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When Retailing and Las Vegas Meet: Probabilistic Free Price Promotions

Nina Mazar,[a] **Kristina Shampanier,**[b] **Dan Ariely**[c]

[a] Rotman School of Management, University of Toronto, Toronto, Ontario M5S 3E6, Canada; [b] Analysis Group, Boston, Massachusetts 02199; [c] Duke University, Durham, North Carolina 27705

Contact: nina@ninamazar.com (NM); kristina.shampanier@analysisgroup.com (KS); dan@danariely.com (DA)

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Abstract. A number of retailers offer gambling- or lottery-type price promotions with a chance to receive one's entire purchase for free. Although these retailers seem to share the intuition that probabilistic free price promotions are attractive to consumers, it is unclear how they compare to traditional sure price promotions of equal expected monetary value. We compared these two risky and sure price promotions for planned purchases across six experiments in the field and in the laboratory. Together, we found that consumers are not only more likely to purchase a product promoted with a probabilistic free discount over the same product promoted with a sure discount but that they are also likely to purchase more of it. This preference seems to be primarily due to a diminishing sensitivity to the prices. In addition, we find that the zero price effect, transaction cost, and novelty considerations are likely not implicated.

History: Accepted by Yuval Rottenstreich, judgment and decision making.

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Keywords: perception • gamble • uncertainty • prospect theory • probability weighting • value • Weber–Fechner

Introduction

Over the years, a number of retailers have offered gambling- or lottery-type price discounts to promote their sales. For example, a few years ago several retailers in New England promised full refunds to customers who bought their items in the few weeks leading to the Super Bowl and World Series in the event that the Patriots or the Red Sox, respectively, won. In the case of Jordan's Furniture, the retailer took in 30,000 orders during the almost 6-week promotion period in 2007, and one customer, who took advantage of the promotion to buy furniture for his entire house, ended up getting back $40,000 because the Red Sox won the World Series (Reed 2007). Similarly, a family-run appliance store retailer in Worcester that linked its promotion to the win of the Patriots in the Super Bowl 2008 expected that the gambling-type discount would account for 20%–30% of its business in that year (Sanders 2008). These conditional price promotions were by design ambiguous in terms of their probability of occurring.

Most recently three separate retail chains in Germany (Real, a "hyper-store" chain similar to Walmart in the United States; Mann Mobilia XXXL, one of the biggest furniture store chains; and Media Markt, the leading consumer electronics retailer, similar to Best Buy in the United States) ran one-week promotions announcing that every 100th and 10th purchase, respectively, would be free. In case of the Media Markt campaign in 2010, the probabilistic free price promotion, with its unambiguously defined probabilities, was determined at the end of day of the purchase and needed to be cashed in stores within 14 days of the purchase date (see Figure 1).

The retailers mentioned above seem to share the intuition that a gambling- or lottery-type of price promotion is attractive to consumers, which might be based on the observation that consumer spending on gambling, including lotteries, is a multibillion-dollar industry (e.g., $98 billion in the United States; IBISWorld 2013) that continues to show solid growth. This attraction to risk can in part be attributed to wishful thinking and wishful betting, the tendency to be overoptimistic that a desirable future outcome (the big prize) will occur and to bet more aggressively on it

Figure 1. (Color online) Media Markt's Advertised Probabilistic Price Promotion, Offering Every 10th Purchase for Free

Notes. Translation from German:
Focal message: "Every 10th purchase for free! The last digit of a receipt number = Winning number."
Picture of receipt on the bottom left, text above the arrow pointing on the receipt: "Here you find the winning number."
Text in the yellow banner to the right of the receipt: "This is how easy it is go get your money back: With the correct last digit of your receipt number, your purchase is for free! Only until January 9! The daily winning number: after 22:30 o'clock on mediamarkt.de and on the phone at 0800/800 70 60."
Disclaimer in small black font under the yellow banner focuses first on phone and Internet service contracts as well as warranties that are excluded from this promotion and then states: "The winnings need to be picked up within 14 days after date of your purchase."
Source. Used with permission from Media-Saturn-Holding GmbH.

(Bar-Hillel and Budescu 1995, Seybert and Bloomfield 2009, Trope et al. 1997).[1]

Despite such intuitions, the vast majority of promotions are not probabilistic, suggesting that the belief in such pricing mechanisms is far from universal. In addition, it is also unclear how such probabilistic price promotions that offer something for free (probabilistic free price promotion) compare with the ubiquitous traditional sure price promotions (Han et al. 2001) if the latter offered a fixed discount of equal expected monetary value. That is, it is unclear whether and why customers would be more, less, or equally attracted to shopping at a store that offered, e.g., a 10% chance to get their purchases for free (with a 90% chance to pay the regular price) when there are other stores that carry the same items but offer them at a guaranteed, fixed percentage off. Similarly, there may be situations where a retailer (e.g., Kayak.com) sells products (e.g., hotel rooms) by some suppliers with a price promotion and other suppliers without a price promotion, and it is unclear if and why a probabilistic free price promotion may be more successful in shifting the market share of the corresponding product than would a sure price promotion. These questions are highly relevant to marketers (retailers and suppliers alike) who may want to promote some products or stores over others.

In this paper we investigate under controlled conditions whether, to what extent, and why for planned purchases a probabilistic free price promotion is preferred to a sure price promotion of equal expected monetary value (i.e., discount) when the probabilities are unambiguously defined (similar to the Media Markt example from Germany mentioned above) and the discount immediately determined and paid out at checkout. Across six experiments we find that such a probabilistic free price promotion is indeed more attractive. Furthermore, the preference for the probabilistic free price promotion is fairly robust across various probabilities of wining and across various product price levels. Finally, we show that this preference is not driven by an attraction to a zero price, an aversion to transaction cost, or novelty, but rather primarily due to a diminishing sensitivity to the prices.

Standard Rational Fundamentals: Expected Utility Theory

Standard expected utility theory predicts that consumers are risk averse[2] and will thus prefer the sure price promotion over a probabilistic free price promotion of equal expected value. For very small stakes, consumers have been shown to be risk neutral (Rabin 2000), which would imply indifference between the two promotions. Thus, depending on the magnitude of the stakes, we expect either indifference or a preference for sure discounts.

Behavioral Fundamentals

From a behavioral decision theory perspective, the differences between the two types of price promotion can give rise to several types of psychological processes. Moreover, because of the multitude of these potential psychological processes, it is not clear how the two types of price promotion will translate into a preference of one type of promotion over the other.

Factors Favoring the Sure Price Promotion

Uncertainty Effect. The "uncertainty effect" (Gneezy et al. 2006) posits that, because we dislike uncertainty, individuals value a risky gain prospect less than its worst possible outcome (i.e., direct risk aversion; see Newman and Mochon 2012, Simonsohn 2009). That is, according to the uncertainty effect, people value the probabilistic free price promotion with its two possible outcomes (best possible outcome, free; worst possible outcome, paying the regular price) less than paying the regular price. As a result, individuals are expected to value the probabilistic price promotion less than the sure nonfree price promotion of equal expected discount and act accordingly.

Certainty Effect. Similar to the uncertainty effect, the "certainty effect" as coined by Kahneman and Tversky (1979, p. 265) posits that "people overweight outcomes that are considered certain, relative to outcomes which are merely probable" (for all $0 < p < 1$, $\pi(p) + \pi \cdot (1 - p) < 1$). Thus, both the uncertainty effect and the certainty effect predict that consumers would prefer a sure price promotion over a probabilistic price promotion.

Factors Favoring the Probabilistic Free Price Promotion

Zero Price Effect. One factor that could favor the probabilistic price promotion is the attraction to zero prices. Previous research has shown that promotions that offer something for free are likely to be evaluated differently (Chandran and Morwitz 2006, Nunes and Park 2003, Palmeira 2011) than nonfree promotions. Building on this work, Shampanier et al. (2007) found that people experienced significantly more positive affect when facing a free offer (the price equals \$0) compared with other price offers (e.g., the price equals \$0.01 or \$0.02), and this disproportionately positive affect led to a larger demand for zero-priced products than what standard cost-benefit analysis would have predicted. In line with this account, individuals may find the probabilistic free price promotion more attractive than a sure price promotion because the former includes an additional positive element, which is the possibility of getting something for nothing. It is important to note that one other prediction of this account is that the attraction to the probabilistic free price promotion should be independent of the price level or the probability p of winning the product for free (which we test directly).

Transaction Cost. Similarly to the zero price effect, hassle or transaction cost considerations would favor the probabilistic free price promotion. This is because winning the probabilistic free price promotion avoids these costs—there is no need to take out one's wallet and pay.

Novelty. Another factor that could favor the probabilistic price promotion is novelty. Customers may find probabilistic price promotions particularly appealing simply because they have had no previous encounter with such promotions (for novelty as an arousal-inducing stimulus that increases individuals' probability of self-exposure to it, see, e.g., Berlyne 1970). As with the zero price effect and an aversion to transaction cost, this factor should lead to an attraction to the probabilistic price promotion that is independent of the price level or the probability p of winning the product for free.

Diminishing Sensitivity. Another set of predictions can be made based on diminishing sensitivity. As demonstrated by Tversky and Kahneman's (1981) seminal experiment, when participants were asked whether they would travel 20 minutes to purchase a calculator [jacket] typically priced at \$15 [\$125] on sale for \$10 [\$120], they were more willing to travel the 20 minutes for the same \$5 discount for the cheaper calculator than for the more expensive jacket. This finding shows that, when evaluating a sure discount, people compare the discounted price to the regular, full price and behave in a Weber–Fechnerian way (Stigler 1965); that is, people display diminishing sensitivity as prices increase, a basic psychophysical principle that is reflected, e.g., in the concavity of prospect theory's gain value function ($v(x) = x^\alpha$, for $x \geq 0$, with $\alpha < 1$ (see also Thaler (1980)).

Therefore, if individuals display diminishing sensitivity to prices, the perceived value of the sure discount is the difference in perceived magnitude of the regular, full price versus the discounted sure price:

$$\text{V}(\textit{Sure discount}) = (\textit{Regular price})^\alpha - (\textit{Discounted sure price})^\alpha. \quad (1)$$

In a situation in which a customer is choosing between a sure price promotion and a probabilistic price promotion of equal expected value, and where the probabilistic price promotion offers a chance p to not pay anything (i.e., "winning"), from (1) it follows that

$$\begin{aligned}\text{V}(\textit{Sure discount}) &= (\textit{Regular price})^\alpha - ((1-p) \times (\textit{Regular price}))^\alpha \\ &= (1-(1-p)^\alpha) \times (\textit{Regular price})^\alpha. \quad (2)\end{aligned}$$

Although the evidence on how individuals perceive sure price promotions is rather convincing (Tversky and Kahneman 1981), it is an open question how individuals may perceive the value of probabilistic price promotions (i.e., what happens under uncertainty). If individuals perceive them in a similar way to the way in which they perceive sure price promotions (i.e., they focus on the magnitude of the prices), we would expect the value of the probabilistic discount to be

$$\begin{aligned}&\text{V}(\textit{Probabilistic discount}) \\ &= (\textit{Regular price})^\alpha - p \times (\textit{Discounted probabilistic price})^\alpha \\ &\quad - (1-p) \times (\textit{Regular price})^\alpha. \quad (3)\end{aligned}$$

For probabilistic free price promotions (i.e., the discounted probabilistic price = \$0) it follows that

$$\begin{aligned}&\mathrm{V}(\textit{Probabilistic free discount})\\&\quad= (\textit{Regular price})^{\alpha} - (1-p)\times(\textit{Regular price})^{\alpha}\\&\quad= p\times(\textit{Regular price})^{\alpha}.\end{aligned} \tag{4}$$

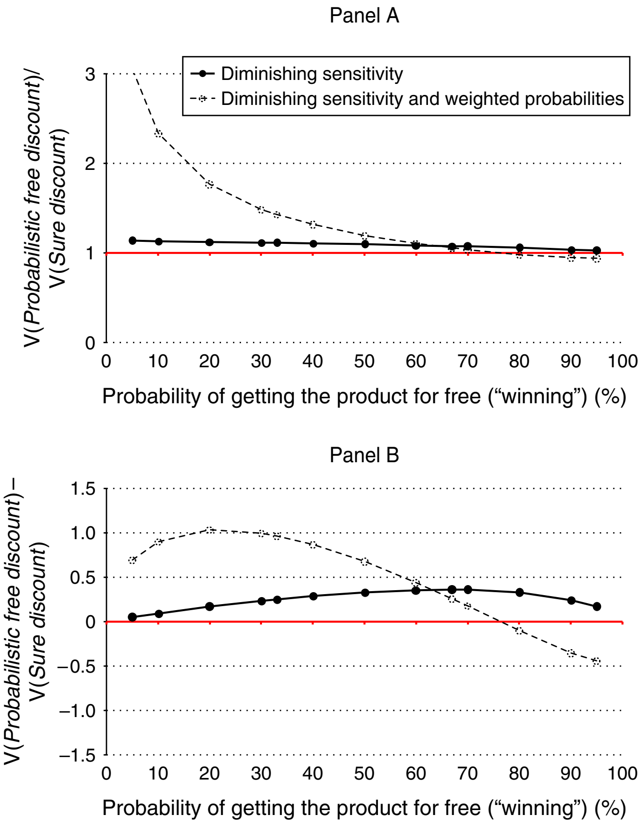
From this it follows that

$$\mathrm{V}(\textit{Sure discount}) < \mathrm{V}(\textit{Probabilistic free discount}),\quad \text{for all } 0<p<1 \text{ and } \alpha<1.\text{[3]} \tag{5}$$

With these assumptions, individuals should always prefer a probabilistic free price promotion to a sure price promotion of equal expected value. In other words, if we assume that individuals display diminishing sensitivity and we are dealing with probabilistic promotions that include the chance p of getting the purchase for free (otherwise $(1-p)$ chance of paying the regular price), then we would expect individuals to attach a greater value to the probabilistic free price promotion than to the sure price promotion of equal expected value. This would hold true independent of the price level (i.e., for all $\alpha<1$: V(*Probabilistic free discount*)/V(*Sure discount*) > 1). Further, the preference for the probabilistic free price promotion, measured as the ratio V(*Probabilistic free discount*)/V(*Sure discount*), is decreasing as the probability of getting the product for free increases (i.e., $p\to 1$). The solid line in Figure 2, panel A depicts the preference ratio and Figure 2, panel B depicts the difference between the two price promotions' values for diminishing sensitivity $\alpha = 0.88$ (see parameter estimation in Tversky and Kahneman 1992).

Diminishing Sensitivity and Probability Weighting. A modification to diminishing sensitivity could come from adding a component based on the probability value function of Kahneman and Tversky's (1979) prospect theory. Specifically, Kahneman and Tversky (1979) describe decision weights of probabilities $\pi(p)$ such that small probabilities are generally overweighted ($\pi(p) > p$; the probability weighting function is concave) and large probabilities are underweighted ($\pi(p) < p$; the probability weighting function is convex). The dashed line in Figure 2, panel A displays the predicted preference ratio of the probabilistic free price promotion to the sure price promotion based on Prelec's (1998, p. 505) probability weighting function $\pi(p) = \exp[-\beta\times(-\ln p)^{\gamma}]$, with $\beta = 1$ and $\gamma = 0.65$, and with diminishing sensitivity $\alpha = 0.88$ (see the parameter estimation in Tversky and Kahneman 1992); Figure 2, panel B depicts the difference of the two price promotion's values. As can be seen, with these parameter assumptions, individuals should attach a greater value to the probabilistic price promotion over the sure price promotion of equal expected value for most probabilities. Another prediction of this perspective is that the preference for the probabilistic price promotion, measured as the ratio V(*Probabilistic free discount*)/V(*Sure discount*), is decreasing as the probability of getting the product for free increases (i.e., $p\to 1$). Unlike the case with dimishing sensitivity only (i.e., no decision weights), the decrease is much sharper. Yet another prediction of this perspective is that the preference will reverse (i.e., V(*Probabilistic free discount*)/V(*Sure discount*) < 1) to a preference for the sure price promotion for $p > 0.76$.

Figure 2. (Color online) Predicted Attraction to the Probabilistic Free over the Sure Price Promotion



Notes. Panel A shows the value ratios, which are independent of price levels. Panel B shows the value differences for a product with a regular price of \$10.

Previous Consumer Behavior Research on Probabilistic Promotions

The literature most relevant to the work presented here is on ambiguity. Specifically, most recently, Goldsmith and Amir (2010) focused on sales promotions that promised that consumers would either receive a less valued product gift (bag of unpopped popcorn) or a more valued product gift (a can of soda) with the purchase of a candy bar, without disclosing the probabilities of receiving either gift. In their incentive-compatible experiment in an on-campus snack shop, Goldsmith and Amir (2010) observed a higher purchase rate for the promoted candy bar when the gift was more valued than when it was less valued. More importantly, the purchase rate of the candy bar, when coupled with a promotion that was ambiguously defined as either of the two (less or more valued) gifts, did not differ from when coupled with a more valued gift promotion (the three types of promotions were run separately, one condition at a time). The authors suggested that their findings were due to wishful thinking, which made customers focus on the best option of the ambiguously defined promotion. Extrapolating Goldsmith and Amir's (2010) findings from the product promotions domain to our price promotions domain and from unknown to known probabilities, a probabilistic price promotion that offered, e.g., a 10% chance to get a purchase for free and a 90% chance to pay the regular price would cause consumers to focus on the best possible outcome ("free"). As a consequence, such a probabilistic price promotion would be as effective and thus cheaper for a retailer than simply offering a product for free with certainty. That is, individuals would value the risky prospect the same as its best possible realization, a conclusion that may not be intuitive and is in opposition to the prediction of the uncertainty effect. However, if true, then a probabilistic discount would also be superior to a certain discount of equal expected monetary value (e.g., 10% off the regular price for sure).

In other related work Dhar et al. (1995; see also 1999) tested in an incentive-compatible experiment in an on-campus store whether an imprecisely stated price promotion (e.g., "around X% off") was more or less successful in increasing the market share of a candy bar than a precisely stated price promotion ("X% off"), (Dhar et al. (1995, 1999) ran one type of promotion at a time). Although not the main focus of their work, their three precise discount-conditions ("20% off" versus "25% chance of saving 80%" versus "80% chance of saving 25%") allow for the equal expected monetary value-type of comparison on which we are focusing. Interestingly, and unlike the extrapolation from Goldsmith and Amir's (2010) findings, Dhar et al. (1995, 1999) found a null effect. That is, they found no significant difference in the market shares of a candy bar when offered with any of these three price promotions, implying that probabilistic price promotions do not differ in their attraction from sure price promotions of equal expected monetary value or discount.

Overview of Experiments

Given the mixed predictions based on existing theories as well as findings from previous research in marketing, it is unclear if, how, and why a probabilistic price promotion with a chance to get one's purchase for free differs from a sure price promotion of equal expected monetary value—questions that should be of importance for marketers that are trying to improve on their price promotion strategies. The current paper addresses this question for planned purchases through a series of four incentive-compatible experiments in the field (Experiments 1, 2, and 3) and in the laboratory (Experiment 4) and two hypothetical online experiments (Experiments 5a and 5b) across products of varying regular, full-price levels ($0.75 to $200). The paper concludes with a discussion of the theoretical and practical implications and its limitations, as well as several potential directions for future research.

The general set-up in Experiments 1–4 was such that we offered consumers a choice between a probabilistic price promotion and a sure price promotion of equal expected monetary value (joint valuation setting) at the point of purchase, and we measured the percent of purchases made with a probabilistic price promotion choice. In Experiments 5a and 5b, promotions were offered separately (separate valuation setting), one at a time, and we measured the percent of purchases made (traffic) as well as the average consumer demand (basket size). Except for Experiment 1, we presented participants with the following information:[4]

—for the probabilistic price promotion: p% chance of paying the discounted probabilistic price (e.g., $0) and $(1-p)$% chance of paying the regular price;

—for the sure price promotion: 100% chance of paying the discounted sure price, that is, p% off the regular price.

In addition, we randomized the order in which we presented offers. Unless reported otherwise, no conditions, measures, or subjects were dropped from the experiments reported in this paper.

Experiment 1: Vending Machine

For our first experiment we purchased a vending machine (see Figure S1 in the online supplementary materials and methods, available at https://doi.org/10.1287/mnsc.2015.2328) that we placed next to two existing vending machines centrally located in a student lounge where they were frequented by students, faculty, and staff members on a regular basis. Our vending machine had 10 buttons for candies. We stacked the vending machine with five types of candy, with two buttons each: Snickers, M&M's, Twix, 3 Musketeers, and Starburst. The vending machine was opaque (individuals could not see the inside), and the candies were represented with a picture and a price placed next to each of the 10 buttons. All candies retailed at a regular, full price of $0.75 (the same as the candies in the other two vending machines in the lounge). A candy's price also appeared on the display when people pressed a button. The vending machine could sell only one candy at a time.

Figure 3. (Color online) Vending Machine Sign Announcing the Promotions in Experiment 1

Procedure

We manipulated the prices for the candy over time and recorded the sales volume. Our experiment consisted of three two-week periods. For the first two weeks ("before period") and the last two weeks ("after period"), we offered the candy at the regular price of $0.75 each. Between these two periods we ran a two-week sales promotion in which we offered two different types of price promotion: A sure price promotion offering 33% off the regular price (consumers had to pay a discounted sure price of $0.50 for a candy) and a probabilistic price promotion that required consumers to first pay the regular price $0.75 for a candy but offered a 33% chance to get their money back when the candy was released (the money was wrapped around the candy).[5] Both types of promotions offered an expected discount or "gain" of $0.25. The two promotions were offered simultaneously with a sign prominently displayed at eye level on the front of the vending machine announcing and color-coding both types of promotion (see Figure 3). Since each type of candy occupied two buttons of the vending machine, one button (with a green sticker) represented the sure price promotion and the other button (red sticker) represented the probabilistic free price promotion. Thus, consumers could decide which promotion they wanted by pressing the corresponding button (for more details, see Supplementary Materials and Methods).

Results and Discussion

First, the promotion proved very successful: sales increased from 83 candies in the "before period" to 204 candies during the promotion period. After our promotion ended, sales in the "after period" went back to 81 candies. Second and more importantly, during the promotion period we sold almost 50% more candy with the probabilistic price promotion (120 candies) compared to sales with the sure price promotion (84 candies). In other words, of the 204 candies sold during the promotion period, 59% were purchased with the probabilistic free promotion and 41% were purchased with the sure promotion, and this ratio was significantly different from an equal split ($\chi^2(1, N = 204) = 6.353$, $p = 0.012$).[6]

Experiment 2: Differing Probabilities at a Local Video Store

Our first experiment with the vending machine shows that, when offered a choice between the two types of promotion, consumers are more likely to choose the probabilistic (risky) free price promotion than the traditional, sure price promotion. Next, we examined the robustness of the attraction to the probabilistic free price promotion across a range of probabilities and with a higher-priced product for which the prices and discounts are less likely considered "peanuts." Previous research (see, e.g., Prelec and Loewenstein 1991, Weber and Chapman 2005) has shown that for small-stakes gains with at least medium probabilities ($p > 10\%$) to win, people become less risk averse than for large-stakes gains. Furthermore, for sufficiently small gains of less than $1, Markowitz (1952) posited that people might even become risk seeking.[7] Thus, if we found that, for choices where the sure discount was greater than $1, we continued to observe an attraction to the probabilistic free price promotion (i.e., significantly more than 50% choose it), the findings could be less likely considered an artifact of the "peanuts" effect.

In addition, given the promotional sign on the vending machine, we might have attracted some consumers that originally did not intend to purchase a candy. Similarly, some of the higher sales volume for probabilistic free price promotion candy in Experiment 1 could have been caused by individual customers purchasing more than one candy due to the "windfall" of getting a candy for free (i.e., customers making additional unplanned purchases on top of their planned purchase rather than the probabilistic free price promotion attracting more of the planned purchases than the sure price promotion). Thus, we attempted to replicate our findings in a more controlled setting where we could limit the quantity eligible for discount to one item per customer and ensure that customers learned about the promotions only when they were at the checkout counter. For this purpose, we conducted our experiment at a local video rental store where a DVD rental cost $4.50.

Procedure

Three hundred and twenty-five customers in a local video rental store were informed at checkout by experimenters disguised as staff that the store had a special price promotion valid for one DVD movie per customer. Customers were told that they could choose between two types of price promotion, a sure promotion and a probabilistic promotion, and that if they

Table 1. Customers' Choices Between the Probabilistic Free and Sure Price Promotions in the Five Between-Subjects Conditions in Experiment 2

Condition (%)	Probabilistic free price promotion prices	Sure price promotion price	Customers choosing the probabilistic free price promotion (%)	χ^2 (df, N)	p-value
10	10% : $0 90% : $4.50	$4.05 (10% off $4.50)	76	19.059 (1, 68)	<0.001
33	33% : $0 67% : $4.50	$3 (33% off $4.50)	68	8.067 (1, 60)	0.005
50	50% : $0 50% : $4.50	$2.25 (50% off $4.50)	68	8.727 (1, 66)	0.003
67	67% : $0 33% : $4.50	$1.50 (67% off $4.50)	66	6.452 (1, 62)	0.011
90	90% : $0 10% : $4.50	$0.45 (90% off $4.50)	55	0.710 (1, 69)	0.399

Note. The test results indicate the probability that the percent of customers choosing the probabilistic free price promotion is different from the 50% chance level; df, degrees of freedom.

chose the probabilistic promotion they would have to roll a die in order to find out if they had to pay $0 (discounted probabilistic price) or $4.50 (regular price).

Using either a 6-sided or 10-sided die, we manipulated the probabilities of winning between customers on five different levels: 10%, 33%, 50%, 67%, and 90%, with the expected discounts $0.45, $1.50, $2.25, $3, and $4.05, respectively (see Table 1). The conditions were run one at a time, one hour each, with a 30-minute break between conditions. By design, the experimenters knew which condition they were running at any given point in time but they were not aware of any hypotheses. The experiment was conducted over several days. Each day included all the conditions in a randomized order.

Results and Discussion

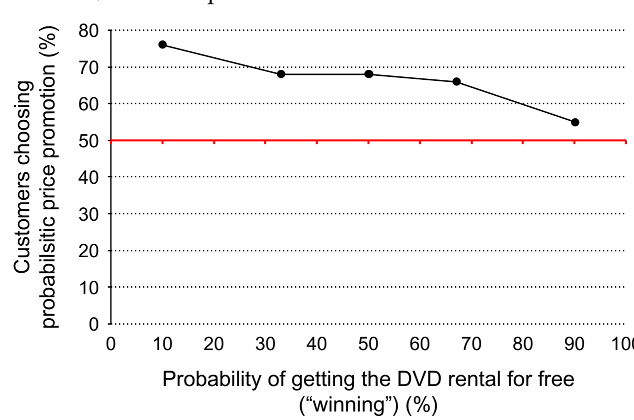
The percentages of customers choosing the probabilistic price promotion rather than the sure price promotion are presented in Figure 4, and the χ^2 test results for the difference from an equal split are presented in Table 1. As can be seen, contrary to what standard rational fundamentals and the uncertainty and certainty effects would predict, the probabilistic free price promotion attracted significantly more customers than the sure price promotion at all levels but one discount level: all the way up to and including $p = 67\%$ (customers' choice between the two promotions at the $p = 90\%$ level was not significantly different from an equal split). First, these results replicate the findings from Experiment 1 for a more expensive product and over a wider range of probabilities with expected discounts greater than $1 (i.e., for $p > 10\%$). Thus, we conclude that our findings are less likely an artifact of the "peanuts" effect (Prelec and Loewenstein 1991).

Second, we observed a general decrease in the attraction to the probabilistic price promotion relative to the sure price promotion as the probabilities of winning and the expected discounts increased (nominal logistic regression parameter estimate for probability level p as continuous variable $B = -1.1$, $SE = 0.43$, $\chi^2 = 6.48$, $p = 0.01$). This downward-sloping trend counters the zero price effect, transaction cost, and novelty effects as sole drivers of the attraction to the probabilistic free price promotion, because each of those explanations would require the attraction to remain constant across probability levels.

Third, the facts that we do not see a sharp decline in the attraction of the probabilistic free price promotion and that we do not observe any probability level p at which people significantly prefer the sure price promotion over the probabilistic free price promotion suggest that individuals' preferences are largely affected by a diminishing sensitivity to the prices and less so by decision weights (compare results in Table 1 and Figure 4 to those in Figure 2).

The following two experiments further examine possible causes underlying the apparent boost to people's

Figure 4. (Color online) Observed Preference for the Probabilistic Free Price Promotion Over the Equal Expected Value Sure Price Promotion for a DVD Rental at a Regular Price of $4.50 in Experiment 2



risk seeking in purchases with probabilistic free price promotions.

Experiment 3: Zero as a Special Price and Transaction Cost

Experiment 3 was designed to test if customers' attraction to the probabilistic free price promotion was boosted at all by positive affective utility associated with a free offering or by an aversion to transaction cost. Following the experimental design of Shampanier et al. (2007), we set out to test this possibility by comparing the attraction to the probabilistic price promotion across conditions in which the best possible outcome of the probabilistic price promotion either involved a chance to get something for free (discounted probabilistic price = \$0) or a chance to pay a small but relatively insignificant amount (discounted probabilistic price > \$0). If the attraction to the probabilistic price promotion is driven solely by the affective utility associated with a zero price or lower transaction cost due to a chance of not having to pay, the attraction should be significantly lessened or eliminated once the best possible outcome of the probabilistic price promotion does not offer a chance of getting the product for free but requires paying a small price.

Procedure

The experiment was conducted at the same local video rental store and with a similar procedure as in Experiment 2. That is, customers were informed at checkout by experimenters disguised as staff that the store had a special promotion valid for one DVD movie per customer (regular price = \$4.50) and that they could choose between two types of promotion: a sure promotion that guaranteed a discounted sure price of \$4 (i.e., 11% or \$0.50 off the regular price) and a probabilistic price promotion. The probabilistic price promotion was presented as one of the following, depending on the condition:[8]

(1) 11% chance to pay a discounted price of \$0 and 89% chance to pay the regular price of \$4.50,

(2) 12% chance to pay a discounted price of \$0.38 and 88% chance to pay the regular price of \$4.50, or

(3) 13% chance to pay a discounted price of \$0.69 and 87% chance to pay the regular price of \$4.50.

That is, we manipulated the chance of winning the probabilistic price promotion between customers on three different levels (p = 11%, 12%, and 13%, respectively) while keeping the expected value of the discounts at \$0.50 across all three levels (unlike in Experiment 2 where the expected value of the discount increases as p increases) and across both the probabilistic and sure price promotion options.

The three conditions were run one at a time, one hour each, with a 30-minute break between conditions. The experiment was conducted over the course of one day with 163 customers. The order of the conditions was randomized and the probabilistic price promotion was carried out by having customers "pull" the handle of a digital slot machine on a laptop.

Results and Discussion

Independent of whether the probabilistic price promotion offered a chance to get the DVD for free or not, customers significantly preferred the probabilistic price promotion over the sure price promotion: 73% ($p = 11\%$ free condition 1: $\chi^2(1, N = 55) = 11.364$, $p < 0.001$), 75% ($p = 12\%$ nonfree condition 2: $\chi^2(1, N = 55) = 13.255$, $p < 0.001$), and 77% ($p = 13\%$ nonfree condition 3: $\chi^2(1, N = 53) = 15.868$, $p < 0.001$). More importantly, we compared the percentage of customers choosing the probabilistic price promotion over the sure price promotion across the three conditions. A nominal logistic regression revealed no significant difference between the three conditions ($\chi^2(2, N = 163) = 0.313$, $p = 0.856$, $R^2 = 0.002$).

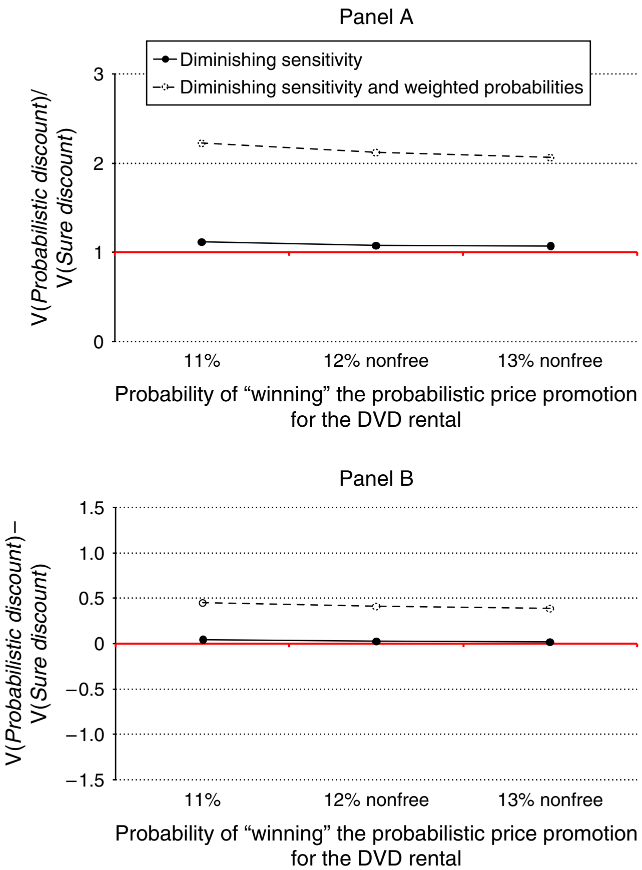
One possible explanation of our findings is that the two discounted probabilistic nonzero prices (\$0.38 and \$0.69) were perceived as zero prices. However, given that the zero price effect was shown for the difference between \$0 and \$0.01 (Shampanier et al. 2007), this explanation does not seem likely. Rather, we interpret our findings to suggest that the preference for the probabilistic free price promotion is substantial and not dependent on the attraction of a zero price or an aversion to transaction cost.

Figure 5 displays predictions based on only diminishing sensitivity $\alpha = 0.88$ (Tversky and Kahneman 1992) as well as diminishing sensitivity $\alpha = 0.88$ and Prelec's (1998) probability weighting function $\pi(p) = \exp[-\beta \times (-\ln p)^{\gamma}]$, with $\beta = 1$ and $\gamma = 0.65$. Focusing on the preference ratios depicted in Figure 5, panel A, a surprising observation to make again is that the slope of our findings may be better explained by diminishing sensitivity to prices without weighted probabilities.

Experiment 4: Replication and Novelty

Experiment 4 conceptually replicates Experiment 2 with several extensions. First, it examines the generalizability of the attraction of the probabilistic free price promotion to a more expensive product, a rOtring pen sold at a regular, full price of \$10. Second, it tests a more fine-grained set of probabilities of winning the probabilistic free price promotion (13 p-levels from 5% to 95%) to further support the shape of the attraction to the probabilistic price promotion curve observed in Experiment 2. Third, it contrasts individuals' choices between the probabilistic free and sure price promotions with their choices between risky monetary gain gambles and sure monetary gains of equal expected surplus. Fourth, this experiment was run in the laboratory as a within-subject design, with one of the participants' decisions actually carried out, to assess whether

Figure 5. (Color online) Predicted Attraction to the 11% Probabilistic Free and 12% and 13% Probabilistic Nonfree Price Promotions Over the Sure Price Promotion in Experiment 3



Notes. The exepcted discount was held constant at $0.50. Panel A shows the value ratios, and panel B shows the value differences for a regular price of $4.50.

the attraction to the probabilistic free price promotion in any way received a boost from being novel to some individual participants. Work by Berlyne (e.g., Berlyne 1970, Berlyne and Parham 1968) suggests that novelty as an arousal-inducing stimulus and its hedonic value decrease in the face of prolonged repetition of exposure to the novel stimulus and its preference judgment. In fact, recent work by Dijksterhuis and Smith (2002) shows that affective adaptation even happens with subliminal exposure. Thus, although a probabilistic free price promotion may have been novel to participants at the beginning of the series of preference judgments, we would expect novelty and its resulting attraction to the probabilistic free price promotion to decline over the duration of the experiment as a result of affective adaptation.[9]

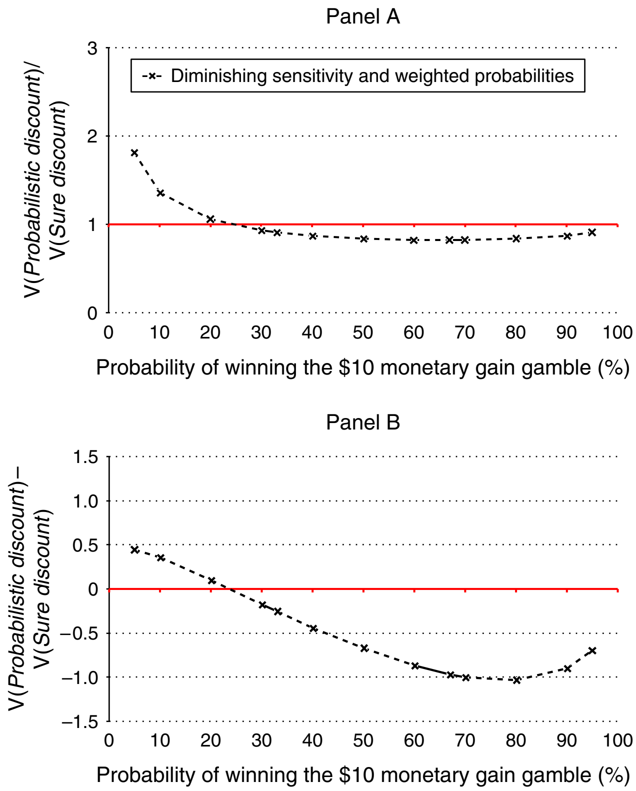
Procedure

The computer-based experiment was part of a one-hour experimental session consisting of several studies. The payment for participation in the session was $10. According to the recruiting flyer and consent form, participants expected to leave the session with an average compensation of $12–$18 in cash and/or in kind and knew they could withdraw from participation at any point during the experimental session.

The experiment started with a screening question asking participants whether they were interested in the possibility of actually purchasing either a rOtring pen worth $10 [pictures of the pen in different colors were displayed on the screen] or a $10 gift certificate for Amazon.com [a picture of the gift certificate was displayed on the screen] with their own money. Only participants who indicated interest proceeded to the experiment. Eighty-two students participated in this experiment.

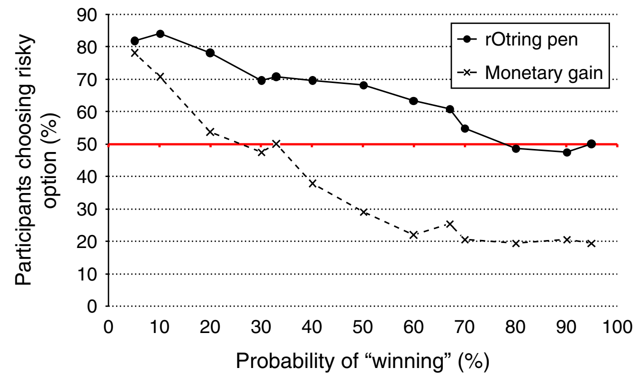
The instructions of the experiment explained that participants would face 52 decisions and that, at the end of the experiment, one of the 52 decisions would be randomly selected and their choice for that decision would actually be carried out. Participants were presented with 52 choices each between a risky option and a sure option (of equal expected value) in terms of a price promotion on the purchase of a $10 rOtring pen, a price promotion on the purchase of a $10 gift certificate for Amazon.com, monetary gains of up to $10, or monetary losses of up to $10. For each of our four stimuli (pen, gift certificate, monetary gain, monetary loss) we varied the probabilities of "winning" the risky option on 13 levels (i.e., $p = 5\%$, 10%, 20%, 30%, 33%, 40%, 50%, 60%, 67%, 70%, 80%, 90%, 95%). For example, for the $p = 60\%$ level price promotions domain, participants were offered a choice between a probabilistic free price promotion with a 60% chance of paying $0 [$(1-p) = 40\%$ chance of paying the regular price of $10] and a sure price promotion that required paying $4 [i.e., 60% off the regular price of $10]. For the 60% level monetary gain domain, participants were offered a choice between a gamble for a monetary gain with a 60% chance of getting $10 [$(1-p) = 40\%$ chance of getting $0] and a sure monetary gain of $6. The expected surplus/discounts in these two choice sets were the same, $6. Figure 6 displays prospect theory's predictions for the monetary gain domain (assuming diminishing sensitivity $\alpha = 0.88$ and probability weighting with $\pi(p) = \exp[-1 * (-\ln p)^{0.65}]$ applied to all gains). As can be seen, prospect theory predicts that participants prefer the probabilistic monetary gain over the sure monetary gain for small probabilities. Their preference, however, is expected to decline quickly, and for $p > 24.54\%$, we expect a preference reversal with a preference for the sure monetary gain over the probabilistic monetary gain for medium and large probabilities. Thus, for most probabilities we expect to find lower risk seeking for monetary gains than for purchases with a price promotion (compare Figure 6 and Figure 2).

Figure 6. (Color online) Prospect Theory's Predicted Attraction to the Probabilistic Monetary Gain over the Sure Monetary Gain in Experiment 4



Note. Panel A shows the value ratios; panel B shows the value differences.

Figure 7. (Color online) Observed Risk-Seeking Behavior Across the Pen Purchase-with-Price Promotion Domain and the Monetary Gain Domain in Experiment 4



Note. The domains are matched on their expected surplus at each of the 13 probability levels on the x axis.

The 52 decisions were split into 4 blocks of 13 by stimuli. The blocks were randomized in order, as well as the 13 decisions within each block. In addition, we counterbalanced between subjects whether the risky option was displayed to the left or right side of the sure option. The entire experiment had a 4 (stimuli) × 13 (probabilities) within-subject randomized-block design. In the following, we focus on only 26 decisions: the 13 decisions about the purchase of the rOtring pen and the 13 decisions about monetary gains. For a full account including all four within-subject conditions, see Supplementary Materials and Methods.

Results

Figure 7 displays the percentage of participants choosing the risky option over the sure option (i.e., their risk seeking) on each of the 13 probability levels for the two domains (rOtring pen with price promotion as well as monetary gain). As can be seen, for each of the 13 probability levels, despite equivalent expected surplus, participants were more risk seeking in the price promotion domain than in the monetary gain domain. In addition, the observed risk seeking for the monetary gains followed to some extent the predicted pattern in Figure 6 (for winning probability $p > 20\%$, participants no longer preferred the probabilistic monetary gain to the sure monetary gain).

The top left half of Table 2 shows the parameter estimates from a linear regression model with fixed effects for respondents (i.e., a dummy variable for each participant, excluding one) and cluster-robust standard errors, choice (0 = sure option, 1 = risky option) as the dependent variable, and it assumes domain-specific intercepts and slope parameters over the 13 probability levels. The regression model constant was excluded. To further support our observation from Figure 7 that participants' risk-seeking behaviors differed by domain (rOtring pen purchase with price promotion and monetary gain), we performed pairwise Wald tests comparing the two intercept and slope parameter estimates to each other (see the bottom left half of Table 2). The results revealed that the intercept and slope parameter estimates for the rOtring pen and monetary gain were significantly different from each other, suggesting that participants' risk-seeking behavior was indeed higher for the purchase with a price promotion domain than for the monetary gain domain despite equivalence in expected surplus. Further, the same as in Experiment 2, all the way up to the winning probability $p = 67\%$ the preference for the probabilistic price promotion over the sure price promotion was significantly different from an equal 50:50 split (all p-values < 0.05); for winning probabilities $p \geq 70\%$, there was no significant difference from equal 50:50 split (all p-values > 0.3).

Finally, we can examine whether the attraction to the probabilistic free price promotion for the rOtring pen was boosted by novelty. For that we can take advantage of the fact that individuals made 2 (blocks: rOtring pen and Amazon.com gift certificate) × 13 (probabilities) repeated choices in the price promotions domain and examine participants' risk seeking for the rOtring pen purchase when its block came before (i.e., novelty, $N = 494$) or after (i.e., previous exposure, $N =$

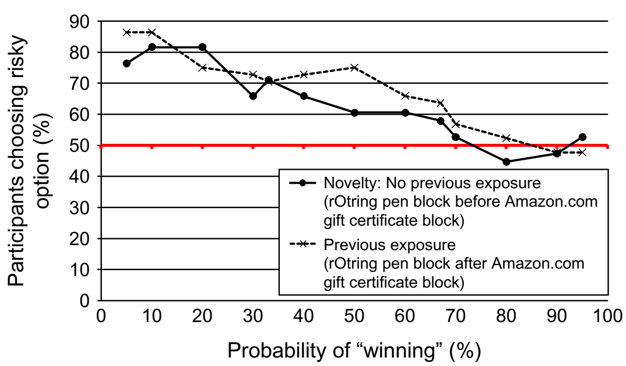
Table 2. Parameter Estimates B for Choice of Probabilistic/Risky Option Including Wald Tests of Intercept and Slope Parameter Estimates in Experiment 4

Parameters	B (Robust SE)	Parameters	B (Robust SE)
Intercepts		Intercepts	
rOtring pen	0.799***	Novelty	0.821***
	(0.040)	(pen before Amazon)	(0.068)
Money gain	0.644***	Prior exposure	0.882***
	(0.046)	(Amazon before pen)	(0.061)
Slopes		*Slopes*	
rOtring pen	−0.403***	Novelty	−0.038***
	(0.078)		(0.010)
Money gain	−0.637***	Prior exposure	−0.042***
	(0.085)		(0.011)
R^2	0.667	R^2	0.673
No. of observations	2,132	No. of observations	1,066
Parameter comparisons	$F(1,81)$ (p)	Parameter comparisons	$F(1,81)$ (p)
Intercepts		Intercepts	
rOtring pen = Money gain	8.72	Novelty = Prior exposure	0.43
	(0.004)		(0.514)
Slopes		Slopes	
rOtring pen = Money gain	6.73	Novelty = Prior exposure	0.06
	(0.011)		(0.811)

Notes. The top left half of the table shows the parameter estimates from a linear regression model with fixed effects for respondents with cluster-robust standard errors ($N = 82$ clusters), choice (0 = sure option, 1 = risky option) as the dependent variable, and assuming domain-specific intercepts and slope parameters over the 13 probability levels. Test parameters on the top right half of the table were estimated from a linear regression without fixed effects because our two conditions (novelty and prior exposure) are between subjects and thus perfectly correlated with respondents.
$^{***}p < 0.001$.

572) having encountered the probabilistic price promotion block for the Amazon.com gift certificate. As can be seen in Figure 8 and the right half of Table 2, we did not find support for the novelty (also known as adaption) hypothesis. For the most part, it seems that participants' were equally or less likely to choose the probabilistic free price promotion for the rOtring pen when this was their first, as opposed to second, probabilistic free price promotion block encounter. That is, the attraction to the probabilistic free price promotion, if at all, increased with more exposure (see nonsignificant difference of intercept and slope parameters in pairwise Wald tests in the bottom right half of Table 2).

Figure 8. (Color online) Observed Preference for the Probabilistic Free Price Promotion over the Equal Expected Value Sure Price Promotion for the rOtring Pen Offered at a Regular Price of $10 With or Without Previous Experience with Probabilistic Free Price Promotions in Experiment 4



Discussion

Together, the results of Experiment 4 replicate the findings from Experiment 2 with a more fine-grained set of probabilities of winning the probabilistic free price promotion and a more expensive product: individuals generally prefer a probabilistic free price promotion over an equal expected value sure price promotion across a wide range of probabilities.

The downward sloping trend suggests that the effect cannot be solely due to the zero price effect, transaction cost considerations, or novelty. Additionally, the comparison of participants' choices in the first versus second free price promotion block encounter further demonstrates that novelty is likely not the decisive factor for the observed attraction to the probabilistic free price promotion: participants' attraction does not decrease over the course of the within-subject design with its multiple trials.

The direct comparison of participants' choices in the monetary gain domain and the price promotion domain in Figure 7 shows that participants were significantly more risk seeking (i.e., more likely to choose the risky option) in the context of price promotions than in the context of monetary gains. Participants' observed behavior for monetary gains largely followed prospect theory's predicted pattern (compare dashed lines in Figure 7 and Figure 6). Similarly, the behavior observed in the price promotion domain can be sufficiently explained by individuals' diminishing sensitivity to the prices with or without weighted probabilities (compare solid line in Figure 7 to solid and dashed lines in Figure 2).

Experiment 5: Separate Evaluation Setting

Experiments 1–4, the main focus of this paper, revealed that when consumers face a choice (joint evaluation setting) between a sure price promotion and a probabilistic free price promotion of equal expected discount for the same product, they overwhelmingly choose the probabilistic price promotion (risky option).

In what follows, we expand our focus and present two hypothetical experiments with substantially more expensive products (hotel rooms sold at a regular, full price of $200 per night) in which we examine the effectiveness of the two types of promotions in separate evaluation settings. That is, we examine their effectiveness in an indirect choice paradigm with two different products (adopted from Gneezy et al. 2006) where one product is promoted and another product is not. We do this to broaden the generalizability of our findings and examine if, when a company wants to temporarily promote one of their products over others (e.g., Procter and Gamble deciding to promote their Pantene shampoos but not their Herbal Essences shampoos), offering a probabilistic free price promotion versus a sure price promotion makes a difference in terms of market shares. Specifically, we test whether the probabilistic free price promotion is likely to attract more consumers (increase traffic; Experiment 5a) and encourage greater spending (basket size; Experiment 5b) than a sure price promotion—two measures of great importance for marketers.

The findings from Experiments 1–4 support the conclusion that, when comparing sure and probabilistic free price promotions, people focus on the magnitude of the prices. In addition, because in these joint evaluation settings we offered two types of promotion for the same product, the product itself became irrelevant (nondiscriminatory), making prices and discounts particularly salient. In the new, separate evaluation setting in Experiments 5a and 5b, because we now also make the product become a discriminatory attribute, the impact of prices and discounts relative to the product may be reduced. However, as long as prices and discounts continue to be discriminatory, we would continue to expect an attention to prices and thus, based on our previous theoretical reasoning with diminishing sensitivity (see the Behavioral Fundamentals section), higher demand for the probabilistic free price promotion than the sure price promotion.

In addition, previous research has shown that joint versus separate evaluation settings change the way people evaluate options (Hsee et al. 1991). The underlying evaluability hypothesis posits that attributes that are relatively difficult compared to relatively easy to evaluate independently have a lesser impact in separate than in joint evaluation settings, whereas easy-to-evaluate attributes remain equally impactful. Our separate evaluation setting in Experiments 5a and 5b removes the comparison price promotion (e.g., a probabilistic free price promotion product is now compared to a nonpromotion product rather than to another sure price promotion product). Given that prices and discounts are considered to be relatively easy-to-evaluate attributes, they therefore continue to be salient attributes. Thus, again, we would continue to expect to find the probabilistic free price promotion to attract more demand than the sure price promotion.

Procedure

Four hundred (Experiment 5a) and five hundred (Experiment 5b) participants in the United States were recruited through Amazon's Mechanical Turk (MTurk[10]) in exchange for 30 cents to complete a short vacation study on Qualtrics.

Participants were randomly assigned to one of five between-subject conditions in which they were asked to imagine that they were going on a seven-day vacation to Spain and were debating between a cultural vacation in the city of Barcelona and a beach vacation in a coastal resort approximately 100 miles south of Barcelona. The participants were told that they went on Kayak.com to compare hotel prices and found one four-star hotel in Barcelona and one four-star hotel in the beach resort, both offered at a regular, full price of $200 per night, where they would consider staying at. They were then presented with regular or discounted prices per night for those two hotels and asked in Experiment 5a, to indicate which vacation (Barcelona city hotel or beach resort hotel) they would choose; in Experiment 5b, they were asked how many of the seven days, if any, they would book at each place. That is, in each condition participants needed to make a decision between the Barcelona city hotel and the beach resort hotel.

The price per night for the beach resort hotel was kept at the regular, full price of $200 across all conditions, whereas the price of the Barcelona city hotel was varied across conditions to either be $200 (control condition) or discounted such that the expected discount was $20. There were three discounted price conditions for the Barcelona city hotel: a sure price promotion condition with a discounted price of $180; a probabilistic free price promotion condition with a 10% chance of not paying anything and 90% chance of paying the regular, full price of $200; and a probabilistic nonfree price promotion condition with a 20% chance of paying a discounted price of $100 and 80% chance of paying the regular, full price of $200. Finally, we added an exploratory fifth condition in which we told participants that the Barcelona city hotel offered a choice between a sure price promotion (with a discounted price of $180) and a 10% probabilistic free price promotion (with a 10% chance of paying $0 and 90% chance of paying the regular, full price of $200; choice condition). In this exploratory condition, in Experiment 5b, if participants indicated they wanted to spend one or more days at the Barcelona city hotel, on the next page they were asked to choose between the sure and probabilistic free price promotion for the Barcelona city hotel.[11]

Participants were randomly assigned to one of the five conditions. Upon indicating how they would want to spend their seven-day vacation, participants in both experiments were asked to indicate how much, in general, they liked beach vacations and city vacations (on nine-point scales each), their gender, age, ethnicity, and highest finished degree of education. The survey ended with an attention question that we planned to use to exclude participants if wrongly answered (for all questions, see Supplementary Materials and Methods).

In what follows we present and discuss our findings excluding the exploratory fifth condition. For a full account of the data and results, see Supplementary Materials and Methods.

Experiment 5a: Results

Table 3 shows the parameter estimates from a nominal logistic regression model with choice (0 = beach resort vacation, 1 = Barcelona city vacation, $N = 326$) as the dependent variable, the sure price promotion condition as baseline, and the remaining three conditions as independent variables (dummy coded with 1 = condition, 0 = not this condition). As can be seen, significantly more participants chose the Barcelona city vacation over the beach resort vacation when the Barcelona city hotel was offered with a probabilistic free price promotion (75.3%) than when it was offered with a sure price promotion (50.0%). Interestingly, no promotion for the Barcelona city hotel (control: 53.7%) was not less successful than offering a sure promotion (50.0%).

The difference between the two probabilistic price promotions (nonfree, 63.0%, vs. free price, 75.3%) was only marginally significant ($\chi^2(1, N = 162) = 2.908$, $p = 0.088$), the same as the difference between the probabilistic nonfree price promotion (63.0%) and the sure price promotion (50.0%; see Table 3). Figure 9 displays predictions based on only diminishing sensitivity $\alpha = 0.88$ (Tversky and Kahneman 1992) as well as diminishing sensitivity $\alpha = 0.88$ and Prelec's (1998) probability weighting function $\pi(p) = \exp[-\beta * (-\ln p)^{\gamma}]$, with $\beta = 1$ and $\gamma = 0.65$. As in Experiment 3, a suprising observation to make is that our findings seem best explained by diminishing sensitivity to prices without weighted probabilities.

Finally, an ANOVA found no significant effect of our conditions on how much participants liked a city vacation over a beach vacation (mean = 0.01, SD = 2.71, $F(3, 322) = 1.622$, $p = 0.184$; for means and standard deviations by condition, see Table S5 in the online supplementary materials and methods).

Experiment 5b: Results

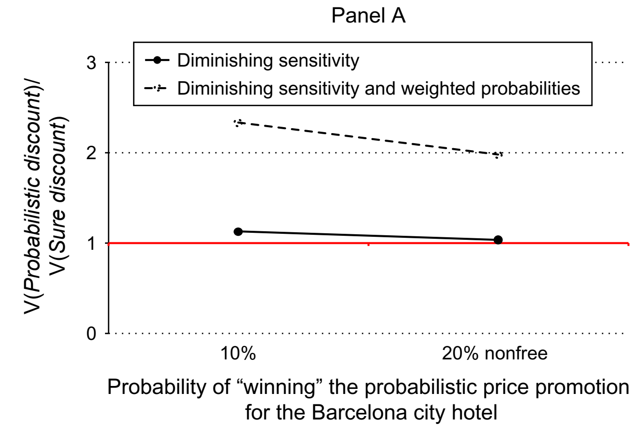
An overall ANOVA revealed a significant difference of condition on number of days booked at the Barcelona city hotel ($F(3, 405) = 7.515$, $p < 0.001$). Table 4 shows the parameter estimates from a linear regression model

Table 3. Percentages and Parameter Estimates B for Choice of Barcelona City Hotel over Beach Resort Hotel in Experiment 5a with Sure Price Promotion as Baseline

		Nominal logistic regression				
Condition	Choice of Barcelona vacation (%)	B (SE)	χ^2	p-value	95% CI	
Intercept	—	< −0.001 (0.221)	0.00	1.000	−0.435	0.435
Sure price promotion	50.0	—	—	—	—	—
Probabilistic free price promotion	75.3	1.115 (.339)	10.80	<0.001	0.460	1.795
Probabilistic nonfree price promotion	63.0	0.531 (0.319)	2.77	0.096	−0.091	1.162
Control (no price promotion)	53.7	0.147 (0.313)	0.22	0.639	−0.466	0.762

Notes. The baseline condition is highlighted in grey. Whole model test pseudo-$R^2 = 0.031$, $N = 326$. CI, confidence interval.

Figure 9. (Color online) Predicted Attraction to the 10% Probabilistic Free and 20% NonFree Price Promotions over the Sure Price Promotion in Experiment 5a



Note. The exepcted discount was held constant at $20 and the regular price at $200.

with number of days booked at the Barcelona city hotel as the dependent variable, the sure price promotion condition as baseline, and the remaining three conditions as independent variables (dummy coded with 1 = condition, 0 = not this condition). As can be seen, participants ($N = 409$) booked significantly more days at the Barcelona city hotel when it was offered with a probabilistic free price promotion (mean = 4.53 days, SD = 1.97) than when it was offered with a sure price promotion (mean = 3.83 days, SD = 1.83, $t(405) = 2.731$, $p = 0.007$), a probabilistic nonfree price promotion (mean = 3.97 days, SD = 1.84, $t(405) = 2.197$, $p = 0.029$), or no price promotion (mean = 3.34 days, SD = 1.54, $t(405) = 4.715$, $p < 0.001$). The difference between the probabilistic nonfree price promotion (mean = 3.97 days) and the sure price promotion (mean = 3.83 days, $t(405) = 0.555$, $p = 0.579$) was not significantly different. Finally, an ANOVA found no significant effect of our conditions on how much participants liked a city vacation over a beach vacation (mean = −0.19, SD = 2.84, $F(3,405) = 0.831$, $p = 0.478$; for means and standard deviations by condition, see Table S5 in the online supplementary materials and methods).

Discussion

Together, the results of Experiments 5a and 5b suggest that, even for fairly expensive products and in a separate valuation setting, the probabilistic free price promotion can be superior to a sure price promotion of equal expected discount. The findings are particularly powerful because they show that the probabilistic free price promotion in comparison to the sure price promotion may not only encourage more people to make a planned purchase (i.e., increase the number of customers) but also the average customer to spend more money (i.e., increase the average basket size per customer).[12]

General Discussion

What type of price promotion is more attractive to customers: a probabilistic price promotion that offers a chance p to get one's selected products for free and

Table 4. Means and Parameter Estimates B for Number of Days Booked at the Barcelona City Hotel in Experiment 5b with Sure Price Promotion as Baseline

	Days	Linear regression				
Condition	Mean (SD)	B (SE)	t	p-value	95% CI	
Intercept	—	3.832 (0.180)	21.40	<0.001	3.480	4.184
Sure price promotion[A]	3.83	— (1.83)	—	—	—	—
Probabilistic FREE price promotion[B]	4.53 (1.97)	0.693 (0.254)	2.73	0.007	0.194	1.192
Probabilistic nonfree price promotion[A]	3.97 (1.84)	0.139 (0.251)	0.55	0.579	−0.355	0.634
Control (no price promotion)[C]	3.34 (1.54)	−0.495 (0.251)	−1.97	<0.050	−0.989	−0.001

Notes. Conditions not connected by the same superscript letter A, B, or C are significantly different ($p < 0.05$), by pairwise student's t-tests. The baseline condition is highlighted in grey. Whole model test $R^2 = 0.053$, $N = 409$.

a chance $(1 - p)$ to pay the regular, full price or a certain price promotion of equal expected discount? Across four incentive-compatible experiments (Experiments 1–4, three in the field and one in the laboratory) we considered consumers' choices between sure and probabilistic free price promotions (joint valuation setting) and demonstrated that consumers consistently, over a range of probabilities (5%–67%), products (candy, DVD rental, rOtring pen), expected discounts, and regular prices ($0.75, $4.50, and $10), preferred the probabilistic free price promotion to the sure price promotion. In addition, extending our findings from the joint valuation settings, Experiments 5a and 5b showed, in hypothetical, separate valuation settings with even more expensive products (hotel rooms; regular price = $200), that the probabilistic free price promotion can also increase demand for a product and do so significantly better than the sure price promotion in two ways: by attracting more consumers (i.e., traffic) and by increasing the average demand of consumers (i.e., their basket size). Together our experiments demonstrate that a probabilistic free price promotion can be a powerful promotions tool to attract more purchases.

From a theoretical perspective, our findings extend previous research on psychological pricing by showing that they cannot be explained by the uncertainty or certainty effect. In addition, our results do not seem to be driven by an attraction to zero prices, transaction cost aversion, or novelty. Instead, our findings can be best explained by the assumption that individuals behave in a Weber–Fechnerian way: they display diminishing sensitivity ($\alpha < 1$) to the prices.

Limitations and Future Research

Several of our findings are worth further examination. First we did not find any evidence for the uncertainty effect (Gneezy et al. 2006, Newman and Mochon 2012, Simonsohn 2009), which would have favored the sure price promotion. One of the fundamental differences we found was that in those uncertainty effect studies where participants were asked to choose between a sure versus a probabilistic option, the (un)certainty was in windfall (i.e., there was no cost involved for participants) rewards. For example, in Gneezy et al. (2006, Section IV) in one of the choice task conditions, participants were asked to choose between a sure monetary reward (100 shekels) and a lottery that would pay out one of two possible products of differing values (a 50% chance at a 200-shekel gift certificate and a 50% chance at a 400-shekel gift certificate for a bookstore). Seventy-four percent of their participants choose the sure 100 shekels in cash, whereas only 43% of participants did so when the alternative was a sure 200-shekel gift certificate. By contrast, in our setting, the (un)certainty was in the prices that consumers paid in exchange for a good.

Note also that in Dhar and colleagues' (1995, 1999) research, which we discussed in the section "Previous Consumer Behavior Research on Probabilistic Promotions," participants were asked to choose between a sure versus a probabilistic option where the (un)certainty was in the percent discounts that consumers would receive when making a payment. By contrast, in our setting the (un)certainty was in the absolute prices that consumers would pay. Dhar et al. (1995, 1999) did not find any difference in the attraction of the sure versus risky option.

Given the differences between our findings, the uncertainty effect findings by Gneezy et al. (2006), and the findings by Dhar et al. (1995, 1999), one avenue for future research could be to examine to what extent the type of focal attribute (e.g., reward, absolute price, or percent discount) and context (e.g., whether there is a purchase transaction and as such a cost to the consumer) influences consumers' decision-making process and, ultimately, preferences (i.e., they become risk averse, risk seeking, or risk neutral).

The zero price effect is another factor for which we found no evidence of it being a fundamental driver of the attraction to the probabilistic free price promotion. One possibility is that the excessive attraction to the zero price reported in Shampanier et al. (2007) was not apparent in our probabilistic setup because the zero price represents only one of two possible price outcomes, and therefore the zero price effect does not apply. In the original work on the zero price effect, the authors argued that, when there is a zero price option that does not have any downside (i.e., no cost), individuals experience a positive affective reaction, which acts as a decision-making cue (i.e., the cause of the zero price effect is the affective component). In the probabilistic free price promotion, however, there is a downside or cost: a chance to pay the regular price. In addition, choosing between a nonfree offer and a free offer arguably requires fewer cognitive resources than choosing between a nonfree sure offer and a risky offer of two possible outcomes: one free (discounted probabilistic price of $0) and one nonfree (regular price of >$0). This aspect is critical because, in their zero price paper, Shampanier et al. (2007, Experiment 6) showed that making more cognitive and deliberate evaluations of alternatives eliminates the zero price effect because of a lower weight on affective evaluations. Future work could validate this distinction.

An additional research opportunity may stem from our surprising findings in Experiments 2, 3, and 5, which suggest that diminishing sensitivity without probability weighting predicts the observed pattern of preferences for probabilistic free price promotions better than diminishing sensitivity with probability weighting. Future research may want to examine if and why individuals do not appear to weight probabilities in probabilistic price promotions as they have been shown to do in simple monetary gambles.

Finally, it remains an open question how robust the attraction of the probabilistic price promotion is to different types of framing. For example, in three pricing experiments, Yang et al. (2013) found that participants' willingness to pay for a risky product (e.g., a gift certificate for a Barnes and Noble bookstore that has a 50% chance to have a $50 value and a 50% chance to have a $100 value) is substantially reduced when it is labeled instead as a gamble, lottery, raffle, or coin flip with two outcomes. The authors posit that this is due to an aversion to bad deals that causes buyers to shift the focus of their attention to risk and the worst possible outcome. In our experiments we did not present the risky option as a gamble but as a price promotion. In addition, our consumers engaged in a choice task typical for purchase situations rather than a pricing task. Future research may want to examine to what extent the bad deal aversion also applies to choice tasks and thus may reduce the attraction of the probabilistic free price promotion over the sure price promotion when the former is framed in terms of a gamble. The question of such potential boundary conditions is of great practical importance for marketers.

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Endnotes

[1] See Ailawadi et al. (2014) for a recent paper that formulates, estimates, and analyzes a model of consumer response to conditional nonfree discounts (i.e., there is no chance to get something for free) with ambiguous probabilities linked to a popular sports event occurring (versus sure discounts). Ailawadi et al. (2014) find that the response to such conditional promotions is highly segmented and related among others to perceived thinking costs, saving benefits, and entertainment benefits, as well as to event involvement and gambling proneness, the latter two of which in particular affect a consumer's estimate of the likelihood of the event occurring.

[2] Although traditionally the terms "risk aversion" and "risk seeking" are used to describe concavity and convexity, respectively, of the utility function, we use these terms to refer to their resulting choice properties. For example, "risk seeking" refers to an observed preference for a risky option over a sure option of equal expected monetary value.

[3] Equation (5) is true if and only if $1-(1-p)^{\alpha} < p$, which is equivalent to $1-p < (1-p)^{\alpha}$, which is true for all $0 < p < 1$ and $\alpha < 1$.

[4] In all experiments, except for Experiment 1, probabilities were presented as percentages. The discounted probabilistic free price was typically presented as both $0 and "free."

[5] The vending machine was stocked to produce a random sequence for the probabilistic discount as opposed to, for example, a free candy every third purchase.

[6] We are assuming independence of observations for the χ^2 test but, in actuality, we were not able to track and thus ensure that each of our purchase observations was made by a unique customer.

[7] As Weber and Chapman (2005) report, it is not clear whether people actually become risk seeking. Further, risk seeking is not a necessary requirement of the "peanuts" effect (Prelec and Loewenstein 1991).

[8] As a result of rounding, the expected values of the probabilistic price promotions are not exactly $0.50. They are $0.495 in condition 1, $0.494 in condition 2, and $0.495 in condition 3.

[9] Given the work by Berlyne (e.g., Berlyne 1970, Berlyne and Parham 1968), as well as Dijksterhuis and Smith (2002), it is reasonable to argue that our participants would experience affective adaption even without each decision actually being played out before the onset of the next trial. That is, for affective adaption to happen, it is not necessary for participants to experience winning or losing with the probabilistic free price promotion before they make the next decision.

[10] For an examination of the demographic makeup of MTurk participants and the quality of the data obtained with that sample, see, e.g., Buhrmester et al. (2011) and Paolacci et al. (2010).

[11] That is, unlike in the other conditions, in this condition participants had to engage in a two-step decision-making process. This second step was not existent in Experiment 5a.

[12] Note, in this separate valuation setting, the inferiority of the sure price promotion to the probabilistic free price promotion could also be in part a result of the sure discount undermining perceptions of quality, which free offers are believed less likely to do (see, e.g., Chandran and Morwitz 2006, Darke and Chung 2005).

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