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Effects of Reference Prices on Evaluations of Discounts

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Abstract

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The research reported in this paper explores the effects of price framing on consumer evaluation of discounts using reference prices as the key manipulation. In the context of a within-subjects experimental design, subjects engaged in a hypothetical shopping task where they rated five different variables related to discount evaluations. One price frame that included both original and sale reference prices emerged as especially effective in enhancing reported levels of savings, though statistically significant differences among discount frames do not hold across the other measured variables of satisfaction, extent of savings, and intent of additional or future purchase. Additional analysis suggests that the roles of internal price estimates and price anchoring are demonstrated to be empirically plausible and offer explanations of the ways reference prices can in fact influence perceptions of discounts.

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I. Introduction

Retailers frequently face the decision of how to price products at levels that appeal to consumers. One familiar tactic is to boost spending through sales that temporarily lower prices. In a strictly economic sense, discounts are effective due to the utility consumers gain from the dollars saved. From the standpoint of behavioral economics, discounts may generate satisfaction due to additional nonmonetary factors, such as the knowledge that one is getting a better deal or discount than others (Darke and Dahl 2003). Regardless of the various elements that can contribute to discount utility, it is arguable that evaluations of discounts ultimately rely strongly on a price standard known as a reference price (Monroe 1973).

Reference prices play a significant role in price framing, and retailers employ reference prices as a device to influence how they want consumers to perceive certain discount presentations. Depending on how believable they judge available reference prices to be, consumers generally use reference prices as comparison points, often enhancing their perception of savings when doing so (Hong et al. 2002). Utility can also stem from consumers' judgments of product quality if the magnitude of prices prior to discounts is at a level consumers internally associate with higher quality (Cai 2008). Thus, reference prices play an important role in not only providing consumers with a sense of the economic value of a discount but also with a subjective feeling of satisfaction when available reference prices frame a discount as a fair deal on quality products. Empirically, the use of reference prices in framing manipulations does appear to affect consumer evaluation of discounts. Tversky and Kahneman (1981), for example, find that subjects' perceptions of discounts can change depending on their judgments of

the size of the discount relative to the original price, even when dollar-off savings are equal. Another study by DelVecchio, Krishnan, and Smith (2007) suggests that the display of discounted prices, in the forms of percent-off versus dollars-off the previous price, even influences consumer expectations of future prices. The implications of these findings indicate that the optimal way to communicate discounts to consumers can—and should—be a strategic decision.

This paper studies the impacts of reference prices in the context of discount price frames and investigates whether the inclusion of pre-discount and post-discount reference prices affects subsequent evaluations of savings. Section II begins by providing a framework discussion of several prominent theories in the field of behavioral economics that explain the significance of reference prices along with their relation to framing effects and price anchoring; adding to the theoretical discussions are related studies in the literature. In Section III, I state my hypotheses regarding the possible manipulation potential of reference prices and describe the experimental approach undertaken to test these hypotheses. Section IV details the methodology, experimental design, and hypothetical shopping task my investigation centers on. Section V presents the results collected from the experimental survey and includes an analysis of measured post-purchase variables that appear to be significant among the discount frames used in the study. Finally, Section VI offers my conclusions and some suggestions for further research.

II. Background

a. Transaction Utility Theory

The frequent use of discounts in the retail industry undoubtedly stems from proven understanding of why and how discounts are appealing to consumers. Intuitively, the purely economic judgments of savings are a large part of the reason consumers gain utility from purchasing items on sale. Accompanying the financial savings is the subjective enjoyment consumers receive from participating in a transaction that involves discounted prices. In the fundamental context of Thaler's Transaction Utility Theory, consumers experience utility based on their evaluation of how "good" the transaction or deal they have come across is; that is, transaction utility stems from a consumer's comparison of the price they pay p to the price they either expect (internal reference price) or observe (external reference price) p^* (Thaler 1985). The value of an internal p^* usually derives from the consumer's past observations or knowledge of prices for a certain good, though it may also draw on externally posted prices such as manufacturer's suggested retail prices (Putler 1992). The subjective value of a discount is positive when the consumer deems p as "fair" or "just" relative to the internal or external non-sale reference prices, and this utility increases as the gap between p and p^* widens[1].

In addition to the positive valuations of discounts, there are other feelings consumers experience when they believe they have encountered a great sale. Some consumers believe that finding great price deals can be the result of skillful shopping and/or sheer luck (Darke and Freedman 1995). In fact, Garretson and Burton (2003) suggest that even consumers who are money and value conscious report an "ego-related" enjoyment from the process of discovering good deals that goes beyond the actual

[1] In a discount situation, the assumption is that $p < p^*$

calculations of financial savings. In any case, it is apparent that the transaction utility gained from a decent discount depends on the valuation of the discount, which in turn depends on internal or external reference prices.

From the discussion above, it is observable that the relation of transaction utility to reference prices is intact, largely exhibited by the fact that perceptions of a discount rely on a judgment that the reduced sale price paid is "just" or "fair" relative to a non-sale price. One of Thaler's (1985) experiments uncovers several factors that influence consumer judgments of the fairness of paid prices. In asking subjects to price ice hockey tickets, Thaler finds that even with knowledge of market prices, buyers strongly consider the seller's costs[2] both when calculating what actual price *p* was acceptable to them and in determining their own internal reference price *p**. To further highlight the importance of reference dependence, another of Thaler's studies finds that people report significantly higher reservation prices—the maximum price they are willing to pay—for beer when told that this beer purchase would occur at a resort hotel versus at a grocery store. Transaction utility here affects willingness to pay and again shows the major role reference prices—in this case, internal reference prices—have during transactions. When such internal prices are not well established or have yet to be formed for unfamiliar products, consumers rely on posted reference prices, providing retailers with the opportunity to influence the impressionable consumer's values of *p** and consequently, the relative evaluation of *p*.

b. Price Framing and Anchoring Effects

Given that reference prices affect a consumer's evaluation of discounts so

[2] Subjects were given information about seller's costs in three different conditions and asked to list the price they would charge for a ticket under each cost condition. This in turn helped estimate prices that subjects considered "fair."

strongly, it is worth considering the manipulation factor of discount presentation in the context of framing effects. Framing effects, as described by Tversky and Kahneman (1981) affect our perception and evaluation of a judgment or decision task. Kahneman (2003) explained that framing effects occur because various frames of the same situation emphasize different features. As a result, framing effects can elicit preference reversals, which challenge traditional economists' views of how people order preferences and how those preferences translate into choices. To illustrate an application of framing, Janiszewski and Cunha Jr. (2004) find that in a bundling discount situation, consumers are more likely to rate a two-item bundle as attractive when the discount is attached to the less appealing "tie-in" product even when the value and cost of the two bundle discounts are equivalent.[3]

The inclusion of reference prices seems to be significant across varying discount price frames, though empirical data suggests that the effects owing to the presence of reference points is bounded to a certain point. In one study, researchers Blair and Landon, Jr. (1981) set out to determine whether consumers report different levels of savings (no savings, slight, moderate, or large) between advertisements that include comparison prices and those that purposefully leave out these prices. Compared to those who viewed control advertisements without reference prices to specify amount of savings, subjects who viewed advertisement frames containing reference prices report relatively higher degrees of savings; moreover, they report higher regular prices when asked to estimate how much a store would typically charge for non-advertised, regular-

[3] One example Janiszewski and Cunha Jr. used was "buy one large pizza for $7.99 and get an order of chicken wings for $3.99" versus "buy an order of chicken wings for $7.99 and get a large pizza for $3.99." Subjects viewed the pizza as the "focal product" and the chicken wings as a secondary or "tie-in product," so the former discount bundle was deemed more appealing than the latter even though the bundles are equivalent and simply framed differently.

priced goods.[4] Interestingly, the same group of subjects also rate perceived savings consistently lower than the face value of discounts in the advertisements, suggesting that reference prices, while having the ability to boost perceived savings, are not necessarily taken as absolute by consumers. These results match those of the meta-analysis conducted by Hong et al. (2002), where regular prices serving as reference prices increase consumer perceptions of deals as long as consumers are not skeptical or view these prices as exaggerated. A logical conclusion is that available reference prices at least have the ability to facilitate consumers' estimates of pre-discount prices as well as influence the levels of these estimates. Questionnaires show, however, that enhanced deal perception effects weaken as people recognize and become more aware of the implausibility of posted reference prices (Compeau, Grewal, and Chandrashekaran 2002).

Price anchoring is another related phenomenon that both underlies and serves to magnify the effects of reference prices in discount frames. Anchoring occurs when people's numerical estimates tend towards the initial values (i.e. an anchor) they are exposed to (Tversky and Kahneman 1974). Chandrashekaran and Grewal (2006) examine price anchoring effects during the formation of reference prices and find that higher initial reference prices push consumers' internal reference prices upward. As a result, there is a larger difference between what consumers estimate as a reasonable price and the lower discounted price; in other words, transaction utility increases. Undoubtedly, serving as price anchors to manipulate consumer valuations of discounts is an appealing function of reference prices, particularly when framing marks the discounted price as even lower in the consumer's mind. In the absence of such anchors,

[4] This estimate was specifically used by the authors to gauge the targeted measure of perceived savings rather than calculation of actual savings.

consumers are left to make their own price estimates, which are likely to steer on the lower end. This can stem from the belief that if discount frames do not highlight pre-sale prices, then the discount must not be very substantial (Urbany, Bearden, and Weilbaker 1988). With careful selection of price anchors and strategic framing, retailers can influence consumer evaluations of discounts and use such pricing strategies to facilitate the conversion of these evaluations into additional and future purchases.

III. Hypotheses and Approach

The discussion above provides compelling evidence supporting the function of reference prices in discount price frames and leads me to formulate several hypotheses that guide my experimental approach.

a. Hypotheses

H1$_0$: The inclusion of reference prices in discount frames creates no significant differences in consumers' evaluations of savings.

H1$_a$: The inclusion (or exclusion) of reference prices in discount frames creates differences in consumers' evaluations of savings.

H2$_0$: The inclusion of reference prices in discount frames creates no significant differences in consumers' reported levels of buying satisfaction, intent of additional purchase, and intent of future purchase.

H2$_a$: The inclusion (or exclusion) of reference prices in discount frames creates differences in consumers' reported levels of buying satisfaction and intent of additional and future purchases.

b. Approach

While the empirical studies cited thus far provide many elements from which I draw inspiration and guidance, my approach to testing the above hypotheses expands on previous experiments in several ways. First, I expand on the complexity of discount frames by including ones that utilize the availability and absence of both original prices and discounted prices as a key manipulation. The meta-analysis conducted by Hong et. al (2002) suggests a possible interaction between reference prices and percent-off, and I attempt to research the nature of this interaction by including several frames that contain

percent-off information. Next, I extend the analysis of consumer discount perceptions to include other related variables such as buying satisfaction and future purchase likelihood. These variables serve to gauge consumer attitudes and impressions of retailers based on the retailers' discount frames. I view the use of the price frames depicted in Figure 1 as both a deviation and extension to previous research that tends to heavily emphasize the effects of pre-discount reference prices only (e.g. Blair and Landon, Jr. 1981).

Figure 1: Discount Price Frames Included in the Study

(A) With original price listed next to sale price; no percent-off mention **Was $36.99** **Now $19.99**	(B) With original price listed next to sale price; include percent-off mention **~~$36.99~~** **46% off** **Now $19.99**
(C) Without original price listed or visible next to sale price **Now 46% off original price** **$19.99**	(D) Without sale price listed next to original price **$36.99** **Now take 46% off**

The four price frames in Figure 1 are taken from observations at actual retailers—both in-store and online—and represent a sample of simple discount presentations consumers may encounter. There are several explanations that provide some insight as to why frames may be viewed or perceived slightly differently by consumers. Price frames that do not include both pre-sale and discounted reference prices but do include percent-off information (in Figure 1, frames C and D) have the potential to trick consumer discount perceptions by withholding the direct mention of dollar savings (France et al. 2000). Under these circumstances, consumers may casually compare identical percent-off discounts on two similarly priced items and conclude no major differences to their

wealth. Thus, retailers may employ price frames without reference prices if the percent-off is high. Such deals are effective when they lead consumers to perceive themselves as better off since lower prices elsewhere seem unlikely (Darke, Freedman, and Chaiken 1995).

In contrast, price frames like A and B which explicitly include both pre-discount and post-discount reference prices depend on price anchoring effects to augment the level of savings consumers estimate to receive. These discount frames are particularly useful on items that consumers may not be familiar with and allow retailers to take advantage and manipulate consumers' beliefs about the typical non-sale price of these items. Retailers may also use price frames with reference prices to adjust consumers' internal reference prices (Chandrashekaran and Grewal 2006) or to emphasize the original price as a signal of high product quality. In either case, the intention of the seller is to enhance evaluation and enjoyment of the perceived deal.

At this point, it is sensible to address the possible criticism that a rational consumer—or any consumer who consciously values their money, for that matter—will calculate dollar savings even when only percent-off discount frames are available, thus deeming the differences among price presentations as negligible. While this may be true, many of the examples discussed thus far provide empirical evidence supporting the fact that perceived savings is a separate concept from actual calculated savings. Thus, it is not unreasonable to believe that retailers can indeed use strategic price framing to influence consumers' judgments of discounts. Moreover, the focus of this study is on price framing methods that most appeal to consumers and can steer consumers toward the products they perceive to bring them the best or highest valued savings. The emphasis,

then, is not on how consumers rate their savings after they have paid at the register but rather on the initial reaction to discounts during the impressionable time stretch when consumers first make the decision to walk into a store or visit a retailer's website. It is during this first encounter with discounted prices that consumers generally make quick estimates of expected savings. Minor adjustments in price frames can greatly impact these approximations and first impressions and affect the consumer's decision to either purchase from one retailer or to further his search at another retailer. Researchers Biswas and Blair (1991) report that the deliberate inclusion of reference prices has the ability to shift a consumer's "prior perceptions of market-wide prices" (qtd. in Bobinski et. al 1996). Thus, reference prices along with discount frames indeed have some influence on the consumer's search and consequent internal price estimates and attitudes, variables I find to be of value in my study.

c. Relevance

The motivation behind my research pivots on applications to retail, and one primary goal is to provide insights from the perspective of the consumers who arguably drive the entire industry. While the purchasing behavior studied here is undoubtedly of worth to those on the selling side, it is also valuable to examine our own consumer responses to the often overlooked strategies retailers may be using to subtly manipulate our shopping decisions.

IV. Methodology

a. Participants

Undergraduate students (n = 64; 44 females, 20 males) at Emory University participated in the survey component of this study designed to capture buyer discount evaluations. The use of email communication and postings on the university's Research Studies message board informed subjects of the hypothetical shopping task entailed in the study, and volunteers participated by following a link to the online survey. The content administered to every participant was identical in treatment, though the ordering of several pages[5] in the survey was deliberately randomized to minimize potential order biases.

b. Procedure

Subjects were given on-screen instructions informing them of the hypothetical shopping task they were asked to engage in, and due to the nature of the study, no deception was necessary to achieve the variables of interest. After a few pre-task questions to measure shopping preferences[6], subjects viewed samples of product listings[7] (i.e. products for sale) at four fictitious retailers (Q, W, Z, X). Every retailer's product sample contained items for sale at a discount, and each retailer presented the items with one of four distinct discount price frames, as shown in Figure 2.

The percent-off discount of 35% was applied across all retailers, though it was not explicitly specified in the discount frame for Retailer W. The determined level of the percent-off was slightly below the mean of 10% and 70%, two percentages that are extreme enough for consumers to assume respectively, a very high possibility of lower

[5] More specifically, the pages for Retailers Q, W, Z, and X
[6] Refer to Table 1 in Appendix
[7] Refer to Table 2 in Appendix

prices at other retailers and a very low possibility of lower prices elsewhere (Darke, Freedman, and Chaiken 1995). All price points on items for sale at the retailers ended in .99 as a way to both mimic popular price endings in the real market and to discourage exact mathematical calculations of savings.

Figure 2: Discount Frames Presented at Each Retailer

RETAILER **W** With original price listed next to sale price; no percent-off mention **Was $36.99** **Now $23.99**	RETAILER **X** With original price listed next to sale price; include percent-off mention **35% off original price** **~~$36.99~~ $23.99**
RETAILER **Z** Without original price listed next to sale price **Now 35% off original price** **$19.99**	RETAILER **Q** Without sale price listed next to original price **$36.99** **Now take 35% off**

I selected the small sample of products shown at each of the four fictitious retailers from an assortment of "neutral" household products priced at the average market values of several large discount retailers[8]. The preliminary research conducted served as a means to control for inherent preferences towards certain products and to, as much as possible, present fair prices that would not influence evaluations of the retailers' discounts. Additionally, the assortment of products chosen for each retailer was random in order to make the retailers as similar as possible in terms of product offerings and to avoid designating any of the retailers as specializing in a certain category, e.g. "cleaning

[8] A list of common household objects was screened by a small group to test for neutrality (alternatively, for the trait of being neither "liked" nor "disliked"). These items were carefully chosen to avoid the possibility of showcasing personal characteristics or habits of the subjects, e.g. allergy medicine would indicate that the subject has allergies.

supplies store." As an added measure, it was also clearly specified to subjects that the retailers were in fact fictitious.

After observing the available products and discounts at each retailer, subjects answered a series of questions regarding purchase intention, shopper satisfaction, and evaluation of the discount they encountered on the product they would most likely purchase. Questions designed to capture attitudes toward repeat and future purchases were included as well[9]. One open-ended response question asked subjects how much they believed other retailers typically charge for a product when that product is not marked down or on sale. I included this question to look for possible indications of price anchoring relative to the reference prices posted in each retailer's discount frame.

It is essential to note that the questions measuring variables of satisfaction, level of savings, extent of savings, and intent of additional or future purchase are set on a Likert scale. This allowed subjects to respond on a five-point range. The inclusion of Likert-type questions not only caters well to the aim of the study but also provides the ability to gauge the extent of the subjects' opinions; this is particularly useful in the subsequent analysis comparing responses across the four retailers. However, because it is difficult to assume that the interval between any two adjacent responses is equal for all respondents, the average value of Likert scale responses is not as meaningful when drawing conclusions from descriptive statistics in the context of the study[10]. While the mean does provide an indication of central tendency, it holds more valuable for the inferential analysis discussed hereafter and is not taken as the main statistic of interest when interpreting the implications of the statistical results.

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[9] Refer to Table 3 in Appendix for variables measured and coding

[10] For example, coded Likert responses can result in a mean of 3 for responses of [1 and 5] or [3 and 3], making it difficult to compare and interpret [strongly disagree and strongly agree] vs. [neutral and neutral]

V. Results

a. Results

A total of 64 students participated in the hypothetical shopping task, with the percentages of female subjects and male subjects at 68.8% and 31.2%, respectively. While these percentages may seem skewed, the gender ratio of the sample roughly matches up with estimates of shoppers in the overall population, where females represent an overwhelming majority of all consumer purchases[11]. It is also worthwhile to address the possibility of selection bias in the sample taken, since those who chose to participate in the hypothetical shopping task are more likely to enjoy shopping in the first place and may be more familiar with or more partial to certain discount presentations. These anticipated preferences are consistent with the pre-task responses in Table 1 where over 70% of respondents enjoy in-store and online shopping and nearly 97% report looking for discounts when doing so. Such bias does not contaminate the results of the survey and is not necessarily unwelcomed, since, in order to be effective, retailers' discount strategies often must overcome the challenge to appeal to even the savviest shoppers.

Tables 4 and 5 in the Appendix present some interesting results. Retailer W, with the discount frame of both original and sale prices listed with no percent-off mentioned, clearly emerges as a leader among the other retailers in terms of earning the highest mean, mode, and median scores. Such is the case across all the measured variables of satisfaction, level of savings, extent of savings, intent of additional purchase, and intent of future purchase. On the other hand, Retailer Z, with the discount frame that leaves out the pre-discount reference price, averages the lowest for all five measured variables.

[11] This figure was recently estimated to be around 70% in Michael J. Silverstein and Kate Sayre's "The Female Economy" in *Harvard Business Review*

Supporting these results are the direct retailer comparisons summarized in Table 6 where a third of all respondents chose Retailer W as the retailer where they received the most savings and as the retailer they predicted to have better sales and promotions in the future. Table 7 shows that in a direct ranking across retailers, more than 35% of respondents rated Retailer W as having the best sale. The fact that there are clear and consistent patterns in the response scores provides reasonable support that the discount frames did have some impact on subjects' evaluations of discounts.

To test the significance of Retailer W's dominance across the measured variables, I conducted the non-parametric Friedman's Test with a Chi-square test statistic for further analysis. I chose non-parametric testing due to the difficulty in fulfilling the parametric assumptions of a normal distribution with the relatively small sample size used in the study. This consideration combined with the within-subjects design of the survey made Friedman's Test the statistical test of choice.

I applied this ranked sum[12] procedure to all five variables across Retailers Q, W, Z, and X. Table 8 details the results of Friedman's Test. I find that differences among retailers are statistically significant for reported level of savings. The low p-value of 0.0183 for this variable enables us to reject the null hypothesis that there are no differences in subjects' evaluations of discounts—more specifically, level of savings—among various discount frames. Since the p-values are higher than .05 for the other variables of satisfaction, extent of savings, and intent of additional or future purchase, we cannot reject the second null hypothesis that there are no significant differences among discount frames for these particular variables. Following these results, I conducted

[12] Friedman's test first ranks values across rows and then sums the ranked values within every column; the mean rank can then be calculated for each treatment, or in this case, for each retailer and discount frame

Tukey's Test for the comparison of means as a post hoc measure to determine which retailers were different from each other in terms of reported level of savings. As anticipated by earlier examination of the descriptive statistics, I find Retailer W to be significantly different from Retailers Q, Z, and X. I must also emphasize that in using Tukey's Test, none of the other three retailers were found to significantly differ amongst each other. Thus, Retailer W's discount price frame appears to stand out as one that elicited the highest reported level of savings in the context of evaluating discounts. The effectiveness of Retailer W's discount frame suggests that reference prices do indeed play a role in influencing and possibly enhancing evaluations of discounts. Such results are consistent with those in the literature, particularly in regards to consumers' perceived levels of savings (e.g. Blair and Landon, Jr. 1981).

b. Discussion

The results of this study bring forth some important considerations to address. First, in reviewing the results tabulated in Table 5, we find that Retailer X averages scores that are much lower than Retailer W across all variables despite having the same discount frame as Retailer W but with the add-on of a percent-off specification. Table 7 also evidences this apparent negative effect on evaluations of discounts, where Retailer X received the ranking of "worst sale" by nearly 40% of the respondents. In this case, the inclusion of a percentage next to reference prices seems to yield similar results to a study by France et. al (2000), where participants comparing rough estimates of price reductions seem to prefer an overt value of dollars saved over a corresponding percent-off discount with the same amount of monetary savings. It is interesting that providing more information to help subjects estimate their savings can actually produce the counter effect

of lower perceived savings. From this, we can see that even minor changes in discount frames can create consideration differences in perceptions of discounts.

Table 5 also reveals that Retailer Z consistently has the lowest scores, suggesting that a discount frame which leaves out original pre-sale prices weakens evaluations of savings, satisfaction, and additional and future buying intention. This mirrors the results of one study by Berkowitz and Walton (1980), where the "percent-off, now $x" proves the least effective among other discount presentations for measured variables such as "value for the money."

In analyzing the subjects' responses to the question "*For the item you chose [as the one you would purchase] in the previous question, how much do you think other retailers typically charge for this item when it is NOT on sale/marked down to a sale price? Please enter your estimate in dollars*," I find that only 25% of price estimates were higher[13] than the actual pre-sale prices (which were not explicitly listed) for Retailer Z. The response rate is much lower than those for Retailers Q, W, and X, which respectively, garnered 60%, 44%, and 46% of estimates higher than the posted pre-sale reference prices. Some anchoring effects are likely present here, since Retailer Z distinctly left out the pre-sale reference prices and only presented the reduced prices. This can perhaps help explain why Retailer Z averaged such low scores across the variables measured, since subjects seem to believe that Retailer Z's products were overpriced to begin with. The actual discount prices subjects saw strongly influenced their price expectations even when asked to approximate corresponding non-sale prices, a result also observed in a reference price

[13] I only considered the answer to the open-ended estimation question to be higher than the reference price when the difference was more than $1. For example, I did not consider $16 to be higher than a reference price of $15.99 but I did consider $16.99 or $17 to be higher. I made this distinction since the .99 price format was used throughout the study for pre-sale prices.

study by researchers Kopalle and Lindsey-Mullikin (2003).

On a related note, I acknowledge the argument that Retailer W could have elicited superior ratings—and of course, a significantly higher reported level of savings—because its product assortment[14] includes an item with the highest price point of $57.99. Thus, it is possible that subjects viewed Retailer W as having the best sale since it offers a larger chunk of savings off more expensive products. This is feasible, and I must point out that 66% of respondents estimated the non-sale prices on Retailer Q's goods to be higher elsewhere; 44% of subjects said the same for Retailer W. We can infer, then, that subjects find Retailer Q's prices to be relatively less expensive overall and should accordingly view Retailer Q as having the best discounts—but this is not the case. It is therefore reasonable to believe that price anchoring is at least partially accounting for Retailer W's high scores across the board. Moreover, the inclusion of both pre-sale and post-sale reference prices in Retailer W's price frame may be particularly effective due to partial influences on internal reference prices as well as the shifting of price expectations with the guidance of posted discount prices.

[14] Refer again to Table 2 in the Appendix

VI. Conclusions

When it comes to framing discounts, sellers can strategically choose price presentations to give off the impression that they are offering the best deal. Given the results found in this study, frames that include both pre-sale and discounted prices with no percent-off mention can significantly enhance consumers' reported levels of savings, though these very effects on variables such as likelihood of future purchases proves to be limited.

The results of this study are generally consistent with the findings of previous research on reference prices, though the attempted extension of reference price effects to measures like shopper satisfaction are not observed. Such an outcome is not surprising given the hypothetical nature of the study and the lack of salient monetary incentives in a task that calls for the evaluation of monetary gains. Another possible limitation affecting responses involves the small sample of product listings subjects viewed at each retailer, where potential biases can arise from inherent preferences toward certain products and asymmetrical knowledge of prices on these household products. Thorough pre-testing or pilot studies to gather a larger assortment of product offerings can help produce a larger variability in responses to minimize such biases. Future research may also include post-survey questions to examine whether subjects believed the fictitious retailers corresponded to real retailers, since this may have affected responses. On a related note, exploring whether subjects may have based their evaluations of discounts on their perceptions of the retailers (e.g. bargain shop, higher-end store) can help determine if other confounding factors may be involved. The use of more advanced survey techniques

such as the ability to randomize price frames on products may drive more robust results as well.

In addition to accounting for the limitations outlined above, future research may strengthen the external validity of lab results by applying a similarly controlled study to a real shopping setting and using questionnaires to capture evaluations of discounts on actual purchases. Another consideration may be to account for the seller's perspective, in particular, gathering an understanding of why and how sellers strategically alternate between discount frames even when research has demonstrated certain frames to be more effective than others. As the popularity of online shopping continues to increase, the exploration of reference price implications is especially valuable. Consumers can quickly and easily compare discounts between different retailers' websites and decide whether to stay on one retailer's web shop or turn to another retailer that, at a glance, seems to offer better discounts. Choosing the optimal discount frame can thus put a retailer at a distinct advantage. Lastly, potential applications to advertising are vast, especially in ads containing discounted prices as a focal point to attract potential consumers.

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VIII. Appendix

Table 1: Pre-task Questions – Summary Statistics for Shopping Preferences

"Please rate how often you shop or browse for products online"	
Never	1.6%
Not very often	17.2%
Sometimes	37.5%
Often	28.1%
Very frequently	15.6%
"How much do you enjoy shopping for products either in stores or online?"	
Don’t enjoy at all	0%
Don’t enjoy that much	15.6%
Neither like nor dislike	14.1%
Tend to enjoy	50%
Very much enjoy	20.3%
"Do you tend to look for discounts or sale prices when you shop?"	
Yes	96.9%
No	0%
Don't care	3.1%
"Do you enjoy buying things at discounted prices/on sale?"	
Yes	96.9%
No	0%
Don't care	3.1%

Table 2: Product Listings at Retailers Q, W, Z, X

Retailer Q

Ironing board
Was $18.99
Now 35% off

Tablecloth
Was $15.99
Now 35% off

Filing cabinet
Was $49.99
Now 35% off

Towel
Was $10.99
Now 35% off

Packing tape
Was $6.99
Now 35% off

Retailer W

Vacuum cleaner
Was $49.99
Now $32.49

Blinds
Was $32.99
Now $21.44

Extension cord
Was $11.99
Now $7.79

Silverware
Was $16.99
Now $11.04

Microwave
Was $57.99
Now $37.69

Retailer Z

Desk lamp
35% off original price
Now $19.49

Step ladder
35% off original price
Now $11.04

Lint roller
35% off original price
Now $3.90

Dry erase board
35% off original price
Now $9.74

Oven mitt
35% off original price
Now $5.84

Retailer X

Ice cube tray
35% off original price
~~$4.99~~ $3.24

Shower curtain
35% off original price
~~$17.99~~ $11.69

Flashlight
35% off original price
~~$15.99~~ $10.39

Shoe shelf
35% off original price
~~$27.99~~ $18.19

Laundry basket
35% off original price
~~$6.99~~ $4.54

Table 3: Variables Measured and Coding

Variable	Coding
Satisfaction *"How satisfied are you with the discount on this item you would purchase?"*	1 = Not satisfied at all 2 = Not satisfied 3 = Neither satisfied nor dissatisfied 4 = Satisfied 5 = Very satisfied
Level of Savings *"In your opinion, how good were the savings on the item you would purchase?"*	1 = Little or no savings 2 = Slight savings 3 = Decent savings 4 = Moderate savings 5 = Large savings
Extent of Savings *"Overall, how much did you feel you saved by purchasing an item during the sale/discount offered by the retailer?"*	1 = Did not save at all 2 = Saved a little 3 = Neither saved nor lost money 4 = Saved a moderate amount 5 = Saved a large amount
Intent of Additional Purchase *"Would you purchase a second product under the same sale/at the current discount at this retailer?"*	1 = Definitely not 2 = Not likely 3 = Unsure 4 = Likely 5 = Definitely
Intent of Future Purchase *"What is your likelihood of purchasing a product from this retailer again on the assumption that similar sales are characteristic of this retailer?"*	1 = Definitely not 2 = Not likely 3 = Unsure 4 = Likely 5 = Definitely

Table 4: Variables and Response Percentage Across Retailers

Variable		Response % Q	W	Z	X
Satisfaction	Not satisfied at all	9.1	3.6	5.5	3.6
"How satisfied are you with the discount on this item you would purchase?"	Not satisfied	5.5	7.1	10.9	10.9
	Neither satisfied nor dissatisfied	20	10.7	27.3	18.2
	Satisfied	**58.2**	**62.5**	**47.3**	**61.8**
	Very satisfied	7.3	16.1	9.1	5.5
Level of Savings	Little or no savings	12.7	5.4	14.5	5.5
"In your opinion, how good were the savings on the item you would purchase?"	Slight savings	14.5	10.7	21.8	25.5
	Decent savings	**32.7**	23.2	27.3	32.7
	Moderate savings	25.5	**44.6**	**30.9**	**34.5**
	Large savings	14.5	16.1	5.5	1.8
Extent of Savings	Did not save at all	12.7	3.6	9.1	7.3
"Overall, how much did you feel you saved by purchasing an item during the sale/discount offered by the retailer?"	Saved a little	23.6	23.2	32.7	23.6
	Neither saved nor lost money	9.1	5.4	12.7	14.5
	Saved a moderate amount	**47.3**	**58.9**	**38.2**	**52.7**
	Saved a large amount	7.3	8.9	7.3	1.8
Intent of Additional Purchase	Definitely not	9.1	12.5	7.3	3.6
"Would you purchase a second product under the same sale/at the current discount at this retailer?"	Not likely	16.4	8.9	21.8	25.5
	Unsure	**45.5**	33.9	**43.6**	**40**
	Likely	25.5	**39.3**	25.5	30.9
	Definitely	3.6	5.4	1.8	0
Intent of Future Purchase	Definitely not	7.3	1.8	1.8	1.8
"What is your likelihood of purchasing a product from this retailer again on the assumption that similar sales are characteristic of this retailer?"	Not likely	12.7	12.5	23.6	14.5
	Unsure	30.9	23.2	30.9	36.4
	Likely	**43.6**	**57.1**	**40**	**41.8**
	Definitely	5.5	5.4	3.6	5.5

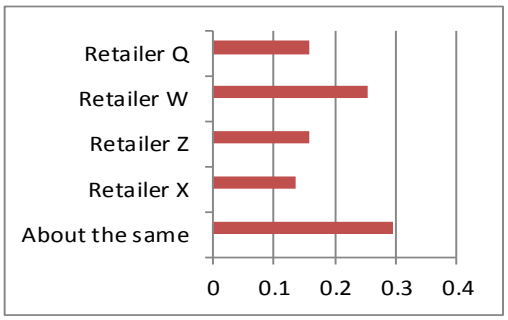
Table 5: Comparison of Variables – Descriptive Statistics Across Retailers

Variable	Descriptive Statistics (completed n = 53)	Retailer Q	W	Z	X
Satisfaction *"How satisfied are you with the discount on this item you would purchase?"*	Mean	3.47	3.77	3.42	3.57
	Median	4	4	4	4
	Mode	4	4	4	4
	Standard Deviation	1.05	0.93	1.01	0.89
Level of Savings *"In your opinion, how good were the savings on the item you would purchase?"*	Mean	3.13	3.53	2.89	3.04
	Median	3	4	3	3
	Mode	3	4	4	4
	Standard Deviation	1.24	1.08	1.17	0.96
Extent of Savings *"Overall, how much did you feel you saved by purchasing an item during the sale/discount offered by the retailer?"*	Mean	3.13	3.47	3.06	3.19
	Median	4	4	3	4
	Mode	4	4	4	4
	Standard Deviation	1.24	1.07	1.18	1.06
Intent of Additional Purchase *"Would you purchase a second product under the same sale/at the current discount at this retailer?"*	Mean	2.96	3.21	2.92	2.98
	Median	3	3	3	3
	Mode	3	4	3	3
	Standard Deviation	0.98	1.06	0.94	0.84
Intent of Future Purchase *"What is your likelihood of purchasing a product from this retailer again on the assumption that similar sales are characteristic of this retailer?"*	Mean	3.30	3.49	3.21	3.34
	Median	4	4	3	3
	Mode	4	4	4	4
	Standard Deviation	1.01	0.85	0.91	0.83

Table 6: Direct Retailer Comparison

"Which retailer in your opinion had the best sales/discounts?"

Retailer Q	15.7%
Retailer W	25.5%
Retailer Z	15.7%
Retailer X	13.7%
About the same	29.4%



"Which retailer made you feel like you received the most savings on the product you would purchase?"

Retailer Q	21.6%
Retailer W	33.3%
Retailer Z	11.8%
Retailer X	11.8%
About the same	21.6%

"Which retailer do you predict to have better sales/promotions in the future?"

Retailer Q	15.7%
Retailer W	33.3%
Retailer Z	11.8%
Retailer X	9.8%
About the same	29.4%

"Which retailer are you most likely to return to given that similar sales will occur at each retailer?"

Retailer Q	11.8%
Retailer W	23.5%
Retailer Z	13.7%
Retailer X	11.8%
About the same	39.2%

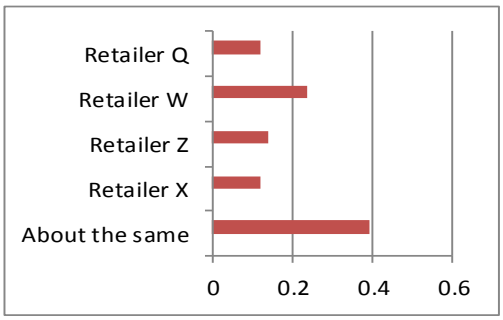


Table 7: Retailer Discount Ranking

"Please rank the retailers in terms of the sales/discounts you encountered, starting with the retailer you feel had the WORST sale"

	Retailer			
	Q	W	Z	X
WORST SALE	27.5%	9.8%	23.5%	39.2%
OKAY SALE	19.6%	37.3%	25.5%	17.6%
GOOD SALE	29.4%	15.7%	27.5%	27.5%
BEST SALE	21.6%	35.3%	23.5%	19.6%

Table 8: Friedman's Test for Differences Among Retailers

Variable	Friedman's Chi-Square	Kendall's W	P-value
Satisfaction	6.0113	0.0378	0.1111
Level of savings+	10.0358	0.0631	0.0183**
Extent of savings	4.7264	0.0297	0.193
Intent of additional purchase	2.8585	0.018	0.414
Intent of future purchase	4.8113	0.0303	0.1861

Notes:
1. Friedman's Chi-square test statistic here has 3 degrees of freedom, where df = # of measures - 1
2. The value of Kendall's W, or Kendall's coefficient of concordance, gives some indication of how much the respondents agreed (value closer to 1) or disagreed (value closer to 0)
3. **Asteriks indicate statistically significant p-value < .05
4. +Post hoc testing using the differences in mean ranks indicates that reported level of savings in Retailer W differs significantly from the other three retailers