A Dragging-Down Effect:

Consumer Decisions in Response to Unit-Price Increases

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Abstract (154 words)

Six studies, across a range of consumer purchase domains and manipulating unit-price increases in different forms, all found that consumers purchased fewer units of a product when a discount applied to a larger (vs. smaller) number of units. In each case, this purchasing pattern led consumers to purchase more units of the same item when they were sold for a higher per-unit price. Results show that consumers take the quantity at which the unit price of a product increases as the quantity they choose to purchase, but they do so only if that quantity falls within a reasonable range relative to the consumer's purchasing preferences. Mediation analyses reveal that the perceived acceptability of a given quantity as a purchase quantity and additional transaction utility derived from taking full advantage of discounts explain the importance of this numeric cue in causing the observed pattern. Implications of the research for consumers, marketers, and policy-makers are discussed.

Keywords: purchase quantity, price perception, discounts, reference prices, anchors, numeric cues

Promotions and discounts are key tools that marketers use to vary pricing. These discounts are generally used to incentivize consumers to purchase more of their products. Discounts, such as coupons, commonly come with quantity limits, particularly in the case of large discounts. For example, the coupons offered by Costco typically have quantity limits presented next to the discounted price, such as “limit 4 each.” Coupons from other stores also come with fine-print limitation terms, such as “limit 1 per customer” or “limit of 4 like coupons in same shopping trip” (The Krazy Coupon Lady 2011). In cases of quantity-limited discounts, consumers can buy up to a certain number of units at the discounted price, but they will have to pay the regular price for additional units beyond that limit. Consequently, the unit price of a product increases as the number of items purchased increases beyond the quantity limit. However, quantity-limited discounts do not appear only when a discrete number of items can be purchased. For example, the United Kingdom offers a Personal Savings Allowance in which taxpayers can earn up to £1,000 in savings income tax free (HM Treasury 2017). Beyond that amount, they pay the basic tax rate on their savings. In this case, we can consider £1,000 in savings income as the quantity limit. We consider quantity-limited discounts broadly in a range of contexts where consumers receive a discount that returns to a base level as the consumer purchases greater amounts.

Presumably, firms decide quantity limits carefully and expect that consumers will purchase more (or save more in the case of the UK tax exemption) when the limits are higher. However, we propose that this type of promotion might instead lead consumers to purchase fewer units when the limits are higher. This oversight could lead to mispredictions about the effect of a price promotion, such that a change intended to increase purchase quantity has the opposite effect. The paper aims to study the relationship between the quantity limit (i.e., the number of units available at a discounted price) and consumer purchase decisions.

We might reasonably expect price-sensitive consumers to purchase an equal or greater number of units of an identical product as the unit price of the product decreases.[1] This pattern should hold irrespective of whether a reduction in the base price of the product or a discount leads to the unit-price decrease. However, we find situations in which consumers purchase less when the seller provides more discounts. In this paper, we demonstrate this purchasing pattern across online, lab, and field studies that vary product type as well as the form of the price increase. We propose that people take the quantity available at a discount as a stopping point for purchasing, but only when that quantity falls within their reasonable range of preference for purchasing. This price-increase cue exerts particular strength as a stopping point because of its implications for transaction utility.

THEORETICAL BACKGROUND

Research in consumer behavior has explored psychological factors that influence consumers' purchase decisions in reaction to discounts (Cheng and Cryder 2018; Inman, Peter, and Raghubir 1997; Janiszewski and Cunha 2004; Shampanier, Mazar, and Ariely 2007; Sussman and Olivola 2011; Wansink, Kent, and Hoch 1998). When making purchase decisions, economic factors (e.g., costs and benefits) are not the only elements that influence choices. For example, consumers' perceptions of price depend on contextual factors such as the way price and cost are framed and the reference price consumers choose for a particular transaction (Rajendran and Tellis 1994). In some cases, additional product features or additional unattractive items in an

[1] This tendency would hold in most but not all cases. For example, Veblen goods and Giffen goods do not work this way, but they are beyond the scope of this paper.

otherwise attractive set can reduce the probability of purchasing the product or the set (Hsee 1998; Simonson, Carmon, and O'Curry 1994). Furthermore, consumers can derive pleasure from the act of purchasing if their actual price is lower than the expected price (Thaler 1985). Finally, consumers may anchor on random numeric cues presented in the shopping context when making purchasing decisions (Manning and Sprott, 2007; Wansink, Kent, and Hoch 1998). Research on the influence of numerical cues on decision-making, as well as the role of transaction utility in purchasing decisions, underlies our predictions about how consumers will react to promotions with quantity limits.

Discounts with Quantity Limits

Research has shown that numeric cues presented in price promotions can influence purchase-quantity decisions (Manning and Sprott 2007; Wansink, Kent, and Hoch 1998). These numeric cues include the quantity in multiple-unit prices, purchase-quantity limits, and suggestive selling. Prior research has examined situations in which these cues act as anchors (see Tversky and Kahneman 1974). For example, Wansink, Kent, and Hoch (1998) find that promotions can increase purchase quantities by acting as anchors. Consumers who were presented with high anchors in the form of high (vs. low) purchase-quantity limits purchased more units of product. Moreover, consumers purchased more units when the pricing was presented in multiple-unit prices than in single-unit prices (e.g., "6 cans for $3" vs. "1 can for 50c"). This pattern was specific to high-consumption products (Manning and Sprott 2007).

Although research on anchor-based promotions suggests that random numbers can influence purchase decisions, we propose that there is a qualification to that effect. An anchor-based account predicts that consumers will purchase more units as more units are available at a discounted price. This pattern would also be consistent with a basic reaction to prices, purchasing more when the available price is less. However, we propose that consumers will be more likely to take a numeric cue as an anchor if the number seems reasonable than unreasonable to them. This will lead to situations in which consumers may actually purchase fewer units when more are on sale. For example, consider a promotion in which either 1 or 3 units of a product are available on sale. If 1 unit is outside of a consumer's preference range and 3 units is within the range she considers reasonable, she would purchase more with a quantity limit of 1 unit than with a limit of 3 units, which cannot be explained by the traditional anchoring account.

In the anchoring literature, existing evidence about the effect of implausible or extreme anchors is mixed. From the anchoring-and-adjustment perspective, no matter how extreme or implausible a numerical anchor is, it can influence one's judgment of an uncertain value (e.g., Epley and Gilovich 2006; Jacowitz and Kahneman 1995). The selective accessibility model also supports the notion that extreme or implausible anchors can produce larger effects than plausible anchors (Mussweiler and Strack 1999; Strack, Bahnik, and Mussweiler, 2016; Strack and Mussweiler 1997). This model suggests that people adjust from the implausibly extreme values to the boundary of plausible ones, and they confirmatively test the hypothesis that the suitable answer is equal to the adjusted value. Thus, the implausible anchors produce effects at least as large as do plausible anchors, because the boundary of plausible values is the extreme of all possible answers. However, other evidence suggests that implausible anchors exert less influence than plausible ones (e.g., Wegener et al. 2001, 2010). Chapman and Johnson (1994) find that implausibly extreme anchors exert a diminishing anchoring effect. Furthermore, Wegener et al. (2010) find that implausibly extreme anchors can produce weaker effects than moderately extreme anchors and explain their finding from an attitude change perspective. Zhang, Hsee, and

Yu (2018) found that participants' evaluations of a fair compensation can be influenced by a reasonable anchor but not by an unreasonable anchor.

The current paper demonstrates a pattern that has similarities to prior work in anchoring, in which extreme anchors can have a weaker impact on decisions or judgments. However, the present work identifies a unique underlying psychological mechanism and specifies conditions under which an anchor is likely to have a weak influence or have no influence on a decision or judgment. Furthermore, we provide evidence that this differential reliance on numeric cues can lead to situations in which people purchase more units of a product when the per-unit price is higher (vs. lower).

While extreme anchors examined in prior anchoring literature have typically been far away from the non-extreme values (e.g., $48 vs. $13,660 per year for a guess of annual salary; 68 vs. 158,020 years old for a guess of age in Wegener et al. 2001), numeric cues in this work are close to each other in absolute value and are not likely to be considered numerically extreme (e.g., limit 1 vs. limit 3 in experiment 2; limit 2 vs. limit 6 in experiment 6). Instead, while the units separating an extreme vs. a non-extreme focal value in the current work may be small, the psychological distance is large. Specifically, whether or not a focal value is considered reasonable as a purchase quantity determines the extent to which a consumer will rely on it as an anchor or decision point. We propose that numeric cues that are incompatible with consumers' preferences are less likely to affect decisions, even if the values are not extreme, such as a limit of one versus three on a product for which a consumer would normally purchase about five. Thus, we build on existing literature on anchoring and promotions, proposing that quantity limits, taken by consumers as numeric cues, can affect consumers' purchase decisions and further develop theory underlying when these numeric cues will or will not be relied upon. Drawing from this theory, we arrive at a novel conclusion.

Quantity Limit as a Decision Point

We propose that the quantity limit of a discount is a numerical cue that influences subsequent decisions by acting as a decision point (e.g., Cheema and Soman 2008; Soman and Cheema 2011; Tsiros and Hardesty 2010; Wansink, Kent, and Hoch 1998; Zhang, Sussman, and Hsee 2018;). Cheema and Soman (2008) found that separating an aggregated quantity of food or money into smaller units indicated by a partition could reduce the quantity consumed. They reasoned that the partition introduced a small transaction cost that provided participants with a "decision point" at which they would pause to consider whether to continue consuming or to stop. Without such a decision point, consumers would be more likely to absentmindedly continue consumption. Rather than being limited to a partition, a variety of numeric cues could serve as decision points as well. For example, Zhang, Sussman, and Hsee (2018) found that debtholders in their study took the timing of a future interest-rate increase as a decision point for debt repayment. If people were able to repay their credit card debt in full before interest rates increased, they increased their monthly payments to avoid the higher interest rate.

Similarly, the point of a price increase in a quantity-limited price promotion (e.g., limit of 3 per person) can serve as a decision point, attracting attention and prompting consumers to consider whether to continue purchasing (e.g., Cheema and Soman, 2008). In contrast to prior research on decision points, we propose that the introduction of decision points does not always reduce consumption and in fact, decision points at low levels may actually increase consumption relative to those at higher levels. Consumers may take the quantity of discountable products as a cue when making purchase decisions, but only when that quantity seems like a reasonable purchase amount. During the phase of purchasing or consumption, consumers make a decision either to take that quantity limit as a stopping point (i.e., decide to stop) or to abandon it (i.e., decide to continue and ignore the cue), returning to their initial purchasing preference.

Although decision points have been discussed in the context of a partitioning framework (Cheema and Soman 2008), they may also share some properties with other numeric cues, such as anchors (e.g., Hsee, Dube, and Zhang 2008; Mussweiler and Strack 1999; Tversky and Kahneman 1974) or target values (i.e., goals; e.g., Heath, Larrick, and Wu 1999; Pope and Simonsohn 2011; Sackett et al. 2014). When a numeric quantity is treated as a goal, people will exert extra effort to meet or exceed the goal amount. Similarly, people are more likely to select goals for themselves that they believe are achievable, and they are more committed to reaching attainable (vs. unattainable) goals once they are set (Bandura 1977; Locke and Latham 2002; Soman and Cheema 2004).

Transaction Utility

Consumers are attentive to discounts because price promotions allow them to purchase the same goods at a lower cost. They derive additional utility from taking advantage of price discounts, termed transaction utility (Thaler 1985). Transaction utility is defined as the difference between consumers' expected price and the actual price. It can be thought of as the value consumers derive from the deal itself, which results from a two-stage process: consumers evaluate a potential transaction based on an internal reference price in the first stage, and then they decide whether to accept the transaction in the second stage. A variety of factors can influence the reference price consumers form in the first stage, for example, prior purchase experience (Janiszewski and Lichtenstein 1999), competitors' prices (Rajendran and Tellis 1994), purchase context (Kahn and Schmittlein 1992), framing of the deal (Darke and Chung 2005; Heath, Chatterjee, and France 1995), and store environment (Lynch and Ariely 2000). Based on the internal reference price, consumers judge the actual price and decide whether or how much to purchase. In our context, the full price of the product is likely to serve as the reference price.

Price promotions can influence consumers' perceived utility as well. For example, Chandon, Wansink and Laurent (2000) found that price promotions also provide consumers with hedonic benefits including value expression (the feeling of being smart and good shoppers), entertainment (fun to see and use promotions), and exploration (fulfilling consumers' needs for information). Other research has found that consumers can use the presence of a purchase limit as a source of information to evaluate the quality of a deal (Inman, Peter, and Raghubir 1997). A sales restriction such as "limit X per customer" can manipulate the perceived scarcity of a promotion, leading consumers to infer the price promotion is a "good value."

Consistent with prior research, we assume consumers derive transaction utility from applying coupons and discounts to their purchases. Additionally, we propose that the transaction utility is greatest when consumers purchase the maximum quantity offered at the discount; and therefore, it makes the option of buying exactly that quantity particularly salient and attractive.

CURRENT RESEARCH

In this research, we examine how a unit-price increase at a given purchase quantity influences consumers' purchase decisions. Specifically, we find situations in which consumers choose to purchase fewer units of a product when the product's unit price increases at a higher purchase quantity than when it increases at a lower purchase quantity.

For many products, consumers have an initial preference for how many they want to consume. Often, that preference is flexible and can be extended across a reasonable range, with a reasonable threshold that denotes the minimum quantity that is acceptable to consumers. In a pilot survey (N = 104), we found 79% of grocery shoppers make a shopping list when they go grocery shopping and, for most of the products they frequently purchase, 82% of the shoppers have an idea of how many of each product they would like to purchase. In our research we consider this initial idea of how much consumers believe they will purchase to be their "initial preference." This can also be considered as similar to a consumer's internal reference quantity. In our research, we examine how initial preferences influence subsequent consumption. For example, imagine John, who enjoys hanging out with friends at bars. When John goes to a bar with friends, he commonly orders five drinks over several hours, i.e., his initial preference. But he is also happy to consume as few as three drinks or as many as seven drinks. Any number outside of that range is either too few or too many drinks for him to really enjoy his time at the bar, and he would rather be home. Thus, his reasonable range for drinking at a bar is between three and seven drinks.

Suppose the bar is running a promotion in which each customer can get a discount for one drink at the bar. Because John will not enjoy consuming only one drink during his time at the bar, he would order more at the regular price. In this case, John would not take the quantity limits of one drink as his stopping point, because it is below his reasonable range. This choice can be compared to one that is made in the face of an unreasonable goal or anchor value that is often ignored. Instead, he would base the decision on his initial preference for drinks, largely ignoring the one-drink decision point, and be more likely to purchase five drinks.

In another situation, suppose the bar is running a promotion and the same discount for drinks is limited to three per person. In this case, the three-drink value would be salient because of the price increase. Furthermore, we would expect John to take this salient value (i.e., the three-drink quantity limit) as his decision point and stop consumption at this quantity because this quantity falls within his reasonable range of preference (i.e., three drinks are good enough for the night) and stopping at this quantity provides him the largest transaction utility (i.e., he is taking the full advantage of the discount). As a result, we predict a purchasing pattern in which John purchases fewer units of a product (three drinks vs. five drinks) when more units are discounted (three drinks vs. one drink). Moreover, we predict John will purchase fewer drinks when three drinks are discounted, as compared to his initial preference of purchasing five drinks when there is no price discount. That pattern is inconsistent with a focus purely on price. Therefore, we propose the following hypotheses:

H1A: There are situations in which consumers purchase fewer units of a product if the unit price of the product increases at a high purchase quantity than at a low purchase quantity.

H1B: There are situations in which consumers purchase fewer units of a product if the unit price of the product increases at a given purchase quantity than if the unit price is static at the regular level (e.g., no price discount).

H2: Consumers are more likely to take the price-increase point as their purchase quantity if that point falls within the reasonable range of their preference than if it is below that range.

Moreover, the reasonable range of a consumer's preference determines whether or not a consumer considers the quantity available at a discount as an acceptable purchase quantity. A consumer is more likely to find a quantity acceptable if the quantity falls within her reasonable range of preference than if it falls outside of the range. The consumer is subsequently more likely to respond to a price increase at an acceptable purchase quantity by choosing to purchase exactly this amount while ignoring a price increase point that occurs in an unacceptable range. Therefore, we predict that acceptability mediates the effect of a price increase on the purchase quantity.

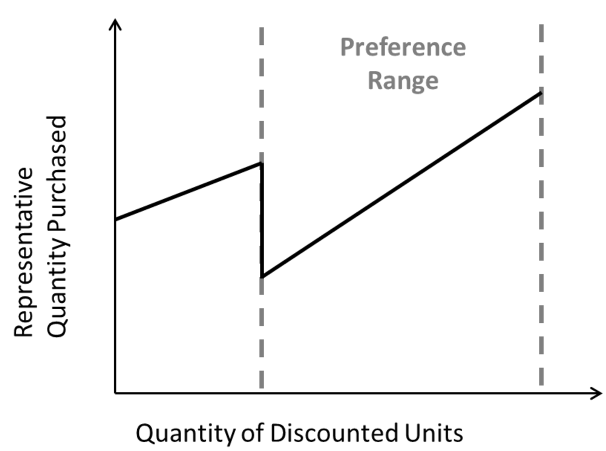
H3: Acceptability of a given quantity as a purchase quantity mediates the effect of a price increase at a certain purchase quantity on the purchase decision.

Furthermore, we propose that this quantity is particularly salient—and particularly likely to act as a stopping point—because consumers derive maximum transaction utility from the purchase when they can take *full* advantage of the discount without purchasing any units at a non-discounted price. Therefore, we define the perceived transaction utility as the additional utility consumers derive from taking full advantage of a deal. If that additional utility is large enough, it can incentivize consumers to choose the price-increase point over their initially preferred quantity, because the perceived transaction utility may be large enough to offset the downside of this choice. Consequently, if this price-increase point falls within consumers' reasonable range, they are likely to take the price-increase point as purchase quantity. We propose the following:

H4: Perceived transaction utility mediates the effect of a price increase at a certain purchase quantity on the purchase decision.

We label the phenomenon described in H1A and H1B as the "dragging down" effect, because the anomaly (depicted in figure 1) leads to situations in which the pricing strategy of quantity-limited discounts can drag down the quantity purchased by consumers. The x-axis in figure 1 represents the quantity of discounted units and the y-axis represents the quantity purchased. The grey dashed line represents the reasonable range of a consumer's preference. The solid line represents our prediction of purchase quantity in response to the quantity of discounted units.

Figure 1. Predicted quantity purchased as a function of quantity of units available at a discount.



Note that this paper focuses on the left side of the chart, which is where we would expect to see the pattern described. Although we would anticipate that a similar process would also operate on the right side of the chart (the upper end of a consumer's reasonable range of purchasing), we would not necessarily expect this pattern to lead to a dragging-down effect in which people purchase fewer items as more are offered at a discount. Although consumption might return to a consumer's initial preference level when the discounted quantity increases above her reasonable range, there are additional factors at play. For example, people may not be as confident in their upper threshold as they are in their lower threshold. Additionally, a more traditional anchoring effect may counteract an ambiguous desire for a given quantity and push in the opposite direction. Because we do not have a clear prediction for a similar dragging-down effect on the right side, an examination of the right side of the chart is beyond the scope of this paper and we instead focus on the dragging-down effect.

In most cases, we would expect a price-sensitive consumer to purchase an equal or greater quantity of a product as more units of the product are discounted, all else being equal. In other words, we would not expect the solid curve in figure 1 to decrease. Consider the previous drinking example: if maximizing the pleasure of consumption were the only relevant factor for John, he would order five drinks irrespective of whether one or three were on sale (i.e., a flat curve). By contrast, if John cared only about maximizing the value of the deal, he would only order the discounted number of drinks in both situations (i.e., a monotonically increasing curve). In reality, consumers often aim to reconcile both factors, and the combination effect of transaction utility and consumers' initial preferences leads to the pattern of a kink in the curve, which we label as the dragging-down effect.

We explore the effect of price increases on purchase decisions, examining the role of a priori preferences for quantities of consumption and transaction utility in these decisions. We examine unit price increases across consumer purchase domains. For example, studies include price increases that occur when a consumer purchases a given number of discrete units of a food (experiments 1, 2, and 5) and when a consumers' cost of borrowing money to finance a purchase increases at a certain cost (experiment 6). Product types vary as well, including perishable (experiments 1 and 2) and durable (experiments 3, 4, and 5) products, material (experiments 1, 2, 3, and 5) and experiential (experiment 4), hedonic (experiments 1, 4, 5) and utilitarian (experiments 2 and 3), and high (experiments 4, 5, and 6) and low cost products (experiments 1, 2 and 3). Experiment 1 provides initial evidence of the dragging-down effect (H1A and H1B) in an incentive-compatible study of purchasing behavior in the lab. Experiment 2 replicates the basic effect in the field, examining behaviors of grocery shoppers. Experiment 3 tests the boundary conditions of the dragging-down effect and finds that the effect is more likely to occur with a large discount than a small discount. Experiment 4 explores underlying mechanisms of this purchasing pattern and tests potential mediators. Analyses reveal that the acceptability of a price-increase point as a purchase quantity and consumers' desire to take advantage of discounts jointly explain the importance of the price-increase point as a numeric cue in causing the observed pattern (H3 and H4). Experiments 5 and 6 examine the reasonable range as a moderator of the observed patterns (H2). Experiment 5 manipulates participants' reasonable range and finds that the dragging-down effect occurs only when the price-increase point falls within consumers' reasonable range of preference (H2). Finally, experiment 6 extends the findings from purchase quantity decisions to a broader domain of quantity decisions such as willingness to spend and conceptually replicates findings from experiment 5.

EXPERIMENT 1:

DEMONSTRATING THE DRAGGING-DOWN EFFECT IN THE LAB

In experiment 1, we tested Hypotheses 1A and 1B. We examined whether participants purchased and consumed fewer chocolates when more units of the chocolate were offered for free than when fewer or no units were offered for free. Purchase decisions were implemented for all participants.

Method

Participants. We recruited a total of 130 participants (42% female; M_{age}=33.84, from 19 to 70) to complete this experiment in a lab for nominal monetary compensation. They received a fixed payment of $2 for participating, plus a $0.68 bonus they could use to purchase chocolates during the experiment.

Design and Procedure. All participants were told the experiment consisted of two parts. The first part would last five minutes, during which they could eat M&M's milk chocolates. They could eat as many or as few as they wanted. They did not need to do anything else during those five minutes. In the second part, they would answer a survey about their opinions of the chocolates.

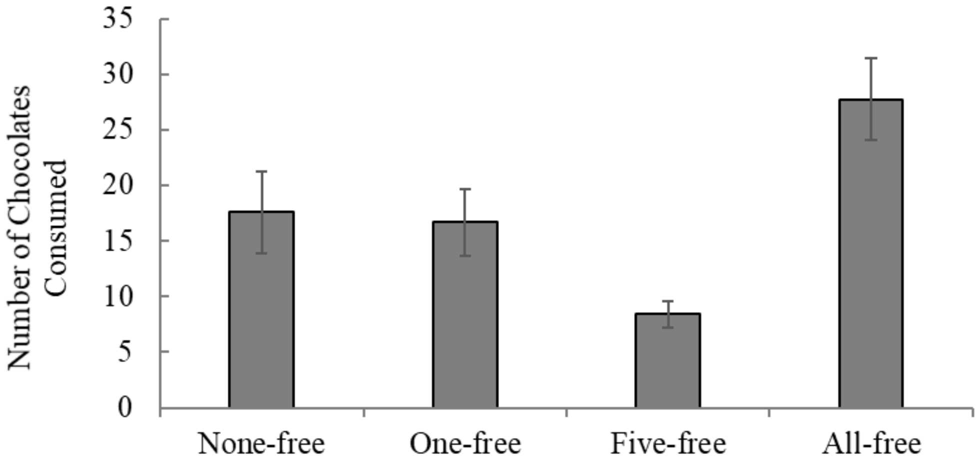
Participants were randomly assigned to one of four conditions (price discount: all for free, none for free, one for free, or five for free) in a between-subjects design. In the all-for-free condition, participants were told that each chocolate they ate was free. In the none-for-free condition, they were told that each piece of chocolate they ate cost 1 cent and that the experimenter would deduct the cost from their bonus. In the one- (or five-) for-free condition, they were told that the first piece (or first five pieces) of chocolate they ate was (were) free; after that, each piece cost 1 cent and the experimenter would deduct the cost from the bonus. In all the conditions, we clarified that participants could only eat during the five minutes in the first part of the experiment at the specified price and they could not take those chocolates home. During the experiment, participants were presented with a bowl of M&M's and they decided how many to eat. A magazine was present that they could read if they chose. We recorded the number of chocolates participants chose to eat during the experiment as our main dependent variable. After consuming the chocolates, participants answered a survey in which we asked them to report their feelings toward the candy, their happiness during the experiment, their hunger level, the time of their last meal, and whether they were on a diet, as well as demographic information. The experimenter deducted the cost of the chocolates participants consumed according to the pay schedule in their experimental condition before giving bonuses. Additional details on all studies reported in this paper can be found in the online supplementary materials.

Results and Discussion

Data from four participants who reported being on a diet (indicating they did not want to eat chocolate) were excluded from all analyses.[2] Results are summarized in figure 2. A one-way ANOVA revealed a significant effect of condition, $F(3, 122) = 7.50$, $p < .001$, $\varphi^2 = 0.16$. We conducted several planned comparisons to test our hypotheses. First, the comparison between all-free and none-free was significant ($t(122) = 2.32$, $p = .022$, $d = 0.42$), indicating participants were sensitive to a price difference between zero and 1 cent per piece.

[2] Results are consistent and remain significant when we include these responses.

Figure 2. Average number of chocolates purchased as a function of discount condition in experiment 1. (Error bar represents ±1 SEM.)



Consistent with H1A, the comparison between the five-free and the one-free conditions was significant (*M*s = 8.42 and 16.66, *SD*s = 7.24 and 17.58, *Median*s = 5.00 and 9.00; $t(122) = 2.14$, $p = .034$, $d = 0.39$), indicating participants purchased fewer M&M's when five chocolates were free than when one was free, despite the lower unit cost of eating more chocolates past the free amount in the five-free condition. Participants in the one-free condition paid almost four times the price for each chocolate they consumed (0.81 cents) than participants in the five-free condition (0.22 cents).

Consistent with H1B, the comparison between the five-free and the none-free condition revealed participants purchased fewer chocolates when five chocolates were offered for free than when none were free ($M = 17.59$, $SD = 19.14$, *Median* = 11.00; $t(122) = 2.23$, $p = .028$, $d = 0.42$). Similarly, they paid approximately twice as much per chocolate in the none-free condition (1.00 cent) than participants in the five-free condition (0.22 cents). We also found a significant difference in the quantity consumed across the five-free and all-free conditions (*M* = 27.75, *SD* = 19.39, *Median* = 24.50; $t(122) = 4.73$, $p < .001$, $d = 0.86$).

Finally, in evidence that is suggestive of H2, when only one piece of chocolate was free, participants' purchases did not differ from the none-free condition ($t(122) < 1$, *n.s.*).

In addition to the comparisons, we analyzed whether participants took exactly the number of free samples as their purchase quantity in the free-sample conditions. Examining the number of participants who consumed exactly one chocolate, we found no difference across conditions (6% in one-free, 0% in all other conditions; $\chi^2(3, N=126) = 5.28$, *n.s*). However, significantly more participants in the five-free condition (39%) consumed exactly five chocolates than those in the other conditions (3% in one-free, 0% in all other conditions; $\chi^2(3, N=126) = 35.16$, $p < .001$). These results suggest participants took five chocolates (a reasonable amount) but not one chocolate (an unreasonable amount) as a stopping point.

We found no differences across conditions in responses to other questions collected, including participants' attitudes toward M&Ms and their happiness during the experiment (*F*s < 1.74, *n.s.*). Furthermore, we tested perceived scarcity as an alternative explanation, which argues that a small quantity limit may signal scarcity and thus lead consumers to purchase more. In a posttest ($N = 54$), we presented a separate group of participants the instructions of either the one-discounted or the three-discounted condition and asked, "Given the price, how scarce do you think the product is? (1=not scarce at all, 5=very scarce)" We found no difference in perceived scarcity between the two discount conditions ($t(52) < 1$, *n.s.*).

Experiment 1 provided initial evidence supporting H1A and H1B, showing that participants may purchase and consume more units of a product when fewer units of the product are offered at a discounted price, despite the fact that each of these units is offered at a higher per-unit price. In this experiment, participants made the decision of whether to continue consuming more chocolates as they ate (i.e., during the consumption process). In the next experiment, we will test whether the effect persists when decisions are made before consumption.

EXPERIMENT 2:
A FIELD EXAMINATION OF THE DRAGGING-DOWN EFFECT

Experiment 1 provided initial evidence for the dragging-down effect in a lab setting involving real consequences. However, the findings may not be broadly representative. First, free products might be an extreme example of price discounts, because zero is a special price in consumers' cost-and-benefit analyses as compared with non-zero discounts (Shampanier, Mazar, and Ariely 2007). Second, participants spending bonus money may act differently than consumers spending regular income.

To address these possible limits, experiment 2 used non-zero prices. Importantly, experiment 2 also extended the findings to a field setting, which allowed us to test whether these patterns are strong enough to operate outside of a controlled laboratory environment and are likely to be consequential for marketers.

Method

Participants. We partnered with two fruit shops on the east coast of China (one located in Hangzhou and one in Shanghai) that allowed us to vary the prices for peaches over a one-week period in August of 2017. We observed 212 peach buyers (148 females; M_{age}=31.42) out of 1299 total customers walking by the peach stand during this period. Customers were residents living nearby who generally visited the shop once or twice per week.

Design and Procedure. Prior to the experiment, we talked to the shop staff about fruit-sales patterns and customers' preferences. We also observed grocery shoppers' fruit-purchasing behaviors in stores for a few days. Peaches were a popular fruit for the season and customers generally purchased four to five peaches at a time. Therefore, we decided to set three peaches as slightly, but acceptably, below customers' typical purchase quantity and one peach as unacceptably below this quantity.

This experiment adopted a 3 (price discount: zero discounted (control), one discounted, or three discounted) between-subject design. We ran the experiment for six days. We rotated the three conditions every one and a half hours each day across two different grocery store locations, from 5:30pm to 10:00pm, and we also rotated which condition began each day. In the two sale conditions, customers could get 3 RMB (equivalent to $0.45) off each peach, but this discount was limited to either one per customer or three per customer, depending on the condition. The discount information was written on a post next to the price tag for peaches (see figure 3), so every customer walking by could see the promotion. The regular price for peaches was 13.8 RMB per 500g. Roughly speaking, each peach cost around 8 RMB (equivalent to $1.20). In addition to the posted sign, research assistants told customers in the two sale conditions who approached the peach stand that the peaches were on sale. After communicating the discount, research assistants then left customers to make independent decisions (e.g., without RAs watching them) about how many to purchase. In addition to these two sales conditions, research assistants observed peach-purchasing patterns but did not interact with customers in a control condition in which no discounts were available.

The main dependent variable was the number of peaches purchased. When buying peaches, customers usually pick one after another by themselves. Thus, the research assistants could easily record data without being noticed. After picking the peaches, customers would receive a checkout coupon corresponding to their condition. Research assistants also recorded the total number of customers who walked by the peach stand during the time period of each condition, basic demographic information such as gender and age (guessed), and whether the customer purchased other fruits at the same time.

Figure 3. An example of the promotion displays at the peach stand in experiment 2. The price tag (in yellow) reads "Feng Hua Peaches (Sweet and Fresh), 13.8 RMB per half kg." And the promotion post (in white) reads "3RMB off each of the first three peaches."

Results and Discussion

A summary of results can be found in Table 1. A one-way ANOVA revealed a significant effect of condition ($F(2,209) = 17.04$, $p < .001$, $\varphi^2 = 0.14$). Planned comparisons show that customers in the three-discounted condition ($M = 3.38$, $SD = 1.40$, *Median* = 3.00, *Mode* = 3.00) bought significantly fewer peaches than customers in the one-discounted condition (*M* = 5.14, *SD* = 2.34, *Median* = 5.00, *Mode* = 4.00; $t(209) = 5.82$, $p < .001$, $d = 0.81$), consistent with H1A. This analysis shows that a discount that was applied to more units of product resulted in customers buying fewer. Furthermore, when comparing customers in the three-discounted condition with the control condition (*M* = 4.37, *SD* = 1.48, *Median* = 4.00, *Mode* = 4.00), we found that customers in the three-discounted condition bought significantly fewer peaches than those receiving no discounts ($t(209) = 2.59$, $p = .011$, $d = 0.36$), consistent with H1B.

Next, we found that, compared with the control condition, customers in the one-discounted condition bought significantly more peaches ($t(209) = 3.31$, $p = .001$, $d = 0.46$). These results indicate customers value discounts and would likely purchase more when the quantity limit of the discounts is above consumers' reasonable range.

We next examined the distribution of responses to gain insight into whether participants in the one-discounted or the three-discounted condition were likely to take the number available at a discount as a stopping point. Specifically, if they were, we would expect to see a discontinuous spike in purchases at the discounted number. Examining the number of purchases at one unit, we found no differences in the number of one-peach purchases across conditions (1% in control, 3% in one-discounted, and 4% in three-discounted; $\chi^2(2, N=212) = 1.14$, *n.s.*). However, significantly more customers in the three-discounted condition (52%) purchased exactly three peaches than customers in the control condition (13%) or the one-discounted condition (13%; $\chi^2(2, N=212) = 26.00$, $p < .001$). These results support H2, which predicts that customers take the price-increase point as their purchase quantity only if that point falls within their reasonable range.

Examining the histogram by condition (figure 4), we found a peak in the number of customers who purchased three peaches in the three-discounted condition as well as a decrease in the number of customers who purchased four or five peaches in that condition, as compared with the other two conditions. These distributions suggest that a price discount limited to three peaches led customers who originally wanted to purchase four or five peaches to stop their purchases at three peaches. The asymmetric data flow from right above the quantity limit to the exact quantity limit also suggests that customers treated the quantity limit as a decision point that takes on properties of a target value rather than an anchor (Bartels and Sussman 2018).

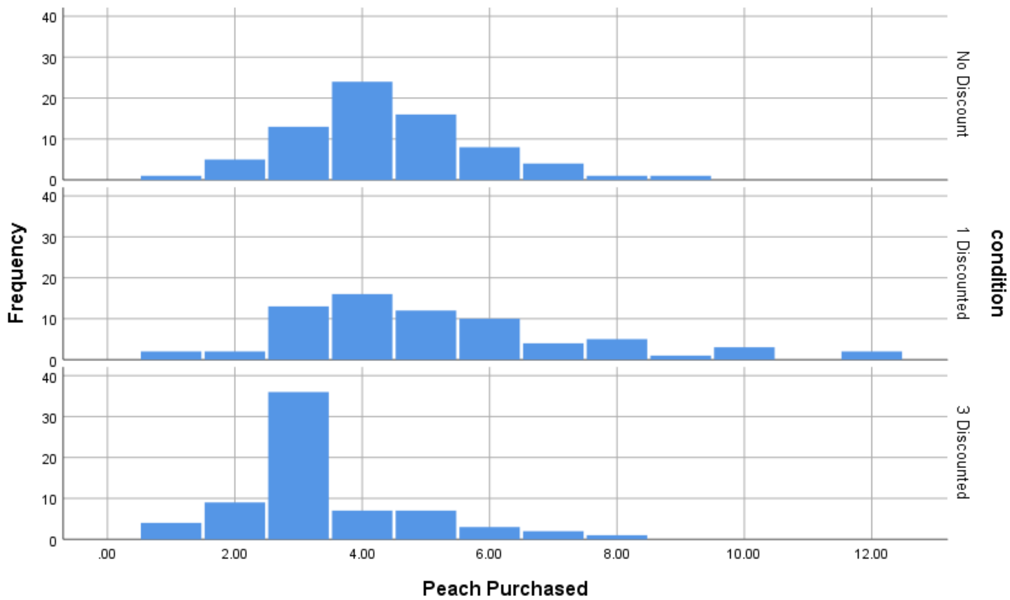
Although customers bought fewer peaches when more peaches were discounted, customers in the three-discounted condition might have found the discount more attractive and were more likely to purchase peaches at all, when compared to the one-discounted condition. Furthermore, the low purchase quantity may have come from customers who had not planned to purchase peaches. However, we found no evidence supporting that proposition. Across conditions, we found no difference in the percentage of peach buyers out of the total number of customers who walked by the peach stand ($\chi^2(2, N=1299) < 1$, *n.s.*; see table 1).

Table 1. Results of Experiment 2.

	No Discount	One Discounted	Three Discounted
Peaches Purchased (Mean/SD)	4.37 (1.48)	5.14 (2.34)	3.38 (1.40)
Total Purchase Amount (in RMB)	30.59 (10.34)	33.00 (16.35)	15.38 (8.95)
Per-Unit Purchase Price (in RMB)	7.00	6.26	4.34
Likelihood of Peach Purchase	15.57%	16.83%	16.67%
Likelihood of Peach Buyers Buying Other Fruits	77.59%	76.47%	73.08%

*The total purchase amount and the per-unit purchase price were calculated assuming the pre-discount average price per peach was 7 RMB, consistent with a standard sized peach.

Figure 4. Histogram indicating the number of people purchasing a given quantity of peaches as a function of discount condition in experiment 2.



Customers who bought fewer peaches in the three-discounted condition might also have been more likely to purchase other fruit during their visit. That is, they might have considered spending the money they saved from the peaches on other fruits. To test that possibility, we recorded whether each customer who bought peaches also purchased other fruits during the same visit.[3] We found no significant differences between the three conditions in the likelihood of peach buyers buying other fruits during the same visit ($\chi^2(2, N=161) < 1$, *n.s.*; see Table 1). Thus, our evidence does not support the possibility that the customers who purchased fewer peaches in the three-discounted condition were more likely to purchase other fruits in the shop instead.

Different from the previous experiment, we found customers purchased slightly more peaches in the one-discounted condition than in the control condition in this field experiment. One possibility is that the presence of a research assistant introducing the discount in the two

[3] This data was not available for the first two days.

discount conditions might have caused the increased purchase quantity. Given the nature of the field experiment, although the research assistant was present in all conditions, she was not able to say anything about the promotion in the control condition to be consistent with procedures in the store when no promotions are present. While differences in the research assistant interaction could potentially explain the increased purchase quantity in the one-discounted condition as compared with the control condition, it would not explain the difference between the one-discounted and the three-discounted condition.

Consistent with our hypotheses, the results of this field experiment suggest that a quantity limit that falls within customers' reasonable range of preference can "drag down" the quantity of items purchased. Results from the first two experiments demonstrated the basic effect with purchase decisions both during the process of consumption and prior to consumption, both in the lab and in the field. In the next experiment, we aim to explore boundary conditions of this purchasing pattern and test the role of a reasonable range in purchase decisions.

EXPERIMENT 3:
THE ROLE OF DISCOUNT SIZE

In the previous two experiments, we demonstrated the dragging-down effect with large discounts (100% off in experiment 1 and 37% off in experiment 2). Experiment 3 was designed to test whether the dragging-down effect varies according to the size of the discount (large vs. small). We propose that the dragging-down effect occurs partially due to the additional transaction utility consumers derive from purchasing exactly the number of items available at the discounted price. The transaction utility should decrease as the size of the discount decreases.

Therefore, we predict that the dragging-down effect is more likely to occur with a large discount than with a small discount.

Method

Participants. We recruited 412 participants (57% female; M_{age} = 33.85, from 18 to 86) online through Amazon's Mechanical Turk (MTurk) platform, and they completed the study for nominal monetary compensation.

Design and Procedure. This study adopted a 2 (discount limit: 10 vs. 20 discounted) x 2 (discount size: large vs. small) between-subjects design. Participants were asked to imagine they were buying light bulbs for the renovation of their apartment. According to an interior designer, they ideally needed to buy 28 light bulbs, but there was some wiggle room depending on their own preference. The number of light bulbs they needed could range from 18 to 36.

Participants then read that, as a member at Home Depot, they could apply a price discount to the light bulbs they chose to buy. The size of the discount was randomly determined and was either a large discount (50%) or a small discount (10%). The discount limit was also randomly determined and was either 10 or 20 light bulbs. After reading the scenario, participants reported the number of light bulb they would like to purchase. This survey was preregistered on AsPredicted.org[4].

Results and Discussion

In the current study, as well as all experiments reported in this paper that use online participants, we included comprehension questions and excluded participants who answered

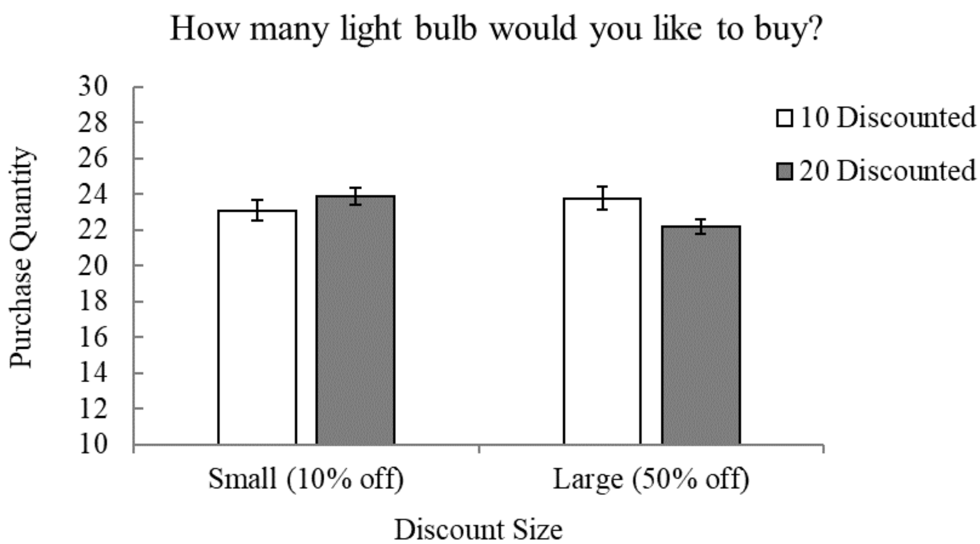
[4] The pre-registration form is available at http://aspredicted.org/blind.php?x=rp3it6.

more than half of the comprehension questions incorrectly or who provided responses that were more than three standard deviations away from the mean response. In this experiment, this procedure led to the exclusion of thirty-three participants who failed more than half of the comprehension check questions. After this data exclusion, the sample size was $N = 379$ (60% female; M_{age}=33.32, from 18 to 86).

A 2 (discount limit: 10 vs. 20 discounted) x 2 (discount size: large vs. small) ANOVA revealed no main effect of discount limit ($F(1, 375) < 1$, *n.s.*), no main effect of discount size ($F(1, 375) < 1$, *n.s.*), and a significant interaction between discount limit and discount size ($F(1, 375) = 4.91$, $p = .027$, $\varphi^2 = 0.01$), see figure 5. The comparison within the large discount conditions replicated the dragging-down effect and revealed that participants purchased significantly fewer light bulbs if twenty were discounted ($M = 22.21$, $SD = 4.06$, *Median* = 20.00, *Mode* = 20.00) than if ten were discounted ($M = 23.77$, $SD = 6.07$, *Median* = 25.50, *Mode* = 28.00; $t(375) = 2.13$, $p = .034$, $d = 0.30$) with a 50% (large) discount. However, in the small discount conditions, no significant difference was found in purchase quantity between the twenty-discount ($M = 23.87$, $SD = 4.34$, *Median* = 20.00, *Mode* = 20.00) and the ten-discounted conditions ($M = 23.09$, $SD = 5.68$, *Median* = 23.00, *Mode* = 28.00; $t(375) = 1.02$, *n.s.*).

Next, we compared the purchase quantity within the twenty-discounted conditions and found that participants purchased significantly fewer light bulbs with a large discount than with a small discount ($t(375) = 2.21$, $p = .027$, $d = 0.40$). Moreover, marginally significantly more participants in the large discount condition (63%) purchased exactly twenty light bulbs than participants in the small discount condition (48%; $\chi^2(1, N=188) = 3,33$, $p = .068$). These results suggest that participants were more likely to take the price-increase point as their purchase quantity if it was a large discount than if it was a small discount. As a consequence, we observed a counter-intuitive pattern where participants purchased more light bulbs with a small discount than with a large discount.

Figure 5. Average number of light bulbs purchased as a function of discount limit and discount size in experiment 3. (Error bar represents ±1 SEM.)



Experiment 3 tested discount size as a boundary condition of the dragging-down effect and found that the size of the discount influenced the pattern. The dragging-down effect was more likely to occur when the focal discount was large rather than small. In practice, stores are more likely to rely on large discounts in conjunction with these limited quantity offers for the sake of cost control. Findings from this study implicate a possibility for the transaction utility explanation because the quantity limit of the discount (i.e., the numeric cue) remains the same in both cases, whereas the transaction utility decreases with a small discount relative to a large discount. The reduced transaction utility might be the reason that leads to the reduced likelihood of participants shifting from the optimal purchase quantity to the quantity of a price increase. We test this explanation directly as well as other possible explanations in the next experiment.

EXPERIMENT 4:
EXPLORING THE MEDIATING ROLE OF ACCEPTABILITY AND TRANSACTION UTILITY

The previous studies demonstrated the dragging-down effect. In this experiment, we examined whether the observed patterns would extend to a new consumer context, examining the purchase of tickets to a museum-pass that varied the number of museums available at a discount. Additionally, the current study explores the underlying mechanism of this effect.

We propose that the effect of a price-increase point on purchase quantity operates through two paths. The first path is perceived acceptability—whether or not a consumer considers the quantity available at a discount as an acceptable purchase quantity. A consumer is more likely to find this quantity acceptable if the price-increase point falls within her reasonable range of preference than if it falls outside of this range. Consumers are subsequently more likely to respond to a price increase at an acceptable purchase quantity by choosing to purchase exactly this amount while ignoring a price increase point that occurs in an unacceptable range. We therefore predict that acceptability mediates the dragging-down effect. The second path is the additional transaction utility a consumer derives from taking full advantage of price promotions (vs. purchasing the amount of their initial preference). This additional transaction utility varies as the price-increase point changes, which in turn influences purchase quantity. Therefore, we predict that perceived transaction utility mediates the dragging-down effect.

In addition, for exploratory purposes, we also tested a variety of alternative explanations, including consumption (or social) norms, reference prices, decision weights, and anticipated regret. The consumption (or social) norm explanation suggests that consumers might infer a suggested purchase quantity from the quantity limits in the promotions and that they might be more likely to conform if the suggested quantity is reasonable than if it is not. The reference price explanation suggests that consumers might form different reference prices corresponding to the different price conditions (Grewal, Monroe, and Krishnan 1998; Rajendran and Tellis 1994), which in return could lead to the observed purchasing pattern. If consumers set a lower reference price when more units are available at a discount, the lower reference price might discourage consumers from purchasing the product at its regular price. The decision weight explanation suggests that a better discount might shift consumers' decision weights from following their initial purchase preference to taking advantage of price discounts. The anticipated regret explanation suggests that consumers might anticipate more regret if they fail to minimize the cost (Tsiros and Hardesty, 2010) when there is a better deal.

Method

Participants. Three hundred and fifty-four participants (53% female; M_{age}=33.73, from 18 to 74) from MTurk participated in exchange for nominal monetary compensation.

Pretest. We ran a pretest with a separate sample from Amazon Mechanical Turk (N = 196) to determine consumers' preferences for the focal stimuli, the number of museums consumers would like to visit for a two-week vacation in New York City. We elicited preferences for the ideal number of museums as well as the minimum and maximum that they would like to visit. Results showed that participants, on average, would ideally visit 5 museums

(*Mean* = 5.27, *SD* = 2.53, *Mode* = 5.00), with a minimum of 2 museums (*Mean* = 2.78, *SD* = 1.75, *Mode* = 2.00), and a maximum of 8 museums (*Mean* = 7.61, *SD* = 3.86, *Mode* = 8.00) for such a vacation (see supplementary materials for further details).

Design and Procedure. This study adopted a 3 (price discount: zero, one, or three discounted) between-subject design. Based on pretest results, we chose a price-increase point at one museum visit as a quantity outside of consumer's reasonable range of preference (i.e., 2 to 8), a price-increase point at three museum visits as a quantity within the reasonable range though lower than the optimal preference (i.e., 5), and a control condition in which none was discounted.

All participants read that they were travelling to New York City for two weeks on a vacation and wanted to visit the museums there. Ideally, they would like to visit five museums, but they could also be flexible depending on pricing. They decided to purchase all the museum visits on a museum pass because the pass gave them additional benefits such as fast-track access to the museums. They could only purchase visits on the museum pass for themselves. Participants in the zero-discounted (control) condition read, "On the museum pass, each museum visit costs $30." Participants in the one-discounted condition read, "On the museum pass, the first museum visit costs $20, and each additional costs $30." Participants in the three-discounted condition read, "On the museum pass, the first three museum visits each cost $20, and each additional costs $30." After answering a few comprehension questions, all participants then decided how many museum visits they would like to purchase.

On the next screen, we asked several questions to explore the underlying process and examine possible explanations. To test the transaction utility account, we measured participants' perceived transaction utility at one, three, and five museum visits, "Given the pricing, how good of a deal do you think it is for you to purchase exactly 1 (3, or 5) museum visit(s) on the museum pass?" (1=not a good deal at all, 7=a very good deal). To test the reasonable range account, we measured the acceptability of the price-increase point as a purchase quantity, "To what extent do you think it is acceptable for you to visit only X museums for your trip?" (1=definitely not acceptable, 7=definitely acceptable; X equals to the price-increase point).

We also tested a list of possible alternative explanations. To test the role of consumption (or social) norms, we asked: "Given the pricing, how many museum visits do you think a typical buyer of the Museum Pass would usually purchase?" (free response). To test the role of reference prices, we asked: "Given the price information in the scenario, what do you think is a fair price (i.e., not too high nor too low) for museum admission fee?" (a sliding scale from $0 to $40). To test the role of shifting decision weights, we asked: "When making your purchase decision, to what extent did you base your decision on the price discounts and to what extent did you base it on your museum-going preferences?" (1=my decision was entirely based on the price discounts, 7=my decision was entirely based on my museum-going preference). Finally, to test the role of anticipated regret, we adapted a question from Tsiros and Hardesty, 2010, asking: "If I purchase additional museum visits with the higher price on the pass (i.e., purchase more than 1 visit), I will regret it later" (1=strongly agree; 7=strongly disagree).

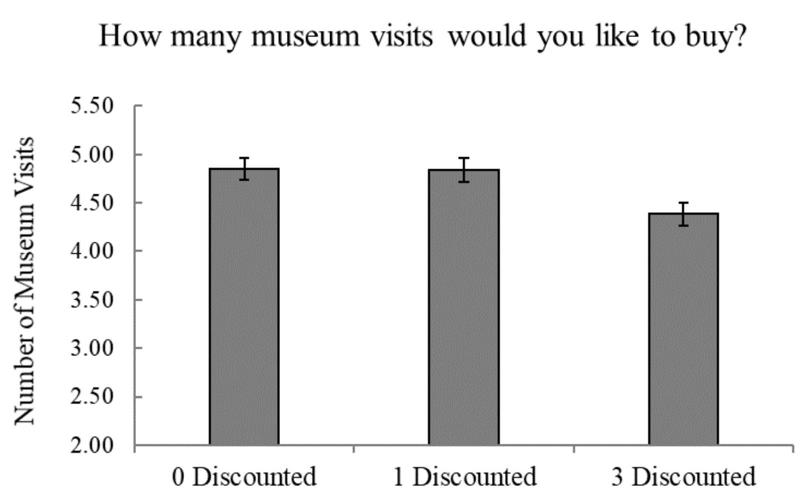
Results and Discussion

Consistent with our prior exclusion criteria, we excluded seventeen participants who failed the comprehension check and of three participants who provided responses that were more than three standard deviations away from the total mean from all analyses. After data exclusion, the sample size is N = 334 (53% female; M_{age}=33.97, from 18 to 74).

Purchase Quantity. A one-way ANOVA revealed a significant effect of condition

($F(2,331) = 5.27$, $p = .006$, $\varphi^2 = 0.03$), see figure 6. As predicted, planned comparisons revealed that participants in the three-discounted condition purchased significantly fewer museum visits (*M* = 4.38, *SD* = 1.23, *Median* = 5.00, *Mode* = 5.00) than either those in the one-discounted condition (*M* = 4.84, *SD* = 1.16, *Median* = 5.00, *Mode* = 5.00; $t(331) = 2.77$, $p = .006$, $d = 0.36$) or those in the zero-discounted condition (*M* = 4.84, *SD* = 1.29, *Median* = 5.00, *Mode* = 5.00; $t(331) = 2.85$, $p = .005$, $d = 0.39$). In addition, significantly more participants purchased exactly three museum visits if three were discounted (25%) than if none were discounted (7%; $\chi^2(1, N=224) = 15.29$, $p < .001$) or if only one was discounted (5%; $\chi^2(1, N=222) = 11.56$, $p < .001$). We did not find any difference in the likelihood of purchasing exactly one museum visit if one was discounted (4%) than if none was discounted (2%; $\chi^2 < 1$, *n.s.*) or if three were discounted (1%; $\chi^2 < 1$, *n.s.*). These results suggest consumers were more likely to take the price-increase point as their purchase quantity when the price-increase point fell within the reasonable range of preference than outside of the range.

Figure 6. Average number of museum visits purchased as a function of discount condition in experiment 4. (Error bar represents ±1 SEM.)

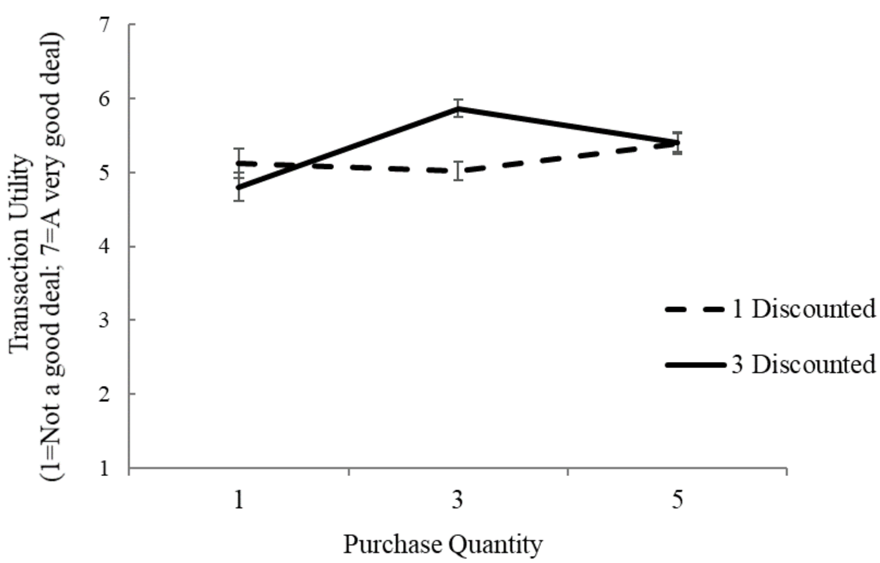


Acceptability. We measured the acceptability of the price-increase quantity as a purchase quantity only in the two discount conditions because this question would not have been comprehensible in the control condition where there was no price increase (the same applies to the measure of transaction utility). Results showed that participants in the three-discounted condition considered visiting only three museums significantly more acceptable (M = 5.63, SD = 1.47) as compared to participants' feelings towards the idea of visiting only one museum in the one-discounted condition (M = 3.58, SD = 2.30; $t(222)$ = 7.92, p < .001, d = 1.06).

Mediating Role of Acceptability. To test whether acceptability explains the dragging-down effect (H3), we conducted a mediation analysis. Our model included the price-increase point as the independent variable (with one-discounted coded as 0 and three-discounted coded as 1), acceptability as the mediating variable, and the purchase quantity as the dependent variable. We used the bootstrap procedure with 10,000 resamples (PROCESS Model 4; Hayes 2012) and found a significant indirect effect of acceptability (indirect effect = -0.38, SE = 0.11, biased-corrected 95% confidence interval = [-0.62, -0.20]). The three-discounted condition significantly increased acceptability (a = 2.04, p < .001), and acceptability was negatively associated with purchase quantity (b = -0.19, p < .001). Including acceptability in the model reduced the effect of a price increase on purchase quantity (from c = -0.46, p = .008 to c' = -0.07, p = .69). Thus, we concluded that acceptability mediated the dragging-down effect.

Additional Transaction Utility. Figure 7 summarizes the average transaction utility (i.e., "how good a deal it is …") of purchasing one, three, or five museum visits by condition. When three were discounted, the transaction utility was larger at the purchase quantity of three than at the purchase quantity of one (M_{one} = 4.80, SD_{one} = 2.07 and M_{three}=5.87, SD_{three} = 1.20; $t(111)$ = 5.85, p < .001, d = 0.63) and 5 (M_{five} = 5.40, SD_{five} = 1.37; $t(111)$ = 3.21, p = .002, d = 0.34). But when only one was discounted, the transaction utility was not significantly larger at purchase quantity of one than at three (M_{one} = 5.13, SD_{one} = 2.09 and M_{three}=5.02, SD_{three} = 1.37; $t(111) < 1$, *n.s.*) or five (M_{five} = 5.39, SD_{five} = 1.54; $t(111) = 1.02$, *n.s.*). We operationalize additional transaction utility as the extra utility a consumer perceives from purchasing at the price-increase point compared to her baseline transaction utility from purchasing at the initially preferred quantity. Therefore, we calculated the additional transaction utility in the three-discounted condition as the utility of purchasing three minus the utility of purchasing five and the counterpart in the one-discounted condition as the utility of purchasing one minus the utility of purchasing five. We found that participants derived significantly larger transaction utility from purchasing at the price-increase point in the three-discounted condition (M = 0.46, SD = 1.53) than in the one-discounted condition (M = -0.27, SD = 2.77; $t(222) = 2.34$, $p = .015$, $d = 0.33$).

Figure 7. Average transaction utility at given purchase quantities by conditions in experiment 4. (Error bar represents ±1 SEM.)

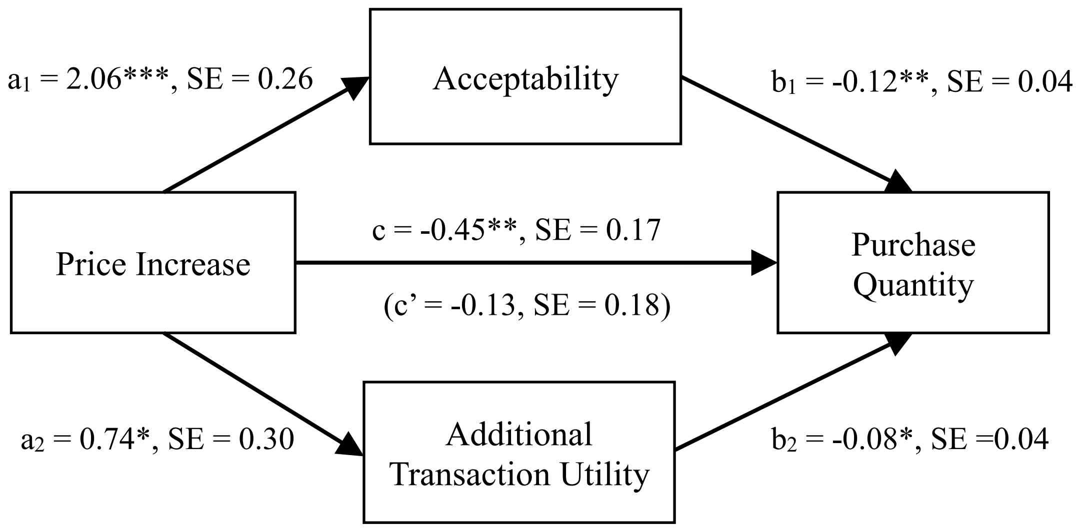


Mediating Role of Additional Transaction Utility. To test whether the additional transaction utility from taking full advantage of discounts explains the dragging-down effect (H4), we conducted another mediation analysis with additional transaction utility as the mediating variable. Using the same procedure, we found a significant indirect effect of additional transaction utility (indirect effect = -0.11, SE = 0.05, biased-corrected 95% confidence interval = [-0.23, -0.03]). The three-discounted condition significantly increased transaction utility (a = 0.73, p = .015), and additional transaction utility was negatively associated with purchase quantity (b = -0.15, p < .001). Including additional transaction utility in the model reduced the effect of a price increase on purchase quantity (from c = -0.46, p = .008 to c' = -0.35, p = .037). Thus, we concluded that transaction utility partially mediated the dragging-down effect.

Mediation Analyses. We conducted a series of mediation analyses with the other potential mediating variables (consumption/social norm, reference price, decision weight, and anticipated regret) in separate mediation analyses. We found no significant effects of the price-increase point on consumption/social norm, reference price, decision weight, or anticipated regret (*p*s > .20). Therefore, no evidence was found to support these alternative explanations for the dragging-down effect.

In addition, we tested the mediation model by simultaneously including acceptability, additional transaction utility, and the four alternative explanations. Similar to the prior mediation analyses, we only found significant indirect effects of acceptability (indirect effect = -0.26, *SE* = 0.12, *CI* = [-0.54, -0.07]) and additional transaction utility (indirect effect = -0.06, *SE* = 0.04, *CI* = [-0.17, -0.01]), see figure 8. The three-discounted condition significantly increased acceptability (a_1 = 2.06, $p < .001$), and acceptability was negatively associated with purchase quantity (b_1 = -0.12, p = .005). Similarly, the three-discounted condition significantly increased additional transaction utility (a_2 = 0.74, p = .016), and additional transaction utility was negatively associated with purchase quantity (b_2 = -0.08, p = .025). Including acceptability and additional transaction utility in the model reduced the effect of a price increase on purchase quantity (from c = -0.45, p = .008 to c' = -0.13, p = .48).

Figure 8. Acceptability and additional transaction utility mediate the effect of a price increase on purchase quantity in a mediation model simultaneously including acceptability, additional transaction utility, and the four alternative explanations. *p<.05; **p<.01; ***p<.001.



Results in this experiment suggest the dragging-down effect can apply to not only food but also to more expensive, experiential consumption, products. These results also support the hypothesis that acceptability and additional transaction utility explain the effect of a price increase on purchase quantity. These findings suggest that the additional transaction utility derived from taking full advantage of the low price led consumers to take the price-increase point as their purchase quantity when the price-increase point was acceptable as a purchase quantity. Acceptability is related to consumer's reasonable range of preference: A quantity is more acceptable when it falls within a reasonable range of consumer's preference. Therefore, in the next study, we manipulate the reasonable range and test the moderation effect of the range.

EXPERIMENT 5:
THE MODERATING ROLE OF REASONABLE RANGE

Experiment 5 was designed to test whether reasonable range would moderate the pattern of results observed thus far. We directly manipulated participants' reasonable range and compared purchase decisions when the same price-increase point fell within versus below the reasonable range, shifting whether the price-increase point would be considered acceptable as a possible purchase quantity. Since we propose that acceptability of the discounted quantity influences the dragging-down effect, we hypothesize that varying the reasonable range will moderate the dragging-down effect. Specifically, we predict consumers will be more likely to take the price-increase point as their purchase quantity if that point falls within the reasonable range of their preference than if it is below that range (H2).

Method

Participants. We recruited 401 participants (51% female; M_{age} = 33.38, from 18 to 86) online through Amazon's Mechanical Turk (MTurk) platform, and they completed the study for nominal monetary compensation.

Design and Procedure. This study adopted a 2 (price discount: 2 vs. 6 discounted) x 2 (reasonable range: narrow vs. wide) between-subjects design. Participants were asked to imagine they were buying wines for themselves to consume while they were staying at a new town for several weeks. We manipulated the quantity limits for a price promotion for wines: The wines in the store were 30% off, but the discount was limited either to two or to six bottles per person.

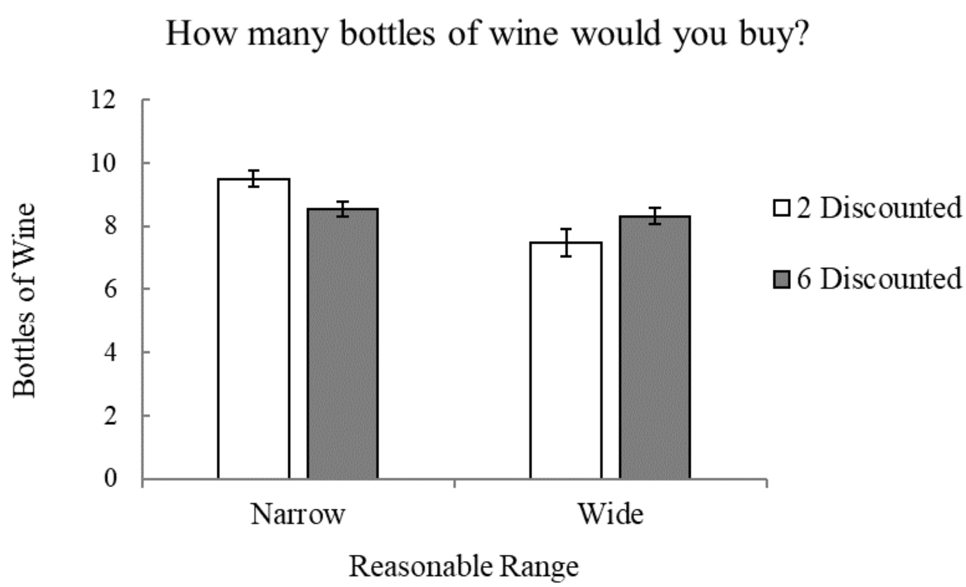
To keep the preference for the optimal purchase quantity constant across conditions, all participants were told that they were thinking of buying 10 bottles of wine, but they could be flexible within a given range depending on pricing. In the narrow range conditions, the flexible range was 6 to 14 bottles. In the wide range conditions, the flexible range was 2 to 18 bottles. Note that the discounted quantity of six bottles was within the reasonable range in both conditions, but the discounted quantity of two bottles was acceptable only in the wide range condition. After answering comprehension questions about the scenario, participants reported how many bottles of wine they wanted to buy in a free-response format.

Results and Discussion

Consistent with our prior exclusion criteria, we excluded forty-eight participants who failed more than half of the comprehension check questions from all analyses. After this data exclusion, the sample size was $N = 353$ (52% female; M_{age}=33.48, from 18 to 86).

A 2 (price discount: 2 vs. 6 discounted) x 2 (reasonable range: narrow vs. wide) ANOVA revealed no main effect of price discount ($F(1, 349) < 1$, *n.s.*), a significant main effect of range ($F(1, 349) = 14.08$, $p < .001$, $\varphi^2 = 0.04$), and a significant interaction between price discount and range ($F(1, 349) = 9.08$, $p = .003$, $\varphi^2 = 0.02$), see figure 9. The comparison within the narrow-range conditions replicated the dragging-down effect and revealed that participants purchased significantly fewer bottles of wine if six bottles were discounted, a quantity within their reasonable range, ($M = 8.53$, $SD = 2.30$, *Median* = 10.00, *Mode* = 6.00) than if two bottles were discounted, a quantity outside of their reasonable range, ($M = 9.49$, $SD = 2.23$, *Median* = 10.00, *Mode* = 10.00; *t*(349) = 2.27, $p = .024$, $d = 0.42$). By contrast, in the wide-range conditions, participants purchased significantly more bottles of wine if six bottles were discounted (*M* = 8.31, *SD* = 2.44, *Median* = 10.00, *Mode* = 6.00 and 10.00) than if two bottles were discounted (*M* = 7.48, *SD* = 3.95, *Median* = 10.00, *Mode* = 10.00; *t*(349) = 2.00, $p = .047$, $d = 0.25$), consistent with a more traditional pricing or anchoring explanation.

Figure 9. Average number of bottles of wine purchased as a function of price discount and reasonable range in experiment 5. (Error bar represents ±1 SEM.)



In the conditions with two items discounted, participants with a narrow preference range purchased significantly more bottles of wines than those with a wide range (*t*(349) = 4.63, $p < .001$, $d = 0.63$). Moreover, significantly more participants chose to purchase exactly two bottles of wine in the wide-range condition (27%) than those in the narrow-range condition (5%; $\chi^2(1, N=164) = 15.82$, $p < .001$). These results indicate that participants were more likely to take the price-increase point as purchase quantity if the point was within (rather than outside of) the reasonable range. Consistent with our predictions for cases in which the price increase amount falls within the preference range, we found no difference in purchase quantities between the narrow and wide range conditions when six bottles were discounted ($t(349) < 1$, *n.s.*). In this case, we found no difference in the percentages of participants who purchased exactly six bottles between the two range conditions (narrow = 40% and wide = 43%; $\chi^2(1, N=189) < 1$, *n.s.*).

Results in this study demonstrate the role of reasonable range as a moderator, and supports hypothesis 2. Consumers were more likely to respond to a price-increase within their reasonable range than below that range. The reasonable range is likely to be related to a variety of contextual factors such as the usage frequency of the focal product, a consumer's frequency of shopping, familiarity of the product, and the durability and the storage cost of the product. Consequently, the importance of reasonable range for the dragging down effect demonstrated here suggests that these additional contextual factors are likely to influence the observed dragging down patterns to the extent that they alter a consumer's perceived reasonable range.

EXPERIMENT 6:
REASONABLE RANGE AND NOVEL DISCOUNT TYPE

Experiment 6 aimed to replicate the role of the reasonable range on the dragging-down effect through moderation. In addition, this experiment tests quality inference as a possible alternative explanation and tests whether the dragging-down effect extends to cases in which the price increase takes a different form, with implications for consumers' willingness to spend on a single product.

One alternative explanation for our findings is that consumers may infer inferior product quality from the discounted low price, leading them to purchase fewer units when more are available at a discount (e.g., Raghubir and Corfman 1999). This explanation would be inconsistent with the findings in experiment 1, in which the price promotion took the form of free samples, given research that suggests free gifts maintain quality perceptions while increasing perceptions of a deal (Darke and Chung 2005), or with experiment 5 which includes identical price discounts and finds different patterns as a function of reasonable range. However, to further probe whether inferior quality inferences explain the dragging-down effect, we designed the current experiment to vary pricing without inferences for product quality by changing the cost of funds used to make a purchase rather than the price of the product itself.

Moreover, we aimed to extend the findings from the previous experiment to a broader domain of consumer decisions. Instead of varying the price of a product on a per-unit basis and examining a traditional measure of purchase quantity (e.g., “how many units of product consumers would like to buy”), we tested the effect of increasing the cost of borrowing money to finance a purchase. Through this approach, we were able to examine the effect of unit-price increases on quality decisions (i.e., what quality product would consumers choose to purchase) and to conceptually extend our findings from items that consumers are likely to purchase many units of to those of which consumers may purchase only one. In the current experiment, we used willingness to spend on a product as a proxy for quality selected and tested the effect of a unit-price increase in financing costs on the consumers’ willingness to spend on a single product.

Method

Participants. We recruited 340 participants (56% female; M_{age} = 35.14, from 19 to 74) online through Amazon's Mechanical Turk (MTurk) platform, and they completed the study for nominal monetary compensation.

Design and Procedure. This study adopted a 2 (price increase: low vs. high) x 2 (range: narrow vs. wide) between-subjects design. Participants were asked to imagine they were shopping for a new three-piece sectional sofa set for their newly remodeled living room.

In this experiment, we used another form of a price increase, namely, an increase in the financial cost associated with the purchase. The price increase was operationalized through the interest cost of purchasing the focal product. Because a sofa is a big-item purchase, participants were told they had to use their credit cards (with different rates and spending limits) for the purchase: "You plan to use your credit cards to pay for the furniture and repay the money in a year. You have two credit cards, and you can use either or both of them. Card A charges an annual interest rate of 22% and has no spending limit. Card B charges an annual interest rate of 12% and has a spending limit of [low] $100 / [high] $500." Thus, if participants preferred a high-quality sofa set, they would have to incur a higher interest rate for every dollar they spent above $100 (or $500).

We manipulated consumers' reasonable range of preference through the advice of an expert: "Your friend, an interior designer, recommends that a typical sofa suitable for your newly remodeled living room should cost you around $750, but you may also consider any sofa with a price range [narrow] between $500 to $1,000 / [wide] between $100 to $1400." Note that in the narrow-range conditions, $500 was within the recommended price range of a decent sofa set, whereas $100 was well below the standard. In the wide-range conditions, both $100 and $500 were within the price range. Participants then reported their willingness to spend of the purchase.

Results and Discussion.

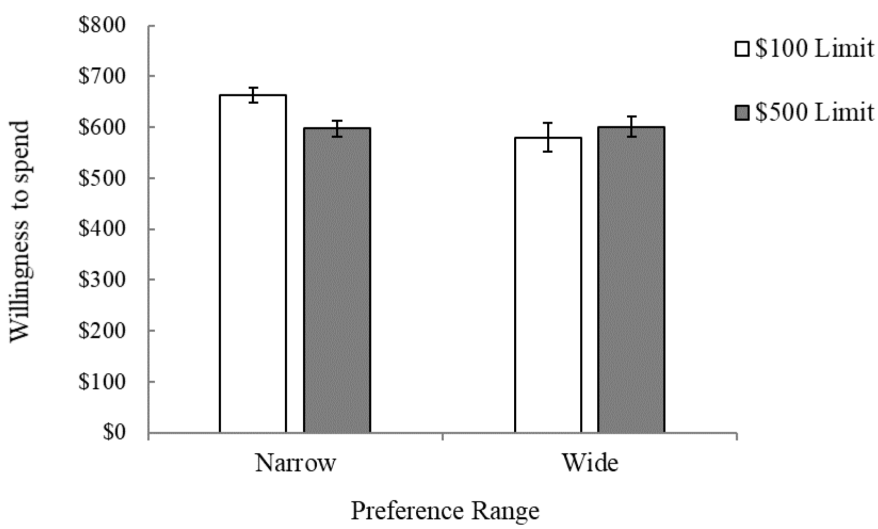
Consistent with our prior exclusion criteria, we excluded ten participants who failed more than half of the comprehension check questions from all analyses. After this data exclusion, the sample size was N = 353 (57% female; M_{age}=35.22, from 19 to 74).

Results are summarized in figure 10. A 2 (price increase: low vs. high) x 2 (reasonable range: narrow vs. wide) ANOVA revealed a significant main effect of range ($F(1, 326) = 4.04$, $p = .045$, $\varphi^2 = 0.01$), and a significant interaction ($F(1, 326) = 4.79$, $p = .029$, $\varphi^2 = 0.01$). We found no main effect of cost increase (F=1.28, *n.s.*). The comparison within the narrow-range conditions replicated the dragging-down effect and revealed that participants planned to spend significantly less on a living room sofa set if they would incur a higher interest-rate cost for the amount they spent over $500 ($M$ = $597.13, SD = 139.42, *Median* = $500, *Mode* = $500) than for the amount they spent over $100 ($M$ = $663.11, SD = 138.20, *Median* = $700, *Mode* = $750; $t(326) = 2.43$, $p = .016$, $d = 0.27$). As a result, participants in the latter condition would have ended up paying a higher total cost for the purchase, measured both in dollars and in financing costs. By contrast, we found no difference in willingness to spend as a function of the cost-increase point for the wide-range conditions (Ms = $600.68 and $579.63, SDs =172.10 and 252.21, *Median*s = $500 and $650, *Mode*s = $500 and $750, for high and low; $t(326) < 1$, *n.s.*). These results suggest that when both the low and high cost-increase points fell within consumers' reasonable range, their purchase decisions were insensitive to this difference.

Next, we examined whether participants took the price-increase point as their purchase quantity in each condition. Within the narrow-range conditions, we found no difference in the number of purchases of a $100 sofa set (1% for $100-Limit, 0% for $500-Limit; $\chi^2(1, N=176) < 1$, *n.s.*) but significantly more purchases of a $500 sofa set in the $500-Limit condition (61%)

than in the \$100-Limit condition (22%; $\chi^2(1, N=176) = 26.79$, $p < .001$). These results replicate previous findings and support H2, namely, that consumers take the price-increase point as their purchase quantity only if the point falls within their reasonable range. Within the wide-range conditions, we found significantly more purchases of a \$100 sofa set in the \$100-Limit condition (12%) than in the \$500-Limit condition (0%; $\chi^2(1, N=154) = 9.64$, $p < .01$), and significantly more purchases of a \$500 sofa set in the \$500-Limit condition (38%) than in the \$100-Limit condition (20%; $\chi^2(1, N=154) = 6.51$, $p < .05$). These results suggest that when both price-increase points fell within participants' reasonable range, participants could take either one as their purchase quantity, in line with the price-increase amount.

Figure 10. Average willingness to spend on a sofa set as a function of price increase and reasonable range in experiment 6. (Error bar represents ±1 SEM.)



The interaction effect suggests the reasonable range of preference moderates the dragging-down effect. A cost-increase encourages consumers to stop spending at the point of the increase only if it falls within consumers' reasonable range. Experiment 6 again provided evidence supporting the hypothesis regarding the reasonable range (H2). Directly manipulating participants' reasonable range of preference, we found additional evidence that a price increase can affect willingness to spend on a purchase, but only if the point of increase is within consumers' reasonable range. In the next experiment, we explored the underlying mechanism of this effect and the complementary role of transaction utility.

GENERAL DISCUSSION

Across six studies, we observed a dragging-down effect in purchase decisions. Specifically, consumers purchased fewer units of a product when the unit price of the product increased at a high purchase quantity than when it increased at a low purchase quantity, or if the unit price was static at the regular level. As a consequence, consumers purchased more units of the product while paying a higher per-unit price for their purchases when fewer units were available at a discount. Consumers' desire to take full advantage of the price promotion and their initial purchasing preferences together led to this pattern.

Exploring mechanisms and boundary conditions, we found that consumers take the price-increase point as a decision point and are more likely to choose to stop purchasing additional units when the unit price increases at a quantity within consumers' reasonable range for consumption. In this case, the quantity is close to their preference and has the additional benefit of maximizing transaction utility. However, when a unit price increases at a quantity below consumers' reasonable range, consumers do not stop purchasing at the decision point and instead rely on their initial preferences for the purchase decision.

Experiments 1 and 2 demonstrate the dragging-down effect (H1A and H1B) in consequential settings. Using real money in a lab setting, Experiment 1 examined participants' decisions to purchase chocolates as a function of the number of free samples available. Experiment 2 presented supermarket shoppers with different price promotions and examined how these promotions differentially affected the number of fruits purchased in a field experiment. Experiment 3 examined the boundary condition of the discount size and found that the dragging-down effect emerges only with a large discount. Experiment 4 examined the mechanisms underlying the dragging-down effect, finding that that acceptability of the price-increase quantity and additional transaction utility mediate the effect of a price-increase point on purchase quantity (H3 and H4). Experiment 4 also tested a series of alternative explanations for the effect. Experiments 5 and 6 further examined the moderating role of reasonable range and found that a price-increase affects purchase decisions only when this price-increase point falls within the reasonable range of consumers' preference. Experiment 6 also extended the dragging-down effect from decisions about purchase quantity to decisions about how much to spend. Across these studies, we find evidence of the dragging-down effect for a wide range of consumer products.

One alternative reason people might purchase fewer items when more are available at a discount is that consumers infer a motivation (e.g., inferior quality) for the price promotions with a larger quantity limit. If this inference leads consumers to develop an unfavorable impression of the product or the marketer, it could lead to lower purchase quantities. However, we manipulated the source of the price increase in several ways, such as by introducing free samples, discounts with quantity limits, and an interest cost increase, and found the dragging-down effect in each case—despite different inferences that people may make about the reason for the price discount in each case. Perhaps most relevant, the price increase in the form of an interest cost (experiment 6) came through a third party rather than the company selling the focal product, making the possibility that participants would infer the retailer's motives unlikely. Moreover, the reasonable range moderated the effect of the additional interest on the dragging-down effect, which is inconsistent with a quality-inference explanation.

In this paper, we demonstrated that price increases act as decision points and take on properties of numeric cues, such as anchors or target values, with consumers placing less weight on the cue when it is outside of a range they perceive as reasonable. This moderation builds upon prior literature on extreme anchors and elucidates specific conditions under which numeric cues may not be incorporated into judgments and decisions. In contrast to prior literature, the numbers in our studies were not extreme values—they were not far away from the reasonable ones in terms of an absolute difference but were instead considered unreasonable as purchase quantities (e.g., limit 1 vs. limit 3 in experiment 2; limit 2 vs. limit 6 in experiment 6). Thus, the mechanism behind the dragging-down effect may contain elements of anchoring, but the patterns we describe (i.e., focal values that can lead people to purchase less as they increase in value) materialize as a function of a reaction to focal values that goes beyond what has been documented in prior literature on anchoring.

Furthermore, in our context, we find the distribution of consumers' choices in response to these values mimics that of a typical distribution of responses around target values rather than anchors (e.g., see figure 4 for a representative histogram of responses, taken from experiment 2). Specifically, we see asymmetric piling up at the decision point, suggestive of a response to a goal amount rather than a symmetric distribution that would be suggestive of an anchor (see Bartels and Sussman, 2018).

We focus on the effect of a price increase on purchase decisions in this paper, but a price increase is only one example of a numeric cue that may signal a decision point for consumers to consider whether to continue purchasing additional items. We propose that other factors may also trigger such a decision point. For example, setting a default value (Goswami and Urminsky 2016; Haggag and Paci 2014) or presenting a social norm by indicating how much others consume (Goldstein, Cialdini, and Griskevicius 2008) may produce the same effect. As in the case of a price increase, we would expect that when the default value (or social norm) suggests a consumption level that falls within their reasonable range, consumers would be more likely to adopt this amount and take it as their purchase quantity. When the default value (or social norm) is below their reasonable range of consumption preference, they would be more likely to ignore the default value (or the social norm) and stick with their initial preferences. In the case of a price increase, additional transaction utility adds to the motivation for consumers to adopt the external cue as their decision point. In other cases, alternative motivations (e.g., need to conform) may be operating instead. Although the underlying reason for such effects would be different from the effect caused by price increases, these alternative cues could similarly influence consumer decisions by acting as plausible numerical cues. In the case of price increases, resulting effects yield counter-intuitive purchasing patterns in which people purchase fewer units of a product when they are offered at lower per-unit costs.

In this paper, we examined a consumer's reasonable range as one moderator of the dragging-down effect and found that consumers were more likely to respond to a price-increase quantity within their reasonable range than below that range. We propose that the reasonable range is related to a variety of contextual factors including product type, a consumer's familiarity of the product, and the usage frequency of the product. For example, consumers may be more likely to have a wider range of purchasing preferences for durable goods (rather than perishable goods) or for products with low storage costs. Similarly, uncertainty about usage frequency or unfamiliarity with a given product may lead to a wider range of preference because the consumer does not have firm beliefs that bound this preference range. While we did not find that moderation by product type in the current paper, we believe that product type could be correlated with a variety of contextual factors that can affect the dragging-down effect through their impact on the reasonable range.

Implications

We show that pricing strategy can influence consumers' purchase and consumption decisions in counterintuitive ways. One implication for marketers is that when designing promotion strategies, they should consider their consumers' reasonable range for consumption. They should set the quantity limit of price promotions either low enough for consumers to ignore them as a decision point or high enough to be above consumers' initial consumption quantity to avoid leading consumers to purchase lower quantities at a lower price. When the price-increase point falls between these two levels, the promotion may be damaging for two reasons. First, firms forgo more profit to offer more units of product on sale; and second, the higher quantity limit could reduce purchase quantity when the quantity limit falls within consumers' reasonable range for consumption.

Another possible implication is inverse price-break points as a new kind of behavioral nudging. In the context of energy consumption, researchers have been exploring possible ways to encourage savings consumption, such as emphasizing the health hazard (Dietz, 2015) or introducing a time-varying electricity pricing (Badtke-Berkow et al. 2015). One method some countries have adopted to reduce energy consumption is to use inverse tiered pricing for electricity. For example, in South Korea, the electricity rates vary from 8.1 to 62.0 South Korean won, based on energy use (Bojanczyk 2012). As households consume more energy, the price increases at discrete intervals. In an additional experiment with an electricity consumption scenario using a pricing strategy similar to the South Korea case, we found that participants chose to consume less energy when the electricity rate increased at a reasonably low household consumption level than at an unreasonably low consumption level (see the supplementary materials for additional details). These findings suggest the price-increase point can be used to alter consumption, and the choice of this point may be useful for changing consumption behavior based on this pricing approach. A price increase at unreasonably low consumption levels is unlikely to affect decisions or reduce energy consumption.

The current findings also suggest that non-linear pricing strategies could help consumers regulate unhealthy consumption in other domains. For example, an extra tax on soda drinks exceeding a certain consumption quantity may help consumers reduce the quantity of sugar consumed. Compared with a flat soda tax, a tax-increase at a reasonable consumption level may provide consumers with additional decision points to reconsider their choices. In the context of financial decision-making, extra credits or reduced tax on predetermined levels of savings, such as the UK Personal Savings Allowance, may encourage consumers to save more. Importantly, to avoid an unintended effect, the level of such tax-free income should be set in a way that exceeds an average household’s savings.

The current research addresses a fundamental issue in consumer behavior, examining how consumers react to price increases. Consumers encounter unit-price increases in various forms, such as limited free samples, discounts with quantity limits, price surcharges or additional interest costs above a specified quantity, or tax breaks below a certain amount. This paper adds to the literature of non-linear price increases in marketing by studying cases in which price increases can lead consumers to purchase more (vs. less) units when the per-unit price is higher (vs. lower). Future research should explore additional psychological factors that may influence consumer behavior in response to price increases.

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