

# When Opposites Detract: Categorical Reasoning and Subtractive Valuations of Product Combinations

AARON R. BROUGH  
ALEXANDER CHERNEV

Can pairing items from different price tiers decrease consumers' perceptions of monetary value? Prior research suggests that adding an item with positive utility to an offering can only increase the offering's overall value. In contrast, we show that combining expensive and inexpensive items can lead to subtractive rather than additive judgments, such that consumers are willing to pay less for the combination than for the expensive item alone. We attribute this subtraction effect to the categorical nature of consumers' processing of numeric information when evaluating combinations of items classified into opposing categories. Five empirical studies lend converging support to the proposition that categorical reasoning can lead to subtractive judgments.

Consumers often encounter product combinations that include items from different price tiers. For example, many cars come with an optional navigation system, many sofas include ottomans, and computers are frequently bundled with comparatively low-priced printers. Similar combinations are also found among service offerings in which one component accounts for a relatively large proportion of the total expenditure, such as a hotel room and Internet access, premium cable and a telephone line, or a flight and a rental car. Disparately priced combinations are also common for items within the same product category. For example, an expensive textbook may be bundled with a lower priced handbook, an expensive suitcase may be offered as a set with a much cheaper carryall, and a luxury built-in gas barbecue may be paired with a lower priced portable grill.

In addition to bundles offered by retailers and manufac-

turers, consumers often form ad hoc combinations comprising items from different price tiers encountered during a single shopping trip or that form part of the same consumption episode. Thus, consumers may consider individual items in their shopping basket as a set, even if they are sold separately. For example, consumers might think of a \$2,000 flat-screen television and a \$10 cable as a bundle when the items are purchased during the same shopping trip. In the same vein, consumers might buy an expensive bottle of wine and a lower priced pack of crackers and consequently evaluate them together because they intend to consume them together.

Despite the prevalence of such combinations, the issue of how consumers evaluate combinations that contain products from different price tiers has received little attention in prior research. Moreover, related research examining individuals' valuations of product bundles would make conflicting predictions about how consumers form a judgment of a combination of disparately priced items. In particular, one might expect consumers' evaluations to be perfectly additive, such that a consumer's willingness to pay for a set of items would not change in joint versus separate evaluation—a common assumption in economic theory (Adams and Yellen 1976; Bitran and Ferrer 2007; Schmalensee 1982, 1984). Alternatively, one could expect valuations of items from different price tiers to be superadditive, meaning that the value of the combination would be greater than the summed value of the individual items (Gale 1990; Telser 1979). Finally, one could expect valuations of items from

---

Aaron R. Brough (aaron.brough@pepperdine.edu) is assistant professor of marketing, Pepperdine University, 24255 Pacific Coast Highway, Malibu, CA 90263. Alexander Chernev (ach@northwestern.edu) is associate professor of marketing, Northwestern University, 2001 Sheridan Road, Evanston, IL 60208. Correspondence: Aaron R. Brough. The authors thank Bobby Calder, Adam Galinsky, Ryan Hamilton, Mathew Isaac, Alice Tybout, the editor, associate editor, and reviewers for their helpful comments and suggestions.

*Baba Shiv and Laura Peracchio served as editors and Joel Huber served as associate editor for this article.*

*Electronically published December 13, 2011*

different price tiers to be subadditive, meaning that a consumer's willingness to pay for a combination would be lower than the combined willingness to pay for the individual items it includes (Estelami 1999; Heeler, Nguyen, and Buff 2007).

All of the above predictions, however, are additive, suggesting that consumers will perceive a combination to be as least as valuable as the more expensive item in the combination. Indeed, even in the case of subadditive valuations, consumers' willingness to pay for the bundle is predicted to be higher than that of the more expensive item considered alone. In contrast, we argue that combining items from different price tiers can result in judgments that are not only subadditive, but also subtractive, such that the combination is perceived as less valuable than the more expensive item considered alone. In this context, we show that adding a positively valued item can decrease rather than increase consumers' willingness to pay for a high-priced offering. We attribute this effect to the categorical nature of consumers' evaluation of bundles comprising disparately priced items. The role of categorization in evaluating combinations of items from different price tiers is discussed in more detail in the following sections.

## THEORETICAL BACKGROUND

We first review literature pertaining to how consumers determine the monetary value of a product bundle, as well as research related specifically to the valuation of bundles that contain items from different price tiers. We then discuss the impact of categorization and categorical reasoning on consumer valuations of product bundles and outline the theory leading to subtractive valuations of disparately priced product combinations.

### Consumer Evaluation of Product Combinations

Prior research suggests that consumers judge the overall value of a bundle by aggregating judgments of the individual items in an additive fashion. To illustrate, a common assumption in economic theory is that a customer's reservation price for a bundle is the sum of the individual reservation prices of its components (Adams and Yellen 1976; Bitran and Ferrer 2007; Schmalensee 1982, 1984). The prevalence of this assumption is further illustrated by the fact that perfect additivity is the most common utility structure used in research on bundling (Dansby and Conrad 1984).

Consistent with the idea that consumers use an additive function to determine the overall value of product combinations, research on price partitioning suggests that a combination's value can be represented as either a set of individual prices for each item or a single price for the entire bundle (Chakravarti et al. 2002; Hamilton and Srivastava 2008; Morwitz, Greenleaf, and Johnson 1998; Soman and Gourville 2001). The general finding that consumers are sensitive to which of these two price formats is used challenges the notion of perfect additivity and suggests that judging a combination's value may be more complex than simply adding up the value of individual items. The notion

that consumers' judgments are subadditive rather than perfectly additive is supported by the finding that consumers are willing to pay less for combined items than for the same items offered separately (Cooke, Pecheux, and Chandon 2005; Estelami 1999; Heeler et al. 2007). Subadditive judgments may occur because consumers expect to save money when purchasing items as a bundle (Dolan 1987; Foubert and Gijbrecchts 2007) or because they experience decreasing marginal utility from each additional item in a combination (Bernoulli 1738; Frederick and Loewenstein 1999; Tversky and Kahneman 1991).

The additive nature of subadditive judgments is evident from the assumption that even consumers who expect bundle savings or experience decreasing marginal utility would be willing to pay at least as much for a combination as for the most expensive item it contains. In other words, an expectation for quantity discounts would not lead consumers to believe that the savings associated with the purchase of an additional item would exceed its cost. Such a belief would imply that consumers expect to be paid to take the additional item. Similarly, the notion of decreasing marginal utility would not suggest that an offering's overall utility could be decreased by adding an item with positive utility.

Much of the research described above has focused on bundles consisting of items in similar price tiers, with little research directly examining how large differences in the value of combined items might affect bundle valuations. One related stream of research examines bundles in which price disparity within the combination arises from price promotions rather than from differences in price tier. For example, several studies found devaluation of one or both items in a bundle when one of the items is discounted or described as "free" (Kamins, Folkes, and Fedorikhin 2009; Raghuram 2004, 2005). As described above in the case of quantity discounts, such devaluation can be expected to generate subadditive rather than subtractive judgments.

Another stream of research related to the evaluation of disparately priced items examines how consumers evaluate a combination that contains an item with negative utility. For example, after supplementing an offer with an unwanted item, one study found that an unattractive premium can reduce an offering's choice share (Simonson, Carmon, and O'Curry 1994). More specifically, participants were less likely to choose a brownie mix when it included an option to purchase a Pillsbury Collector's Plate at a discounted rate. In the same vein, other research suggests that adding an unattractive item from a lower price tier could dilute the perceived value of the other item in a combination if the lower value item carries a negative stigma that spills over and contaminates the other item in the combination (Anderson and Simester 2001; Darke and Chung 2005; Kamins, Folkes, and Fedorikhin 2009; Mishra, Mishra, and Nayakankuppam 2009).

Building on prior research, we argue that consumers tend to devalue combinations of items not only when one of these items is viewed as unattractive but also when both items have positive utility. Specifically, we propose that when

evaluating bundles comprising items in disparate price tiers, combining two items can lead to subtractive judgments whereby consumers' willingness to pay for the bundle will be lower than that of the more expensive item considered alone. We attribute this subtractive effect to the categorical nature of consumers' reasoning, which influences their numeric value judgments of the individual items in the bundle. We discuss the role of categorical reasoning in consumer judgments in more detail in the following section.

### Categorization Processes in Consumer Decision Making

A basic premise of this research is that consumers may represent monetary value categorically as well as numerically. This premise builds on prior literature showing that thinking in categorical terms can facilitate decision making by simplifying and structuring complex information (Ozanne, Brucks, and Grewal 1992; Rosch 1975b; Smith and Medin 1981). In this context, existing research has shown that consumers frequently simplify information by categorizing objects into dichotomous groups, such as good and bad, large and small, safe and risky, and expensive and inexpensive (Gutman 1982).

Grouping items into categories is important because it can influence individuals' judgments and decisions (Rosch 1975a; Smith and Medin 1981). For example, categorization has been shown to affect consumers' choices (Whitfield and Slatter 1979), perceptions of assortment variety (Kahn and Wansink 2004; Mogilner, Rudnick, and Iyengar 2008), perceptions of calorie content (Chernev 2011; Chernev and Gal 2010) and satisfaction (Mogilner et al. 2008).

It has further been shown that differences between items classified into different categories are accentuated in joint evaluation (Herr 1989; Hsee and Leclerc 1998; Krueger and Clement 1994; Tajfel and Wilkes 1963; Thomas and Morwitz 2005). For example, the perceived difference in length between two lines is greater if the lines are labeled differently (Tajfel and Wilkes 1963), the perceived difference in temperature between two consecutive days is greater if the days happen to be in different months (Krueger and Clement 1994), and the perceived difference in magnitude between two prices is greater if the prices have different left digits (Thomas and Morwitz 2005).

Building on the view of categorization as a fundamental process underlying consumer judgments, we argue that consumers often classify items into price tiers on an expensiveness continuum. The classification of an individual product as expensive or inexpensive can be determined by two types of comparisons. One such comparison is an item's price relative to the average price of the items in the same product category (Elio and Anderson 1981; Rosch and Mervis 1975). For example, a \$50 hamburger is likely to be categorized as expensive because it costs substantially more than the average hamburger, but a \$50 suit is likely to be thought of as cheap because it costs much less than the average suit.

In addition to relying on category-specific prices, categorization can be influenced by other available options, such that the same option can appear expensive when compared with a low-priced item and inexpensive when compared with a high-priced item. For example, a \$200 floor mat can be classified as inexpensive in the context of buying a \$20,000 car and expensive when considered together with a \$2 air freshener. Similarly, a \$100 printer can be viewed as inexpensive in the context of buying a \$1,500 computer and expensive when considered together with a \$5 ream of paper.

Building on the notion that consumers process information both numerically and categorically, we argue that combining items from different price tiers can lead to evaluations that are not additive—as shown by prior research—but are instead subtractive. We discuss the rationale for this prediction in the following section.

### Categorical Reasoning in Monetary Valuation of Product Combinations

This research posits that when items categorized in different price tiers are considered together—either because they are sold as a bundle or because they are perceived to be a part of the same purchase/consumption episode—they are often evaluated in a subtractive fashion, whereby consumers are willing to pay more for the more expensive item alone than for the same item combined with a less expensive one. More important, we argue that these subtractive valuations occur even (1) when both items have positive utility and consumers are willing to pay for each item considered alone and (2) in the absence of negative synergies between the jointly evaluated items.

We further propose that this subtraction effect can be attributed to the way in which consumers integrate categorical judgments to form an overall impression of a combination—a process we refer to as categorical averaging. Specifically, we argue that rather than simply adding prices to determine a combination's overall value, consumers may instead blend the categorical judgments of expensive and inexpensive to form a balanced impression of the combination (e.g., moderately expensive).

We use the term “categorical averaging” to describe the process by which consumers combine categorical valuations of disparately priced items. Of course, strictly speaking, categorical information cannot be averaged because averaging typically implies quantifying the value of the considered options. Rather, we use this term to describe a process whereby polar opposites converge toward the center of a continuum, such that their combination becomes progressively less extreme. The key difference is that unlike numeric averaging, categorical averaging lacks a quantitative component.

Categorical averaging reflects consumers' insensitivity to the fact that the total value of a combination of two items with positive utility is inherently greater than the value of either individual item alone. This insensitivity to the difference in quantity between a combination and an individual

item occurs because categorical judgments lack units of magnitude. That is, the same categorical terms are used to describe individual items and combinations of items. The fact that both a single item and multiple items may be described by an identical label (e.g., expensive) can lead to the perception that a moderately expensive combination consisting of two items is less valuable than an expensive item by itself, even if the combination is objectively worth more than the individual item.

Building on the idea of categorical averaging, we predict that when items from different price tiers are combined, consumers' overall evaluation of the combination's monetary value will reflect its average expensiveness rather than its total price. As a result, when the perceived expensiveness of an offering declines with the addition of an inexpensive item, consumers will respond as though the offering's total monetary value has decreased, and their willingness to pay for the combination will decline as well. The paradoxical nature of such a judgment is that adding an item with positive utility tends to decrease rather than increase consumers' subjective value of the offering.

In sum, we argue that people often think about monetary value in categorical as well as in numeric terms. In this context, we propose that combinations of disparately priced items will be evaluated in a subtractive fashion whereby consumers will systematically place a lower monetary value on the combination of items than on the more expensive item alone. We attribute this subtraction effect to consumers' reliance on categorical averaging, which lacks units of magnitude.

We test the prediction that consumer valuations of combinations containing products from different price tiers can lead to subtractive price judgments in a series of five experiments. In particular, our first study aims to demonstrate the subtraction effect in consumer choice by showing that adding an inexpensive item to an expensive offering can decrease the offering's choice share, even when the inexpensive item is perceived to contribute additional value to the offering. Study 2 aims to demonstrate the subtraction effect in terms of willingness to pay rather than choice by showing that participants are willing to pay less for a combination containing an expensive and an inexpensive item than for the expensive item alone. Study 3 investigates the role of categorical reasoning in subtractive judgments by testing whether the effect is more likely to occur when participants aggregate categorical evaluations of each item to form an overall impression of the combination rather than processing combined items in piecemeal fashion. Study 4 aims to provide further evidence that categorical reasoning underlies the subtraction effect by showing that the effect is attenuated when participants categorize items in terms of functionality rather than monetary value. Finally, study 5 aims to lend further support to our theorizing by showing that the subtraction effect occurs for combinations of items from opposite price tiers but not for combinations of items from the same price tier.

## STUDY 1

The goal of our first study was to document the subtraction effect. In particular, we aimed to show a decline in the choice share of an offering when an inexpensive item is added, even if the item has positive utility.

### Method

Two hundred and ninety participants were recruited through an online panel and randomly assigned to either a single-item condition or a bundle condition. All participants were asked to choose among product offerings in each of two scenarios, whose presentation order was counterbalanced across participants. For example, in one scenario participants imagined they had set a goal to improve physical fitness and were asked to choose between a one-year gym membership and a target option that consisted of either a home gym (single-item condition) or a home gym combined with a fitness DVD (bundle condition). In the other scenario, participants imagined they had set a goal to learn German and were asked to choose between an online course and a target option that consisted of either Rosetta Stone software (single-item condition) or Rosetta Stone software combined with a German dictionary (bundle condition). Both scenarios included pictures of each item and the overall price of each option, which was held constant across conditions. Thus, the only difference between the single-item and bundle conditions was the addition of an item that was inexpensive relative to the item with which it was combined.

This design enabled us to compare choice shares across conditions to determine whether adding the inexpensive item to the single expensive item changed the choice share of the target option (relative to the reference option). In addition, to increase external validity and help control for possible alternative explanations, the scenarios were designed to diverge as much as possible in aspects that were not central to our theorizing. For example, the reference option was presented on the left of the target option in the fitness scenario but on the right of the target option in the language scenario. In addition, the price of the target option was higher than the price of the reference option in the fitness scenario (\$2,299 vs. \$849) but lower than the price of the reference option in the language scenario (\$449 vs. \$575). Furthermore, the fitness DVD was presented on the left of the home gym but the German dictionary was presented on the right of the Rosetta Stone software. Thus, these scenarios provide a test of the subtraction effect's robustness across many variations in the stimuli and presentation mode.

### Results

We predicted a subtraction effect, such that adding an item from a lower price tier to a single expensive item would detract from rather than increase the offering's choice share. Consistent with our prediction that the choice share of an expensive option would decline when it was combined with an inexpensive item, choice share of the target option was

lower when it consisted of both an expensive and inexpensive item bundled together rather than just the expensive item alone. Specifically, 51% of participants in the fitness scenario preferred the home gym to a one-year gym membership, but only 35% preferred the home gym combined with a fitness DVD to a one-year gym membership ( $\chi^2(1) = 6.32, p < .05$ ). Similarly, in the language scenario participants were less likely to prefer Rosetta Stone software to an online course when the software was combined with a German dictionary (36% vs. 49%;  $\chi^2(1) = 4.35, p < .05$ ). Thus, across scenarios, a subtraction effect was observed in which including an inexpensive item in the target offering resulted in a lower choice share than when the inexpensive item was absent (36% vs. 50%;  $\chi^2(1) = 11.13, p < .001$ ). We attribute this decline in subjective value to consumers' reliance on categorization when evaluating a combination that included items from opposite price tiers.

A follow-up study with 130 participants from the same population further showed that the inexpensive item was perceived to be of value above and beyond the value of the primary item. Participants were asked to imagine that they had set a goal to improve physical fitness (learn German) and that they already owned a home gym (Rosetta Stone software). Participants were then shown a picture of the inexpensive item (fitness DVD or German dictionary) that was identical to the picture seen by participants in the main study. Participants indicated the dollar amount they would be willing to pay for this item. Results confirmed that the inexpensive products were indeed perceived to add value above and beyond the more expensive options; on average, participants were willing to pay \$23 (median = \$10) for the fitness DVD and \$24 (median = \$13) for the German dictionary. Thus, the results demonstrate that even in cases where an inexpensive item is perceived to contribute additional value to the offering, it can decrease the offering's subjective value.

## Discussion

Consistent with our predictions, results of study 1 document a subtraction effect in which a combination of items from different price tiers was less likely to be preferred than a single expensive item within the combination. In contrast to previous research, which documents a decline in the choice share of an item when it is combined with an unattractive option that consumers do not need or want (Simonson et al. 1994), our results show that subtractive judgments can occur even when the additional item is perceived to contribute value above and beyond the original item. Thus, the decline in choice share observed in our results cannot be attributed to the fact that people do not value one of the items in the combination or that they do not want or need both items. Instead, we explain the results by proposing that people think about the combination's value as a blend of expensive and inexpensive qualities, which makes it less preferred than an item that is perceived as purely expensive.

In the next study, we attempted to provide further evidence of subtractive judgments by using individuals' will-

ingness to pay rather than choice as the dependent variable. Because willingness to pay provides a continuous measure of an individual's subjective valuation of an item, it provides more direct access than choice to the mechanism underlying our theorizing. Thus, showing that the addition of an inexpensive option to an expensive option decreases willingness to pay would provide converging evidence that is consistent with our account of the subtraction effect.

## STUDY 2

The goal of this experiment was to demonstrate the subtraction effect in participants' willingness to pay for a combined offering that includes both an expensive and an inexpensive item. In particular, we aimed to show that willingness to pay would be higher for an expensive item alone than for the same item combined with an inexpensive item. We tested this prediction using a variety of items from different product categories.

## Method

Two hundred and four participants were recruited through an online panel and randomly assigned to one of three conditions. Depending on their condition, participants evaluated an expensive item alone, an inexpensive item alone, or a combination consisting of the same two items. Each participant evaluated items from six different product categories (scooters, BBQ grills, phones, jackets, backpacks, and TVs). Expensiveness was manipulated by showing participants a picture of the product(s) accompanied by a brand label. Both the pictures and the brand labels were selected to convey the impression that one item from each combination was higher priced than the other (e.g., The North Face Gore-Tex jacket vs. Old Navy jacket). This design enabled us to compare participants' subjective valuation of two items from different price tiers when the items were evaluated together versus separately.

Within each product category, participants were asked to imagine that they needed to buy an item (or multiple items, depending on condition) from that category and then to indicate the dollar amount they would be willing to pay for the offering they were shown. Thus, some participants evaluated only the expensive item within each product category, some participants evaluated only the inexpensive item within each product category, and the remainder of participants evaluated combinations of expensive and inexpensive products within each product category. In the latter condition, the two items were presented simultaneously. The order in which product categories were evaluated was held constant across conditions so that differences between conditions could not be attributed to presentation order.

## Results

We predicted a subtraction effect, in that we expected the perceived value of a combination of high- and low-priced items to be less than the perceived value of the expensive

item alone. We tested this prediction using responses from each of the 204 participants who evaluated products in six categories, which yielded a total of 1,224 data points. To test for the subtraction effect, we compared the 407 responses of participants who evaluated combinations to the 405 responses of participants who evaluated only expensive items.

Consistent with our predictions, average willingness to pay was lower for the combination ( $M = \$473$ ,  $SD = \$1,110$ ;  $N = 407$ ) than for the expensive option alone ( $M = \$631$ ,  $SD = \$1,276$ ;  $N = 405$ ) across the six categories tested. This difference represents a 25% reduction in the perceived value of a product offering when an inexpensive item, valued individually at an average of \$247 ( $SD = \$572$ ;  $N = 407$ ), was included as part of a combination. To address the possibility that outliers may have skewed the mean values, we also examined median willingness to pay. As expected, median willingness to pay was lower for the combination (\$100) than for the expensive item alone (\$140), despite the fact that median willingness to pay for the inexpensive item was \$56.

The same pattern of results was observed within each of the six categories (i.e., willingness to pay for the combination was consistently less than willingness to pay for the expensive item alone, looking at both mean and median values). For example, participants were willing to pay an average of \$2,348 ( $SD = \$2,148$ ; median = \$1,600) for the expensive scooter alone. However, when an inexpensive scooter valued at \$616 ( $SD = \$988$ ; median = \$250) was added to the offering, participants decreased their willingness to pay to \$1,624 ( $SD = \$2,037$ ; median = \$1,000), which is a 31% reduction. Across the six categories, the subtraction effect ranged from a 10% to 31% reduction in mean willingness to pay when an inexpensive item was included in the offering (see table 1).

The significance of this data pattern was tested with a model in which willingness to pay was given as a function of the evaluation target (i.e., combination vs. expensive item alone), which was a between-subjects factor, and the par-

ticular product category included in the test, which was a within-subject factor (Winer, Brown, and Michels 1991). The data show that across product categories participants were on average willing to pay significantly less for the combination than for the expensive item alone ( $F(1, 201) = 4.55$ ,  $p < .05$ ), providing evidence of the subtraction effect. Results indicate a main effect of product category ( $F(5, 1,000) = 129.19$ ,  $p < .001$ ) and a significant interaction between product category and conditions ( $F(5, 1,000) = 4.30$ ,  $p < .001$ ), suggesting that the effect was stronger for some product categories than others.

## Discussion

As predicted, results of study 2 documented a subtractive valuation in which consumers were willing to pay less for a combination of disparately priced items than for the higher-priced item alone. The fact that valuation was subtractive rather than merely subadditive—even when the less expensive item had positive utility—suggests that our findings are not due to quantity discounts or decreasing marginal utility.

We attribute the subtraction effect to consumers' reliance on categorical reasoning when articulating their willingness to pay for a combination of disparately priced items. One might argue that the decline in subjective value could have been driven instead by a reduction in the perceived value of the expensive item due to its presentation alongside an inexpensive item regarded as having negative utility. Such an argument is rooted in prior research, which suggests that inexpensive items may have negative utility because consumers do not want or need them (Anderson and Simester 2001; Darke and Chung 2005; Kamins et al. 2009; Simonson et al. 1994). Although such an account seems unlikely given that consumers assigned the inexpensive item a positive value in separate evaluation, it is possible that consumers in joint evaluation perceived the inexpensive item as having negative utility.

Therefore, the next study presented all participants with the same combination of items side by side. If a negative

TABLE 1

THE SUBTRACTION EFFECT IN WILLINGNESS TO PAY FOR COMBINED VERSUS INDIVIDUAL ITEMS (STUDY 2)

Category	Expensive item alone (\$)	Inexpensive item alone (\$)	Expensive + inexpensive (\$)	Subtraction effect (%)
Scooters	2,348	616	1,624	31
BBQ grills	281	78	202	28
Phones	89	44	68	24
Jackets	103	56	78	24
Backpacks	50	30	43	14
TVs	908	664	814	10
Overall	631	247	473	25

NOTE.—Numbers in the first three columns represent participants' average willingness to pay. The last column reports the subtraction effect, which is calculated as the percentage by which including an inexpensive item in a combination decreases willingness to pay for the offering relative to the expensive item alone.

association with the inexpensive item was driving the subtraction effect, we would expect to see no differences across participants who saw the same combination of items. In contrast, our theory predicts that the subtraction effect will be observed when consumers combine categorical evaluations of high- and low-priced items in such a way that the overall impression of the combination is perceived to be less expensive than the high-priced item alone. We argue that this value judgment will be reflected in the monetary amount consumers are willing to pay for the combination versus the expensive item alone. Thus, anything that interferes with the process of forming an overall impression of the combination's expensiveness should attenuate the subtraction effect.

If our theory is correct, consumers should be less likely to form an overall impression of a combination when items are perceived as a collection of disparate items rather than a unified whole. Such a prediction is consistent with prior research, which suggests that piecemeal evaluation improves accuracy (Chandon and Wansink 2007). Thus, building on the notion that the subtraction effect stems from reliance on a categorical impression of the combination, we predict that the bias should be more likely to occur when consumers must generate a single price for a combination of items from different price tiers rather than a price for each individual item. The next experiment was designed to test this prediction.

### STUDY 3

The goal of this experiment was to examine the role of categorical reasoning in the subtraction effect by examining how the effect is influenced when consumers psychologically represent adjacent items as a combination versus as individual items. In particular, we aimed to show that the subtraction effect will be attenuated when consumers who evaluate a combination of items presented side by side use piecemeal processing rather than aggregating categorical judgments of each item to evaluate the combination holistically.

#### Method

Study 3 was conducted with 100 paid participants from an online subject pool. The procedure was similar to that used in study 2, with one key variation. Unlike study 2, in which participants saw either one or two items, all participants in study 3 were presented with the same combination of two items, displayed side by side. Participants were asked to imagine that they needed to buy two items from a particular product category and that they had found the products shown. One group of participants evaluated the two items holistically as a combination, whereas the other group evaluated the two items in piecemeal fashion. This difference in mode of evaluation was operationalized by asking participants to indicate either a single dollar amount representing the subjective value of the entire combination (holistic evaluation) or two different dollar amounts representing the subjective value of each item in the combination (piecemeal evaluation). These indications of willingness to

pay constituted the dependent measure. Participants evaluated products from four different categories (watches, shoes, luggage, and bikes). All other aspects of the procedure were identical to that of study 2.

#### Results

We predicted that the subtraction effect was more likely to be observed when participants evaluated the combination holistically rather than in piecemeal fashion. Each of the 100 participants evaluated products in four categories, which yielded a total of 400 observations. These observations were divided into two groups based on whether participants were in the holistic or piecemeal evaluation condition.

To test the impact of evaluation mode on the subtraction effect, we compared willingness to pay for a combination of items that were presented side by side but evaluated either holistically or in piecemeal fashion. Consistent with earlier findings, results of study 3 show that across all four categories, the average perceived value of the combination (when the offering was evaluated holistically) was lower than that of the expensive option alone (when the offering was evaluated in piecemeal fashion). Specifically, participants were willing to pay less for the combination ( $M = \$225$ ;  $SD = \$335$ ; median = \$120;  $N = 208$ ) than for the expensive option alone ( $M = \$303$ ;  $SD = \$396$ ; median = \$200;  $N = 192$ ). This difference constitutes a 26% decline in willingness to pay as a result of including an inexpensive item, valued individually at an average of \$66 ( $SD = \$74$ ; median = \$40;  $N = 192$ ), in the combination. The magnitude of the subtraction effect varied by product category, ranging from an 11% to 42% reduction in subjective value when an inexpensive item was evaluated holistically along with the expensive item (see table 2).

The significance of this data pattern was tested with a model in which willingness to pay was given as a function of the evaluation mode (i.e., holistic vs. piecemeal), a between-subjects factor, and the particular product category included in the test, a within-subject factor (Winer, Brown, and Michels 1991). The data show that across categories evaluation mode had a significant impact on willingness to pay ( $F(1, 98) = 9.49, p < .01$ ), suggesting that forming an overall impression of a combination can influence the likelihood that categorical thinking will bias numeric value judgments. More specifically, participants were willing to pay significantly less for the combination, evaluated holistically, than for the expensive item alone, evaluated in piecemeal fashion ( $F(1, 98) = 2.99, p < .05$ ). Results indicate a main effect of category ( $F(3, 294) = 25.34, p < .001$ ) but no significant interaction between category and conditions ( $F(3, 294) < 1, NS$ ), suggesting that the subtraction effect was equally strong across each of the categories.

#### Discussion

Results from study 3 show that when expensive and inexpensive items are presented side by side, consumers who perceive the combination as a whole are likely to form sub-

**TABLE 2**  
WILLINGNESS TO PAY AS A FUNCTION OF EVALUATION MODE  
(STUDY 3)

Category	Piecemeal evaluation		Holistic evaluation	
	Expensive item (\$)	Inexpensive item (\$)	Expensive + inexpensive (\$)	Subtraction effect (%)
Watches	387	32	226	42
Shoes	121	25	84	31
Luggage	225	54	165	27
Bikes	479	150	425	11
Overall	303	66	225	26

NOTE.—Numbers in the first three columns represent participants' average willingness to pay. The last column reports the subtraction effect, which is calculated as the percentage reduction in willingness to pay for the combination (evaluated holistically) relative to the expensive item alone (evaluated in piecemeal fashion).

tractive value judgments; however, this tendency is attenuated among consumers who mentally segregate the juxtaposed items during valuation. Consistent with our explanation that the subtraction effect results from forming an overall impression of items from opposite price tiers, these data suggest that thinking of items from different price tiers as a single entity rather than as discrete items is a key element in the process underlying the subtraction effect.

Thus, study 3 contributes to an understanding of the underlying processes in subtractive judgments by showing that the bias can be attenuated when consumers think of adjacent items individually rather than as a combination. Furthermore, the observation of a subtraction effect even when items were presented side by side in both conditions suggests that the effect is not driven by negative inferences about the less expensive product. For example, if consumers interpreted the less expensive item as a loss (e.g., perceived a cost associated with disposing of the unwanted item), the combination should have been devalued in both conditions since all participants evaluated an identical combination of items.

Finally, study 3 provides converging evidence with earlier studies that the subtraction effect is incompatible with an anchoring account. Prior research on bundling suggests that individuals may anchor willingness to pay for a combination on the numeric price of an individual item and then adjust for any additional items in the combination (Yadav 1994). Based on this research, one might argue that the subtraction effect is due to anchoring on the low price of the inexpensive item. However, such an argument is inconsistent with our data in several ways. First, Yadav suggests that consumers anchor value judgments on the most important item in a combination, which is likely to be the more expensive item rather than the least expensive item. If consumers were to anchor on the higher priced item, it would lead to higher rather than lower estimates of the combination's value, which is inconsistent with our findings. Second, no externally provided prices were available to serve as anchors for participants in our studies, which decreases the plausibility

of an explanation based on systematic numeric anchoring. An exception to this was study 1, in which prices were displayed but counterbalanced in such a way that anchoring would have led to inconsistent results across product categories. Third, anchoring on the evaluation of an individual item involves sequential rather than simultaneous evaluation. Thus, even if participants in our studies self-generated a specific price for one of the items, it is not clear how anchoring would explain the subtraction effect observed in study 3, in which all participants evaluated the same two products side by side.

Building on study 3, which demonstrated the role of holistic evaluation in the subtraction effect, the next study focused directly on the relationship between categorical and numeric expressions of value. To the extent that consumers' willingness to pay for a combination is driven by an overall impression of its expensiveness, the influence of categorical reasoning on numeric judgments should be most apparent when both categorical and numeric judgments express the same dimension. To illustrate, categorical judgments (e.g., expensiveness) are likely to influence numeric judgments (e.g., willingness to pay) because both dimensions express monetary value. However, if consumers were to categorize a combination on a different dimension (e.g., functionality rather than expensiveness), the effect of categorical reasoning on willingness to pay would likely be attenuated. Therefore, the next study focused directly on the relationship between categorical and numeric expressions of value by manipulating the dimension along which items are classified.

## STUDY 4

The goal of study 4 was to further document the role of categorical reasoning in subtractive judgments by showing that the subtraction effect is attenuated when items in a combination are categorized on a dimension other than monetary value. In particular, we aimed to test whether the subtraction effect persists when an alternative means of categorization (e.g., functionality) is salient.



## Method

Participants were 166 undergraduates recruited at Northwestern University in exchange for class credit. This study employed a three (evaluation target: expensive item alone vs. inexpensive item alone vs. combination)  $\times$  two (categorization type: price based vs. functionality based) between-subjects design. Each participant was shown products from four categories (shoes, wine, luggage, and sunglasses). Consistent with the previous studies, all products in the stimuli were represented pictorially and with brand labels that identified different price tiers within a category (e.g., Gucci shoes vs. Payless shoes).

The procedure used in this study was similar to that of study 2, with the addition of categorization type as an independent variable. To prompt categorization on a nonprice dimension, half of the participants were asked to categorize each product on the basis of functionality prior to indicating the dollar amount they would be willing to pay for the offering. For example, when evaluating shoes, some participants were asked to categorize the target brand in terms of the expected thickness of the soles relative to a typical brand (e.g., thicker, thinner, about the same). This functionality question was omitted for the other half of the participants, who focused exclusively on generating the price they would be willing to pay for the offering.

## Results

We predicted that participants who focused on functionality rather than price would be less likely to form subtractive value judgments, since classifying items on a nonmonetary dimension was expected to decrease reliance on a categorical assessment of a combination's expensiveness. Each of the 166 students evaluated products in four categories, yielding a total of 664 observations. The willingness-to-pay data included 220 observations for a combination, 216 observations for an expensive item alone, and 228 observations for an inexpensive item alone. These observations were further divided into two groups based on whether participants answered the functionality question prior to articulating a price or focused exclusively on price.

Consistent with our prediction, the subtraction effect was attenuated when participants focused on functionality rather than price. In particular, among participants in the price-focused condition, the subtraction effect observed in prior studies was replicated: the subjective value of a combination of items from different price tiers ( $M = \$70$ ;  $SD = \$79$ ; median = \$50;  $N = 112$ ) was judged to be less than that of the expensive item alone ( $M = \$123$ ;  $SD = \$140$ ; median = \$90;  $N = 104$ ). This represents a 43% decrease in perceived value when the inexpensive item was combined with the expensive item. However, after functionality-based categorization, the perceived value of the combination ( $M = \$149$ ;  $SD = 157$ ; median = \$100;  $N = 108$ ) did not differ significantly from that of the expensive item alone ( $M = \$135$ ;  $SD = \$141$ ; median = \$100;  $N = 112$ ).

We tested the significance of this data pattern using a model that examined the impact of categorization type and

evaluation target (between-subjects factors) on willingness to pay, taking into account the effects of product category as a within-subject factor (Winer et al. 1991). The interaction between evaluation target (expensive item alone vs. combination) and categorization type (price based vs. functionality based) was significant ( $F(1, 160) = 6.75, p < .01$ ), showing that the subtraction effect was more likely to be observed following price-based rather than functionality-based categorization. Specifically, participants in the price-focused condition were willing to pay significantly less for the combination than for the expensive item alone ( $F(1, 160) = 8.32, p < .01$ ), whereas willingness to pay did not differ significantly among participants in the functionality-focused condition ( $F(1, 160) < 1, NS$ ). These results, which are illustrated in figure 1, show that the subtraction effect was observed for combinations of expensive and inexpensive products when the items were categorized strictly on the basis of price, but not when they were categorized on a nonprice dimension.

The observed data pattern was consistent across product categories: the subtraction effect was observed within each of the four categories when participants categorized the items on the basis of price, but not when they categorized items on the basis of functionality. Relative to willingness to pay for the expensive item alone, the combination's subjective value was reduced by 37% to 45% in different product categories within the price-focused condition. Furthermore, participants who focused on price were willing to pay 49% to 60% less for the combination than participants who categorized items on the basis of functionality, thus illustrating the effect of categorization type on willingness to pay for a combination. These data show that the subtraction effect can be attenuated when consumers focus on functionality rather than price (see table 3).

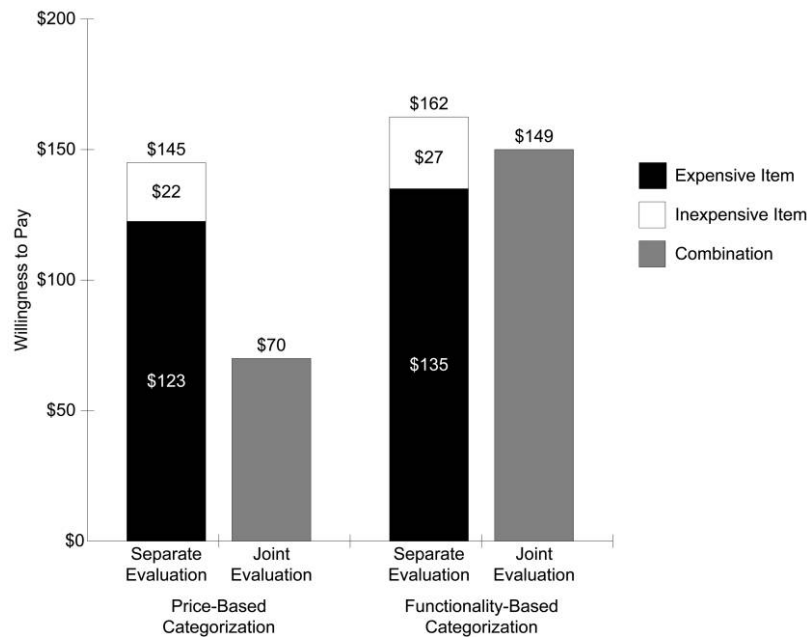
## Discussion

Results from study 4 provide further evidence of the role of categorization in subtractive judgments by showing that in addition to whether people categorize, how they categorize options can change the likelihood that the subtraction effect will occur. In particular, the data show that the subtraction effect is attenuated when consumers categorize items on the basis of functionality rather than price, which led to additive rather than subtractive judgments. This suggests that when categorical evaluations occur along a nonprice dimension (e.g., functionality), consumers are less likely to rely on categorical processing when forming a numeric judgment of monetary value. However, when categorical and numeric evaluations occur along the same dimension (e.g., price), consumers are more likely to directly apply categorical reasoning to numeric expressions of value.

Our theorizing suggests that the subtraction effect is a function of categorization and is most likely to be observed when combined items are classified into opposite categories of monetary value (i.e., expensive vs. inexpensive). The next study aims to more directly test this aspect of our theory by manipulating the likelihood that consumers will classify

FIGURE 1

WILLINGNESS TO PAY AS A FUNCTION OF CATEGORIZATION TYPE (STUDY 4)



NOTE.—Within categorization type (i.e., price based vs. functionality based), average willingness to pay across four product categories is displayed for each evaluation target. Results indicate that participants who focused exclusively on price were willing to pay significantly less for the combination than for the expensive item alone but that this effect was attenuated among participants who first categorized items on the basis of functionality.

items into opposite categories versus into the same category. If the subtraction effect occurs because options are perceived as polar opposites, classifying options into the same category should attenuate the effect.

Building on the notion that a product's perceived value can be altered by invoking different reference prices at the time of judgment (Alba et al. 1994; Herr 1989; Mazumdar, Raj, and Sinha 2005; Urbany and Dickson 1991), we reason that introducing a high reference price prior to evaluation should change the criteria people use to classify an option as expensive. For example, after exposure to high (vs. low) reference prices, participants in one series of experiments judged a previously evaluated product to be less expensive, despite recalling a higher price for the item (Adaval and Monroe 2002). This suggests that exposure to an extremely high reference price should increase the likelihood that even a high-priced item will be perceived as inexpensive. Thus, study 5 will examine whether the subtraction effect is observed when consumers generate an extremely high reference price prior to evaluating a combination of items from different price tiers.

## STUDY 5

The goal of study 5 was to show that the subtraction effect is a function of polarized categorization and is weakened

when items are classified into the same price tiers rather than opposite price tiers. We used reference prices to alter individuals' tendency to classify individual items into opposite categories versus into the same category.

## Method

Study 5 was conducted with 189 participants from an online subject pool. This study employed a two (evaluation mode: holistic vs. piecemeal)  $\times$  two (reference price: high vs. low) between-subjects design. To enhance the generalizability of earlier findings and provide converging evidence that thinking categorically about value influences price judgments of a product, study 5 measured fair price perceptions in addition to willingness to pay.

All participants evaluated a combination consisting of two target items—a "High Resolution Digital Camera" and a "Disposable Camera." As in study 3, evaluation mode was manipulated by presenting both cameras side by side and asking participants in the holistic condition to enter a single dollar amount that they perceived to be a fair price for the combination and participants in the piecemeal condition to enter the dollar amount they perceived to be a fair price for each camera individually. After estimating a fair price, par-

**TABLE 3**  
WILLINGNESS TO PAY AS A FUNCTION OF CATEGORIZATION TYPE (STUDY 4)

Category	Price-based categorization				Functionality-based categorization				Categorization effect (%)
	Expensive item alone (\$)	Inexpensive item alone (\$)	Expensive + inexpensive (\$)	Subtraction effect (%)	Expensive item alone (\$)	Inexpensive item alone (\$)	Expensive + inexpensive (\$)	Subtraction effect (%)	
Wine	34	12	19	44	44	11	48	-9	60
Luggage	214	45	118	45	267	66	258	3	54
Shoes	152	24	88	42	122	27	181	-48	51
Sunglasses	89	7	56	37	108	9	109	-1	49
Overall	123	22	70	43	135	27	149	-10	53

NOTE.—Within categorization type (i.e., price based vs. functionality based), average willingness to pay is displayed for each evaluation target. The subtraction effect is calculated as the percentage by which including an inexpensive item in a combination decreases willingness to pay for the offering relative to the expensive item alone. Negative values indicate additive rather than subtractive judgments. The categorization effect is calculated as the percentage by which willingness to pay for a combination is reduced after price-based categorization relative to functionality-based categorization.

ticipants in each condition also indicated their willingness to pay for the offering.

Prior to evaluating the two cameras, participants were asked to estimate the likely price of a reference item. This manipulation was intended to affect participants' categorization of the two cameras into opposite categories (i.e., expensive and inexpensive) or into the same category (i.e., inexpensive). The reference item depicted a yacht labeled as a "Five-Inch Toy Yacht" in the low-reference condition and a "Fifty-Foot Luxury Yacht" in the high-reference condition. Although the picture of the yacht was identical across conditions, the label was intended to evoke a price that was either similar to the prices of the target items or much higher. Our logic was that after evaluating a luxury yacht, participants in the high-reference condition would classify both a digital camera and a disposable camera into the same category (i.e., inexpensive), thus attenuating the subtraction effect. However, after evaluating a toy yacht, participants in the low-reference condition would still perceive the digital camera as expensive relative to the disposable camera and the subtraction effect would be replicated.

## Results

The manipulation of the reference price was successful: participants in the high-reference condition perceived the reference item to be much more valuable than did participants in the low-reference condition. On average, participants who saw the picture described as a luxury yacht estimated its price to be \$810,450 (median = \$160,000). By comparison, participants who saw the picture described as a toy yacht estimated its price to be only \$25 (median = \$10).

Results were consistent with our prediction that the subtraction effect would occur among participants in the low-reference price condition but not in the high-reference price condition. Specifically, participants in the low-reference condition who evaluated the cameras in piecemeal fashion perceived the fair price of the digital camera alone to be \$463 (median = \$300), whereas those who evaluated the

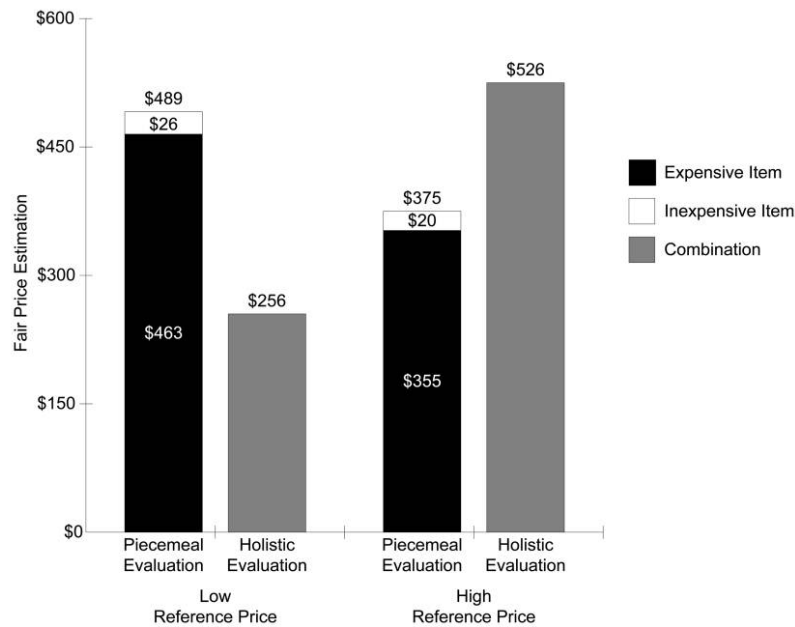
cameras holistically perceived the fair price of the combination to be only \$256 (median = \$200). This subtractive judgment suggests that adding an inexpensive camera valued at an average of \$26 (median = \$10) decreased the perceived fair price of the combined offering by 45%. In contrast, the subtraction effect was not observed among participants exposed to an extremely high reference price. Among these participants, the estimated fair price increased from \$355 (median = \$300) for the digital camera alone to \$526 (median = \$313) for the combination when a camera valued at \$20 (median = \$10) was included in the offering. This evidence supports our theory that the subtraction effect is more likely to be observed when combined items are classified into opposite categories rather than the same category.

We tested the impact of evaluation mode (holistic vs. piecemeal) and reference price (high vs. low)—both between-subjects factors—on participants' estimates of fair price. Results indicate that reference price moderates the impact of evaluation mode on perceived fair price, such that the subtraction effect is significantly stronger following exposure to a low rather than high reference price ( $F(1, 185) = 6.10, p < .01$ ). These results, which are illustrated in figure 2, can be accounted for by our explanation that reference prices can affect the classification of target items. In particular, the data are consistent with our proposition that the subtraction effect is more likely to occur when items are classified into opposite categories than when they are classified into the same category.

Analysis of participants' willingness to pay showed a similar pattern of results. In the low-reference condition, a subtraction effect was observed: participants were willing to pay an average of \$379 (median = \$200) for the digital camera and \$20 (median = \$6) for the disposable camera, but only \$218 (median = \$150) for the two cameras together. In contrast, participants in the high-reference condition were willing to pay an average of \$264 (median = \$200) for the expensive camera and \$14 (median = \$6) for the inexpensive camera, but \$390 (median = \$298) for the combined offering. Thus, reference price moderated the impact of evaluation mode on willingness to pay, such that

FIGURE 2

FAIR PRICE ESTIMATION AS A FUNCTION OF REFERENCE PRICE (STUDY 5)



NOTE.—Following exposure to a low reference price, participants were likely to make subtractive value judgments, such that they estimated the fair price of a combination to be less than the fair price of its more expensive component alone. However, following exposure to a high reference price, participants estimated the fair price of a combination to be higher than the total fair price of both its components.

the subtraction effect was significantly stronger following exposure to a low- rather than high reference price ( $F(1, 185) = 4.74, p < .05$ ). These data provide further evidence of the role of categorization by showing that exposure to reference prices can affect the likelihood of classifying items into opposite categories, thus moderating the subtraction effect.

As an additional test of our theory, we ran a regression analysis to determine whether the variation in participants' subjective value of the combination was a function of the reference price they provided. Reference price predicted participants' estimates of both fair retail price ( $\beta = .0002, t(87) = 2.34, p < .05$ ) and willingness to pay ( $\beta = .0001, t(87) = 3.08, p < .01$ ) for the combination. These data imply that the subtraction effect was stronger among participants for whom our categorization manipulation was more successful.

## Discussion

Results from study 5 demonstrate the importance of polarization in price-based categorization. Consistent with our expectation that subtractive judgments are a function of how individual items in a combination are classified, we found subtractive judgments following exposure to a low reference

price but additive judgments after exposure to a high reference price. We explain this pattern of results by the notion that a low reference price did not interfere with participants' classification of the target items into opposite categories (i.e., expensive and inexpensive), so the subtraction effect was observed. In contrast, because a high reference price caused both target items to be classified into the same category (i.e., inexpensive), an additive effect was observed. This finding is significant given that the target items were identical in both reference price conditions.

Study 5 also provides evidence that the subtraction effect is robust across different measures of perceived value. Asking participants to articulate a fair price in addition to stating their own willingness to pay allowed us to decrease the impact of idiosyncratic factors and measure monetary value independently of personal needs and preferences. The fact that the subtraction effect was observed on this measure provides converging evidence that subtractive judgments may occur even when both items in a combination are perceived to have positive value.

## GENERAL DISCUSSION

This research examines how consumers determine the monetary value of a combination of items from different price

tiers. By investigating categorical reasoning as a neglected dimension of value, we make novel predictions about when consumers may form subtractive rather than additive judgments. In contrast to prior research suggesting that valuation is additive (i.e., perfectly additive or subadditive), our results show that when a combination consists of items classified into opposite price tiers, consumers' reliance on categorical reasoning to express monetary value in numeric terms can produce subtractive judgments and alter their choices. We attribute this effect to categorical reasoning and show that the subtraction effect depends on whether and how consumers categorize the items in a combination.

Five studies document subtractive value judgments and are consistent with our explanation that they occur as a result of categorization when consumers form an overall impression of items from different price tiers. In particular, study 1 demonstrates the subtraction effect in consumer choice by showing that the choice share of an expensive offering declined when an inexpensive item was added to it, even when the inexpensive item was perceived as having positive value. Study 2 focuses on the subjective valuation underlying the subtraction effect by demonstrating subtractive value judgments across six different product categories in which participants were willing to pay less for a combination containing an expensive and an inexpensive item than for the expensive item alone. Study 3 highlights the role of categorical reasoning in subtractive judgments by showing that the subtraction effect was more likely to occur when participants blended categorical judgments to form an overall impression of the combination rather than processing combined items in piecemeal fashion. Study 4 lends further support to the argument that the subtraction effect stems from the application of categorical reasoning to numeric expressions of value, showing attenuation of the effect when participants categorized items on the basis of functionality rather than price. Finally, study 5 provides further evidence of categorical reasoning by documenting an attenuation of the subtraction effect following exposure to a high reference price that encouraged same-category classification rather than classification of combined items into opposite categories.

At a conceptual level, this research contributes to the literature on categorization by showing that when items are classified into opposite categories, the monetary valuation of the combination may be subtractive rather than additive. Our finding that the classification of items into different categories can influence subsequent judgments of a combination's monetary value demonstrates a novel consequence of categorization in consumer judgments and decisions and adds to a growing body of empirical findings that illustrate the impact of categorization on consumer behavior (Chernev 2011; Chernev and Gal 2010; Khan and Dhar 2010; Krueger and Clement 1994; Mogilner et al. 2008; Tajfel and Wilkes 1963; Whitfield and Slatter 1979).

We also contribute to the literature on price perception by showing that the relationship between two fundamentally different representations of value—categorical and numer-

ic—can affect consumers' price perceptions, leading to subtractive rather than additive value judgments. Whereas much of the previous literature in this area focuses primarily on how consumers perceive the prices of individual items (Campbell 1999; Janiszewski and Lichtenstein 1999; Monroe 1973), we focus on how consumers perceive the monetary value of combinations of items. Specifically, counter to the notion that product combinations are evaluated in an additive fashion, we show that combining items from different price tiers can lead to subtractive judgments of monetary value. Consistent with our explanation that subtractive judgments are the result of relying on a combination's perceived expensiveness, we also show that emphasizing non-price dimensions of the combined products attenuates the subtraction effect.

In addition, we add to the literature on information integration by providing insight into the underlying mechanisms by which categorization influences numeric estimates of value. In particular, we show that when consumers jointly evaluate items that are classified into opposite categories, the integration process of categorical information can yield numeric judgments of monetary value that are subtractive rather than additive. These results are consistent with the notion of categorical averaging and add to prior work suggesting that information integration often involves averaging rather than adding (Anderson 1965; Gaeth et al. 1991). Furthermore, prior research on joint versus separate evaluation shows that willingness to pay is a function of whether items are evaluated separately versus jointly (Hsee and Leclerc 1998). We extend this research by showing that when items are presented side by side (i.e., joint evaluation), willingness to pay also depends on whether they are regarded as a combination or as disparate items. Specifically, the subtraction effect we observe is attenuated when consumers psychologically partition combined items, when categorical and numeric evaluations are based on different dimensions, or when items are classified into the same category rather than opposite categories.

The finding that adding an inexpensive item to a product offering can lead to a decline in consumers' willingness to pay is analogous, at an abstract level, to the research showing that adding a healthy item to a meal can lead to a reduction in its estimated calorie content (Chernev 2011; Chernev and Gal 2010). Indeed, in a more general sense, combining expensive and inexpensive products and combining healthy and unhealthy food items both lead to underestimation of the magnitude—be it monetary value or calories—of their combination. Moreover, in both cases this underestimation is attributed to individuals' categorical reasoning, which leads to quantity neglect.

Despite their similarities, the subtraction effects in calorie estimation and in pricing have different underlying mechanisms. In the case of calorie estimation, the subtraction effect is caused to a large degree by the fact that people confuse a meal's healthiness with its calorie content, such that healthy items are erroneously believed to have fewer calories (Chernev 2011). In contrast, when combining high-

and low-priced items, expensiveness and willingness to pay are directly related, leaving little or no place for confusion. Instead, the subtraction effect in the latter case is driven purely by people's inattention to quality.

Finally, our studies contribute to the literature on product bundling by showing that adding an inexpensive item to an offering does not always increase—but can also decrease—its perceived value. Our findings show evidence of superadditive, subadditive, and subtractive judgments. These results run counter to the prediction one might form based on prior research: that a combination's overall value is relatively insensitive to the presence or absence of an inexpensive item. Specifically, prior research shows that consumers are most sensitive to the price of the item that accounts for the largest proportion of an expenditure (Mazumdar and Jun 1993; Monroe 1990; Nagle 1987). Thus, our finding that the addition of a low-priced item can significantly affect judgments of a combination's monetary value provides an important contribution to prior research. Furthermore, whereas prior research has shown that devaluation can occur due to the promotional discounting of an item within a combination (Janiszewski and Cunha 2004; Kamins et al. 2009; Raghuram 2004, 2005; Yadav 1995), our results stem from the combination of nondiscounted items from different price tiers in a context where both items have positive utility.

In addition to its conceptual significance, the notion that categorical reasoning can influence price judgments has important implications for marketers. Because bundling is an increasingly common practice among retailers and manufacturers (Khan and Dhar 2010; Shankar, Berry, and Dotzel 2009; Stremersch and Tellis 2002), knowing how consumers determine the value of product combinations can help practitioners make better decisions. Marketers often add an inexpensive item to an expensive item in order to increase the purchase likelihood of the expensive item and thereby increase revenue. Our research suggests that this strategy may not always be successful, since consumers may be willing to pay more for the expensive item alone than for the entire bundle. By eliminating an inexpensive item from a combination, marketers may increase the perceived expensiveness of the remaining item and help consumers justify its exorbitant cost. In addition, marketers may enhance perceptions of price fairness by offering items from different price tiers individually rather than as a combination, since consumers who systematically undervalue a combination are more likely to feel that its market price is unfair. Managers who must bundle items from different price tiers may consider ways to avoid the subtraction effect, such as encouraging separate rather than joint valuation, encouraging categorization on a nonmonetary dimension, or encouraging classification of the items into the same category in terms of monetary value. This research paves the way for future research to further explore how combining products from opposite price tiers may affect judgments of value and influence consumers' choices.

## REFERENCES

- Adams, William James, and Janet L. Yellen (1976), "Commodity Bundling and the Burden of Monopoly," *Quarterly Journal of Economics*, 90 (3), 475–98.
- Adaval, Rashmi, and Kent B. Monroe (2002), "Automatic Construction and Use of Contextual Information for Product and Price Evaluations," *Journal of Consumer Research*, 28 (4), 572–88.
- Alba, Joseph W., Susan M. Broniarczyk, Terence A. Shimp, and Joel E. Urbany (1994), "The Influence of Prior Beliefs, Frequency Cues, and Magnitude Cues on Consumers' Perceptions of Comparative Price Data," *Journal of Consumer Research*, 21 (2), 219–35.
- Anderson, Eric T., and Duncan I. Simester (2001), "Research Note: Price Discrimination as an Adverse Signal: Why an Offer to Spread Payments May Hurt Demand," *Marketing Science*, 20 (3), 315–27.
- Anderson, Norman H. (1965), "Averaging versus Adding as a Stimulus-Combination Rule in Impression Formation," *Journal of Experimental Psychology*, 70 (4), 394–400.
- Bernoulli, Daniel (1738), *Exposition of a New Theory on the Measurement of Risk*, Farnborough Hants: Gregg Press.
- Bitran, Gabriel R., and Juan-Carlos Ferrer (2007), "On Pricing and Composition of Bundles," *Production and Operations Management*, 16 (1), 93–108.
- Campbell, Margaret C. (1999), "Perceptions of Price Unfairness: Antecedents and Consequences," *Journal of Marketing Research*, 36 (2), 187–99.
- Chakravarti, Dipankar, Rajan Krish, Pallab Paul, and Joydeep Srivastava (2002), "Partitioned Presentation of Multicomponent Bundle Prices: Evaluation, Choice and Underlying Processing Effects," *Journal of Consumer Psychology*, 12 (3), 215–29.
- Chandon, Pierre, and Brian Wansink (2007), "Is Obesity Caused by Calorie Underestimation? A Psychophysical Model of Meal Size Estimation," *Journal of Marketing Research*, 44 (1), 84–99.
- Chernev, Alexander (2011), "Semantic Anchoring in Sequential Evaluations of Vices and Virtues," *Journal of Consumer Research*, 37 (5), 761–74.
- Chernev, Alexander, and David Gal (2010), "Categorization Effects in Value Judgments: Averaging Bias in Evaluating Combinations of Vices and Virtues," *Journal of Marketing Research*, 47 (4), 738–47.
- Cooke, Alan D. J., Claude Pecheux, and Elise Chandon (2005), "Subadditive Bundle Preferences and the Value of Variety," Working Paper, Marketing Department, Warrington College of Business Administration, University of Florida, Gainesville, FL 32611.
- Dansby, Robert E., and Cecilia Conrad (1984), "Commodity Bundling," *American Economic Review*, 74 (2), 377–81.
- Darke, Peter R., and Cindy M. Chung (2005), "Effects of Pricing and Promotion on Consumer Perceptions: It Depends on How You Frame It," *Journal of Retailing*, 81 (1), 35–47.
- Dolan, Robert J. (1987), "Quantity Discounts: Managerial Issues and Research Opportunities," *Marketing Science*, 6 (1), 1–22.
- Elio, Renee, and John R. Anderson (1981), "The Effects of Category Generalizations and Instance Similarity on Schema Abstraction," *Journal of Experimental Psychology: Human Learning and Memory*, 7 (6), 397–417.
- Estelami, Hooman (1999), "Consumer Savings in Complementary Product Bundles," *Journal of Marketing Theory and Practice*, 7 (3), 107–14.

- Foubert, Bram, and Els Gijbrecchts (2007), "Shopper Response to Bundle Promotions for Packaged Goods," *Journal of Marketing Research*, 44 (4), 647–62.
- Frederick, Shane, and George Loewenstein (1999), "Hedonic Adaptation," in *Well-Being: The Foundations of Hedonic Psychology*, ed. Daniel Kahneman, Ed Diener, and Norbert Schwarz, New York: Russell Sage Foundation, 302–29.
- Gaeth, Gary J., Irwin P. Levin, Goutam Chakraborty, and Aron M. Levin (1991), "Consumer Evaluation of Multi-product Bundles: An Information Integration Analysis," *Marketing Letters*, 2 (1), 47–57.
- Gale, Ian (1990), "A Multiple-Object Auction with Superadditive Values," *Economics Letters*, 34 (4), 323–28.
- Gutman, Jonathan (1982), "A Means-End Chain Model Based on Consumer Categorization Processes," *Journal of Marketing*, 46 (2), 60–72.
- Hamilton, Rebecca W., and Joydeep Srivastava (2008), "When 2 + 2 Is Not the Same as 1 + 3: Variations in Price Sensitivity across Components of Partitioned Prices," *Journal of Marketing Research*, 45 (4), 450–61.
- Heeler, Roger M., Adam Nguyen, and Cheryl Buff (2007), "Bundles = Discount? Revisiting Complex Theories of Bundle Effects," *Journal of Product and Brand Management*, 16 (7), 492–500.
- Herr, Paul M. (1989), "Priming Price: Prior Knowledge and Context Effects," *Journal of Consumer Research*, 16 (1), 67–75.
- Hsee, Christopher K., and France Leclerc (1998), "Will Products Look More Attractive When Presented Separately or Together?" *Journal of Consumer Research*, 25 (2), 175–86.
- Janiszewski, Chris, and Marcus Cunha Jr. (2004), "The Influence of Price Discount Framing on the Evaluation of a Product Bundle," *Journal of Consumer Research*, 30 (4), 534–46.
- Janiszewski, Chris, and Donald R. Lichtenstein (1999), "A Range Theory Account of Price Perception," *Journal of Consumer Research*, 25 (4), 353–69.
- Kahn, Barbara E., and Brian Wansink (2004), "The Influence of Assortment Structure on Perceived Variety and Consumption Quantities," *Journal of Consumer Research*, 30 (4), 519–33.
- Kamins, Michael A., Valerie S. Folkes, and Alexander Fedorikhin (2009), "Promotional Bundles and Consumers' Price Judgments: When the Best Things in Life Are Not Free," *Journal of Consumer Research*, 36 (4), 660–70.
- Khan, Uzma, and Ravi Dhar (2010), "Price Framing Effects on Purchase of Hedonic and Utilitarian Bundles," *Journal of Marketing Research*, 47 (6), 1090–99.
- Krueger, Joachim, and Russell W. Clement (1994), "Memory-Based Judgments about Multiple Categories: A Revision and Extension of Tajfel's Accentuation Theory," *Journal of Personality and Social Psychology*, 67 (1), 35–47.
- Mazumdar, Tridib, and Sung Youl Jun (1993), "Consumer Evaluations of Multiple versus Single Price Change," *Journal of Consumer Research*, 20 (3), 441–50.
- Mazumdar, Tridib, S. P. Raj, and Indrajit Sinha (2005), "Reference Price Research: Review and Propositions," *Journal of Marketing*, 69 (4), 84–102.
- Mishra, Arul, Himanshu Mishra, and Dhananjay Nayakankuppam (2009), "The Group-Contagion Effect: The Influence of Spatial Groupings on Perceived Contagion and Preferences," *Psychological Science*, 20 (7), 867–70.
- Mogilner, Cassie, Tamar Rudnick, and Sheena S. Iyengar (2008), "The Mere Categorization Effect: How the Presence of Categories Increases Choosers' Perceptions of Assortment Variety and Outcome Satisfaction," *Journal of Consumer Research*, 35 (2), 202–15.
- Monroe, Kent B. (1973), "Buyers' Subjective Perceptions of Price," *Journal of Marketing Research*, 10 (1), 70–80.
- (1990), *Pricing: Making Profitable Decisions*, New York: McGraw-Hill.
- Morwitz, Vicki G., Eric A. Greenleaf, and Eric J. Johnson (1998), "Divide and Prosper: Consumers' Reactions to Partitioned Prices," *Journal of Marketing Research*, 35 (4), 453–63.
- Nagle, Thomas T. (1987), *The Strategy and Tactics of Pricing: A Guide to Profitable Decision Making*, Englewood Cliffs, NJ: Prentice Hall.
- Ozanne, Julie L., Merrie Brucks, and Dhruv Grewal (1992), "A Study of Information Search Behavior during the Categorization of New Products," *Journal of Consumer Research*, 18 (4), 452–63.
- Raghubir, Priya (2004), "Free Gift with Purchase: Promoting or Discounting the Brand?" *Journal of Consumer Psychology*, 14 (1/2), 181–86.
- (2005), "Framing a Price Bundle: The Case of 'Buy/Get' Offers," *Journal of Product and Brand Management*, 14 (2), 123–28.
- Rosch, Eleanor (1975a), "Cognitive Reference Points," *Cognitive Psychology*, 7 (4), 532–47.
- (1975b), "Cognitive Representations of Semantic Categories," *Journal of Experimental Psychology: General*, 104 (3), 192–233.
- Rosch, Eleanor, and Carolyn B. Mervis (1975), "Family Resemblances: Studies in the Internal Structure of Categories," *Cognitive Psychology*, 7 (4), 573–605.
- Schmalensee, Richard (1982), "Commodity Bundling by Single-Product Monopolies," *Journal of Law and Economics*, 25 (1), 67–71.
- (1984), "Gaussian Demand and Commodity Bundling," *Journal of Business*, 57 (1), S211–S230.
- Shankar, Venkatesh, Leonard L. Berry, and Thomas Dotzel (2009), "A Practical Guide to Combining Products + Services," *Harvard Business Review*, 87 (11), 94–99.
- Simonson, Itamar, Ziv Carmon, and Suzanne O'Curry (1994), "Experimental Evidence on the Negative Effect of Product Features and Sales Promotions on Brand Choice," *Marketing Science*, 13 (1), 23–40.
- Smith, Edward E., and Douglas L. Medin (1981), *Categories and Concepts*, Cambridge, MA: Harvard University Press.
- Soman, Dilip, and John T. Gourville (2001), "Transaction Decoupling: How Price Bundling Affects the Decision to Consume," *Journal of Marketing Research*, 38 (1), 30–44.
- Stremersch, Stefan, and Gerard J. Tellis (2002), "Strategic Bundling of Products and Prices: A New Synthesis for Marketing," *Journal of Marketing*, 66 (1), 55–72.
- Tajfel, Henri, and Alan L. Wilkes (1963), "Classification and Quantitative Judgement," *British Journal of Psychology*, 54 (2), 101–14.
- Telser, Lester G. (1979), "A Theory of Monopoly of Complementary Goods," *Journal of Business*, 52 (2), 211–30.
- Thomas, Manoj, and Vicki Morwitz (2005), "Penny Wise and Pound Foolish: The Left-Digit Effect in Price Cognition," *Journal of Consumer Research*, 32 (1), 54–64.
- Tversky, Amos, and Daniel Kahneman (1991), "Loss Aversion in Riskless Choice: A Reference-Dependent Model," *Quarterly Journal of Economics*, 106 (4), 1039–61.
- Urbany, Joel E., and Peter R. Dickson (1991), "Consumer Normal Price Estimation: Market versus Personal Standards," *Journal of Consumer Research*, 18 (1), 45–51.

- Whitfield, T. W. Allan, and Philip E. Slatter (1979), "The Effects of Categorization and Prototypicality on Aesthetic Choice in a Furniture Selection Task," *British Journal of Psychology*, 70 (1), 65-75.
- Winer, Benjamin J., Donald R. Brown, and Kenneth M. Michels (1991), *Statistical Principles in Experimental Design*, New York: McGraw-Hill.
- Yadav, Manjit S. (1994), "How Buyers Evaluate Product Bundles: A Model of Anchoring and Adjustment," *Journal of Consumer Research*, 21 (2), 342-53.
- (1995), "Bundle Evaluation in Different Market Segments: The Effects of Discount Framing and Buyers' Preference Heterogeneity," *Journal of the Academy of Marketing Science*, 23 (3), 206-15.