taken to promote the adoption of reusable shopping bags. Some local, city, and even country-level governments have taken steps to ban retail use of disposable plastic bags, or to require businesses to charge for giving them out (Galbraith, 2012, Wang 2013). For example, by 2011, 28 U.S. cities, including New York, NY and San Francisco, CA had enacted some form of ban, fee or other regulation on the use of disposable shopping bags. In September of 2014, California became the first state to ban single-use plastic bags (Chappell 2014).

There are obvious financial reasons why firms, in addition to policy makers, might encourage consumers to use their own reusable shopping bags in lieu of having to provide disposable or “thin film” plastic bags themselves. Some stores currently promote the use of reusable bags by selling them directly, using reusable bag giveaways, and/or offering financial and social incentives for shoppers who bring their own bags (Smith, 2007; Stern 2007, O’Donnell 2010). Depending on the community, it is likely that significant social approval and developing norms support this behavior as well.

An interesting question that arises is whether introducing the use of reusable bags might have a measurable influence on individuals’ shopping behavior. A recent survey of U.S. consumers found that 29% had utilized their own reusable bags during their most recent shopping trip (Food Shopper Insights, 2011). This reflects a sizeable adoption of the practice, but also indicates that the behavior is not routine for most people, and may be inconsistent between trips even for those who do expect to bring their bags. In contrast to more habitual parts of

grocery shopping, the act of bringing a bag may be distinct, novel, or notable enough to carry meaning for consumers in a way that influences decisions.

For example, a consumer's awareness that they brought their own grocery bags could make green items more salient, evoke goals of making green choices in general, or evoke goals of being a virtuous person who takes socially and/or morally responsible actions. However, it is similarly possible that by bringing a bag, shoppers would feel they have already done something to accomplish progress towards these goals. As a result, behavioral theory is unclear in its predictions as to whether consumers might make more purchases that are consistent with being green and/or good, or whether such goal progress will lead them to shirk environmentally in later choices. Furthermore, while it makes intuitive sense that a green choice might impact green purchases, bringing one's own bags has the potential to influence choices about other types of goods. Since bringing one's own bag might be considered making a virtuous choice, consumers might feel subsequently licensed to make other less virtuous, or more indulgent, decisions (Fishbach and Dhar 2005, Khan and Dhar 2006).

In this article, we provide some of the first evidence demonstrating that the act of bringing one's own grocery bags causes significant changes in purchasing behavior, specifically in terms of food items. Our studies examine this issue by combining empirical and experimental methods. The former allows us to demonstrate our central effects of interest in a robust manner with real world data. The latter is used to strengthen our understanding of these results in a setting where causality can be established, and to build on it by testing hypotheses about specific moderating factors.

In Study 1, we conduct an analysis of consumer purchasing data from a single location of a major grocery store chain using linear probability models, which allow for extensive controls for consumer heterogeneity and unobserved promotional activity. In accordance with our hypotheses, (developed further below) we examine how purchases of both green and indulgent foods are influenced by bringing one's own bags. Given that our effects seem to rest on influencing consumers' self-focused or unconscious motivations, Study 2 tests how having to consider the preferences of others (e.g. dependents) might moderate the impact of bringing one's bag on considered purchases. In Studies 3 and 4 we consider the relevance of barriers in the form of price constraints, and whether our effects depend on the reasons for bringing a bag, including store policies. Our findings have implications for firm decisions regarding product placement and pricing, as well as their strategy for promoting (or not promoting) the use of reusable bags.

## **Theoretical Background**

### ***Priming Effects and Consistent Behavior***

Consumers are subject to a number of influences in nearly any shopping context. For example, various types of experiences or information can increase the accessibility of related mental constructs (see Schacter and Buckner 1998 for review). This priming effect can also occur with personal characteristics or goals, such that once they are made more salient, they can encourage consistent subsequent behavior (e.g. Bargh et al. 2001, Shah 2005, Wheeler and DeMarree 2009). Thus bringing one's own bags to the grocery store could motivate more

consideration of green options by priming environmental thoughts and/or activating a broader goal to help the environment.

How might this desire to make green decisions express itself in the context of a grocery shopping? While different types of stores in different locations offer a number of products that are relevant to environmental concerns, a common element across grocery shopping is food purchases. In this domain, consumers perceive organic foods to be more “green” and/or environmentally beneficial than conventional foods (for review, see Yiridoe et al. 2005; Hughner et al. 2007; Shafie and Rennie, 2012.) In particular, organic foods are most commonly perceived to involve lower levels of pesticides (e.g. Yiridoe et al. 2005), which is in accordance with the definitions used for USDA organic certification.

Based on these consumer perceptions, we chose to examine possible green effects of bringing one’s bags by examining purchases of organic foods.

**H1: When consumers bring their own bags for grocery shopping, they will be more likely to choose organic items (when such options are available).**

As alluded to above, reusable bags could also prime general motivations to behave in a good or virtuous manner which might be expressed via taking positive environmental actions. Increases in organic food purchases are also consistent with this, as they are perceived both more natural, and more moral (e.g. Mazar and Zhong, 2010; Eskine 2013) and are marketed using messages that support these perceptions. Thus our hypothesis focuses primarily on purchase behavior as opposed to the specific construct (green or moral) being primed.

### *Licensing Effects and Contrasting Behavior*

While priming encourages consistent, or assimilative, behavior, there are other psychological mechanisms that might prompt contrasting behavior in this situation. For example, awareness of having made progress towards a goal, or having taken a virtuous action can cause people to feel they have earned a more indulgent reward (e.g. Kivetz and Simonson, 2002). These actions can also unconsciously *license* subsequent indulgences (Fishbach and Dhar 2005, Khan and Dhar 2006). In particular, Khan and Dhar (2006) showed that one instance of virtuous self-signaling, that is, boosting one's self-concept via a virtuous action or expression of intent, could increase the likelihood of choosing a luxury item over a necessity in a subsequent unrelated choice. In this vein, Mazar and Zhong (2010) demonstrated that when individuals consider green purchases such as organic food, they feel virtuous for taking a social and environmentally positive action and are more likely to show negative moral behavior like lying afterwards.

Studies of licensing effects have generally presented participants with specific sequences of unrelated decisions with distinct explicit tradeoffs. Very little research has focused on self-guided open-ended choices within a single overarching context. Since the nature of grocery store shopping allows for unplanned purchases, we propose that it will permit or facilitate licensing-type effects by offering shoppers who bring their own bags a channel to make indulgent choices.

**H2: When consumers bring their own bags for grocery shopping, they will be more likely to purchase indulgent products.**

### **Conflicting and Competing Motivations**

H1 and 2 are the primary hypotheses of this paper, and it is worth considering their implications as a pair since these behavioral effects potentially conflict. While organic foods are perceived to be more green, or environmentally beneficial, they are also perceived to be more healthy (e.g. Yiridoe et al. 2005; Hughner et al. 2007; Shafie and Rennie, 2012). Thus consumers who fill their baskets with these healthy items might feel more guilt or conflict when being tempted by an indulgence. In this case, it might be expected that consumers who brought their bags might buy more organic **or** more indulgent foods, but not both. These effects could also be assumed to be part of the same pathway - particularly if the act of purchasing organic items is construed as “good” while the choice of indulgent items is considered “bad.” That is, it might be that a consumer who brings their bags then purchases more organic items, which aids in licensing them to purchase more indulgences.

However, during the course of a shopping trip, individual purchasing decisions do not have to be made as direct comparisons or tradeoffs. In addition to serving a general purpose (e.g. re-stocking the pantry or eating healthily), products can be selected as part of a specific subset (e.g. the ingredients for one recipe) or entirely independently from each other. Thus shoppers can choose a portfolio of items that achieve multiple goals. As a result, it is also possible that the act of bringing a bag interacts in different ways with different targets. Thus our empirical analyses additionally test the following hypothesis:

**H3A: Bringing one’s own bags increases green and indulgent grocery purchases through separable mechanisms, namely priming and licensing.**

This hypothesis also reflects the fact that our posited underlying mechanisms for the two types of choices are dissociable. That is, while priming and licensing can both influence or

evoke motivations, they do not do so in the same way. For example, a central feature of the work on licensing is that the initial virtuous choice is self-motivated. If the reasons for an individual's "virtuous action" can be attributed to other people or external policies, then its subsequent influence is significantly attenuated (Khan and Dhar 2006). In contrast priming can arise from objects or information in a person's surrounding regardless of any personal impetus or attribution for their presence (Dijksterhuis et al. 2005). This "agency" requirement of licensing is a potentially useful way to validate our proposed mechanism for indulgent purchases. Thus we propose the following:

**H3B: Attributing bringing one's own bags to the store should decrease purchases of indulgent products compared to attributing bringing bags to the self.**

This also allows us to investigate if the licensing effects can be dissociated from priming effects arising from the same source stimulus, since no such decrease would be expected for green purchases. This line of inquiry is a particularly relevant concern for managers, given that legislation mandating the use of one's own bags, or instituting charges for bags from the store is slowly but increasingly being put into place (Galbraith 2012; Chappell 2014). We explore this question directly in Study 4.

*Household Dependents* Although the mechanisms leading to organic and indulgent purchases may not conflict, there are other factors that could broadly compete with, moderate, and/or override, the influence of bringing one's bag. Both priming and licensing act on an individual's own thoughts and motivations, but if that person is shopping for a family, they may make their own conscious and subconscious preferences secondary to accommodate parenting

responsibilities and the desires of others. Generally speaking, children are able to exert their own distinct influences on grocery basket composition (Mangleburg 1990, Martensen and Gronholdt 2008). Thus even if bringing a bag did cause priming or licensing effects, they might not be expressed by a person with dependents who is focusing their choice criteria on the wants and needs of their children. which are likely to vary significantly between households.

We can consider specific possible influences of having children on organic and indulgent foods, to see how it might interact with the consumers' consideration of those items. It has been shown that upon the arrival of a baby in the household, parents initiate or increase their purchases of organic food (Hill and Lynchehaun, 2002), and that households with children are more likely to buy organic items (Thompson and Kidwell, 1998). If parents feel this pre-existing motivation to purchase organic foods, there may be a ceiling effect such that bringing one's own bag has no additional influence. In terms of indulgences, children can increase their parents' health conscious choices (Prasad et al. 2008) but also can increase their purchases of snack foods including indulgences (Marshall et al. 2007). Thus having young dependents can increase *or* decrease indulgent purchases. More simply, the influence wielded by children may simply overwhelm any influence the bags might have on their parent's purchases in these categories.

Given that the expected influence of dependents will add significant variance (heterogeneity) into their parents' choices, we propose the following:

**H4: Shoppers whose households include children (dependents) will show less of an influence of bringing their own bags on organic and indulgent purchases.**

Broadly speaking, this hypothesis rests on the idea that having children introduces sufficiently varied competing motivations or pre-existing purchasing patterns that any effects of priming and licensing mechanisms on the individual's own preferences will be overpowered.

*Price.* Organic groceries are generally offered at a price premium compared to their non-organic counterparts. Thus both the consideration of an organic option and the (unplanned) addition of an indulgence imply an increase in spending. Thus even if a consumer is more willing to consider these categories, if price is a salient factor in the decision environment, they may not be willing to pay more to purchase them.

Purchases of indulgences generally inspire a sense of guilt, and can require a greater need for justification (e.g. Okada 2005), suggesting that consumers would be more price sensitive to these types of items. Supporting this, previous work has suggested that the likelihood of spending on indulgences decreases when price is made more salient by making payments more immediate (Prelec and Loewenstein, 1998). Indeed, increasing the salience of price by using cash (as opposed to credit cards where payment is deferred) decreases the likelihood of buying indulgent or “vice” foodstuffs (Thomas et al. 2011). There is evidence for the converse as well; framing a price as a discount on a hedonic item can provide sufficient justification to increase the likelihood of its purchase (Khan and Dhar 2010).

While it is possible to imagine that individuals who are open to considering organic options belong to a segment that is more price insensitive, previous analyses have shown that the number of consumers who are willing to pay a premium for organic foods decreases as the level of that premium increases (Yiridoe et al. 2005). Such findings lead us to propose the following:

**H5: Increases in the salience of price in the shopper's decision process will reduce the effects of bringing one's own bags on both organic and indulgent purchases.**

Note here that salience refers to the importance placed on price on the decision process. Thus it could arise from the relative amount of attention paid to the price, or the relative level of the price (with higher price premiums being more salient.)

Across four studies, we combine results from empirical and experimental data to demonstrate that the simple choice to bring one's own grocery bags can significantly alter behavior. These studies further provide evidence for the multiple psychological mechanisms working together to create these effects, and the factors that bound their impact. Our findings have implications for firms' optimal strategy to encourage the use of reusable bags, and speak to the managerial question of how various legal policies and incentive programs related to adoption of reusable bags already in place might direct shopper behavior. Thus our paper provides insight into a relatively new consumer behavior with potentially large ramifications for indulgent impulse purchases and higher priced (often higher margin), organic purchases.

### **Study 1: Empirical Analysis of Loyalty Card Data**

To investigate our primary hypotheses (H1&H2) we examined loyalty cardholder data from one location of major grocery retailer chain.<sup>1</sup> The data are from May 29, 2005 through March 31, 2007 for a single store in California. During this time period, there were no government or store policies that placed requirements or restrictions on the use of thin-film

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<sup>1</sup> This chain is not one that specializes in organic products.

plastic bags (or reusable bags). Both plastic and paper bags were offered for free by the store, and shoppers were under no obligations to use a particular option. The store did offer a very small (\$0.03) credit for each bag that was provided by the shoppers themselves. Thus for each transaction event, the data included information on whether or not the consumer brought their own bags and/or purchased a reusable bag, allowing us to track effects on purchasing by the same households over time. There are a total of 2,071,302 transactions by 59,659 households. A histogram of the daily timing of the transactions can be found in Figure 3. Most transactions are made after 6 AM and 10PM. For the analysis, we dropped the 27,549 transactions outside of this time window when factors such as sleep deprivation could confound the effects of interest.

Insert Figure 1 about here

For our transaction-level analyses, we needed to create controls for the possibility that consumers are more likely to bring bags when they plan to go shopping ahead of time, since planning might influence the probability of (unplanned) indulgent purchases. To track the degree to which a shopping trip might be anticipated, we used the time since the last shopping trip at that store. However, this variable is only a good indicator for the need to get more groceries if the consumer does most of their shopping at the specific store under consideration. Therefore, for the analysis, we further restrict the sample to the set of households in the top ten percentile of total shopping trips, or those that made at least 80 trips over the 96 weeks of data. We also drop trips with over 100 items and households with more than 660 trips to exclude households making one trip per day (these are likely small businesses), as well as trips that are the second trip of the day. As a robustness check, we verify that our results do hold in the full sample as well.

Even with these restrictions, the remaining sample is quite large, including 5,987 households. Since these households are the frequent shoppers, they comprise almost half of the shopping trips in the data. This yields 936,232 total transactions for the analysis. We show category-day level summary statistics for the price, organic price, and non-organic price indices used in the regressions in Table 1. The indices are created by averaging the daily prices of all items, all organic items, and all non-organic items for each category on each day, using the full set of transaction data. We also show the difference in the organic and non-organic price indices if both indices can be calculated (i.e. organic and non-organic versions of a product in the category is sold that day).

Insert Table 1 About Here

Transaction-item summary statistics are shown in Table 2 for observations used in the transaction-item-level organic regressions, and transaction-level summary statistics can be found in Table 3 for variables used in the indulgence regressions. While grocery stores offer a tremendous range of items in categories as varied as healthcare, entertainment and pet supplies, we focused our analysis specifically on the domain of food items as the central good of interest in this setting.

Insert Table 2 About Here

Insert Table 3 About Here

*Organic Purchases (H1):* To examine the influence of bringing bags on subsequent green purchase decisions, we used transaction-item-level linear regressions in which the

dependent variable was an indicator variable equal to one if the item in the transaction was organic. Transaction-level regressions were not appropriate here since both the number and proportion of organic products purchased are confounded with the total number of items purchased. Furthermore (unlike the “indulgent” regressions to follow) “organic” is not a distinct or independent category like “coffee” or “rice”. That is, consumers make choices about purchasing organic foods multiple times across the relevant categories the consumer is shopping in, if organic options are available. With transaction-item-level regressions, we could condition on the presence of organic options within the “category” on the day of purchase, using different definitions of the food category (e.g. more or less inclusive) to test for robustness. The estimation equation is:

$$I_{ijth}(organic) = \alpha B_{ith} + \gamma \Delta p_{ct} + \delta \Delta p_{ct} B_{ith} + \eta_t + \zeta_h + \xi_i + \epsilon_{ijt}$$

$$| j \in C, \exists j' \in C \text{ s.t. } I_{j't}(organic)=1, \quad (1)$$

where  $I_{ijth}$  is a dummy variable indicating that product  $j$  that is bought in a transaction on day  $t$  at hour  $h$  by consumer  $i$  is organic,  $B_{ith}$  is a dummy variable indicating whether the consumer brought a bag, and we define  $I_{j't}(organic) = \sum_i \sum_h I_{ij'th}$  as the measure for whether an organic product  $j'$  is available on day  $t$  in category  $C$  as defined by the grocery chain. Examples of product categories are “bananas”, “yogurt” and “cookies”. To control for relative prices of the organic and non-organic versions of products, we included the difference between the two price indices in the regressions, shown in equation (1) as  $\Delta p_{ct}$ .<sup>2</sup> We included household fixed effects to control for heterogeneity, and dummy variable for the hour-of-day,  $h$ , and day,  $t$  (for all days in

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<sup>2</sup> See Study 3 for a discussion of the interaction between  $B$  and  $\Delta p$  (in support of H5).

the data) to control for daily price variation and promotions as well as time-dependent purchasing patterns.

Insert Table 4 About Here

A key point is that the household fixed effects controlled for *all* differences across individuals in their propensity to bring bags and/or purchase organic items, and so the effect we are estimating is the mean effect of bringing a bag *on that purchase occasion* compared to occasion in which the consumer did not bring a bag. It is clear from the significant “bag” coefficient in column 1 in Table 4 that the presence of a bag increases the probability that items purchased are organic, conditional on organic options being available, supporting H1. As expected, the significant coefficient on “ $\Delta$  price,” or the difference between the prices of organic products in comparison to their non-organic counterparts, also has strong predictive power in consumers’ decisions to buy organic (see Study 3 for further discussion).

### ***Indulgent Purchases (H2)***

For the purposes of these analyses and the experiments that follow, we define indulgent foods as those with unambiguously high fat and/or high sugar/salt contents, high palatability (e.g. good tasting) and generally low nutritional value per calorie. Thus indulgent items are themselves specific categories: desserts, candy, and snack chips, unlike organic items, which are options within categories. Building on this, the dependent variable that best allows us to test H2 is whether the transaction includes an indulgent item or items. Therefore, to test the influence of bringing bags on purchasing indulgences, we used linear regression at the transaction level. The

dependent variable to measure the priming effect was whether or not the transaction contained indulgent items, controlling for shopping basket size. The model is given by:

$$P_{ith} = \alpha B_{ith} + \beta_i X_{it} + \eta_t + \zeta_h + \xi_i + \epsilon_{ith}, \quad (2)$$

where  $P_{ith}$  is an indicator variable equal to one if the transaction had any of the indulgent items shown in Table 3 and  $X_{it}$  is a vector of variables to control for the size of the shopping trip and whether or not the transaction was planned. These variables include dummy variables for the number of non-indulgent items purchased (in ranges of five) and the days since the last shopping trip and its quadratic. As with the organic transaction-item-level regressions, the household fixed effects control for all differences across individuals in their propensity to bring bags, and in this case, to purchase indulgent items, and the time dummies again control for hour-of-day effects on shopping behavior and any daily promotional activity. Regression results (for non-dummy coefficients) are shown in Table 5.

Insert Table 5 About Here

As can be seen from the regression results in the first column of Table 5a, there is a significant, positive coefficient on bringing one's own bags, showing that they do indeed increase purchases of indulgent items (H2).

We are also able to examine whether organic and indulgent purchases increase in parallel (e.g. H3A), or whether there is a causal chain in which bringing one's bags encourages making more organic choices, which in turn engages licensing effects that increase subsequent indulgent

choice. We test this by including the number of organic items in the transaction and its interaction with the bag dummy variable. The results in the first column of Table 5b show a main effect in which increases in the number of organic purchases in a transaction indicate *fewer* indulgent purchases. In addition, the interaction effect between bringing bags and number of organic purchases is not significant, suggesting that their effects are not causally interdependent. Therefore, the increase in purchase in indulgent items is not correlated with (or due to) an increase in the purchase of organic items.

These data provide evidence supporting H1 and H2, in that we find the predicted effects of bringing one's own bags as a motivator for additional green behavior, and as a choice that induces reward-seeking in the form of increased purchases of indulgent foods. We further show evidence supporting H3A, that bringing one's bag causes both effects simultaneously but separately, as the increase in indulgent purchases cannot be explained by the increase in organic choices.

While such results demonstrate that these effects are measurable in the noisy setting of the real world, they have limitations arising from our inability to rule out some alternate explanations. For example, it is possible that the decision to bring reusable bags as well as the changes in purchase behavior are due to some unobserved external condition that occurs with varying frequencies. To help address this, and to test the impact of other potential moderators, we designed a series of experimental studies.

## **Study 2: Dependents and Consumer Generated Consideration Sets**

To better understand how bringing a bag might influence consumers' thoughts, we designed an experiment in which participants generated their own lists of the foods they would most likely consider buying. As noted, previous findings suggest that a shopper's decision-making processes can be strongly influenced by whether or not they have children (H4). Thus we randomly assigned bringing one's own bags in a hypothetical shopping scenario, but additionally created participant categories based on whether or not they self-reported having (dependent) children.

### ***Methods***

Participants were recruited for this study online from a national pool via Amazon's Mechanical Turk (AMT), and were randomly assigned to one of two conditions (With Bags, No Bags). Eleven individuals who did not complete all of the measures in the study were excluded from the analysis. The remaining sample consisted of 111 participants (Ages 18-72, 69 F). Participants indicated their age as one of six ranges (e.g. 18-24, 24-34, etc.), with the median age range as 24-34. Participants were also asked to indicate whether they had one or more dependents under the age of 18 currently residing in their household (38 out of the 111 answered in the affirmative).

The instructions stated that the purpose of the study was to understand supermarket shopping behavior. Participants in the With Bags condition read the following scenario:

Imagine that you are heading into a supermarket to do the grocery shopping for your household for the entire week. Picture yourself walking up towards the door, and selecting a shopping cart from the stand just outside. As you wheel the cart

inside, imagine yourself **[putting your reusable shopping bags inside the cart and then]** looking around the entrance.

In the No Bags condition, participants read the identical passage, with the exception of the bolded clause. Since there is significant variation in the types of grocery stores where an individual may shop (e.g. a corner store vs. a large chain), all participants were shown the same schematic of a grocery store (Figure 2A). Thus all participants had the same reference points for the available food categories. Participants were asked to list the ten items they would be most likely to purchase on this trip. They were directed to be as specific as possible about details such as numbers, sizes and brands of the items they listed.

Insert Figure 2 about here

### ***Results***

We chose to measure whether bringing one's bags might be causing a difference in purchasing by increasing the spontaneous consideration or mental accessibility of particular product types. Participants were asked to list 10 food items they would likely buy. Using the criteria from the empirical analyses, we categorized items as indulgences if they were unambiguously identifiable as having a high fat, high sugar and/or salt content, and fell into two general categories: "desserts" (e.g. candy, ice cream, cakes, cookies) or "chips" (e.g. potato chips, corn chips). For each individual, we summed the total number of indulgent items listed. Given our hypothesis (H4) that the effects of bringing one's own bag would be sensitive to whether the shoppers had young dependents, we examined the effects of our bag manipulation

on the average number of indulgences listed for participants who self-reported (not) having dependents under the age of 18 residing in their household.

As indicated in Figure 2B, there were no main effects of bringing one's bag ( $F(1,107) = .760$ ) or of having dependents ( $F(1,107) = .940$ ). However, there was a significant interaction between these factors ( $F(1,107) = 4.776$ ;  $p < .05$ ). Participants with dependents did not show a significant effect of bringing their own bags ( $F(1,107) = 1.342$ ,  $p = .249$ ). Individuals without dependents listed significantly more indulgent items when they imagined bringing their own shopping bags ( $F(1,107) = 4.536$ ;  $p < .05$ ). The differences between the means of the indulgent items for households with and without children in the No Bag condition were not significant ( $F(1,107) = 2.272$ ;  $p = .135$ ). They were similarly not significant for between those with and without children for the With Bag condition ( $F(1,107) = 2.505$ ,  $p = .116$ ).

Supporting both H2 and H4, these findings suggest that bringing one's own bag to the grocery store causes shoppers to increase the number of indulgent foodstuffs in their consideration set, or find these foods more mentally accessible, but only if they have no dependents. The pattern of results raises the interesting possibility that parents' choices are overall less sensitive to aspects of bringing one's bag that relate to their own benefits. Alternately, it may be that individuals with dependents implicitly attribute virtuous behavior like bringing bags to their role as parents and/or to their children, and thus don't feel licensed to indulge. In addition, we found no main effect of having dependents on indulgent purchases. While it is difficult to draw concrete conclusions from a null finding, this may be due to the variance in the range of possible goals that parents integrate in their shopping (health, children's preferences, environmental concerns, applying a budget across more family members, etc.).

Though participants frequently listed items that have organic counterparts, such as milk, they did not necessarily elaborate on whether those foods were organic. In fact, only 1% of the items listed across the entire study were explicitly indicated to be organic, or to have any potentially relevant green designation (“rBST-free”, etc.) To gain further insight into the potential role of having young dependents, particularly on organic purchases, we returned to the empirical data used in Study 1. While demographic information is not available in the loyalty card data, it is possible to create a conservative approximation of the families that have very small children. We determined that of the 5,987 households under consideration, 3,628 do not make any purchases in the baby food/baby care category<sup>3</sup> while 1,733 households purchase products in these baby-related categories at least 1% of the time. Though we do not have definitive data on whether the household includes children, this at least allows identification of two distinct sets of households based on their transaction history.<sup>4</sup>

We estimated the regressions (1) and (2) (as defined in Study 1) separately for these two types of households (see Table 6,7).<sup>5</sup> We find that for households without (very young) children, bringing bags has significant effects on both choosing organic options and making indulgent purchases. However, for households that include children, neither organic nor indulgent purchases are significantly affected by bringing bags, supporting the experimental findings. Given the high number of qualitative differences possible between households with and without children, we compared the regression results for organic and indulgent purchases between

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<sup>3</sup> As classified by the grocery chain – a list of the subcategories included can be found in Appendix W1

<sup>4</sup> This specification only allows us to determine the presence of very young children in the household; those in the “Without Children” condition may in fact have older dependents. However, since the experiment shows that having children diminishes our effects, this analysis becomes a *more* conservative test of our hypothesis.

<sup>5</sup> Regressions were run separately to best accommodate the likely differences in the effects of controls such as “time of day” or “day of week” between households with and without children.

household types using a Hausman test. We find that we can reject the null hypothesis that the regression results (for both organic and indulgent analyses) for households without children are not systematically different than the population with 99.99% certainty. This finding demonstrates that the sub-population of households with children is affected differently by the entire range of explanatory variables, one of which is whether the consumer brought a bag.<sup>6</sup> It also reinforces the importance of conducting separate regressions on the With and Without Children groups.

### **Study 3: Price Sensitivity and Choice Attribution**

In this experiment, we consider how some of the other common motivational factors present during grocery shopping might interact with the effects of bringing one's bag. One major issue is price, or price sensitivity. Adding an indulgent product to the basket requires adding a "novel" or unplanned expense. Since many, if not most, consumers are price sensitive in grocery contexts, the salience of this extra cost might conflict with or deter the effects of bringing one's own bag (e.g. H5).

In addition, our hypothesis is that the virtuous act of bringing one's bag licenses individuals to reward themselves with indulgent choices in other domains. This mechanism predicts that consumers should only seek these rewards if they can attribute the "virtuous act" to themselves. Thus we examine whether attributing the reason for bringing a bag to the store,

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<sup>6</sup> The comparison for a Hausman test is between a consistent estimator and an efficient estimator that may not be consistent. In our context, we expect the bag effects for households without children, so estimating the model on the subsample without baby product purchases will be consistent. Using all households will be an efficient estimator, but if the effects are not present for all households (such as those with children) then our estimates will not be consistent.

rather than the shopper, will indeed reduce the effects of bringing one's bag on indulgent purchases.

### ***Methods***

Participants engaged in this study via Amazon Mechanical Turk, and all completed all of the survey measures. The very brief nature of the survey, and non-specific description of indulgences rendered it difficult to include an explicit attention check query. As a proxy, we excluded the 38 participants who answered the primary dependent variable in less than 5 seconds after the scenario and question appeared on their screen. The final sample size consisted of  $n = 428$  individuals who indicated that they did not have dependents under the age of 18 as part of their household ( $M_{Age} = 36.1, 222F$ ).

Participants were randomly assigned to one of six conditions in a 3 (No Bag, Self Bag, Store Bag) X 2 (No Price, Price) between-subject design. All participants were asked to imagine that they were headed to the checkout counter of a store after doing their normal grocery shopping, and read one of the following three scenarios:

*No Bag:* The checkout person asks if you want paper or plastic bags. You say plastic, and then load your groceries on to the counter.

*Self Bag:* The checkout person asks if you want paper or plastic bags. You have brought your own reusable bags with you to the store, so you hand those over, and then load your groceries on to the counter.

*Store Bag:* This store's policy requires customers to bring their own bags, so you have brought reusable bags with you. You hand them over to the checkout person, and then load your groceries on to the counter.

Participants in the Price condition read the following: “You also look through the attractive array of chocolates and candy [**with prices ranging from 69 cents to \$4**] displayed near the register.” Participants in the No Price condition saw the same text with the bolded clause removed. All participants were then asked to indicate how likely they would be to buy one or more of the sweet options available on a scale from 1 [Definitely Would Not Buy] to 9 [Definitely Would Buy]. They additionally reported basic demographic and household shopping information.

## ***Results***

Examining the average willingness to purchase a sweet item at the checkout counter revealed no significant main effects of price ( $F(1,422) = 1.545, p = .215$ ) or of the bag conditions ( $F(2,422) = .324, p = .723$ ). However, as can be seen in Figure 3, there was a significant interaction of the two ( $F(2,422) = 4.694, p < .02$ )<sup>7</sup>.

To address our hypotheses directly, we can break these results down to their simple effects. First, it is useful to note that in the absence of price information, our results replicate the general findings of Studies 1 and 2 – willingness to purchase indulgences is significantly higher in the Self Bag condition ( $M = 4.17, SD = 2.364$ ) than in the No Bag condition ( $M = 3.34, SD$

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<sup>7</sup> This interaction remains significant when including individuals who responded in less than 5 seconds ( $F(2,465) = 3.316, p < .04$ ). Across this experiment, none of the non-significant results achieved significance in this unrestricted sample.

=2.389;  $p < .05$ )<sup>8</sup>. Given this, we can ask whether the presence of price information causes a reduction in the effects of bringing a bag. In the No Bag condition, the intent to purchase indulgences is not significantly different between the Price or No Price conditions ( $F(1,422) = .574, p = .449$ ). However, in the Self Bag condition, the presence of price information significantly decreases intent to purchase indulgences compared to No Price ( $F(1,422) = 10.413, p = .001$ ). Thus, in line with H5, we find that when costs are made highly salient in a situation that also focuses on payment (e.g. the checkout register), they eliminate the benefit of bringing one's own bag for indulgent purchases. Indeed, comparing No Bag and Self Bag in the Price condition shows a marginal trend suggesting that when prices are salient, choosing to bring one's own bag might decrease indulgent purchases ( $p = .076$ ).

These results provide evidence that high salience of costs at the time of purchase could indeed interrupt the impact of bringing one's own bag, and potentially even reverse it. However, this experiment operationalized the saliency of price by varying its presence or absence. Such a manipulation is more extreme than a true shopping context in which all prices are always accessible, though they may not be attended to. As in Study 2, we can leverage our empirical data to refine and strengthen the experimental results. As noted earlier, in Table 4's grocery store estimates we see that for organic foods, there is a significant interaction effect between price and bringing a bag. Beyond the main effect that higher premiums for organic items lead to fewer organic purchases, we find that a high markup also reduces the effect of bringing one's bag confirming that price appears to actively compete with, or reduce, our effects but does not necessarily prevent them from occurring.

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<sup>8</sup> This effect is reduced to a marginal trend in the unrestricted version of the sample ( $p = .087$ ).

Unlike organic foods, which can be compared directly to conventionally produced substitute items, we cannot look at item-level tradeoffs for indulgent foods. Put another way, it doesn't make sense to assess the relationship between price and bringing one's bag by comparing candy bars to "no candy bars". Thus to use the empirical data, we compared ice cream and yogurt, which are similar food (milk-based) categories, but are differentiated along the utilitarian/indulgent dimension. To verify that people perceive ice cream as much more indulgent than yogurt, we examined data from a separate sample of 163 people from an online survey ( $M_{Age} = 28.88$ , 53 F) who rated several common grocery store foods on a 7-point indulgence scale (see Methods). Yogurt was rated below the midpoint of the scale ( $M = 3.35$ ,  $SD = 1.566$ ), and was perceived to be significantly less indulgent than ice cream within-subject ( $M = 6.43$ ,  $SD = .975$ ;  $F(1,162) = 440.98$ ,  $p < .001$ , repeated measures ANOVA). We were unable to generate any other category pairs that both had highly similar ingredients and were strongly differentiated on the indulgent dimension, and so we only performed the analysis for these two categories.

Within the store loyalty card data, we again used a category price index calculated at the daily level based on the weighted per-volume transaction prices for each of these categories. We ran regressions similar to equation (2), but considered whether the transaction had a product in the focal category (ice-cream or yogurt) as the dependent variable. We included the time since the last purchase in the category as an additional control variable. We also included price, and price interacted with the bag dummy, as two further explanatory variables of interest. Results from the separate regressions (also broken down by with/without children) are shown in Table 6.

Insert Table 6 About Here

In line with our experimental results, the positive effect of a bag exists *only* for the ice cream, and again it appears to be the households *without* baby purchases that drive the effect. Furthermore, the significant negative coefficient on the interaction between price and bringing a bag suggests that as prices of indulgences increase, the effects of bringing a bag on indulgent purchases decrease (H5). The lack of an effect in the yogurt category provides a placebo test and serves to further support our assertion that the set of control variables appropriately addresses unobserved factors and shopping basket size. Overall, such findings indicate that the increased motivation to seek out indulgences can be overridden by competing factors such as price and the presence of dependents.

To compare the relative sizes of the price interaction effects, we can compare elasticities calculated from the organic transaction-item-level regression with that in the ice-cream analysis. The price elasticity, at the average, for an item purchased being organic is equal to the estimated price difference coefficient multiplied by the ratio of average values for whether an item is organic to the price of organic items. This is  $-0.0081 \times 3.467/0.026 = -1.080$  for the organic item, which means that a 1% increase in the price of organic items (assuming no price change for non-organic items) makes a consumer's probability of purchasing the organic version decline by 1.08%. We find that the elasticity increases in magnitude to -1.427 if the consumer brought a bag, although the net effect of the bag is still to increase organic purchases.

The analogous calculation for the ice-cream results is that the price elasticity is  $-0.140 \times 3.812/0.0904 = -0.59\%$ . The elasticity is smaller in magnitude than in the case of organic items. However, we also see that the effect of the bag increases the elasticity to -2.374. This means that although price elasticities are lower in the indulgent ice-cream category than for organic items, the bag effect that we identify is more strongly influenced by price in the case of indulgences.

Moving beyond price, our experiment also tests the effects of attributing reusable bags to the store's policy, as opposed to the shopper's own agency. Figure 3 illustrates the marginal trend towards overall differences between the three types of bag conditions when no price information was given ( $F(2,422) = 2.446, p = .088$ ). Participants in the Self Bag group were significantly more willing to purchase indulgences than those in the No Bag group, as discussed above ( $p < .05$ ), but there was no significant difference between the Store Bag group and No Bag group ( $p = .427$ ). Interestingly, a similar pattern is found across the different bag conditions in the Price groups ( $F(2,422) = 2.585, p = .077$ ) though the directions of the effects are different. Specifically, the marginal decrease in willingness to purchase for the Self Bag versus No Bag groups is not present when comparing the Store Bag to the Self Bag condition ( $p = .757$ ). Summarizing these findings, bringing one's own bag only impacts the likelihood of purchasing indulgences if the consumers can attribute that action to themselves. As such, it suggests that our observed effects are indeed likely to arise from a licensing-type mechanism (H3B).

#### **Study 4: Choice Attribution and the Separability of Organic and Indulgent Effects**

The previous study demonstrated the importance of attribution for only indulgent products. Here we compare the relative willingness to purchase for both indulgent and organic foods when the choice to bring one's own bags is either attributed to the self, or to the store, to examine whether the effects on these two categories are separable (H3A & B). In particular, we predict that there should be no differences in the intent to purchase organic items between attribution conditions, given our assumptions about a priming mechanism. In contrast, we

predict a decrease in the relative desire to purchase indulgent items when the presence of the bags is attributed to the store, replicating Study 3.

### ***Methods***

Participants engaged in this study via Amazon Mechanical Turk. One individual who did not complete the survey was excluded from analysis. As a check for attention, at the end of the survey, participants were asked to enter the name of one grocery item that they had rated during the survey. All participants successfully answered the attention check.

Given that this study involved comparing purchase likelihoods for several specific products within-subject (see below), participants were asked to list “dietary preferences (e.g. vegetarian) or restrictions (e.g. gluten-free, lactose intolerant) which influence the items that you buy when you shop.” This allowed us to prevent spurious results due to unobserved differences in food restrictions across conditions. Based on those responses, eighteen individuals who indicated constraints/considerations that interacted with the specific grocery items in the study were excluded (Appendix W2), resulting in a sample size of  $n = 51$  individuals who indicated that they did not have dependents under the age of 18 as part of their household ( $M_{Age} = 29.9$ , 15F).

Participants were once again asked to imagine themselves engaging in the process of shopping in a grocery store, in a scenario similar to Study 2. In the “Store” attribution scenario they were told to imagine the following: “Because this store is requiring people to bring their own bags, you have brought your own reusable bags with you.” In the “Self” attribution scenario, they read “You have brought your own grocery bags with you”.

Participants were asked to imagine that while in the store, they viewed nine specific products. Three items from each of the following (a priori defined) categories were presented simultaneously. “Baseline” products consisted of chicken, canned soup, and lettuce. “Organic” products were organic milk, sustainably farmed organic apples, and cage-free organic eggs. “Indulgent” products were a candy bar, potato chips, and ice cream. The names of the nine products were shown together on the same page listed in a random order without the explicit category labels. Participants then rated their willingness-to-purchase these items from on a scale from 1 [Definitely Would Not Buy] to 7 [Definitely Would Buy].

Following this, participants viewed the following description of an indulgent product: *“An ‘indulgent’ product is a treat, or a kind of luxury. Indulgences are pleasurable items that reflect more about what you want than what you need.”* They then rated each product on a scale from 1 [Not At All Indulgent] to 7 [Very Indulgent]. Finally, participants indicated basic demographic and household shopping information.

## ***Results***

Examining the average perceived indulgence ratings for the items of the baseline, organic, and indulgent categories revealed no between-subjects effect of the attribution of bringing bags ( $F(1,49)=.101$ ;  $p=.752$ , Figure 4A), nor a significant interaction between attribution and category ( $F(2,98)=1.730$ ;  $p=.183$ ). Thus participants across the two conditions had similar perceptions of how indulgent the different foods were. As expected, there were significant differences among the three categories of foodstuffs within-subject ( $F(2,98)=386.9$ ;  $p<.001$ ). Direct contrasts showed that organic foods were considered somewhat more indulgent more than the baseline items ( $p<.005$ ). Indulgent products were rated much higher on this scale than either of the other

categories, and were considered significantly more indulgent than organic ( $p < .001$ ) and “baseline” products ( $p < .001$ ).

Insert Figure 4 about here

We used the “baseline” category of commonly purchased foods to give us a common reference point for willingness to purchase groceries. Thus, to see whether the effects of the bags on organic and indulgent purchases could be separated merely by changing the attribution for bringing the bags, we compared results for the indulgent and organic items to the to the baseline ones, calculating a difference measure. In turn, we examined whether a Store vs. Self attribution might influence willingness to purchase for indulgent and organic items (Figure 4B). Baseline products were selected as items that are frequent weekly grocery purchases. Aligning with this, participants in both attribution conditions were more willing to purchase the baseline category items than either organic or indulgent items. Thus the indulgent and organic category scores minus the reference willingness to purchase for the baseline category are negative.

Participants in the Self group were more willing to purchase indulgent foods, compared to baseline ( $M_{\text{Self}} = -1.04$ ,  $SD = 1.24$ ), than participants in the Store group ( $M_{\text{Store}} = -1.96$ ,  $SD = 1.64$ ;  $F(1,49) = 4.891$ ,  $p < .05$ ). However, the same Store participants who showed a relative attenuation of their indulgent purchases showed no significant difference from Self participants for organic purchases ( $M_{\text{Store}} = -1.00$ ,  $SD = 1.91$ ;  $M_{\text{Self}} = -1.51$ ,  $SD = 1.55$ ;  $F(1,49) = 1.048$ ,  $p = .311$ ). Note that the interaction between these two effects was significant ( $F(1,49) = 5.933$ ,  $p < .02$ ), demonstrating that the effects of attribution were indeed distinct for indulgent and

organic categories<sup>9</sup>. Integrating these results with the findings in the previous studies supports H3A&B, showing that bringing one's bags can influence both organic and indulgent purchases through separable pathways.

### **General Discussion**

Efforts to combat climate change and address environmental issues have gained prominence across the United States and on the global stage. One domain of these efforts has been in curbing the use of plastic grocery bags, by encouraging the use of one's own shopping bags. Here we study some of the effects of adopting this behavior on shopping patterns. We find that bringing bags can encourage purchases of similarly environmentally friendly items. We also find that this action can spur increased purchases of high fat, high sugar and/or high salt indulgent foods such as desserts, candy, and snack chips. However, shoppers only seem to “treat themselves” to such indulgences when they can comfortably take credit for having brought their own bags – attributing the bags to store policy reduces their influence. In addition, effects on both indulgent and organic products can be crowded out or complicated when shoppers' purchasing priorities are dominated by needs and wants of others, such as young dependents. The effect sizes also depend on price – increasing the salience of price (by increasing attention to it, or by increasing prices) attenuates the likelihood of making these types of purchases.

The increase in purchase of “green” or organic foods when shoppers bring their own bags is notable in that it is observed in empirical tests of repeat transactions across the same

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<sup>9</sup> Conducting these analyses on a sample that included the 18 individuals with dietary restrictions yielded results that followed a similar pattern, but did not reach significance in the interaction between purchase category and attribution ( $F(1,67) = 2.351, p = .130$ ), or in the simple effects contrast between willingness to purchase indulgences for Store vs. Self attribution ( $F(1,67)=2.697; p = .105$ ).

households. This suggests that our results are not simply due to some shoppers being more green or having a higher tendency to buy organic than others. Given the degree to which individuals identify organic foods as both morally virtuous (Mazar and Zhong 2010; Eskine 2013) and environmentally beneficial (Yiridoe et al. 2005; Hughner et al. 2007; Shafie and Rennie, 2012), we would expect this finding to extend to environmentally friendly products domains outside food, such as cleaning supplies or paper products. However, the degree of generalization would depend strongly on whether the price premium between the organic and conventional options was similar to that found for food, given the effects seen in Study 3.

The direction of the organic foods finding might nominally appear to be an intuitive effect. Less obvious is that bringing a bag is accompanied by a rise in indulgent purchases. Previous research on the licensing effect demonstrated that making a virtuous choice in one domain allowed individuals to indulge when faced with their next choice (Khan and Dhar 2006). There are several reasons why the act of bringing a bag is a virtue, in terms of the environmental benefits, potential social approval of the action, and even the positive reinforcement provided by the stores themselves, making this a viable mechanism for the effects observed here.

It is interesting to note that in Study 4, organic products were also considered somewhat more indulgent than conventional products (though by a significantly lesser amount). Thus it is possible that part of the increase in organic choices could also be due to licensing. While we cannot rule this out directly, the findings in Study 4 also suggest that the organic effects of bringing a bag are not influenced by whether that choice is attributed to the consumers themselves or to a policy of the store. Since self-attribution for the virtuous action is a central element of licensing (Khan and Dhar 2006), it is much less likely that this mechanism underlies the changes in buying organic.

Notably our findings extend our theoretical as well as practical understanding of the scope in which licensing might operate. In previous studies, the decisions being made were entirely unrelated, and participants were offered specific forced-choice tradeoffs between virtues and vices. We show that effects consistent with licensing can operate in an externally valid context, where the decisions made can be orthogonal, but are still consciously related to the same overall shopping event.

One of our central hypotheses is that the increases in organic and indulgent purchases are based on separable mechanisms. After the first virtuous action of bringing reusable bags, we find that participants can increase indulgent choices regardless of, or in addition to, making other virtuous choices. Indeed, while the analyses from in Study 1 (e.g. Table 5b) confirm that purchases of organic products do not significantly mediate the bags' effects, the number of organic purchases made does have a negative main effect on indulgences, possibly reflecting that people who generally purchase organic foods tend to purchase less indulgences. It is further important to recognize that organic foods are often selected for health-conscious reasons (e.g. Yiridoe et al. 2005) in addition to environmental ones, and that there may be other sources of individual differences based on socio-economic status that are not captured in this data contribute to purchasing motivations (or lack thereof). Thus it will be necessary for future studies to examine this conflict more directly, and to understand whether such goals, including health concerns, overwhelm one or both of the effects of bringing one's bags.

Though the increases in purchases of organic and indulgent foods did not cancel each other out in our findings, a larger question is whether our results apply equally across different categories of consumers. Our proposed mechanisms both act directly on an individual's thoughts and preferences, but many consumers are making purchases with others in mind. In particular,

shoppers with young dependents may have dominant criteria, goals, or demands that redirect their choices (Thompson and Kidwell 1998; Mangleburg 1990; Hill and Lynchehaun, 2002; Prasad et al., 2008), including consideration of the children's own preferences (Marshall et al. 2007; Martensen and Gronholdt 2008). Our results generally suggest mechanisms that act on the consumer's personal goals or self-perceptions, and as Study 2 demonstrates in the case of consumers shopping for households that include dependents, they may not hold when more importance is placed on other's wants and needs.

A second potential competing factor, or barrier to the expression of our effects, arises from the salience of price. In Study 3, providing individuals with a range of price information appeared to eliminate or even reverse the effect of the bag manipulation in the "Self" condition. One explanation for this result could be that high salience of prices generally evokes goals related to thriftiness or budgeting. In addition, given that the study's scenario takes place at the cash register, after the regular grocery shopping had been mentally accounted for, the impact of considering additional price may have been particularly high. We acknowledge that these factors may not sufficiently predict why high salience of price should cause shoppers who brought their own bags to actively *decrease* consideration of indulgent purchases. In addition, this manipulation somewhat blunt, since price information is always available in a normal store context. A more nuanced picture arises from Study 3's empirical data analysis in which purchasing of either organic options or indulgences was sensitive to the *level* of price, with higher prices reducing the effects of bringing a bag. Thus awareness of costs may simply reduce consumer surplus by increasing a pain-of-paying (e.g. Prelec and Loewenstein, 1998, Thomas et al. 2011). Fundamentally we do show that shoppers with their own bags are not price insensitive; they are much more willing to treat themselves when barriers to doing so are low.

## Managerial Implications

The natural question evoked by these findings is “What should grocery retailers do?” The monetary implications of our findings are not negligible. In our grocery store data, the average premium paid for organic foods across categories (weighted by the number of purchases of items and calculated relative to the alternative products in each subclass) is 14.8%. Since bringing a bag increases the probability of a purchased item being organic by 0.24%, this implies a 0.0355% increase in shopping basket expenditure.

In addition to the effect on organic purchases, we find that consumers are more likely to purchase indulgent items, which can also have high margins. On the average shopping trip, consumers spend \$45.12. Under the reasonable assumption that indulgent items are additional, unplanned purchases (rather than consumers deciding to purchase such items in lieu of other products), the 1.24% increase in the probability of purchasing a indulgent item, and the additional conservative assumption that the indulgent items cost on average \$2.00, this implies a 0.0550% increase in shopping basket expenditure.

The combined effect leads to a 0.0905% increase in shopping basket expenditures on a purchase occasion due to the causal impacts of the bag. While this number does not appear large, the effects can be substantial given the size of the \$550 billion grocery industry. With these figures, we can compute the revenue gains (and profit gains assuming a common proportional markup) from policies that would increase the probability that consumers bring bags. Under a hypothetical policy that would double the share of transactions with bags from 1.6% to 3.2%, there would be a revenue increase of \$7.96 million dollars. Some policies could of course lead to

much larger increases in the use of reusable bags, but making revenue predictions for such policies would extrapolate well beyond the support of the data. Once bringing a bag becomes more habitual either due to external regulation, or due to shoppers own repeat experiences, the efficacy of one's own bag as a signal may decrease and we may see the effects decline in magnitude.

Currently, many stores encourage the practice of using reusable bags by providing such bags for purchase, giving bags away, or offering minor financial credits, all of which encourage the consumer to make an active choice to "be green". In contrast, policy changes requiring the use of ones own bags generally take the form of punishment by charging for the use of bags form the store. Our results strongly suggest that the influence of bringing one's bags on indulgent purchases is sensitive to which of these strategies is adopted. In particular, Study 4 finds that if consumers are aware that they have brought grocery bags because they have to, their desire to purchase indulgences weakens. The psychological effects of bringing reusable bags are likely to be strongest in situations where their use is not mandatory or exogenously determined. Thus policies that to encourage bag use that emphasize the environmental and/or social benefits of the bags, but also emphasize the shopper's agency in choosing to use them are likely to have the strongest impact on behavior in both organic and indulgent domains.

These shifts in behavior also suggest ways of encouraging green decisions as well as ones that could have health benefits. In stores where adoption of reusable bags is growing, our results suggest that promoting offerings like organic, or sustainably farmed, fresh foods as indulgences should increase their purchase rates. Furthermore, they also suggest that consumers might be more willing to consider environmentally friendly brands of indulgent products if emphasis is placed on their indulgent qualities beyond their green virtues.

Our effects are relevant for several additional factors of significant interest to managers. One example is store layout. Hui, Bradlow and Fader (2009) find that licensing-type effects significantly influence grocery store choices in a way that actually changes shopping paths. Since many grocery stores have their fresh produce sections near the entryway, this could entice individuals primed by their own bags to increase organic or healthful choices initially, which might then additionally increase consideration of subsequently encountered indulgent choices.

Another location-based element of interest would be the checkout register. When shoppers reach this point, the presence (or absence) of their own bags is made salient again. In some cases, reusable bags are available for purchase, making the consumer's "virtuous action" much more obvious if they choose to buy bags. At this time, shoppers are simultaneously exposed to relatively low cost "impulse" or unplanned items. Our results from Study 3 show that bringing a bag does influence indulgent purchases at this location, and thus predict that consumers might be open to considering relatively inexpensive environmentally positive products at this time, including non-food items.

### **Concluding Remarks**

Here we demonstrate how taking an environmental action can influence subsequent consumer behavior in actual grocery shopping behavior and in controlled experimental studies, providing results of managerial importance. We establish causality using repeated transactions across households in our empirical analysis, and experimental studies that include open-ended responses. Both types of studies suggest factors which may moderate or override the effects of bringing one's own shopping bags, specifically the presence of children in the consumer's

household and the increased salience or magnitude of price. We find that price salience entirely overrides the effects of bags in the experimental studies, but that in the more sophisticated (and attentionally demanding) grocery environment, it mitigates indulgent purchases without overwhelming or eliminating them. Taking these results as a whole, it seems that shoppers indulge themselves most when situational factors help them feel more deserving and less guilty about doing so.

This paper provides significant contributions to the literature by demonstrating real world downstream priming and licensing effects of a choice that can arise from social, moral and/or political motivations. However, the licensing elements of these results are highly dependent on that motivation arising from the shoppers making a choice for themselves, rather than being directed into it by others. We also shows that these effects can occur concurrently in a complex choice environment in which several other factors are also at play. These findings have important implications for practice, in terms of the product offerings that might be provided, the positioning of such offerings in the store, and any environmental promotional activity in which stores might engage.

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**TABLE 1: Category-level summary statistics used to create the price indices**

Variable	Mean	Std. Dev.	N
Organic price (\$)	3.467	2.350	32,917
Non-organic price (\$)	4.960	19.266	407,134
$\Delta p$ (\$)	0.302	1.494	30,056

**TABLE 2: Transaction-item-level summary statistics, if category has organic and non-organic items**

Variable	Mean	Std. Dev.	N
Organic	0.077	0.266	2,274,865
Txn has bag	0.026	0.161	2,274,865
$\Delta p$ (\$)	0.433	1.011	2,274,865

**TABLE 3: Transaction-level summary statistics**

Variable	Mean	Std. Dev.	N
Expenditure (gross, \$)	\$45.12	\$50.79	936,232
Number of items	13.19	14.12	936,232
Days since last transaction	4.066	8.776	930,317
Txn has bag	0.016	0.124	936,232
Txn has organic	0.144	0.352	936,232
Txn has baby item	0.056	0.231	936,232
Txn has candy	0.050	0.217	936,232
Txn has cookies	0.016	0.125	936,232
Txn has chips	0.084	0.278	936,232
Txn has ice-cream	0.028	0.164	936,232
Txn has any of these indulgent items (candy, cookies, chips, ice-cream)	0.178	0.382	936,232

**TABLE 4:** Transaction-item-level regressions for organic purchases

<b>DV: Item is organic</b>	<b>All</b>	<b>Without children</b>	<b>With Children</b>
Bag	0.0024* (0.0013)	0.0034* (0.0015)	0.0018 (0.0026)
$\Delta$ price	-0.0083*** (0.0002)	-0.0081*** (0.0003)	-0.0086*** (0.0004)
Bag x $\Delta$ price	-0.0006 (0.0011)	-0.0026* (0.0013)	0.0025 (0.0023)
N	2,274,865	1,177,511	803,129
R-squared	0.5772	0.5556	0.5952

Standard Errors in Parentheses. . \*\*\* 0.1% significance, \*\* 1% significance, \* 5% significance. Regressions include household FE and dummies for day and time-of-day.

**TABLE 5: Transaction-level regressions for indulgent purchases**

Table 5a: Not including the number of organic items as a potential mediator

DV: Txn has indulgent	All	Without children	With Children
Bag	0.0124*** (0.0031)	0.0157** (0.0050)	0.0013 (0.0076)
Days since last txn	0.0031*** (0.0009)	0.0045*** (0.0011)	0.0004 (0.0017)
Days since last txn squared	-0.0003* (0.0001)	-0.0003* (0.0001)	-0.0001 (0.0001)
N	930,317	535,088	272,723
R-squared	0.1613	0.1658	0.1585

Table 5b: Including the number of organic items as a potential mediator

DV: Txn has indulgent	All	Without children	With Children
Bag	0.0138*** (0.0041)	0.0190*** (0.0052)	0.0020 (0.0084)
# organic	-0.0035*** (0.0006)	-0.0019*** (0.0011)	-0.0056*** (0.0009)
Bag x # organic	-0.0017 (0.0029)	-0.0069 (0.0043)	0.0005 (0.0043)
Days since last txn	0.0032*** (0.0009)	0.0045*** (0.0011)	0.0006 (0.0017)
Days since last txn squared	-0.0003* (0.0001)	-0.0003* (0.0001)	-0.0001 (0.0001)
N	930,317	535,088	272,723
R-squared	0.1614	0.1658	0.1586

Standard Errors in Parentheses. \*\*\* 0.1% significance, \*\* 1% significance, \* 5% significance. Regressions include household FE and dummies for day, time-of-day, and number of non-indulgent items.

**TABLE 6**

## Ice-cream

<b>DV: Txn has ice cream</b>	<b>All</b>	<b>Without children</b>	<b>With Children</b>
Bag	0.1414 * (0.0616)	0.1732 * (0.0812)	0.0357 (0.1214)
price	-0.0108*** (0.0002)	-0.0140*** (0.0030)	-0.0031*** (0.0041)
Bag x price	-0.0343* (0.0160)	-0.0423* (0.0212)	0.0087 (0.0317)
N	798,762	448,017	240,343
R-squared	0.1225	0.1258	0.1218

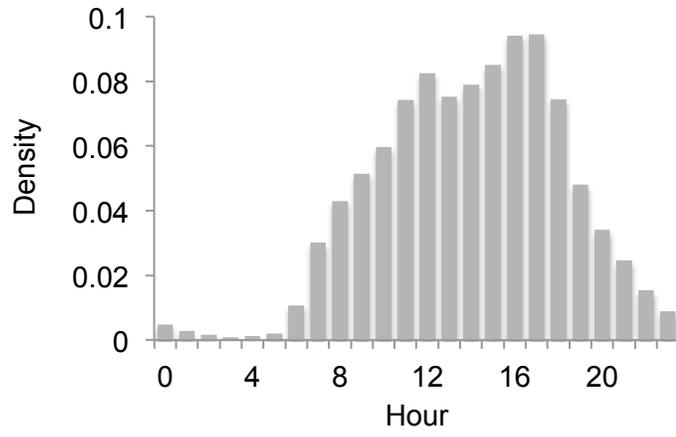
## Yogurt

<b>DV: Txn has yogurt</b>	<b>All</b>	<b>Without children</b>	<b>With Children</b>
Bag	0.0326 (0.0262)	0.0150 (0.0341)	0.0018 (0.0026)
$\Delta$ price	-0.0210*** (0.0031)	-0.0340*** (0.0041)	-0.0086*** (0.0004)
Bag x $\Delta$ price	-0.0207 (0.0208)	-0.0078 (0.0269)	0.0025 (0.0023)
N	764,288	419,371	803,129
R-squared	0.5772	0.2659	0.5952

Standard Errors in Parentheses. \*\*\* 0.1% significance, \*\* 1% significance, \* 5% significance. Regressions include household FE, time since last transaction and its quadratic, time since last purchase in the category, and dummies for day, time-of-day, and number of non-indulgent items.

**FIGURE 1**

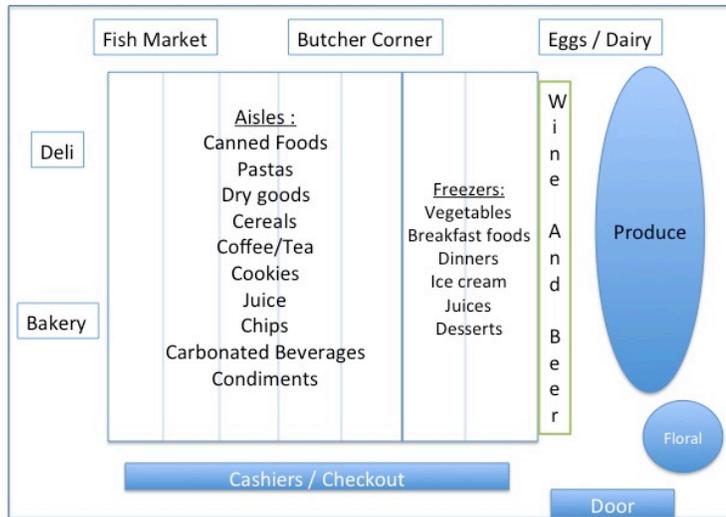
Transaction Purchase Times (Hour 0 = the first hour of the day.)



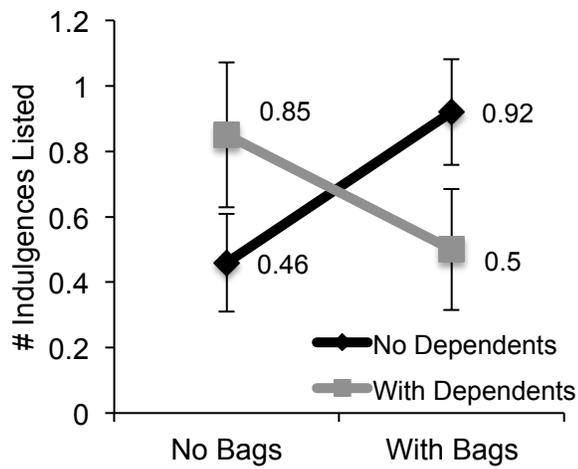
**FIGURE 2**

Study 2 design and results A) Grocery store layout viewed by all participants. B) Number of indulgent items listed across conditions. Reference bars reflect S.E.

A.

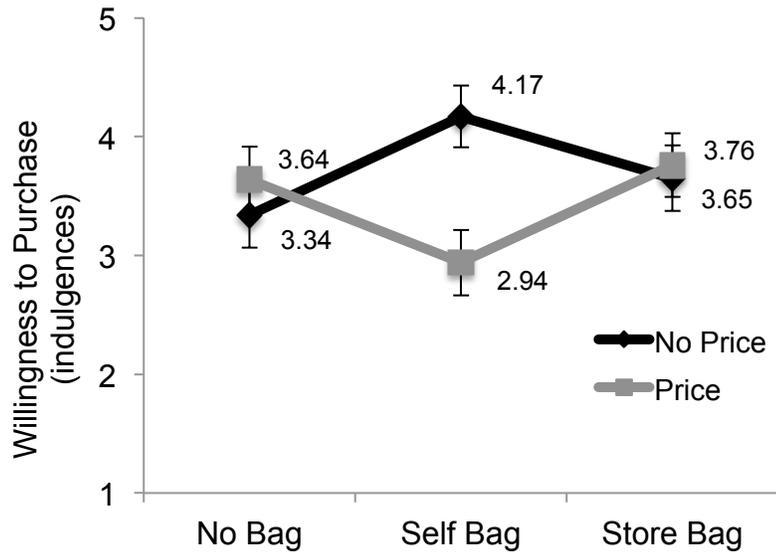


B.



**FIGURE 3**

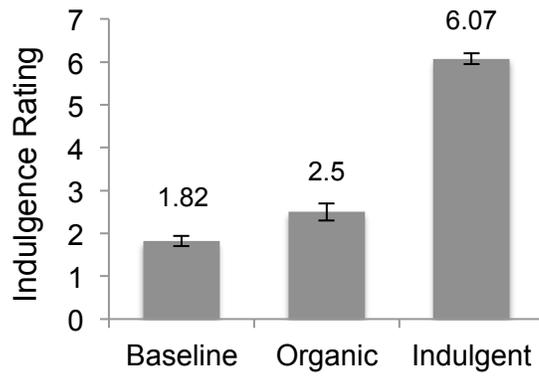
Study 3, Willingness to purchase sweet “treats” at the checkout counter, shown by bag condition and availability of price information.



**FIGURE 4**

Study 4 results. A) Indulgence ratings for the 3 grocery categories. B) Willingness-to-purchase for indulgent and organic foods (with baseline subtracted), shown by attribution condition. Reference bars reflect S.E.

A.



B.



## APPENDIX W1

Complete list of “baby categories” used to define households with young dependents in the empirical analysis portion of Study 2.

APPAREL BABY ACCESSORIES	MAINSTREAM THIRD FOODS BABY FO
BABY ACCESSORIES, CUPS	MAINSTREAM THIRD FOODS BABY FOOD
BABY BATH INFANT TOILETRIES	MAINSTREAM TODDLER FOOD
BABY LOTION INFANT TOILETRIES	MAINSTREAM TODDLER JUICE
BABY LOTION/CREAM INFANT	MAINSTREAM TRAINING PANTS
TOILETRIES	DISPOSABLE
BABY OIL INFANT TOILETRIES	MAINSTREAM YOUTH PANTS
BABY POWDER INFANT TOILETRIES	DISPOSABLE
BABY SHAMPOO INFANT TOILETRIES	MANUFACTURER/WIC INFANT FORMULA
BABY WIPES MAINSTREAM	MEDIUM (24-33LB) DISPOSIBLE SWIM
BABY WIPES SUPER PREMIUM	PANTS
BABY WIPES VALUE/ECONOMOY	MISC
BABY/YOUTH PREMIUM WIPES	MISC BABY/YOUTH WIPES
BEDWETTERS (HUGGIES GOODNITES,	MISC DISPOSABLE DIAPERS
SFWY EAS	MISCELLANEOUS CLOTHING BABY
BIBS BABY CLOTHING BABY CARE	CARE
BOWLS, PLATES & SETS FEEDING	MISCELLANEOUS FEEDING
ACCESSORIE	ACCESSORIES BABY
COWS MILK BASED INFANT FORMULA	MISCELLANEOUS NURSING SUPPLIES
CUPS FEEDING ACCESSORIES BABY	MISCELLANEOUS TOILETRIES
CARE	NURSING PADS NURSING SUPPLIES
DIAPER ACCESSORIES	NURSING SUPPLIES
DIAPER RASH INFANT TOILETRIES	ORAL ELECTROLYTES/WATER
DIAPER RASH/PROTECTIVE OINTMENTS	PACIFIER ACCESSORIES BABY CARE
DISPOSABLE BOTTLES NURSING	PACIFIERS
SUPPLIES	PACIFIERS BABY CARE
FEEDING ACCESSORIES BABY CARE	PREMIUM DISPOSABLE DIAPERS
FIRST FOODS BABY FOOD	PREMIUM INFANT BABY JUICE
FOOD SUPPLEMENTS (PEDIASURE)	PREMIUM INFANT CEREAL BABY FOOD
INFANT BABY JUICE	PREMIUM SECOND FOODS BABY FOOD
INFANT BAKERY	PREMIUM THIRD FOODS BABY FOOD
INFANT CEREAL BABY FOOD	REFILLABLE BOTTLES NURSING SUP
INFANT SOCKS CLOTHING BABY CARE	REFILLABLE BOTTLES NURSING
KIDS/TODDLERS INFANT TOILETRIES	SUPPLIES
LARGE (34+LB) DISPOSIBLE SWIM PANTS	SAFETY BABY ACCESSORIES
MAINSTREAM BABY/YOUTH WIPES	SECOND FOODS BABY FOOD
MAINSTREAM DISPOSABLE DAIPERS	SMALL (16-26LB) DISPOSIBLE SWIM
MAINSTREAM FIRST FOODS BABY FOOD	PANTS
MAINSTREAM INFANT BABY JUICE	SOLID TEETHERS BABY CARE
MAINSTREAM INFANT CEREAL	SOLUTION FOR SPECIAL NEEDS INFANT
MAINSTREAM SECOND FOODS BABY	TOILE
FOOD	SOY BASED INFANT FORMULA

SPECIALTY INFANT FORMULA  
SUPER PREMIUM DISPOSABLE DIAPE  
SUPER PREMIUM DISPOSABLE DIAPERS  
SWIM PANTS (HUGGIES SWIMMERS)  
TEETHERS  
THIRD FOODS BABY FOOD  
TODDLER BAKERY  
TODDLER CEREAL  
TODDLER FOOD  
TODDLER JUICE  
TOYS BABY  
TRAINING PANTS DISPOSABLE  
UA-BABY ACCESSORIES  
UA-BABY FOOD  
UA-BABY/YOUTH WIPES  
UA-CLOTH DIAPERS/LINERS  
UA-CLOTHING BABY CARE  
UA-DELETE  
UA-DIAPER ACCESSORIES BABY CARE  
UA-DISPOSABLE DIAPERS  
UA-DISPOSABLE PANTS  
UA-DISPOSABLE PANTS (TRAINING  
PANTS/YOU  
UA-DISPOSABLE SWIM PANTS DAIPERS  
UA-DISPOSABLE SWIM PANTS DIAPERS  
UA-FEEDING ACCESSORIES BABY CARE  
UA-FIRST FOODS BABY FOOD

UA-INFANT BABY JUICE  
UA-INFANT BAKERY BABY FOOD  
UA-INFANT CEREAL BABY FOOD  
UA-INFANT FORMULA  
UA-INFANT TOILETRIES  
UA-MISCELLANEOUS BABY CARE  
UA-NURSING SUPPLIES  
UA-PACIFIERS AND ACCESSORIES BABY  
CARE  
UA-SAFETY BABY CARE  
UA-SECOND FOODS BABY FOOD  
UA-TEETHERS BABY CARE  
UA-THIRD FOODS BABY FOOD  
UA-TODDLER BAKERY BABY FOOD  
UA-TODDLER CEREAL BABY FOOD  
UA-TODDLER FOOD  
UA-TODDLER JUICE BABY FOOD  
UA-TOYS BABY  
UTENSILS FEEDING ACCESSORIES BABY  
CARE  
VALUE/ECONOMY BABY/YOUTH WIPES  
VALUE/ECONOMY DISPOSABLE DIAPE  
VALUE/ECONOMY DISPOSABLE DIAPERS  
VALUE/ECONOMY TRAINING PANTS  
DIAPOSABLE  
YOUTH WIPES

## APPENDIX W2

In experimental study 4, participants listed dietary preferences, which were used to classify/restrict the data. Responses were excluded from analysis if they directly interacted with, or prevented consideration, of the nine food items in the study. Reasons indicated are listed only once below, but may have appeared in the data multiple times.

Included in Analysis	Excluded from Analysis
None / No / etc.	Gluten-free
“I like fish, I like bison but ... I only buy stuff on sale...”	Vegan
“Heart healthy”	Vegetarian
“Protein based”	No carbohydrates/ no sugar
“Allergic to nuts and fish”	Diabetic
	Pre-diabetic
	Low-calorie and low carbohydrate
	Lactose intolerant
	Pescatarian
	“... don’t eat a lot of meat”