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Journal of Retailing 85 (3, 2009) 336–346

Journal of Retailing

# The Effects of Discount Location and Frame on Consumers' Price Estimates

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**Abstract**

A discount may be defined by the location in which, and frame by which, it is communicated. Discount framing, particularly the differences between cents-off and percentage-off discounts, has been widely studied. Discount location (e.g., proximate to or distal from regular price info) has received considerably less attention. We employ the proximity-compatibility principle and tenets of human memory to demonstrate that discount framing (cents-off, percentage-off, and revised price) and discount location (proximal, distal) interact to differentially affect both the immediate value and the persistence of consumers' price estimates. The implications of these results for retailers and manufacturers are highlighted in the discussion.


*Keywords:* Discount location; Discount frame; On-pack discount

## Introduction

As noted by Hardesty and Bearden (2003), ample research has considered the effect of sales promotions on when, what, and how much people buy but considerably less in known about how to best promote. This sentiment is echoed by Grewal and Levy (2007, p. 448) who note that "the factors that may moderate the effectiveness of temporary price reductions likely can provide insights to both retailers and consumer packaged good manufacturers" (see also Levy et al. 2004). We provide such insights by studying how the effect of a heretofore unstudied discount factor (the location of the discount) affects a variable (price estimates) that is important to both retailers and manufacturers.

A typical on-shelf discount provides discount information adjacent to regular price information (hereon proximal discounts). Manufacturers may attempt to control the location, frame, and depth of a discount by offering it on the product, via a shelf-talker, or as a coupon. When a discount is communicated in these ways, regular price and discount information may be physically separated (hereon distal discounts). As we will outline, theory from human factors research suggests that the separation of price components will affect consumers' ability to integrate discount information into regular price information which, in turn, will affect their price estimates (i.e., the price at which consumers believe the product to be offered). Further, in the case of one type of distal discount – a discount placed on-pack – the promotion serves as a post-purchase cue that should aid consumers' recall of their price estimates, an effect that has implications for future choice.

We also consider how the manner in which the discount is communicated moderates the effect of where it is communicated. Research has investigated the effect of numerous pricing tactics including discount depth and frequency (e.g., Alba et al. 1994), odd versus even price endings (e.g., Schindler 2006; Thomas and Morwitz 2005), comparative pricing tactics (Kopalle and Lindsey-Mullikin 2003), and coupon value (e.g., Darke and Chung 2005; Raghubir 2004) on consumers' dollar-specific price estimates. Similarly, discount framing has been shown to affect general perceptions of the value of the discount (Chandrashekaran 2004; Darke and Chung 2005; Hardesty and Bearden 2003; Kim 2006). Considerably less research has been undertaken on the effect of discount framing on dollar-specific price estimates. The research that has been done on the topic does indicate that discount framing can affect price estimates (Estelami 1999; Kopalle and Lindsey-Mullikin 2003). In turn, lower price estimates are associated with (a) increased choice at the time of the discount (e.g., Varki and Colgate 2001) and (b) decreased choice once the discount has been removed

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doi:10.1016/j.jretai.2009.05.010

(DelVecchio, Krishnan, and Smith 2007); the latter outcome arising due to the effect of price estimates on internal reference prices (e.g., Blair, Harris, and Monroe 2002; Chandrashekaran and Grewal 2003; Kopalle and Lindsey-Mullikin 2003).

The (a) paucity of research on discount location, (b) demonstrated effects of discount communication strategies on price estimates, and (c) recognized effects of price estimates on both current and future choice lead to three research questions. First, do proximal (vs. distal) discounts lead to lower price estimates? Second, are the effects of discount location contingent upon the manner in which a discount is framed? Third, do the effects of location and frame persist to affect price estimates at the time of a subsequent category purchase?

## Study 1: Discount location and frame

In Study 1, we experimentally assess the effects of discount location (proximal, distal) and frame (revised price, percentage-off) on consumers' price estimates and deal value. Research on discount framing has focused primarily on three types of discount frames: cents-off (e.g., 50¢ off a price of $2.00), percentage-off (e.g., 25 percent off a price of $2.00), and revised price (e.g., "Now $1.50") (e.g., Chen, Monroe, and Lou 1998; Krishna et al. 2002; Yin and Dubinsky 2004). We start by considering percentage-off and revised price frames since they represent the extremes in terms of processing complexity.

### *Discount location*

When separated from regular price information, perhaps by being offered on-pack or as a coupon, discount information alone may not allow consumers to discern the dollar value of the discount or the ultimate price of the product. For instance, simply knowing that a product is discounted by 25 percent does not inform a consumer of the promoted price. Thus, processing of discounts is affected by whether the discount and price information is displayed in different places or together (e.g., Coulter and Coulter 2007). To understand how the location of a discount will affect price estimates when price components need to be integrated, we turn to literature in the area of human factors.

Human factors research attempts to improve man–machine interfaces (e.g., Wickens and Hollands 2000). Within the human factors literature, the proximity-compatibility principle serves as a guide to organize visual displays (Wickens and Carswell 1995). The proximity-compatibility principle holds that objects that are perceptually distant are less easy to integrate than those that are perceptually close (Barnett and Wickens 1988; Carswell and Wickens 1987). Perceptual distance may be defined in terms of two general types of proximity—physical and psychological (Wickens and Carswell 1995). Physical proximity refers to spatial proximity as well as similarity of color, size, and shape. Psychological proximity is a function of the similarity in use of displays. For instance, displays are more psychologically similar if they share the same metric or if they covary. Our primary focus in considering discount location is on the spatial proximity of price and discount information.

Proximity hastens integration of information by freeing resources to concentrate on the integration task. Integrating price and discount information often requires multi-step computation. For instance, integrating a 25 percent discount into a $3.40 base price may involve first "rounding" the price to $3.20, dividing $3.20 by four to arrive at an estimate of the discount of 80¢, and then estimating the revised price as the original $3.40 less 80¢ for a final price of $2.60. The computational steps and the need to remember sub-computations (e.g., 80¢, $3.20) can strain working memory. Since working memory is characterized by a finite capacity (e.g., Miller 1956) and a finite time within which initial encoding of information decays (1.5–2 s; Baddeley 2001), placing the necessary informational components (i.e., $3.40 and 25 percent) in close proximity helps processing by freeing up resources that would otherwise be used to search for the information (Wickens and Carswell 1995). Thus, spatial proximity (i.e., placing discount and regular price information together) should lead to more accurate price estimates when integration of price components is necessary. At question is whether inaccurate price estimates resulting from distal discounts will be higher or lower than the discounted price.

When information integration is difficult people place greater weight on information that is known with relative certainty (Jacowitz and Kahneman 1995; Tversky and Kahneman 1974). When price and discount information are distal from one another, integration is more difficult. In this case, greater weight should be placed on the known regular price than on the to-be-calculated discounted price. This implies that price estimates will be biased upwards toward the regular price when integration of the discount information is more difficult. The expectation that price integration is more difficult for distal discounts coupled with a tendency for upward bias when prices are uncertain leads us to the expectation that consumers' price estimates will be higher for distal discounts than for proximal discounts.

**H1.** Distal discounts will result in higher price estimates than will proximal discounts.

### *Discount frame*

When provided, a revised price frame allows consumers to easily recognize the product price and, in turn, should lead to highly accurate price estimates (see Burman and Biswas 2007; Morwitz, Greenleaf, and Johnson 1998 for the same logic applied to surcharges). Conversely, a percentage-off discount is difficult for consumers to process on two accounts. First, from a proximity-compatibility standpoint, percentage-off discounts are perceptually separated from regular prices since they offer price information in a different metrics (percentages of dollars rather than dollars). In addition, the multiplication (or division) task associated with a percentage-off discount renders the revised price difficult to compute (e.g., Rhymer et al. 2002). Following from the earlier discussion on working memory limitations and the anchoring effect of the base price when it is used as a reference to judge the discounted price, the error associated with integrating a percentage-off frame should bias price estimates upward toward the regular price. Thus, a percentage-off

frame will be associated with higher price estimates than a less complex discount of equal value and this relationship is evident in extant research (DelVecchio, Krishnan, and Smith 2007). Of greater interest to the study of discount locations is that discount frame likely moderates the impact of a discount's location on price estimates.

As mentioned previously, the effect of spatial separation of price components on price estimates stems from increasing the difficulty of integrating regular price and discount information. The degree to which this effect occurs is therefore a function of the extent to which such integration is (a) necessary and (b) difficult. Since a revised frame does not require integration of price and discount information, price estimates should not differ for distal and proximal discounts framed as revised prices. Conversely, a percentage-off discount presents a task in which integration is both necessary and difficult. Difficulty of integration should heighten the effect of discount location as the mental resources that are freed by placing price and discount information near one another can be gainfully used to process the percentage-off discount, which needs additional resources (Navon and Gopher 1979). Thus, a percentage-off discount should magnify differences between the higher price estimates associated with distal discounts and the lower price estimates stemming from proximal discounts. The above discussion leads to expectations that discount frame will have a direct effect on price estimates and will also moderate the effect of discount location.

**H2.** Price estimates will be lower for a revised price discount frame than for a percentage-off frame.

**H3.** Percentage-off discounts will lead to lower price estimates for a proximal than a distal discount; this difference will not be significant for a revised price discount.

*Methodology*

The effects of discount location and frame on price estimates were tested via an experiment that sported a 2 (discount location—on-pack, on-shelf) × 2 (discount frame—percentage-off, revised price) between subjects factorial design. Participants were informed that they were to imagine that they were shopping at the local Kroger's grocery store and that they should "shop as they do in real life." They then viewed simulated store shelves offering three brands of orange juice in half-gallon cartons (see Fig. 1). Tropicana offered the focal discount. The regular price of the focal product was $3.35. Discount location was manipulated by having the discount appear as a shelf tag next to regular price information below the product or a shelf tag on the shelf above the product. Discount frame was manipulated to be revised price ("You Pay $2.51") or percentage-off ("25% Off Listed Price").

While viewing the simulated shelf, participants first indicated the brand that they would choose or that they would not make a purchase. Participants next answered questions absent any price or discount information. Respondents were asked to indicate if Tropicana had been offered at a discounted price. Next participants indicated what they believed the price for Tropicana to be net of any discount. This measure serves as the primary independent variable. Following the price estimate measure, participants responded to a seven item scale measuring perceptions of deal value ($\alpha = .940$) and three measures of reference price for the focal brand ($\alpha = .739$). The deal value measure asked respondents to indicate the extent to which they view the discount as large, valuable, favorable, beneficial, satisfactory, attractive, and a good deal (e.g., Darke and Chung 2005; Lichtenstein, Burton, and Karson 1991). The reference price scale is comprised of respondents' perceptions of the average price, fair price, and maximum acceptable price for the focal brand (e.g., Bearden et al. 1992; Chandrashekaran and Grewal 2003; Grewal, Monroe, and Krishnan 1998).

Participants concluded by responding to a manipulation check measuring participants' level of agreement with the statement "discount information was provided near the price information" and a measure of the complexity of calculating the discount for a given frame. To measure perceived computational difficulty, respondents were first reminded of the discount by having the regular price and discount shelf tags displayed next to one another in their response booklet. Respondents then indicated their level of agreement with the statement "the discount requires a lot of effort to determine its value."

One hundred nine undergraduate students at a large Midwestern university participated in Study 1. Data from three participants were dropped because the data reflected a failure to understand the discount information (e.g., the estimated discounted price was greater than the regular price).

*Results*

Perceived proximity of the discount and the regular price differed as a function of discount location, with the proximal location being viewed as closer to regular price information (*mean* = 4.94) than the distal location (*mean* = 3.00, $F_{1,105} = 17.24$, $p < .001$), but not as a function of discount frame ($F_{1,105} = 0.11$, *location by frame interaction* $F_{1,105} = 0.26$). Difficulty of processing the discount was greater for a percentage-off discount (*mean* = 5.00) than a revised price discount (*mean* = 2.70, $F_{1,105} = 47.21$, $p < .001$) but did not differ across discount locations directly ($F_{1,105} = 0.37$) or via a frame by location interaction ($F_{1,105} = 2.42$, $p > .10$, recall that difficulty was assessed while exposing participants to the discount and price next to one another in the response booklet).

Models with awareness of the discount and focal brand choice as factors could not be specified due to the high rates of discount awareness (90.6 percent) and choice of the focal brand (70.7 percent). Effects of awareness of the discount and choice of the focal brand are controlled by including them as covariates in the models described below. As displayed in Table 1 and Fig. 2, ANCOVA results indicate that H1 is supported at $p = .052$. Mean price estimates are $2.73 when discount and regular price information is distal from one another and $2.64 when proximal ($F_{1,105} = 3.86$, $\eta_p^2 = .034$). Consistent with H2, price estimates are lower when the discount is conveyed as a revised price ($2.57) than as a percentage-off ($2.81, $F_{1,105} = 14.34$, $p < .001$, $\eta_p^2 = .139$). Regarding the interaction between location and frame, price estimates differ more across location conditions


Fig. 1. Stimuli in the percentage-off, distal discount condition of Experiment 1 (participants in Experiments 1 and 2 viewed color versions of the stimuli).

for the percentage-off frame than the revised price frame. For the revised price discounts, price estimates were invariant across the distal ($2.58) and proximal ($2.57) discount location conditions ($F_{1,51} = 0.01$, ns). Conversely, the percentage-off discount was associated with higher price estimates when distal from regular price information (*mean* = $2.91) than when proximal to the regular price (*mean* = $2.72, $F_{1,49} = 4.35$, $p < .05$). Overall, the interaction is significant at $p = .06$ ($F_{1,105} = 3.61$, $\eta_p^2 = .033$).

Study 1 provides initial insights into the effect of discount location. Price estimates were chosen as the dependent variable on the belief that they affect choice both at the time of the discount and after the discount is removed; the latter affect

Table 1
Mean (*SD*) perceptions of the discounted price in Experiment 1.

| | Proximate discount | Distal discount | Frame mean |
|---|---|---|---|
| Percentage-off frame | $2.72 (0.31), $n = 27$ | $2.91 (0.32), $n = 23$ | $2.81 (0.32) |
| Revised price frame | $2.57 (0.20), $n = 29$ | $2.58 (0.24), $n = 27$ | $2.57 (0.22) |
| Discount location mean | $2.64 (0.34) | $2.73 (0.32) | |

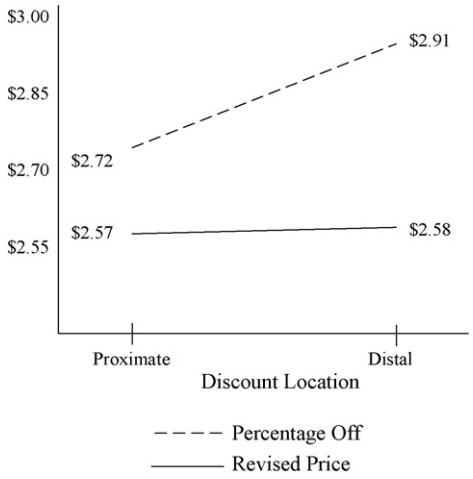


Fig. 2. Perceptions of the discounted price in Experiment 1.

occurring due to the effect of price estimates on reference prices. In support of this belief, binary logistic regression indicates that higher price estimates reduce choice probability at the time of the deal ($\beta = -.02$, $p < .01$). Single regression results indicate a positive relationship between price estimates and reference price (i.e., lower price estimates lead to lower reference prices; *standardized* $\beta = .27$, $p < .01$). Finally, single regression indicates a negative effect of price estimates on perceived deal value (i.e., a higher perceived price is associated with a less positive perception of the deal; *standardized* $\beta = -.19$, $p = .05$).[1]

### *Discussion*

Many retailers desire to project images of low prices (e.g., Dutta and Biswas 2005; Kukar-Kinney, Walters, and MacKenzie 2007). Such retailers are advised to continue placing discount information on-shelf (i.e., proximal to regular price information). On the other hand, manufacturers may push for retailers to separate regular and discount price information, or may do so themselves (e.g., by offering on-pack discounts, coupons, or on company operated websites), to insulate reference prices (i.e., keep people's price perceptions and, in turn, their price expectations high). Study 2 replicates and extends Study 1. Such replication is particularly called for given that H1 and H3 were "supported" by results that were significant at $p = .052$ and $p = .06$, respectively; levels of support just outside the traditional cutoff.

## Study 2: On-pack discounts

In extending Study 1, Study 2 tests the effect of a distal discount that is placed on the product package. In addition to considering an on-pack discount as the distal discount, we also expand the frame types to include a cents-off frame.

The additional computational steps associated with a percentage-off discount (i.e., computing the discount in dollars and cents before subtracting it from the regular price) make such a discount more difficult to process than one framed in cents. Similarly, a cents-off frame offers more complexity than a revised price frame. Thus, the cents-off frame offers a middle ground in terms of processing difficulty. This should result in price estimates for a cents-off frame being between the revised price frame and percentage-off frames. In addition, the moderate difficulty of integrating a cents-off promotion into regular price information should also render the effect of discount location to be more moderate that the large effect location has in the case of a percentage-off frame and the minimal effect of location for a revised price frame. These expectations lead to H4 and H5.

**H4.** Price estimates for a cents-off discount will be (a) higher than those for a revised price frame and (b) lower than those for a percentage-off frame.

**H5.** The extent to which a proximal discount will lead to lower price estimates than a distal discount will be greatest for a percentage-off discount and least for a revised price discount.

### *Methodology*

Study 2 participants viewed simulated store shelves containing three brands of shampoo, via computer monitor. The experimental design was a 2 (discount location—on-pack, on-shelf) × 3 (discount frame—percentage-off, cents-off, revised price) between subjects factorial. Ion, an actual shampoo, was selected as the focal brand and competed against two filler brands. The regular price of the focal product was $3.39. Discount location was manipulated by having the discount appear with the regular price information on the shelf below the product or on the product package. The discount tag was the same size, shape, font, and color scheme in each experimental condition. Discount frame was manipulated to be revised price ("Now $2.44"), percentage-off ("Save 28%"), or cents-off ("Save 95¢"). Fig. 3 displays the focal brand as it was portrayed in two of the six experimental conditions.

[1] Despite the general agreement between price estimates and (a) reference prices and (b) deal value, the effects of discount location and frame were not completely consistent across these constructs. Reference prices were directionally lower for a proximal location ($F_{1,105} = 2.70$, $p = .10$) and, consistent with price estimates, displayed a pattern of result in which there was a greater difference in reference prices between frames when the discount was proximal to regular price information (interaction $F_{1,105} = 2.74$, $p = .10$). Discount frame did not affect the reference price measure ($F_{1,105} = 0.01$). Consistent with the higher price estimates associated with a percentage-off frame, deal value was perceived to be lower (*mean* = 4.71) for this frame than for a revised price frame (*mean* = 5.25, $F_{1,105} = 4.65$, $p < .05$). Deal value was only directionally greater for a proximal discount (*mean* = 5.18) than a distal discount (*mean* = 4.82, $F_{1,105} = 2.23$, $p = .14$) and did not evidence a frame × location interaction ($F_{1,105} = 0.65$). Thus, it appears that price estimates are related to, yet distinct from, the reference price and deal value constructs.


Fig. 3. Focal brand in the (A) revised price, proximal (on-shelf) and (B) cents-off, distal (on-pack) conditions of Experiment 1 (participants in Experiments 1 and 2 viewed color versions of the stimuli).

As in Study 1, participants first indicated the brand that they would choose. Next, participants advanced to a screen that displayed the brand packages absent price and discount information and were asked to indicate if Ion had been offered at a discounted price and the price at which they believe Ion was offered.

*Results*

One hundred fifty-seven undergraduate students at a large Midwestern university participated in the study. Data from five participants were dropped because the data reflected a failure to understand the discount information (e.g., the estimated discounted price was greater than the regular price).

The rates of discount awareness (88.2 percent) and focal brand choice (82.2 percent) were again controlled by including them as covariate variables in an ANCOVA model of the effects of frame and location on price estimates. Price estimates across experimental conditions are displayed in Table 2 and Fig. 4.

Before considering the cents-off frame, we look to replicate the findings of Study 1 regarding the revised price and percentage-off frames. Excluding the cents-off frame results in main effects of discount location (distal > proximal; $F_{1,95} = 3.45$, $p < .07$) and discount frame (percentage-off > revised price; $F_{1,95} = 23.73$, $p < .001$) that are consistent with Hypotheses 1 and 2. A discount location by discount frame interaction ($F_{1,95} = 6.40$, $p < .05$) also emerges as predicted by H3. Specifically, for the percentage-off frame price estimates are higher when the discount is distal to the regular price *mean* = \$3.01 than when the discount is proximal (*mean* = \$2.74, $F_{1,49} = 8.68$,

Table 2
Mean (*SD*) perceptions of the discounted price in Experiment 2.

| | Proximal discount | Distal discount | Frame mean |
|---|---|---|---|
| Percentage-off frame | \$2.74 (0.40), $n = 27$ | \$3.01 (0.35), $n = 23$ | \$2.86 (0.39) |
| Cents-off frame | \$2.59 (0.34), $n = 27$ | \$2.76 (0.47), $n = 29$ | \$2.68 (0.42) |
| Revised price frame | \$2.53 (0.22), $n = 24$ | \$2.50 (0.17), $n = 22$ | \$2.52 (0.20) |
| Discount location mean | \$2.62 (0.34) | \$2.76 (0.41) | |

$p < .01$). The difference in price estimates between the distal (*mean* = \$2.50) and proximal (*mean* = \$2.53) locations for the revised price frame is not significant ($F_{1,45} = 0.14$).

Significant main effects of discount location (*distal mean* = \$2.76, *proximal mean* = \$2.62, $F_{1,151} = 6.45$, $p = .01$, $\eta_p^2 = .041$) and frame ($F_{2,151} = 10.46, p < .01, \eta_p^2 = .121$) persist in Study 2 when including the cents-off frame in the ANCOVA model. Consistent with H4a and b, price estimates are higher for the cents-off discount (*mean* = \$2.68) than the revised price discount ($F_{1,101} = 5.29$, $p < .05$) and lower than those stemming from a percentage-off discount ($F_{1,105} = 5.48$, $p < .05$). Correspondingly, the revised price frame was associated with lower price estimates than the percentage-off frame ($F_{1,95} = 23.73$, $p < .001$).

Overall, the interaction between discount location and frame is significant at $p < .10$ ($F_{2,151} = 2.36$, $\eta_p^2 = .035$). Consistent with H5, there is a greater difference in recalled prices across discount locations (proximal < distal) for a revised price discount than for a percentage-off discount (interaction $F_{1,95} = 6.40$, $p < .05$). However, the relative difference in price estimates across locations for the cents-off discount does not differ from that for a percentage-off discount (interaction $F_{1,105} = 0.54$, $p = .46$) or a revised price discount (interaction $F_{1,101} = 2.49$, $p = .12$). Thus, H5 is only partially supported and it appears that including the cents-off frame tempers an otherwise stronger frame effect; a finding that is consistent with our belief that the revised price and percentage-off frame represent processing extremes.

As in Study 1, the increased accuracy (lower price estimates) associated with placing a discount proximal to regular price information causes price estimates to be invariant across discount frames ($F_{2,77} = 1.81$, $p = .17$). Thus, while the pattern of results for the on-shelf discounts parallels the overall outcome in which price estimates are lower for a revised price frame than a cents-off frame and for a cents-off frame than a percentage-off frame, the overall effect is driven by the distal discount conditions.

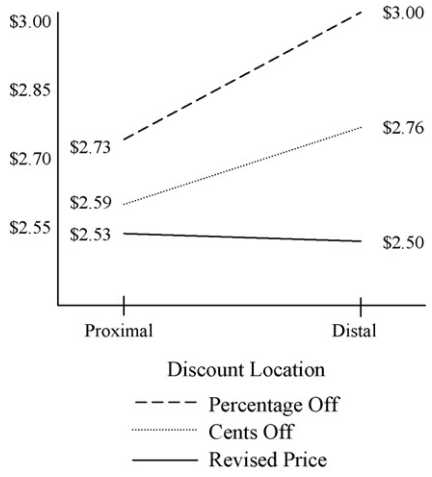


Fig. 4. Perceptions of the discounted price in Experiment 2.

*Discussion*

Studies 1 and 2 demonstrate that a discount's location can affect consumers' immediate price estimates. That price estimates were equivalent across discount locations for the revised price frame but not for other frames suggests that an opportunity may exist to convey low prices at the point of purchase in a manner that enables these perceptions to persist (or not). We address this possibility in Study 3 by measuring price recall for on-shelf and on-pack discounts. As such, our focus continues to shift from the more general topic of proximal versus distal discounts to the more specific effects of on-shelf versus on-pack discounts.

## Study 3: The persistence of price estimates

While price estimates have implications for choice at the time of the discount, they may also affect choice after the discount is removed. A negative effect on choice can arise if lower price estimates stemming from a discount make the higher regular price seem unattractive in the next purchase period (Chang, Siddarth, and Weinberg 1999; DelVecchio, Krishnan, and Smith 2007; Jacobson and Obermiller 1990). However, between the encoding of a price and the next category purchase, the encoded price is subject to memory decay. Thus, it is not consumers' perceptions of the previous price at the time of initial exposure that influences current choice. Rather, it is the recall of those price estimates that affects choice (e.g., Winer 1986).

We draw upon the reconstructive memory paradigm to inform hypotheses relating to how discount framing, discount location, and their interaction affect recalled price estimates. Reconstructive memory theory (Bartlett 1932) suggests that we do not necessarily recall past events in a manner similar to replaying a video recording. Rather, we engage in a process whereby our memories are *reconstructed* from different pieces of information accessed on the basis of retrieval cues (Loftus 1975). Memory therefore might include both original pieces of the picture and aspects that are inferred from currently available information (Jacoby 1978).

From the reconstructive memory viewpoint, price estimates may be recalled from memory or reconstructed using currently available price cues at the second purchase occasion. The extent to which people rely on reconstruction rather than recall depends upon the likelihood of successful recall from memory (Jacoby 1978; Loftus 1975). When recall is difficult, reconstruction is likely. Since price estimates differ as a function of discount frame, discount location, and their interaction, reconstruction at a subsequent purchase occasion may be relied upon differentially across different discount frames and locations. Thus, depending on how discount information is communicated during the first purchase occasion, price estimates at the subsequent purchase may also differ.

*Discount location*

The portable nature of on-pack discounts exposes consumers to discount information beyond the initial product purchase. As

such, discounts that are conveyed on-pack provide a memory cue for the lower price as consumers handle and use the product. Since memory for an object is bolstered when memory cues are provided (Keller 1987; Tulving and Thompson 1973), price estimates are less likely to be based on reconstructed memories when formed in response to an on-pack discount. In the case of an on-pack discount that is framed as a revised price, the memory cue is a direct replication of the lower price. Exposure to cents-off or percentage-off discounts on package should activate retrieval of the related node, namely the lower price thereby indirectly bolstering memory of the discounted price (Anderson 1995; Jewell and Unnava 2003).

For an on-shelf discount, the lack of salient price cue between purchase occasions makes price recall less likely and, in turn, reconstruction more likely. A primary source of information for memory reconstruction is currently observable target-relevant information (e.g., Jacoby, Hessels, and Bopp 2001). Therefore, the current price should serve as target-relevant source information by which to reconstruct previous prices. Assuming the product is no longer discounted, the current price will be higher than the previous price thus leading to an upward bias in the reconstructed prices. In contrast, with on-pack discounts, the memory cue provided on the pack during product transport, use and disposal makes it easier for consumers to recall the lower price and thus reduces their reliance on reconstruction at the second purchase occasion. This makes price estimates that are reinforced via an on-pack discount less susceptible to the influence of the current price. Therefore, as expressed in H6, on-pack discounts should be associated with lower price estimates following the delay between successive price exposures.

**H6.** On-pack discount will result in lower recalled prices following a discount than will on-shelf discounts.

### *Discount frame*

Study 2 indicates that initial price estimates are lower for a revised price frame than a cents-off or a percentage-off frame. Thus, all else equal, recalled prices should be lowest for a revised price and highest for a percentage-off frame. This expectation is captured in H7. In addition, discount frame should moderate the effect of location. Price memory should be bolstered, and therefore a lower price recalled, to the extent that the on-pack discount offers a strong memory cue. By providing an exact indication of the discounted price, the revised price frame offers the most concrete cue and should most bolster memory for the discounted price when on pack. This should cause recalled prices to differ greatly depending on whether the revised price discount is on-pack (i.e., when price memory is strongly bolstered) or on-shelf.

Consider next the effect of cents-off frame on price recall across the on-pack and on-shelf discounts. The cents-off frame provides a less concrete cue than the revised price but the expression of the discount in a dollar metric may serve to activate memory of the discounted price. This aspect of the cents-off-frame makes a difference between on-pack and on-shelf likely, albeit a smaller difference than that predicted for the revised price frame. Conversely, the percentage-off frame provides the least concrete price cue and thus will be least likely to cue the discounted price memory node. Thus, the differences between the on-pack and on-shelf are likely to be attenuated for a percent-off discount. The above logic lead to the expectation of a main effect of discount frame (H7) and a frame by discount location interaction (H8).

**H7.** Recalled prices will be lower for a revised priced discount frame than a cents-off frame or a percentage-off frame.

**H8.** The extent to which a an on-pack discount will be associated with lower recalled prices than an on-shelf discount will be greatest for a revised price discount and least for a percentage-off discount.

### *Methodology*

Study 3 participants chose among brands of shampoo in each of two experimental sessions separated by a week. Participants chose from the same choice set used in Study 2 with Ion again serving as the focal brand. In the first choice period, the focal brand of shampoo was again discounted by 28 percent to $2.44 (from $3.39). In their response booklet, participants indicated only their brand choice. We did not ask for price estimates at the time of purchase to avoid artificially heightening price recall. As participants left the experimental session, each received a bottle of the focal brand of shampoo (Ion).

Discount location (shelf, pack) and frame (revised price, cents-off, percentage-off) were manipulated during the initial choice as in Study 2. Participants in the on-pack condition of Study 3 received a bottle of shampoo that had a yellow discount sticker affixed to the bottle. The discount sticker was 1.5 in. high by 1.0 in. wide. Participants in the on-shelf condition received the shampoo without any discount sticker. To avoid detection of the purpose of the study, data was collected in small groups in which each participant was in the same condition and thus received a bottle either (a) without a discount sticker or (b) with the same discount sticker as others in the session.

In the second experimental session, participants again selected from the set of three shampoos, each of which was offered at its "regular" price ($3.39 for the focal brand). After selecting a brand, participants indicated what they believed to be the price for Ion during the first shopping trip. This measure, which was collected as participants viewed the period two choice set and prices, serves as the dependent variable.

### *Results*

One hundred eighty-seven undergraduate students at a large Midwestern university completed the two experimental sessions comprising Study 3. The effects of discount location and frame were tested via ANCOVA with choice of the focal brand and awareness of the discount in Period 1 again serving as covariate variables. Table 3 reports the results while Fig. 5 displays the effects.

In support of H6, the recalled price was lower when the discount was on-pack (*mean* = $2.95) than when it was on-shelf

Table 3
Mean (*SD*) price recall in Experiment 3.

| | On-shelf discount | On-pack discount | Frame Mean |
|---|---|---|---|
| Percentage-off frame | \$3.28 (0.32), $n = 27$ | \$3.23 (0.35), $n = 30$ | \$3.25 (0.33) |
| Cents-off frame | \$2.98 (0.50), $n = 30$ | \$3.02 (0.57), $n = 29$ | \$3.00 (0.53) |
| Revised price frame | \$3.04 (0.34), $n = 35$ | \$2.63 (0.27), $n = 36$ | \$2.85 (0.37) |
| Discount location mean | \$3.09 (0.41) | \$2.95 (0.47) | |

(*mean* = \$3.09, $F_{1,186} = 5.44$, $p = .02$, $\eta_p^2 = .028$). Consistent with H7, the main effect of discount frame is significant ($F_{2,186} = 14.62$, $p < .01$, $\eta_p^2 = .170$). Recalled prices are lower following a revised price discount (*mean* = \$2.85) than either a cents-off (*mean* = \$3.00, $F_{1,129} = 5.47$, $p < .05$) or a percentage-off frame (*mean* = \$3.25, $F_{1,127} = 47.63$, $p < .01$). Also consistent with H7, mean recalled prices were lower following a cents-off discount than a percentage-off discount ($F_{1,115} = 9.41$, $p < .01$).

Overall the frame by location interaction is significant ($F_{2,186} = 6.17$, $p < .01$, $\eta_p^2 = .076$) as is the difference in recalled prices for a revised price frame when offered on-pack (*mean* = \$2.63) versus on-shelf (*mean* = \$3.04, $F_{1,70} = 31.36$, $p < .01$). Recalled prices did not differ across location conditions for the cents-off ($F_{1,58} = 0.21$, $p = .65$) or percentage-off frames ($F_{1,56} = 0.28$, $p = .60$). Thus, consistent H8, the difference in recalled prices across discount locations was greater for a revised price discount than a cents-off discount (interaction $F_{1,129} = 8.70$, $p < .01$) or a percentage-off discount (interaction $F_{1,127} = 9.95$, $p < .01$). However, the disparity in recalled prices across location conditions did not differ for the cents-off and percentage-off frames (interaction $F_{1,115} = 0.35$).

## General discussion

This research contributes to existing pricing literature by filling a gap in our collective knowledge (Brown and Dant 2008a, 2008b). Specifically, this research is the first to systematically study the effect of physically separating discount information from the regular price. Many distal discounts (e.g., coupons, on-pack discounts) allow manufacturers to influence retailers' prices for a product while controlling the manner in which the discount is framed; control that, in part, may explain the growing popularity of on-line coupons (e.g., Chiou-Wei and Inman 2008). Considering the moderating effect of discount frame rather than focusing solely on revised price discounts is apt since in many instances indicating the price after accounting for the discount is impractical (e.g., when an entire line of products with differing base prices is discounted). As predicted by the proximity-compatibility principle, and demonstrated in Studies 1 and 2, placing discount information in close proximity to the regular price information aids consumers' integration of discounts with base price information leading to lower price estimates. When such integration is not necessary (i.e., when the new price is provided), proximity is not needed and does not improve the accuracy of consumers' price estimates. Study 3 indicates that placing a revised price discount in a location that allows for exposure to the discount between purchases bolsters memory for a lower promoted price.

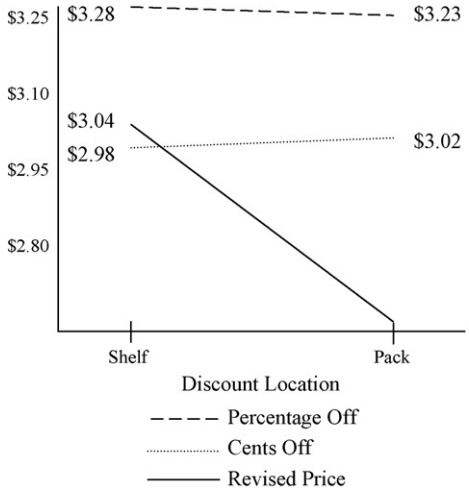


Fig. 5. Price recall in Experiment 3.

The results provide needed consumer insight for retailers looking manage price perceptions across purchase occasions (Kopalle et al. 2009; Puccinelli et al. 2009). Many retailers wish consumers to perceive overall store prices as being low (e.g., Cox and Cox 1990). As such, retailers' move to on-shelf discounts would appear to meet this goal since, on average, price estimates were lower in the on-shelf condition than the on-pack condition of Study 1. However, general perceptions of a store's prices appear to be particularly susceptible to easily recalled instances of low prices (Ofir et al. 2008). Providing revised price discounts on-pack offers an ideal opportunity to create a strong low-price memory trace. Therefore, in shifting to on-shelf price communications retailers appear to be overlooking a tool that can be used to sustain low-price impressions across shopping trips.

The results also add the growing literature on discount framing. A revised price frame was associated with the lowest price estimates (both initial and recalled). In Study 2 we find that a cents-off promotion is associated with lower price estimates than a percentage-off promotion. This result is consistent with DelVecchio, Krishnan, and Smith's (2007) findings that a cents-off discount results in lower price estimates than a percentage-off discount for large discounts. However, the results of extant research do not consistently favor a cents-off frame (see e.g., Chen, Monroe, and Lou 1998; Gendall et al. 2006; Hardesty and Bearden 2003 for varying outcomes of cents-off vs. percentage-off framing). Furthermore, despite the apparent differences in processing cents- and percentage-off discounts, these frames did not differentially moderate the effect of discount location on price estimate (initial or recalled). Given these varying results, additional research on cents versus percentage framing is warranted.

### *Limitations and avenues for future research*

That we used only two discount values limits the ability to identify the boundary conditions on the effect of discount

frames across a variety of price/discount combinations on price estimates. Complex percentage discounts such as the one we employed in Study 1 (28 percent) likely lead to greater discrepancies in price estimates both between frames and within the percentage-off frame across discount location than easier to compute discount values such as 50 percent (DelVecchio, Krishnan, and Smith 2007; Estelami 1999, 2003). Furthermore, discount value and regular price likely interact to affect price accuracy. For instance, the price arising from a 25 percent discount is easier to calculate than that stemming from a 33 percent discount if the base price is $2.80 while the 33 percent discount is likely to be easier to compute if the base price is $2.70. Thus, the relative effect of a percentage-off frame versus a cents-off frame is likely to vary as a function of specific price/discount combinations. More generally, frame-based discrepancies in price estimates arise due to differences in computational difficulty and, as such, are likely limited to consumers who compute the final product price when not provided.

Additional opportunities for research arise when considering pricing strategies through a proximity-compatibility lens. For instance, elements of physical proximity such as color or font consistency between price components may improve the accuracy of price processing. Second, considering the portable nature of some discounts begs the question of whether our results will generalize to other separable and portable discount communications such as coupons. If portability occurs prior to the time of purchase, for instance in the form of a coupon, price estimates at the time of the purchase decision may be lower due to repeated exposure to the discount while clipping, carrying, and redeeming the coupon.

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