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When More Is Less: The Impact of Base Value Neglect on Consumer Preferences for Bonus Packs over Price Discounts

The interpretation of a percentage change often hinges on the base value to which it is attached. The authors identify a tendency among consumers to neglect base values when processing percentage change information and investigate the implications of such base value neglect for how consumers evaluate economically equivalent offers presented in percentage terms, such as bonus packs and price discounts. The authors first document a substantial advantage in sales volume for a bonus pack over an economically equivalent price discount in a field experiment conducted in a retail store. Furthermore, in a mall-intercept survey and multiple lab studies, the authors provide additional evidence in support of the effect and identify managerially useful boundary conditions for when the effect is likely to manifest. The article concludes with a discussion of the theoretical and managerial implications of the findings.

Keywords: bonus pack, price discount, percentage, numeracy, framing

Marketing promotions in the forms of price and quantity changes are ubiquitous in the marketplace. While price discounts are among the most widely employed sales promotion tactics (e.g., DelVecchio, Krishnan, and Smith 2007; Mazumdar and Jun 1993), bonus packs, defined as offering more of the same product for the same price (Mishra and Mishra 2011; Ong, Ho, and Tripp 1997), are becoming increasingly popular. Anecdotal evidence and a quick informal survey of flyers, newspaper inserts, and online coupons reveal the widespread use of bonus packs for a variety of product categories, including clothing (e.g., buy one, get one free at Macys.com), grocery products (e.g., soup, beer, chocolates), and household items (e.g., toothpaste, hair care products, batteries).

The magnitude of both price discounts and bonus packs is frequently communicated in percentage terms (Hardesty and Bearden 2003; Mishra and Mishra 2011). For example, a price discount may be presented as a 33% price reduction on a $10 item, and a bonus pack may be presented as a 50% quantity increment on an 8 oz. package. Consumers calculating the net effect of these two promotions must consider the percentages associated with the base values (i.e., 33% off on a base of $10, and 50% more on a base of 8 oz.) to arrive at an evaluation of the respective deals.

In examining consumers' responses to these two types of promotions, some prior research has speculated that any observed preference for bonus packs might be due to the way the options are framed (Diamond and Sanyal 1990). Specifically, a quantity increment might be perceived as a gain, while a price reduction might be perceived as a reduction in a loss. Because gains are likely to be preferred to reductions in losses due to the curvature of prospect theory's value function (Kahneman and Tversky 1979), bonus packs might be preferred to price discounts. However, this prospect theory–based speculation is theoretically ambiguous because, in some regions of the prospect theory value function, an incremental gain may not be as valuable as a reduction in a loss. Moreover, the empirical evidence for this speculation is mixed at best, with bonus packs being preferred in some settings and price discounts being preferred in others (Diamond 1992; Hardesty and Bearden 2003; Mishra and Mishra 2011).

We develop an explanation for when bonus packs will be preferred on the basis of the thesis that consumers tend to err when they process percentage information. Specifically, we propose that consumers' preference for a bonus pack over an economically equivalent price discount is systematically affected by a tendency to neglect the base value associated with percentages.

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Our research makes the following contributions: Theoretically, we propose a novel and parsimonious explanation for consumers' preferences for bonus packs over price discounts when both are expressed as percentages. We identify a computational error in the processing of percentages, which we term "base value neglect" (BVN), and demonstrate its role in the observed preference for bonus packs over economically equivalent price discounts. Our approach represents an important theoretical advance because we offer and test a theoretical explanation for people's preferences between bonus packs and price discounts. Our theory explains a wider range of phenomena than the extant framing speculation, sets up important boundary conditions for the preference for bonus packs over price discounts, and has the potential to explain diverse existing findings in the literature regarding the preference for bonus packs over price discounts.

Methodologically, we employ multiple approaches, including a field study, a mall intercept, and a laboratory experiment to support our propositions, thus enhancing the robustness of our findings. From the standpoint of practice, we offer a series of useful prescriptions regarding the use of bonus packs versus price discounts as a promotional tactic. Our notion of BVN also allows for the examination of theoretically justifiable and practically consequential moderators of the effect, including conditions under which the advantage of bonus packs over price discounts may be attenuated or reversed. In addition, our research is potentially applicable to other settings in which favorable product enhancements (e.g., improvements in the speed of data processing, increased fuel efficiency) can be presented in percentage terms. Finally, public policy officials may be interested in understanding the circumstances in which consumers err when engaging in percentage calculations and the extent to which such errors affect consumer welfare adversely.

We organized the remainder of the article as follows: We first discuss relevant literature and develop the conceptual rationale for our foundational predictions. Then, we report a field study in which we establish the core phenomenon—namely, that bonus packs are preferred to economically equivalent price discounts and that the provision of bonus packs has a substantial positive impact on the firm's sales. Following this, we report a mall-intercept study of actual shoppers, which confirms that our BVN-based explanation accounts for the observed effect. Finally, in a series of laboratory studies, we demonstrate the superiority of the BVN explanation over extant speculations for the phenomenon and identify managerially relevant boundary conditions.

Literature Review and Conceptual Development

Bonus Packs Versus Price Discounts

Several studies have examined the effects of bonus packs and price discounts on consumers' attitudes and purchase intentions. An important conceptual argument underlying this research is the premise that consumers are inclined to perceive add-ons such as bonus packs as gains but view price discounts as reductions in losses (Diamond 1992; Diamond and Sanyal 1990). Consequently, bonus packs are preferred to price discounts because in most instances, a gain in quantity is preferred to a reduction in a monetary loss as a result of the shape of prospect theory's value function. Because the prediction from prospect theory's value function can be ambiguous (i.e., in some regions of this function, an incremental gain may not be as valuable as a reduction in a loss), it is not entirely surprising that the empirical evidence pertaining to bonus packs is mixed. For example, Smith and Sinha (2000) find a preference for price discounts for expensive products but a preference for bonus packs for inexpensive products, suggesting that for small magnitudes, incremental gains may be preferred to reductions in losses, but for relatively large magnitudes, reductions in losses may be preferred to incremental gains. Similarly, Hardesty and Bearden (2003) find that for small and medium-sized promotions, consumers were indifferent between price discounts and bonus packs, but for large promotions, they preferred price discounts. More recently, Mishra and Mishra (2011) added another level of complexity to the issue with their finding that people display a preference for a bonus pack over an economically dominating price discount for virtuous products but that the preference is reversed for vice products, because of feelings of guilt associated with consuming such products.

In addition to being empirically ambiguous, the results in this literature are often confounded because the bonus pack and price discount are not economically equivalent. For example, Diamond (1992) compares a price discount of $1 off with another offer of an additional free 16 oz. on 64 oz. of laundry detergent originally priced at $4, in effect comparing offers that priced the same product at $.47/oz. and $.50/oz. Similarly, Hardesty and Bearden (2003) compare a price discount of $1.29 off with a bonus pack of 50% more free on a 5.2 oz. tube of toothpaste originally priced at $2.59, in effect comparing offers that priced the same product at $.25/oz. and $.17/oz. While the foci of these studies were different from ours and their manipulations may have served their purposes well, a fair comparison between bonus packs and price discounts should equalize the economic impact of the offers. Failing that, the preference could potentially be explained by the differences in economic impact among the offers, especially when the offers are large (and thus the consequences due to differences in economic impact are high), as Diamond (1992) and Hardesty and Bearden (2003) observe.

However, differences in economic impact do not seem to explain other results in this literature. For example, Ong, Ho, and Tripp (1997) compare bonus packs of 60% or 80% more with a price discount of 20% off. Because a 20% price discount is economically equivalent to a bonus pack of 25% more, the finding that people displayed an overall preference for the economically dominated price discount is surprising.[1]

In summary, the empirical evidence regarding the preference for bonus packs over price discounts is mixed and

[1]The means for the groups of light and heavy users are both below the midpoint of the scale, according to Ong, Ho, and Tripp's (1997, p. 107) Table 4.

appears to be contingent on several situational characteristics. Moreover, previous theorizing has not successfully accounted for the mixed findings. In this article, we propose an alternative explanation for consumers' preferences for bonus packs over price discounts when both are expressed as percentages. We draw on the literature that examines difficulties that consumers experience when processing numeric information (e.g., Chen and Rao 2007; DelVecchio, Krishnan, and Smith 2007; Heath, Chatterjee, and France 1995; Kruger and Vargas 2008; Morwitz, Greenleaf, and Johnson 1998; Thomas and Morwitz 2009) to identify an error that consumers make when interpreting percentages. Our key predictions account for the role of this processing error in affecting consumers' preferences for bonus packs over price discounts. They also allow us to examine managerially relevant boundary conditions that might heighten or dampen the effect of the error. Before offering detailed predictions, we turn to a discussion of an allied literature that is germane to our inquiry.

BVN as an Explanation for the Preference for Bonus Packs

Thaler (1985) presents a popular account of how consumers evaluate economically equivalent options. Most pertinent to the current research, one of Thaler's mental accounting principles posits that when faced with mixed outcomes (a gain and a loss) that yield a net gain, people prefer the outcomes to be combined, due to loss aversion (Kahneman and Tversky 1979). However, when the numerical information associated with the options is presented as percentage changes, it is possible that some of these results may be reversed. For example, Heath, Chatterjee, and France (1995) present the following scenario:

> Mr. A's couch was priced originally at $1,300 but is now reduced by 3.8 percent. Mr. B's chair was priced originally at $300 and his couch was priced at $1,000. His chair is now reduced by 33 percent, and his couch is now increased by 5 percent.

According to mental accounting, an outright gain in one mental account (+$49 for Mr. A) should be preferred to a mixed gain in two mental accounts (+$99 and –$50 for Mr. B). However, Heath, Chatterjee, and France (1995) observe that when enumerated in percentages, a mixed gain (+33% and –5%) was preferred to an outright gain (+3.8%). Apparently, the standard prediction due to loss aversion is not observed when consumers process percentage information.

Consumers' erroneous processing of percentage information may also result in other biases. For example, Chen and Rao (2007) find that consumers prefer a double price discount of "25% off plus an additional 20% off" over the economically equivalent single discount of 40% off. Kruger and Vargas (2008), in a study of percentage increases and decreases in a comparative advertising setting, find that consumers like the target brand more when the comparison refers to its advantage (e.g., 25% better) rather than the alternative brand's disadvantage (e.g., 20% worse).

A common thread among these studies is that consumers tend to ignore the base value associated with a percentage and focus on its numerosity, as if the numerical magnitude associated with the percentage reflected an absolute magnitude. Consequently, when base values are neglected, consumers likely will judge the mixed gain of 33% and –5% to be better than the economically equivalent pure gain of 3.8% (because 33 minus 5 is clearly greater than 3.8), the double discount of 25% off plus an additional 20% off to be better than the economically equivalent single discount of 40% off (because 25 plus 20 is clearly greater than 40), and 25% better to be superior to the economically equivalent 20% worse (because 25 is clearly greater than 20). In other words, the documented evaluation biases associated with percentages can be explained by consumers' tendency to ignore the base values to which the percentages are attached.

Consumers may neglect to incorporate the base values of percentages in their judgment for a variety of reasons. Some consumers may lack the analytical reasoning capability needed to structure ill-defined consumer decisions (e.g., recognizing that two percentages in a double discount have different bases and cannot be summed directly). Other consumers may lack a facility with the mental arithmetic needed to complete the task even if it has been defined correctly (e.g., calculating the final price after a discount). Without the former, a consumer may simply make a judgment according to the magnitudes of percentages and not recognize the need to apply any further problem-solving skills. Without the latter, a consumer may understand that the interpretation of percentages should take into account their base values but may neglect to utilize them anyway because he or she is unable to perform the correct calculations. Therefore, BVN is likely to be prevalent among consumers who have either limited analytical reasoning ability or low computational competence.

Predictions

If consumers neglect the base value associated with percentages, they should generally prefer a bonus pack over the economically equivalent price discount. This is because, mathematically, the percentage associated with a price discount is always smaller than the percentage associated with the economically equivalent bonus pack. For example, for a price discount of 33.33%, the economically equivalent bonus pack quantity increment is 50%. If consumers ignore the base values associated with the percentages, they will compare 33.33% with 50% directly, without paying attention to the differences in their bases. As a result, consumers will prefer the higher percentage associated with a bonus pack over the lower percentage associated with the economically equivalent price discount. This reasoning is the basis for our foundational prediction:

> H_1: BVN yields a preference for a bonus pack over an economically equivalent price discount when both are expressed as percentages.

While our discussion thus far has focused on price and quantity changes that are beneficial to consumers, our notion of BVN also enables us to make predictions about consumers' preferences between price and quantity changes that are detrimental to consumers. For theoretical completeness and because extending our investigation into harmful

price and quantity changes makes it possible to distinguish our explanation from the mental accounting–based explanation discussed previously, we examine this issue here.[2]

Price increases are often masked as quantity decreases for many grocery products (Adams, Di Benedetto, and Chandran 1991; Gourville and Koehler 2004). This approach runs counter to the mental accounting perspective discussed previously (Diamond and Sanyal 1990). The mental accounting explanation, which is based on the argument that a bonus pack is perceived as a pure gain and thus should be preferred to a price discount that is perceived as a reduction in loss (Diamond and Sanyal 1990), would predict a preference for a price increase over a quantity reduction, because a price increase should be perceived as an increase in a loss (much like a price discount is perceived as a reduction in loss) and a quantity reduction should be perceived as a pure loss (much like a bonus pack is perceived as a pure gain). In contrast, BVN predicts that consumers will prefer a reduction in quantity over an economically equivalent price increase. This is because a price increase of 50% is equivalent to a reduction in quantity of 33.33%, and consumers who ignore the bases associated with these percentages will prefer the smaller (33.33%) loss to the larger (50%) loss. Thus:

H_2: BVN yields a preference for a quantity decrease over an economically equivalent price increase when both are expressed as percentages.

This hypothesis also allows us to distinguish BVN from another plausible argument for consumers' preference for a bonus pack over a price discount; that is, a price discount could be the result of a reduction in costs, and thus, it would lower quality perceptions of the focal product (Rao and Monroe 1988, 1989). Following this logic, a price increase should enhance both cost estimates and quality perceptions and thus should be preferred to a quantity reduction, which is contrary to H_2. In summary, whereas the competing perspectives based on mental accounting and price–quality perceptions predict that a bonus pack will be preferred over a price discount but that a price increase will be preferred over a quantity decrease, H_1 and H_2 collectively predict an overall preference for quantity changes over economically equivalent price changes, regardless of whether these changes are favorable or unfavorable to consumers.

Our foundational predictions thus far have emphasized main effects. That is, we predict a preference for quantity increments and reductions over economically equivalent price changes due to BVN. Subsequently, following our demonstration of the main effect and the underlying processes for the observed effect, we turn to an examination of managerially relevant moderators that serve to either enhance or diminish the effect. We first describe the studies designed to test our foundational predictions.

Study 1: Field Experiment

The site for Study 1 was a small retail store located in the suburb of a large U.S. metropolitan area. We selected a 9 oz. unit of Fruits & Passion hand lotion, regularly priced at $13.50, as the focal product. On the basis of consultation with the store owner, we offered either a 35%-off price discount on the regular price or a bonus pack of 50% more free. The specific percentages chosen were frequently encountered in this market. Economically, a bonus pack of 50% more free is equivalent to a price discount of 33.33% off, and thus the use of an economically dominant 35%-off price discount provides a conservative test of our prediction. In addition, the bonus pack was offered as a single bottle rather than two separate bottles (i.e., 6 oz. and 3 oz. bottles). This allowed us to exclude other potential explanations such as the consumer's inability to stockpile, appeal of smaller travel-size packages, the ability to unbundle the product into "his" and "hers" elements, and the like. We held the unit price before and after the promotions, the final price, and the final quantity constant across the two promotion types.

We manipulated the type of promotion over weekly time intervals. Promotional signage was displayed only on the store shelf. The promotions were run on the product for a total of 16 weeks, from January 7, 2008, through May 3, 2008. The price discount was offered during odd-numbered weeks (i.e., Weeks 1, 3, 5, …) and the bonus pack promotion was offered during even-numbered weeks (i.e., Weeks 2, 4, 6, …). The store was open Monday through Saturday in each of the 16 weeks that the promotions were offered. Thus, we obtained 48 days of data for each of the two promotions.[3]

Consistent with H_1, a one-way (promotion format: price discount vs. bonus pack) analysis of variance (ANOVA) showed that the bonus pack promotion yielded significantly more unit sales than the price discount promotion (.56 > .31 units/day; $F(1, 94) = 4.20$, $p < .05$). Weekly sales data showed a similar pattern. In six of the eight weekly comparisons, the sales volume was larger in the bonus pack condition; in the remaining two comparisons, the units sold were the same. An ANOVA on the weekly data also revealed a significant effect of promotion format (1.88 for price discount vs. 3.38 for bonus pack; $F(1, 14) = 11.72$, $p < .005$). Meanwhile, there were no significant differences due to promotion format in the average weekly revenues of the nonpromoted products sold by the store ($F(1, 14) < 1$). Moreover, an ANOVA on the revenues from the focal products as a percentage of the total revenues in the store

[2]Gourville and Koehler (2004) and Granger and Billson (1972) argue that consumers might be more sensitive to price information than quantity information, which would lead to a preference for price discount over bonus packs (contrary to H_1). A speculation offered for this differential sensitivity is the difficulty of processing quantity information due to the complexity of quantity information on packages and the use of odd numbers for sizes (Gupta et al. 2007). Because our focus is on price and quantity changes that are both expressed explicitly as percentages (e.g., 33% off vs. 50% more), in our investigation we have, in effect, equated the difficulty of processing price and quantity information. This allows us to highlight the effect of BVN. Further research could fruitfully study the interactions of processing difficulty and BVN on consumer preferences.

[3]We skipped the week of March 31–April 5, 2008, because the store owner mistakenly thought the previous week was the last week of our data collection.

revealed a significant effect of promotion format ($F(1, 14) = 7.09$, $p < .05$), with the percentage revenue being higher during the bonus pack promotion than the price discount promotion (.07% > .04%). Therefore, the variations in sales response of the focal product were unlikely to be due to some uncontrollable external factor (e.g., a holiday, weather changes) that might have affected the entire store. Regression analyses on the daily and weekly unit sales yielded the same results ($p < .05$ for the predicted effect of promotion format; $p > .10$ for other effects).

In summary, even though a 35% price discount is economically slightly superior to a 50% bonus pack, the store was able to sell 73% (i.e., 3.38 vs. 1.88) more by using a bonus pack promotion. This increase in sales volume is likely driven by the 15% difference between the two percentages (50% and 35%), which is substantial and should be above consumers' response threshold (Gupta and Cooper 1992). Moreover, the observed volume increase is consistent with Davis, Inman, and McAlister's (1992, p. 144) finding of a 71% sales increase for a 15% price cut. In other words, simply restating a 35%-off price discount as a bonus pack of 50% more free may generate a boost in sales volume similar to that of a 15% price cut.

Although the results of this study are consistent with H_1, there are many potential confounds in a field study setting that cannot be controlled. In addition, we have no evidence that the observed effect can be attributed to BVN. To examine the role of BVN directly, we conducted Study 2, described next.

Study 2: Mall Intercept Survey

In Study 2, we surveyed 120 adult consumers using a professional marketing research company located in a major U.S. city. Participants were individually contacted in a large shopping mall and asked to participate in a survey in return for $3 in compensation. Those who agreed to participate were taken to a booth and finished the survey at their own pace. Participants' average household income fell between $30,000 and $49,999, and they shopped for the focal products in this study (i.e., toothpaste and mouthwash) approximately twice per month.

The study employed a three-factor mixed design, with two between-subjects factors and one within-subject factor. The first between-subjects factor was the type of promotion; for example, for the toothpaste, participants read the following information: "Regular price: $3.89 for 8 oz. Special this week: Get 50% more free" or "Regular price: $3.89 for 8 oz. Special this week: 35% off the regular price."

The second between-subjects factor was a measured index of participants' BVN, which we describe in the following section. The within-subject factor was a product replicate: Participants provided responses to sales promotion information for both toothpaste and mouthwash. To enhance realism, the prices of the two products were the shelf prices charged by a large local grocery store at the time of the study.

Measures

For each offer, participants evaluated the deal on a five-item attitude toward the offer scale modified from Burton and Lichtenstein (1988). The scale was unidimensional and reliable ($\alpha = .93$ and .95 for toothpaste and mouthwash, respectively; for details, see the Appendix).

After participants responded to these key dependent variables, we measured their tendency to engage in BVN using a three-item scale involving the processing of percentage information in common situations that consumers encounter: (1) judging the overall impact of a double price discount, (2) calculating compound interest, and (3) calculating the effective interest rate associated with a "convenience check." In all three instances, the intuitive answers arrived at by directly adding up percentages are incorrect and reflect a tendency to ignore the base values associated with percentages, whereas performing the correct calculations requires attention to changes in the base value from one percentage to the next. Low (high) accuracy on these three questions, therefore, indicates a high (low) tendency to ignore the base values from which a percentage change is made.[4] For each of the three items, we provided five response alternatives that included the correct answer, an incorrect answer reflecting BVN, and three additional distracter responses, to reduce the likelihood of successful guessing. Finally, participants responded to some demographic questions.

Analysis and Results

We ran an ANOVA on the attitude scale, with promotion format as a between-subjects factor, product replicate as a within-subject factor, and BVN as a continuous variable. We also included in the model the critical interaction between promotion format and BVN. The analysis revealed a significant main effect of promotion format ($F(1, 114) = 7.06$, $p < .01$) and a significant two-way interaction between promotion format and BVN ($F(1, 114) = 3.91$, $p < .05$; $p > .10$ for other effects).

To shed light on this interaction effect, we conducted a spotlight analysis using Aiken and West's (1991) procedures. For the three realized values of BVN, we found that 50% more was preferred to 35% off when attention to base value was low (i.e., at BVN = 0; $\beta = .72$, $t = 3.73$, $p < .01$), but this preference was weaker when attention to base value was moderate (i.e., at BVN = 1, $\beta = .32$, $t = 1.84$, $p = .07$) and disappeared when attention to base value was high (i.e., at BVN = 2, $\beta = -.08$, $t = .22$, $p > .10$).

Discussion

Corroborating the results from the field study, our survey of adult consumers shows that even though a price discount of 35% off is slightly superior in terms of economic value, consumers generally prefer a bonus pack of 50% more free.

[4]Rust and Cooil's (1994) proportional reduction in loss, which is analogous to Cronbach's alpha, can be used to measure the reliability of categorical data. Proportional reduction in loss is greater than .90 in this and the next study, indicating sufficient reliability for this scale.

However, this preference is weaker among consumers who use the base values associated with the percentages. While these results are consistent with H_1 and our BVN argument, the correlational nature of the data leaves open the possibility that some other latent variable caused respondents both to engage in BVN and to prefer bonus packs over price discounts.

For example, consumers may be characterized by a lack of motivation to carefully process focal information about the two promotion tactics, due to the absence of monetary or social consequences of the decision. When motivation is low, consumers may employ a "satisficing" information-processing strategy (Petty, Cacioppo, and Schumann 1983) and may not exert the effort necessary to carry out the correct calculations even if they have the ability to do so (Kruger and Vargas 2008). Instead, they may rely on some heuristics in evaluating the two promotion tactics (e.g., anchoring and adjustment; Morwitz, Greenleaf, and Johnson 1998). To account for this possibility, in the next study, we manipulated motivation. Furthermore, to directly account for the role of BVN, we also manipulated attention to base values. In addition, to assess support for H_2, we manipulated the valence of the outcome (positive and negative). Finally, we removed the word "free" from the bonus pack description to eliminate any potential confounding effect of semantics (Chandran and Morwitz 2006; Heyman and Ariely 2004; Kamins, Folks, and Fedorikhin 2009; Raghubir 2004).

Study 3: Lab Experiment Providing Process Evidence

Design

Study 3 employed a 2 (attention to base values: low, high) × 2 (motivation: low, high) × 2 (outcome valence: favorable, unfavorable to consumers) between-subjects design. To manipulate attention to base values, we told participants in the high-attention condition that percentages were tricky to work with and that mistakes were often made when the base associated with a percentage was ignored. This instruction was intended to enhance participants' attention to base values of percentages. Participants in the low-attention condition were not provided this instruction but were simply told to evaluate the percentage-based offers carefully.

We manipulated the second factor, motivation, by providing a monetary incentive to half the randomly selected participants. Specifically, those in the high-motivation condition were told that they would earn $5 if their responses were among the top 25% in terms of accuracy, right before they responded to the focal dependent measures. This instruction was omitted in the low-motivation condition.

We manipulated our last factor, outcome valence, as follows (unfavorable outcomes in parentheses):

> Imagine that you are out of coffee beans and you have to buy some today. You noticed that due to decreases (increases) in transportation costs, the prices of your favorite brands of coffee beans have decreased (increased).
>
> The price was $11.59 per lb. for both brands. Now due to the price decrease (increase), you will get 50% more (33.33% less) of Brand A for the same price. In the meantime, the price of Brand B has decreased by 33.33% (increased by 50%) per lb. Both brands are sold by weight. So you can buy as much, or as little, as you want.[5]

With this manipulation, we examined both consumers' preferences for a bonus pack over an economically equivalent price discount (H_1) and their preferences for a quantity decrease over an economically equivalent price increase (H_2).

Participants, Measures, and Manipulation Checks

A total of 191 undergraduate business students enrolled in introductory marketing classes at a large U.S. university participated in this study for extra course credit. They were randomly assigned to one of the eight experimental conditions. Participants indicated their preferences for one of the two brands on the same five-item scale used in Study 2, with appropriate wording changes to reflect the relative nature of the task (e.g., we changed anchors from "bad/good" to "worse/better"). We constructed the scale such that smaller numbers indicated that participants preferred Brand A, the brand with the quantity changes (i.e., either a bonus pack or a quantity decrease).

To measure BVN, participants responded to the same three questions as in Study 2 (M = .87, SD = .69). In addition, as controls, we also measured people's cognitive ability using Frederick's (2005) three-item cognitive reflection test (CRT), as well as their perceptions of differences in the unit price between the two brands after the price/quantity changes. Participants also responded to four questions designed to check the motivation manipulation on seven-point scales ("thought hard," "motivated," "given a significant incentive," and "highly involved"; 1 = "strongly disagree," 4 = "neither agree nor disagree," and 7 = "strongly agree"). The four items formed a unidimensional and reliable scale ($\alpha = .90$). A 2 × 2 × 2 ANOVA on the average score revealed a main effect of the incentive manipulation ($F(1, 183) = 11.17$, $p < .001$), with those in the incentive condition being more motivated than those in the no-incentive condition ($4.73 > 3.92$, $p > .10$ for other effects). Therefore, the motivation manipulation was deemed successful.

Participants were asked to convert the bonus pack offer to a price discount as a check of the attention to base value manipulation (i.e., "If you are offered 50% more at the regular price, what is the effective percentage price discount offered to you?"). We expected that participants in the

[5]Several aspects of the stimuli are noteworthy. First, consistent with previous research showing that perceptions of a firm's profit affected consumers' reactions (Campbell 1999), we justified the price and quantity changes with cost changes to control for profit perceptions, to reduce the possibility of generating extreme reactions (especially to changes that are unfavorable to consumers) that would reduce the power of detecting the predicted differences. Second, we used 33.33% instead of 35%, to reduce the effect of rounding and to make the correct answer unambiguous. Third, we specified the same beginning price for the two focal brands (i.e., $11.59) and told participants that both brands were sold by weight and that they could buy as much, or as little, as they wanted, thus in effect equating the final price. Finally, we described the bonus pack as "50% more" instead of "50% more free" to eliminate the potential confound of the word "free."

high-attention-to-base-value condition would be less likely to make the error of converting a bonus pack of 50% more to a price discount of 50% off compared with those in the low-attention condition. Indeed, a binary logistic regression with our three factors and all two- and three-way interactions as independent variables revealed a significant effect of attention to base value ($\lambda = -.513$, $p < .01$; $p > .10$ for other effects). Participants in the high-attention condition were less likely to make the mistake of converting a bonus pack of 50% more to a price discount of 50% off than those in the low-attention condition (22% < 41%; $\chi^2 = 8.06$, d.f. = 1, $p < .01$). Therefore, we deemed our manipulation of attention to base value successful.

In a separate pretest (N = 38), participants from the same population as those in the main study agreed that both a price discount and a bonus pack were beneficial to consumers (3.13 < 4 on a seven-point scale on which 1 = "strongly agree," 4 = "neutral," and 7 = "strongly disagree"; $p < .05$) and that both a price increase and a quantity decrease were harmful to consumers (3.26 < 4, $p < .05$). These results justify the use of our outcome valence manipulation.

Results

The five items used to measure attitude toward the offer formed a unidimensional and reliable scale ($\alpha = .96$). Table 1 summarizes the cell means and standard deviations. A 2 × 2 × 2 ANOVA on the attitude scale revealed a significant main effect of attention to base values ($F(1, 183) = 4.37$, $p < .05$; $p > .10$ for other effects). Attitudes were higher in the high-attention than in the low-attention-to-base-value condition (3.51 > 2.95, $p < .05$). Both means were significantly lower than the indifference point (3.51 < 4, $F(1, 183) = 7.98$, $p < .01$; 2.95 < 4, $F(1, 183) = 36.66$, $p < .001$), implying that participants preferred quantity changes over price changes regardless of their tendency to neglect the base value. However, the significant main effect of attention to base value indicated that the preference was weaker for participants whose attention to the base values was high. Consistent with this conclusion, the percentage of participants who erroneously displayed a more favorable attitude toward the brand that experienced a change in quantity was lower in the high- than in the low-attention condition (48.5% < 64.1%; $z = 2.18$, $p < .05$).

In addition, the absence of a main effect due to outcome valence is noteworthy. While not significantly different from each other, both means were significantly lower than the point of indifference (favorable outcome: 3.48 < 4, $p < .01$; unfavorable outcome: 2.98 < 4, $p < .001$). The results indicate that, consistent with H_1 and H_2, consumers prefer a bonus pack and a quantity decrement to an economically equivalent price discount and a price increase, respectively.

Process Evidence

To examine the underlying cognitive process, we tested the mediating effect of participants' BVN using the bootstrapping approach that Preacher and Hayes (2008) and Zhao, Lynch, and Chen (2010) propose. The analysis showed that while the total effect of attention to base values on attitude was positive and significant ($c' = .26$, $p < .05$), the direct effect was not ($c = .18$, $p > .10$), and the indirect effect through BVN was positive and significant ($a \times b = .03$, with a 95% confidence interval excluding zero). Therefore, we observe an indirect-only mediation (i.e., a full mediation) effect for BVN. The indirect effects through CRT and unit price perceptions were not significant (with 90% confidence intervals including zero).

Discussion

Although participants in this study preferred a bonus pack of 50% more over the economically equivalent price discount of 33% off and preferred 33% less quantity over the economically equivalent 50% increase in price, those preferences declined significantly for participants who attend to base values associated with the percentages. These results, obtained after controlling for potential confounds such as semantics (i.e., the use of the word "free"), support H_1 and H_2, extending our thesis from favorable changes to the domain of unfavorable changes. In addition, the results also help rule out motivation as a rival explanation for our results. Apparently, our motivation manipulation did not result in an enhanced focus on base value information (presumably because participants were unaware of the source of the bias), and therefore enhanced motivation failed to debias participants in the way attention to base values did.

Having established our foundational prediction with multiple samples and settings and having documented the underlying process for the observed effects, we now turn to empirically examining a set of boundary conditions for the effect. We focus on managerially relevant variables that are likely to either diminish or enhance the effect, thus allowing for the development of prescriptions for practitioners regarding the employment of quantity versus price changes to influence consumer preferences.

TABLE 1
Attitude Toward Offer Means (SD) in Study 3

	Motivation = High		Motivation = Low		
	Valence +	Valence –	Valence +	Valence –	Subtotal
BVN = high	3.04 (1.89)	2.83 (1.76)	3.08 (1.75)	2.86 (1.86)	2.95 (1.80)
BVN = low	3.86 (1.70)	3.00 (1.57)	3.80 (1.65)	3.26 (1.58)	3.51 (1.64)

Notes: BVN = participants' tendency to neglect the base value. Valence +: Changes that are favorable to consumers; that is, 50% more in quantity vs. 33.33% off price. Valence –: Changes that are unfavorable to consumers; that is, 33.33% less in quantity vs. 50% higher price. Small numbers mean that quantity changes are preferred.

Study 4: Lab Experiments Examining Managerially Relevant Boundary Conditions

Cognitive Complexity of Computation

When the cognitive complexity associated with comparing the percentage information of the two offers is high, the computational process may be relatively difficult. For example, converting 50% more into 33% off may be more difficult than converting 100% more into 50% off. In the latter case, consumers could simply note that the bonus pack offer doubles the quantity at the same price, leading to a relatively easy translation of a price discount of 50%. The same calculations may be cognitively more difficult in the case of converting 50% more to 33% off. Therefore, the preference for a bonus pack over the economically equivalent price discount may diminish when ease of conversion is high (as in the case of 100% more vs. 50% off), because under such circumstances people are more likely to assess the two offers as equivalent. In other words, the ease of converting one offer to another should make it more likely for consumers to realize that the two offers are equivalent and thus reduce the extent to which they exhibit BVN. Thus:

H_3: The preference for a bonus pack over the economically equivalent price discount diminishes when the ease of converting one offer to the other is high.

A second element of cognitive complexity is a notion we term "numerical proximity," which captures the distance between two numerical magnitudes on an internal analog scale (Dehaene 1997). Extant research indicates that "comparing two numbers that are closer to each other is relatively more difficult than comparing two numbers that are farther apart" (Thomas and Morwitz 2009, p. 82). In our setting, the numerical proximity between the percentages associated with the two offers tends to decline with the magnitude of the offers. For example, the bonus pack equivalent to a price discount of 33% off is 50% more, a difference of 17% between the two percentages. In contrast, the bonus pack equivalent to a price discount of 10% off is 11% more, only a 1% difference between the two percentages. Because the processing difficulty associated with numerically proximal percentage values is higher, the difficulty of making comparisons is greater. Therefore, even though BVN may be present whenever two different percentages are encountered, the strength of preference due to BVN should diminish as the magnitudes of the percentages decline. In other words, the effect of BVN on consumers' preference for a bonus pack over an economically equivalent price discount should be moderated by the magnitude of the percentages. Formally,

H_4: The preference for a bonus pack over the economically equivalent price discount diminishes when the percentages associated with the offers are small.

Monetary Significance

We identify two conditions under which consumers are likely to be particularly attentive to the monetary components of a transaction. First, when the relative price of the transaction is high (i.e., for an expensive product), because of the salience of price information and associated concerns about monetary sacrifice, a price discount may be preferred. This may be particularly true when the percentages associated with the two promotional tactics are numerically identical (e.g., 33% more vs. 33% off) such that the percentages seem equivalent to each other due to BVN. Specifically, when the two offers have the same percentage, consumers will mistakenly perceive the two offers as being equivalent, due to BVN. In addition, the seeming equivalence of the two offers will make consumers indifferent between the two offers for an inexpensive product; however, for an expensive product, consumers may prefer the price discount because it alleviates concerns regarding the monetary sacrifice associated with purchasing the expensive product. In other words, we predict an interaction effect between price level and promotion type. Formally,

H_5: Consumers are indifferent between a bonus pack and a price discount that have the same percentage for an inexpensive product but prefer the latter for an expensive product.

Second, the effects of BVN on consumers' preferences may also depend on their familiarity with a product. Specifically, for unfamiliar products, the risk associated with acquisition and consumption is relatively high; therefore, monetary sacrifice may be relatively salient, and a price discount may be relatively attractive. Conversely, for familiar products, an increment in quantity may not be that risky, because prior consumption experience should have alleviated risk concerns. Therefore, when the two offers have the same percentage (e.g., 33% more vs. 33% off), consumers will mistakenly perceive the two offers as being equivalent, due to BVN. In addition, the seeming equivalence of the two offers will make consumers indifferent between the two offers for a familiar product; however, for an unfamiliar product, consumers may prefer the price discount because it alleviates the risks associated with purchasing and consuming the unfamiliar product. In other words, we predict an interaction effect between product familiarity and promotion type. Formally,

H_6: Consumers are indifferent between a bonus pack and a price discount that have the same percentage for a familiar product but prefer the latter for an unfamiliar product.

Study 4a

H_3 and H_4 predict that the preference for a bonus pack over the economically equivalent price discount should diminish when the two offers can be easily converted to each other and when the two offers are small, respectively. To test these predictions, Study 4a used three between-subjects experimental conditions: 50% more vs. 33% off (baseline), 100% more vs. 50% off (the easy-to-convert condition), and 11% more vs. 10% off (the small magnitude condition). A total of 117 undergraduate business students at a large U.S. university participated in this study for partial course credit and were randomly assigned to the three experimental conditions. Participants first read a scenario similar to that used in Study 3, with one difference: Whereas in Study 3, the offers were made by two brands, to generalize our findings in this study, we changed the offers to being made by two stores. Participants then responded to the same five-item

attitude toward the offer measure as before, with larger numbers reflecting a more positive attitude toward the bonus pack offer than the price discount offer.

To check our conversion difficulty manipulation, after a word-unscrambling filler task, we asked participants to convert one offer to another (e.g., "50% off of the regular price is equivalent to ____ more at the regular price" in the 100%-50% condition). We expect that participants in the 100%-50% condition would be less likely to make the error of converting a price discount of 50% off to a bonus pack of 50% more, because the ease of conversion should diminish the degree to which we observe BVN. A binary logistic regression confirmed this expectation. The analysis revealed a significant effect of the experimental conditions ($\beta = .30$, $p < .05$), with the proportion of participants who showed BVN being lower in the 100%-50% condition than both the 50%-33% condition (21% < 48%; $\chi^2(1) = 6.02$, $p < .05$) and the 11%-10% condition (21%<51%; $\chi^2(1) = 7.60$, $p < .05$). The latter two conditions did not differ from each other (48% vs. 51%; χ^2 (1) = .11, $p > .10$).

We checked the magnitude manipulation by asking participants to compare the two percentages (e.g., "100% is a much bigger percentage than 50%" in the 100%-50% condition; 1 = "strongly disagree," and 7 = "strongly agree"). We expected that the perceived difference would be smaller in the 11%-10% condition than in the other two conditions. A one-way ANOVA confirmed this expectation (F(2, 113) = 45.08, $p < .001$). Planned contrasts revealed that the perceived difference between the two percentages was larger in the 100%-50% and 50%-33% conditions than in the 11%-10% condition (5.61 > 2.95, F(1, 113) = 72.51, $p < .001$; 5.84 > 2.95, F(1, 113) = 61.12, $p < .001$). Meanwhile, the perceived difference between the two percentages was not different between the former two conditions (5.61 vs. 5.84, F(1, 113) < 1).

To test H_3 and H_4, we used an ANOVA on the unidimensional attitude scale ($\alpha = .96$), which revealed a significant effect of the experimental conditions (F(2, 114) = 3.16, $p < .05$). Planned contrasts showed that participants in the 50%-33% condition held a more favorable attitude toward the bonus pack offer (vs. the price discount offer) than those in the 100%-50% condition (4.98 > 4.14; F(1, 114) = 5.08, $p < .05$) or those in the 11%-10% conditions (4.98 > 4.23; F(1, 114) = 4.29, $p < .05$). There was no difference between the latter two conditions (4.14 vs. 4.23; F(1, 114) < 1). When comparing each cell mean with the midpoint of the scale, we found that participants preferred the bonus pack over the price discount in the 50%-33% condition (4.98 > 4; F(1, 114) = 14.25, $p < .001$), but they were indifferent between the two offers in the 100%-50% and 11%-10% conditions (4.14 vs. 4 and 4.23 vs. 4; F(1, 114) < 1). These results support H_3 and H_4.[6]

[6]We also measured participants' perceptions of the economic impact (whether the bonus pack made consumers better off than the price discount) and affective impact of the two offers (whether the bonus pack made consumers happier than the price discount), as well as perceptions of quality and unit price. A bootstrapping analysis revealed an indirect-only (full) mediation through perceived economic impact only. Therefore, the effects of BVN seem to operate through a cognitive (i.e., perceived economic impact) rather than an affective (i.e., happiness) process.

Study 4b

To test H_5, Study 4b employed a 2 (price level: low vs. high) × 2 (percentage: same vs. different) between-subjects design. In the same percentage condition, the two offers were 33% more and 33% off. In the different percentage condition, the two offers were 50% more and 33% off.[7] We manipulated price level through unit price (i.e., \$10.59/lb. vs. \$.69/oz.). In reality, the latter is slightly more expensive than the former, but we expect that people would perceive the opposite to be true because they are likely to be unduly influenced by semantic cues in the decision context (e.g., Grewal, Marmorstein, and Sharma 1996). This expectation was confirmed, with a 2 × 2 ANOVA revealing a main effect of unit price (F(1, 115) = 60.22, $p < .001$; $p > .10$ for all other effects), and \$10.59/lb. being perceived as more expensive than \$.69/oz. (5.94 > 4.33).

A total of 121 undergraduate business students participated in this study for partial course credit and were randomly assigned to the experimental conditions. After participants read a scenario similar to that in Study 4a, we measured their attitude toward the two offers using the same scale as described previously, with larger numbers indicating a more positive attitude toward the bonus pack offer. We also measured CRT, need for cognition ($\alpha = .87$; Cacioppo, Petty, and Kao 1984), and product liking and purchase frequency. We averaged the latter two questions to form a single measure of liking (r = .52, $p < .001$). We used these three measures as covariates in our subsequent analyses. None was significant ($p > .10$), and thus we do not discuss them further.

A 2 × 2 ANOVA on the unidimensional five-item attitude toward the offer scale ($\alpha = .94$) revealed a significant main effect of percentage (F(1, 112) = 12.64, $p < .001$), with the bonus pack being perceived more favorably in the different percentage condition than in the same percentage condition (4.72 > 3.76, $p < .001$). When comparing each number with the midpoint of the scale, we found that participants preferred 50% more over 33% off (4.72 > 4; F(1, 112) = 12.27, $p < .001$), and they were indifferent between 33% more and 33% off (3.76 vs. 4; F(1, 112) = 1.34, $p > .10$). These results are consistent with our argument of BVN. The ANOVA also revealed a significant interaction between percentage and price level (F(1, 112) = 4.29, $p < .05$). The main effect of price level was not significant ($p > .10$).

Planned contrasts for the significant interaction effect showed that participants' preference between 50% more and 33% off was similar between the low- and high-price conditions (4.77 vs. 4.69, F(1, 112) < 1), and in both conditions, they preferred 50% more over 33% off (4.77 > 4, F(1, 112) = 6.01, $p < .05$; 4.69 > 4, F(1, 112) = 6.30, $p < .05$). However, their preference between 33% more and 33% off was different between the low- and high-price conditions (3.13 < 4.29, F(1, 112) = 7.81, $p < .01$). Participants were indifferent between 33% more and 33% off when the price

[7]A pretest using participants from the same population as the main study (N = 68) confirmed that the bonus pack was perceived to have a better percentage than the price discount in the 50%-33% condition (4.73 > 4; F(1, 64) = 4.33, $p < .05$) but was perceived to have a similar percentage as the price discount in the 33%-33% condition (3.77 vs. 4; F(1, 64) < 1).

was perceived to be low (4.29 vs. 4; $F(1, 112) = 1.08$, $p > .10$), but they preferred 33% off over 33% more when the price was perceived to be high ($3.13 < 4$; $F(1, 112) = 8.06$, $p < .01$). These results support H_5.

Study 4c

To test H_6, Study 4c employed a 2 (product familiarity: low, high) × 2 (percentage: same, different) between-subjects design. We manipulated percentage (same, different) in the same manner as in Study 4b and manipulated product familiarity by specifying the product either as "your favorite brand" or "a new brand." Product price was set at $.69/oz. According to the results in Study 4b, we expect that people will prefer 50% more over 33% off and that they will be indifferent between 33% more and 33% off. However, according to H_6, these preferences should be observed only for the familiar product.[8] For the unfamiliar product, although people should still prefer 50% more over 33% off, they should prefer 33% off over 33% more, according to H_6.

One hundred seven undergraduate business students participated in this study for partial course credit. After reading the scenario, participants responded to the same attitude measure described previously. In addition, we checked the familiarity manipulation by asking participants for their agreement with the statement "I know for sure that I will like this brand of coffee beans." As expected, a 2×2 ANOVA revealed that participants were more in agreement with this statement in the favorite-brand condition than the new-brand condition ($4.81 > 3.20$, $F(1, 100) = 31.03$, $p < .001$; $F < 1$ for other effects). Therefore, we deemed the familiarity manipulation to be successful.

To test H_6, we used a 2×2 ANOVA on the unidimensional attitude scale ($\alpha = .95$), which revealed a significant main effect of percentage ($F(1, 103) = 10.70$, $p = .001$). As we predicted, participants preferred 50% more to 33% off (4.87 vs. 4; $F(1, 103) = 3.97$, $p < .01$), and they were indifferent between 33% more and 33% off (3.81 vs. 4; $F(1, 103) = .85$, $p > .10$). The ANOVA also revealed a significant interaction between percentage and product familiarity ($F(1, 103) = 3.78$, $p = .05$). The main effect of familiarity was insignificant ($F(1, 103) = 1.33$, $p > .10$).

Planned contrasts for the significant interaction effect revealed that participants' preference between 50% more and 33% off was similar between the familiar and unfamiliar product conditions (5.00 vs. 4.75; $F(1, 103) < 1$), and in both conditions they preferred 50% more over 33% off ($5.00 > 4$; $F(1, 103) = 9.84$, $p < .01$; $4.75 > 4$, $F(1, 103) = 6.21$, $p < .05$). However, their preference between 33% more and 33% off was different between the familiar and unfamiliar product conditions ($3.36 < 4.33$; $F(1, 103) = 4.66$, $p < .05$). In particular, participants were indifferent between 33% more and 33% off for the familiar product (4.33 vs. 4; $F(1, 103) = 1.01$, $p > .10$), but they preferred 33% off over 33% more for the unfamiliar product ($3.36 < 4$; $F(1, 103) = 4.38$, $p < .05$). These results support H_6.

[8]Indeed, in Studies 3, 4a, and 4b, the focal products were familiar products (e.g., "your favorite brands of coffee beans").

General Discussion

Percentage information is ubiquitous in the communication of important marketplace information, ranging from price and quality metrics to the state of a consumer's financial well-being as captured by the day-to-day movement of the Dow Jones Industrial Average or the quarterly changes in his or her retirement portfolio. Therefore, how consumers encode and evaluate changes in percentage information and employ this information in their decision making is of importance to marketing researchers and practitioners. However, extant literature shows that consumers experience difficulties in processing changes in percentage information. As a result, they tend to mistakenly add up sequential percentages (Chen and Rao 2007), are more likely to use the anchoring-and-adjustment heuristic when a surcharge is expressed in percentage terms (Morwitz, Greenleaf, and Johnson 1998), and are less likely to update their reference price and more likely to continue to make a purchase after a percent-off (vs. a dollar-off) discount is withdrawn (DelVecchio, Krishnan, and Smith 2007). Consumers' response to comparative advertisements (Kruger and Vargas 2008) and mental accounting biases (Heath, Chatterjee, and France 1995) also demonstrate the challenges that percentage information pose for many consumers.

In the current research, we examine consumers' tendency to neglect base values associated with percentages and the impact of this tendency on their preferences for one of two commonly used promotion tactics: price discounts and bonus packs. Consistent with our argument of BVN, we document a substantial advantage in sales volume for a promotion that employed a bonus pack over the economically equivalent promotion that employed a price discount, link this effect to consumers' tendency to neglect the base values of percentages, and establish boundary conditions for this effect due to various theoretically justifiable and managerially relevant factors.

Theoretical Implications

The current research contributes to the field's understanding of consumers' preferences for bonus packs and price discounts. In particular, we provide a parsimonious explanation regarding these preferences when both offers are expressed as percentages and obtain supporting evidence for our predictions across multiple studies using multiple settings and samples including a field study, a survey of adult consumers, and multiple lab experiments.

A parsimonious account. Our results show that consumers' preferences for these types of promotions are better explained by BVN than other accounts such as prospect theory (Diamond and Sanyal 1990), price–quality perceptions (Rao and Monroe 1988), and motivation (Kruger and Vargas 2008). For example, the mental accounting explanation would suggest that a bonus pack of 33% more, which should be perceived as a pure gain, should be preferred over a price discount of 33% off, which should be perceived as a reduction in loss. Similarly, the price–quality perception explanation would predict that because quality perceptions are damaged by lower prices, a quantity increment of 33% more should be preferred to a price discount of 33% off.

However, this is not what we observe. Consistent with BVN, we find that consumers are indifferent between 33% more and 33% off for an inexpensive or familiar product and prefer 33% off for an expensive or unfamiliar product.

Similarly, both the mental accounting–based explanation and the price–perceived quality heuristic would predict a preference for a price increase over a quantity reduction. In contrast, we find in Study 3 that quantity reductions are generally preferred to price increases. Furthermore, the observed interaction effects between BVN and ease of conversion (i.e., numerical proximity), while consistent with our theoretical argument, cannot easily be accommodated by competing accounts. Finally, our results cannot be explained by a motivation-based argument either, as evidenced by the null effect of the motivation manipulation in Study 3. Unlike Kruger and Vargas (2008), who measured participants' numerical ability, we manipulated BVN and motivation independently, thus enabling us to test their respective effects on consumers' preferences. Therefore, our results offer evidence of nomological validity for our theoretical argument. In other words, BVN provides a parsimonious explanation for consumers' preferences between the two promotional tactics when both are expressed as percentages.

Our notion of BVN also has the potential to explain some of the existing results in the literature regarding the comparison of bonus packs and price discounts. For example, it has been documented that the preference for bonus packs weakens as the economic consequences of the offers increase (Diamond 1992; Hardesty and Bearden 2003; Smith and Sinha 2000), consistent with our result in Study 4b on price levels. Similarly, researchers have documented that the preference for bonus packs strengthens for heavy (vs. light) users (Ong, Ho, and Tripp 1997), consistent with our result in Study 4c regarding product familiarity.

On the processing of percentage information. Our argument regarding BVN also contributes to the literature on percentage information processing (Chen and Rao 2007; Heath, Chatterjee, and France 1995; Kruger and Vargas 2008). The possible link between BVN and consumers' mathematical ability suggests that our results may complement Peters et al. (2006) and Reyna and Brainerd's (2008) arguments that numeracy plays a critical role in bettering understanding of framing effects in particular and individual decision making in general. While Peters et al. (2006) demonstrate that people's numerical abilities may moderate some well-established framing effects (e.g., attribute framing, concrete thinking), the current research shows that BVN, which may be a function of people's mathematical naïveté, may also produce framing effects. Consumers may treat the numerosity associated with percentages as if they were absolute magnitudes and display predicted effects due to the framing of percentages (Heath, Chatterjee, and France 1995; Thaler 1985). Thus, much like absolute magnitudes, percentage values may contribute to framing effects as well.

It is important to note that our concept of BVN differs materially from the nominally similar concept of base rate neglect (Kahneman and Tversky 1972). Specifically, we define BVN in terms of a person's combined level of analytical reasoning and computational competence needed to assess a given price promotion. In contrast, the underutilization of base rate information pertains largely to the way people combine concrete case information with statistical base rate data to make a probabilistic judgment of category membership (e.g., the likelihood that a person is an engineer or an attorney). Thus, BVN differs from its well-known precursor in terms of both its antecedents and the outcomes that it is designed to predict.

Nonetheless, we suspect that the two phenomena could share the same evolutionary underpinning. Perhaps because people are evolutionarily wired to function in "frequentist" (i.e., whole number based) rather than "probabalist" (i.e., percentages, decimals, fractions) terms (Cosmides and Tooby 1996), they tend to have difficulties with percentages. Thus, when confronted with percentage representations of numerical information, they might form preferences and make choices that are biased.

Finally, the notion that consumers focus on the face value of a percentage and ignore its base is also analogous to people's tendency to attend to nominal value and neglect the real value of money. In their demonstration of the "money illusion," Shafir, Diamond, and Tversky (1997) show that a person who sold a house for 23% more than what he or she paid for it when the annual inflation rate was 25% was judged to be better off than another person who sold a house for 23% less than what he or she paid when the annual deflation rate was 25%, even though in real money terms, the first person experienced a loss while the second experienced a gain. Therefore, our results corroborate Shafir, Diamond, and Tversky's conclusion that people focus on nominal values and ignore the real values associated with percentages.

Practical Implications

As we discussed previously, extant evidence for the preference for bonus packs over price discounts is mixed and is based on studies that often failed to ensure the economic equivalence of the various options. In addition, most prior studies were conducted primarily in laboratory settings. In our research, we employ a field experiment, a survey of adult consumers, and multiple lab experiments. The field experiment in particular demonstrates the sales impact of bonus packs compared with price discounts of equal or slightly greater economic value. Conducted in an upper-middle-class suburban store setting, the field study suggests that the effects of BVN are present in everyday purchases made by educated consumers, a result that is of nontrivial significance to managers. Next, we expand on several additional implications for practitioners that can be derived from our research.

Bonus pack preference is strong but not universal. Contrary to prior research, we show that preference for bonus packs over price discounts cannot be predicted simply on the basis of products' price level or familiarity. For example, Smith and Sinha (2000) find that a preference for bonus packs over price discounts for the less expensive bread and bath tissue was reversed for the more expensive detergent

and sliced cheese. When we controlled for potential confounding effects of the stimulus product, we observed preference for a bonus pack over the economically equivalent price discount regardless of the price of the product. Similarly, whereas Ong, Ho, and Tripp (1997) find that people's preference for a price discount over a bonus pack was relatively weak for heavy users, when we controlled for potential confounding effects due to different groups of users, we found that consumers of both familiar and unfamiliar products (a proxy for usage rate) prefer a bonus pack to the economically equivalent price discount.

In addition, we also found that when bonus packs and price discounts are numerically equivalent such that the bonus pack is economically dominated by the price discount, consumers are indifferent between the two options for inexpensive or familiar products. In other words, BVN could lead to a preference for bonus packs over economically equivalent price discounts, as well as indifference between bonus packs and economically dominating price discounts. Therefore, bonus packs should be the preferred promotional tactic as long as the incremental costs of producing, transporting, and shelving the bonus pack do not exceed the benefits. In addition, BVN may provide an opportunity for a firm to creatively respond to a rival that emphasizes price discounts. For example, if a popular product by a competitor offers a price discount (e.g., 33% off), a firm could successfully offset any competitive disadvantage by offering a seemingly dominating bonus pack (e.g., 50% more).[9]

However, we also find that consumers' preference for bonus packs over price discounts can be mitigated or even reversed under certain circumstances. For example, our finding that people are indifferent between 10% off and 11% more, and between 50% off and 100% more, suggests that the preference for bonus packs over price discounts may vary nonlinearly with offer magnitude (cf., Diamond 1992; Hardesty and Bearden 2003). In particular, when the economic value of the promotion is small and therefore the numerical magnitudes associated with the promotions are similar, the preference for bonus packs is likely to disappear, a consideration that managers should keep in mind. Moreover, if the numerical values associated with the options are easily converted into each other, even if the offer magnitude is large (e.g., 50% off is easily translated into 100% more), the advantage of bonus packs may also disappear. Indeed, when the marketer factors in the incremental costs of producing, transporting, and shelving the bonus pack, it could conceivably result in a disadvantageous promotion when ease of conversion is high or when the offers are small.

[9]Indeed, in a study not described here (N = 90) in which participants chose between their favorite brand that offered a bonus pack and a new brand that offered a price discount or vice versa, we found that participants' preference for their favorite brand over the new brand was significantly weakened by the effect of BVN, such that they were indifferent between a new brand that offered a bonus pack of 50% more and their favorite brand that offered a price discount of 33% off.

In addition, while we find that consumers are indifferent between bonus packs and numerically (but not economically) equivalent price discounts for inexpensive or familiar products, they actually prefer price discounts over bonus packs that have the same percentages for expensive or unfamiliar products. Therefore, if competitors in a relatively high-priced category, or those introducing a new product, were to employ a bonus pack tactic (e.g., 33% more), the focal firm might consider employing a price discount that is numerically equivalent to the percentage increment offered by the competitor. Compared with competing head-on with a tit-for-tat bonus pack tactic (e.g., offering 50% more), such a price discount (e.g., 33% off) may be more effective in garnering sales because it better alleviates consumers' concerns with monetary sacrifice.

In addition, many consumer packaged goods firms may feature both premium and bargain priced brands in the same product category (e.g., Procter & Gamble's Tide and Gain detergents) or market both established and new products to existing and new customers. Similarly, consumers in different countries or markets may be differentially familiar with certain brands. Our results suggest that marketers could manage their product lines more effectively by choosing the appropriate promotional tools (e.g., price discount for a new market).

Nonprice implications. In addition to price, many other product attributes feature numerical information, and changes in those attributes can be, and often are, communicated as percentage changes. Our findings regarding the role of BVN in the processing of percentage changes is readily applicable to these settings as well. For example, firms promoting health-related claims can highlight the increase (e.g., of 50%) in package size (12 oz. bottle) for the same calorie count (100 calories) rather than the equivalent decrease (e.g., of 33%) in calorie count for the same package size. Similarly, firms emphasizing speed, such as quantity of data transferred per time interval (e.g., SanDisk USB drive with read and write speed at 30 MB/second), product delivery (e.g., UPS delivers a package within two business days), response to product failure (e.g., Xerox technicians arrive on-site within 24 hours from the service call), product efficiency (e.g., Whirlpool's washing machine finishes one normal wash cycle in 30 minutes), or travel services (e.g., United Airlines flies from San Francisco to Sydney in 15 hours) can highlight improvements that emphasize the increase in speed (e.g., of 25%) rather than the equivalent decrease in time taken (e.g., of 20%).

Implications for public policy. Recognizing the role of BVN in the observed preference for large versus small percentages suggests several interventions for policy makers and regulators interested in enhancing consumer welfare. For example, it may be valuable to improve the convertibility of economically equivalent offers to minimize the effect of BVN. Alternatively, it may be desirable to require firms to provide both percentage and magnitude information, so consumers susceptible to BVN can assess the magnitudes associated with the numerical information accurately. Educational programs aimed at heightening consumers' sensitivity to base values or their ability to deal with percentages

in general may also prove helpful. Finally, the marketing effort associated with green products may be helped if firms communicate improvements in energy efficiency rather than the decline in energy consumption (e.g., a 50% increase in miles per gallon of a car vs. the equivalent 33% decrease in its fuel consumption). In these situations, public policy can be similarly informed to accelerate the adoption of healthier/faster/greener products.

Appendix
Attitude Toward Offer and BVN Measures in Study 2

1. Measure of attitude toward offer:
   I think the offer on my favorite brand of toothpaste [mouthwash] is:

Bad	1	2	3	4	5	6	7	Good
Unattractive	1	2	3	4	5	6	7	Attractive
Not beneficial	1	2	3	4	5	6	7	Beneficial
Unfavorable	1	2	3	4	5	6	7	Favorable
I don't like it	1	2	3	4	5	6	7	I like it

2. Measure of people's tendency toward BVN:
   i. If a price is reduced by 40% and then reduced further by 10%, what is the total percentage discount you are getting?
   a. 44% b. 46% c. 48% d. 50% e. 52%
   ii. If the annual percentage yield (APY) on a certificate of deposit (CD) is 5%, what is the total percentage return on this CD in 5 years?
   a. 23.5% b. 25% c. 26.5% d. 28% e. 29.5%
   iii. You receive a "convenience check" in the mail from one of your credit card companies (that is, you have an opportunity to take a loan). The offer states that you can borrow $10,000 at an annual percentage rate of 1% for the next 4 months. After that, the interest rate will go up to 8.99%. In addition, there is a one-time transaction fee of 3% on any amount you borrow. Assuming that you borrow $10,000 now and pay back the loan right before the rate adjusts higher, approximately what is the effective annual interest rate on this $10,000 loan?
   a. 1% b. 4% c. 7% d. 10% e. 13%

The following was not provided to participants:
Correct answers: b, d, and d
Answers reflecting BVN: d, b, and b

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