When Opposites Detract: The Impact of Categorization on Consumers’ Willingness to Pay for Product Combinations

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How do consumers determine the value of combinations that include both high- and low-priced products? Prior findings suggest that value judgments are typically additive, such that when each bundled item has positive utility, the overall value of the bundle is at least as great as the value of any individual item it contains. In contrast, this research documents that combining items in different price tiers can lead not only to additive, but also to subtractive judgments in which consumers are willing to pay less for a bundle than for one of the items it contains. This subtraction effect is attributed to the interplay between categorical and numeric representations of value when items classified into opposing categories are combined. Four empirical studies lend converging support to the proposition that categorization can lead to subtractive judgments.

Keywords: categorization, behavioral decision theory, pricing, consumer choice
Consumers often encounter bundles that include products and/or services from different price tiers. For example, consumers may encounter bundles that include a high-priced computer and a less expensive printer, a premium cable service with a comparatively cheap telephone line, or an expensive large-screen TV bundled with a smaller, lower priced TV. In addition to evaluating bundles that are intentionally formed by retailers or manufacturers, consumers may form joint evaluations of high- and low-priced products that share certain synergies (e.g., a razor and its replacement blades), are manufactured by the same brand (e.g., PC audio speakers and a home theater system), or are frequently purchased at the same time (e.g., airfare and accommodations). The ubiquity of actual or perceived bundles that contain products with disparate prices raises the question of how consumers determine their willingness to pay for such combinations.

When deciding how much a bundle is worth, individuals could simply combine the subjective values of each individual item in the bundle. For example, consider an individual who is willing to pay $100 for a theatre ticket and $20 for a concert ticket when each ticket is evaluated individually. One might expect the consumer to be willing to pay $120 for the two tickets together. Consistent with this logic, most prior research suggests that the aggregation of individual values is additive, such that an offering’s perceived value increases with the addition of each item. In particular, prior research has argued that bundle valuation can be either perfectly additive, such that the value of a bundle is equal to the total value of its individual components (Adams and Yellen 1976; Bitran and Ferrer 2007) or subadditive, such that the value of a bundle is lower than the value of its components (Cooke et al. 2005; Heeler et al. 2007). Both of these scenarios, however, imply decisions that are additive in nature such that the
overall value of the combination is greater than or equal to the value of any individual item in the combination.

In contrast, our research shows that when considering combinations of items in different price tiers, consumers’ valuation of bundles can be not only subadditive but also subtractive. This means that consumers sometimes estimate the value of a combination to be less than the value of a single item in the combination, despite the fact that each item in the combination has positive utility when evaluated individually. In the context of the earlier example, a consumer’s value judgment is subtractive when she is willing to pay $100 for the first ticket alone and $20 for the second ticket alone, but is willing to pay less than $100 for both tickets combined. The paradoxical nature of such a judgment is that including an item with positive utility in a bundle can instead decrease rather than increase consumers’ willingness to pay for the offering, even when controlling for price-quality inferences. We attribute this subtraction effect to the categorical nature of consumers’ processing of price-tier information. In the following sections, we discuss in greater detail the role of categorization in evaluating combinations that include items in different price tiers.

**THEORETICAL BACKGROUND**

Prior research on pricing has devoted significant attention to examining how individuals process value-related information (Campbell 1999; Janiszewski and Lichtenstein 1999; Monroe 1973). For example, multiple studies have shown that consumers often judge an item’s value by comparing its price to internal or external reference prices (Alba et al. 1994; Herr 1989; Mazumdar et al. 2005; Urbany and Dickson 1991). As a result, a product’s perceived value can be altered by invoking different reference prices at the time of judgment. Such variation in how consumers perceive and evaluate prices highlights the subjective nature of value judgments and
their susceptibility to the influence of the evaluation context. Because the context in which products are evaluated exerts a strong impact on value judgments (i.e., price perception or price generation), it is important to identify how product valuation differs among various contexts.

Our work builds on previous pricing research by investigating valuation in the context of product combinations rather than individual products. This distinction is important because factors that are irrelevant in determining the value of a single item may influence bundle valuation. Thus, identification of those factors will contribute to a better understanding of consumer judgment and decision making.

Although we are not the first to examine valuation in the context of multiple items, prior research does not offer a clear prediction about how valuation is affected when items are evaluated as a combination rather than individually. In some cases, bundle valuation is assumed to be perfectly additive, such that the total value of two items is identical regardless of whether they are evaluated individually or together (Adams and Yellen 1976; Bitran and Ferrer 2007; Mazumdar and Jun 1993). However, bundle valuation may involve more than a simple aggregation of the value of individual items. Indeed, ample evidence suggests that consumers are influenced by whether the price of a combination is presented as a single value or is partitioned into two or more component prices (Chakravarti et al. 2002; Hamilton and Srivastava 2008; Kaicker et al. 1995; Morwitz et al. 1998; Soman and Gourville 2001; Venkatesh and Mahajan 1993).

Even in cases where combining two items is predicted to change consumers’ valuation of the items, it is unclear whether the overall value would increase or decrease. On one hand, bundling may produce superadditive value judgments, in which consumers are willing to pay more for two items purchased together than for the same two items purchased individually. For
example, by enabling consumers to purchase multiple items in a single transaction, bundles can reduce transaction costs (Thaler 1985) and the cognitive effort of adding individual prices (Estelami 1999). On the other hand, bundling may produce subadditive value judgments, such that the combined value of two items is discounted, or less than the sum of the items’ individual values. For example, consumers who purchase product bundles might expect to receive quantity discounts (Dolan 1987).

Consistent across nearly all the predictions of prior research on bundling is the notion that value judgments are additive, such that an offering’s perceived value increases with the addition of another option that has positive utility for consumers. Even in the case of subadditivity, where the total value of combined items is perceived to be lower than the sum of their individual value, individuals are generally expected to be willing to pay at least as much for a bundle as for the most expensive item it contains (Bakos and Brynjolfsson 1999).

In contrast, we argue that bundle valuation can be not only subadditive, but also subtractive. Specifically, we predict that consumers may perceive the value of a bundle consisting of high- and low-priced items to be lower than the value of an individual item in the bundle, even when each item has positive utility for consumers. The prediction that including an additional item in a bundle can decrease rather than increase a consumer’s willingness to pay for the bundle is predicated on the notion that individuals process value-related information not only numerically (e.g., in terms of price), but also categorically (e.g., in terms of expensiveness).

A key assumption of our theory is that consumers do not always represent value on a strictly numerical basis, but often think of a product’s value in categorical terms as well. For instance, consumers seem to intuitively categorize high-priced items as expensive and low-priced items as inexpensive. Of course, an item’s price is not the sole determinant of perceived expensiveness.
Categorical judgments are inherently subjective and the same product at a given price may be “coded cognitively as ‘expensive’ for some consumers and ‘cheap’ for others” (Dodds et al. 1991).

Prior research on categorization has identified multiple factors that may contribute to the variation in an item’s classification as expensive or inexpensive (Barsalou 1991; Cohen and Basu 1987; John and Sujan 1990; Mandler 1982; Rosch 1975; Rosch and Lloyd 1978; Sujan 1985). For example, a product’s perceived expensiveness may be a function of perceptual or conceptual product attributes (e.g., price or status), consumer goals (e.g., saving money), and category salience. The evaluation context also plays an important role in categorization. An item’s expensiveness is likely to be judged relative to some categorization cue, such as a prototypical member of the product category or another item evaluated at the same time. For instance, evaluating an item in the context of another item that differs along a salient dimension is likely to produce a contrast effect (Herr 1989) and may result in the classification of the two items into opposite categories.

Understanding how value is represented categorically is important because category membership can influence product evaluations. Relevant research on knowledge organization suggests that “evaluative judgments of products may stem from their category placement” (Cohen and Chakravarti 1990). One well-documented effect of categorization on evaluative judgments is the polarization of options classified into different categories (Sujan and Dekleva 1987), which can lead to an accentuation of cross-category differences (Krueger and Clement 1994). For example, in one experiment on categorization, participants judged differences in the length of two lines to be greater when the labels next to the lines were different (A vs. B) rather than the same (Tajfel and Wilkes 1963). Although categorization does not always result in a
sharp dichotomy, evidence that categorization can lead to polarized judgments may also be found in prior research on price perception (Anderson and Simester 2003; Coulter and Coulter 2007; Thomas and Morwitz 2005). To illustrate, the left-digit effect (Thomas and Morwitz 2005) describes a phenomenon in which an equal difference between two prices is perceived as greater when the left digit of the prices is different (e.g., $3.00 and $2.99) rather than the same (e.g., $3.60 and $3.59). One interpretation of these results is that the perceived difference in monetary value between two options is exaggerated when they are classified into different categories rather than the same category.

In the context we are examining, when items from opposite price tiers are combined, consumers are particularly likely to process value-related information not only numerically but also categorically. This is because a large contrast between the prices of jointly evaluated items is apt to make expensiveness a salient category that will dominate comparisons between combined items on other dimensions. As a result of this comparison, consumers may classify the items into opposite categories (i.e., expensive or inexpensive) and evaluate the combination in terms of expensiveness.

When items representing the polar ends of a continuum are combined, the resulting combination will likely be represented somewhere in the middle of the continuum and perceived to be less extreme than either item alone. For example, just as combining hot with cold results in lukewarm, and combining black with white results in gray, consumers may reason that combining expensive with inexpensive results in moderately expensive. We describe this process as categorical averaging because individuals seem to blend or merge the categories of expensive and inexpensive into a balanced impression of the combination. Our proposition that the subtraction effect in bundle evaluation stems from categorical averaging is consistent with prior
research suggesting that consumers often integrate information by averaging or balancing rather than adding (Anderson 1965; Gaeth et al. 1991). However, we do not claim that averaging occurs at the numeric level, in which case the value of a two-item bundle would be exactly half the summed value of the two items. Rather, we suggest that averaging occurs at the category level. Although categorical information cannot be literally averaged, consumers may intuitively reason as though it could. When this type of categorical reasoning is applied to the numeric expression of value, it can lead to biased judgments.

More specifically, as a result of categorical averaging, consumers may perceive a bundle containing both an expensive and an inexpensive product to be only moderately expensive, which could lead them to be willing to pay less for the bundle than for the expensive item alone. For example, consider a bundle consisting of a high-priced Rolex watch and a low-priced Timex watch. Although the Rolex may be considered expensive when evaluated alone, when the inexpensive Timex is added to it, the overall bundle may be perceived as only moderately expensive. Given that perceived expensiveness takes into account multiple factors, many of which are idiosyncratic, consumers may consider it to be more diagnostic than price in determining their willingness to pay for a combination (Feldman and Lynch 1988; Lynch 2006). Therefore, a decrease in the perceived expensiveness of an offering following the addition of a low-priced item will likely translate into decreased willingness to pay, despite the combination’s objectively greater value.

To summarize, we suggest that when presented with bundled items from different price tiers, consumers process value-related information both numerically and categorically. As a result of categorical reasoning, they may perceive the combination to be less expensive than the high-priced item alone. This leads to a counterintuitive prediction that consumers may be willing to
pay less for a combination than for one of the items it contains. To test this prediction, we conducted four experiments that document subtractive price judgments in the evaluation of bundles containing products with disparate prices. In these studies, we presented consumers with combinations of items that were clearly either expensive or inexpensive within the context of the study. We also aimed to demonstrate that altering whether and how consumers categorize the items can influence their susceptibility to the subtraction effect.

STUDY 1

The goal of this experiment was to document the subtraction effect in value judgments by showing that including an inexpensive item in a bundled offering tends to decrease rather than increase the bundle's subjective value. We tested this prediction using a variety of items from different product categories.

Method

Respondents were 204 individuals recruited through an online panel of paid participants. We manipulated the evaluation target as a between-subjects variable: one group of participants evaluated an expensive item alone, a second group evaluated an inexpensive item alone, and a third group evaluated a combination consisting of the same items presented to participants in the first two conditions. This design enabled us to compare participants’ subjective valuation of two items from different price tiers when the items were evaluated together versus separately.

Each participant was presented with six different kinds of products (scooters, BBQ grills, phones, jackets, backpacks, and TVs). Participants who evaluated combinations were shown an expensive item and an inexpensive item from the same product category. For each category, participants were asked to imagine that they needed to buy one or multiple items (depending on
condition) from that category and found the product offering shown. Participants saw a picture of the product(s), accompanied by a brand label that most participants would clearly recognize as being either expensive or inexpensive within that category (e.g., The North Face Gore-Tex jacket vs. Old Navy jacket). They then indicated the dollar amount they would be willing to pay for the offering. 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. Each of the 204 participants 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 bundle ($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, was included as part of a bundle. A similar pattern of results was observed within each of the six categories, such that the perceived value of the bundle was consistently less than the perceived value of the expensive item alone. For example, participants were willing to pay an average of $2,348 for the expensive scooter alone. However, when an inexpensive scooter valued at $616 was added to the offering, participants decreased their willingness to pay to $1,624, which is a 31% reduction. Across the six categories, the subtraction effect ranged from a 10% to 31%
reduction in willingness to pay when an inexpensive item was included in the offering (see Table 1).

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., bundle versus expensive item alone), which was a between-subjects factor, and the particular product category included in the test, which was a within-subject factor (Winer et al. 1991). The data show that, across categories, participants were willing to pay significantly less for the bundle 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 category ($F(5,1000) = 129.19; p < .001$) and a significant interaction between category and conditions ($F(5,1000) = 4.30; p < .001$), suggesting that the effect was stronger for some categories than others. This may be due to differing levels of experience with products in each category, which can impact variation in prices.

Discussion

Results from Study 1 document a subtraction effect in which consumers were willing to pay less for a combination of disparately priced items than for the higher priced item alone. From a conceptual standpoint, we attribute the subtraction effect to thinking categorically about value. Categorical averaging can lead consumers to judge a combination of items from different price tiers as less expensive than the higher priced item alone, and this value judgment is reflected in the monetary amount consumers are willing to pay.
Note that the subtraction effect cannot be explained by consumers’ expectations to receive quantity discounts for the bundled items (Dolan 1987; Estelami 1999; Foubert and Gijsbrechts 2007; Guiltinan 1987; Heeler et al. 2007; Janiszewski and Cunha 2004) or by decreasing marginal utility from each additional item in a combination (Bakos and Brynjolfsson 1999; Bernoulli 1738; Cooke et al. 2005; Frederick and Loewenstein 1999; Tversky and Kahneman 1991), as both explanations would predict subadditive, but not subtractive, value judgments.

Given that some participants in Study 1 evaluated individual items in isolation while others evaluated items jointly, contagion may provide an alternative explanation for the results. Contagion implies that if consumers perceive a cheap item to be “bad” (e.g., in terms of status or quality), evaluations of surrounding products may be negatively impacted (Rozin and Royzman 2001). Related research suggests that the stigma of the cheaper item in a combination may “leak” onto the more expensive item, and that such spillover could contaminate or dilute the perceived status, quality, or value of the expensive item (Anderson and Simester 2001; Darke and Chung 2005; Kamins et al. 2009; Ostman and Kjellin 2002; Podolny 2005; Raghubir 2005; Raghubir 2004; Simonson et al. 1994; Yadav 1994; Yadav and Monroe 1993).

While we do not claim that contagion could not produce a subtraction effect, we aim to show that subtraction effects may occur independently of contagion. Therefore, in the next study expensive and inexpensive items are juxtaposed for participants in all conditions. By presenting the exact same combination of items to all participants, we negate the likelihood that participants in one condition will be more likely than participants in another condition to perceive the expensive item to be of inferior quality, status, or value simply because it is evaluated in the context of the inexpensive item. Therefore, if the subtraction effect is due solely to contagion, devaluation should occur across all conditions of Study 2.
Our theory suggests that the subtraction effect occurs because of categorical averaging, in which 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. Consumers are less apt to engage in categorical averaging and form this overall impression of a combination when items are perceived as a collection of disparate items rather than a unified whole. Based on this reasoning, the subtraction effect 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 is designed to test this prediction.

**STUDY 2**

The goal of this experiment was to examine how the subtraction effect is influenced when consumers psychologically represent adjacent items as a combination versus as individual items. To test this, we compare willingness to pay for a combination of items that are presented side by side but evaluated either holistically or in piecemeal fashion.

**Method**

Study 2 was conducted with 100 paid participants from an online subject pool. Unlike Study 1, in which participants saw either one or two items, all participants in Study 2 were presented with the same two items, side by side. One group of participants evaluated the items holistically as a combination, whereas the other group evaluated the 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 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). Participants were asked to imagine that they needed to buy items from a particular product category and that they had found the two products that were shown. As in Study 1, participants were shown a picture of the products, accompanied by brand labels that most participants would recognize as either expensive or inexpensive within that category (e.g., Rolex watch vs. Wal-Mart watch).

Results

We predicted that the subtraction effect would be more likely to be observed when consumers 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 conditions based on evaluation mode.

Consistent with earlier findings, results of Study 2 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 bundle ($M = 225; SD = 335; N = 208) than for the expensive option alone ($M = 303; SD = 396; 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, in the bundle. 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).
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), which was a between-subjects factor, and the particular product category included in the test, which was a within-subject factor (Winer et al. 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 2 show that when expensive and inexpensive items are presented side by side, consumers who perceive the combination as a whole are likely to form subtractive value judgments, but this tendency is attenuated among consumers who mentally unbundle the juxtaposed items during valuation. These data suggest that thinking of items from different price tiers as a single entity rather than as discrete items seems to be a key element in the process underlying the subtraction effect. This is consistent with our explanation that the subtraction effect is a result of categorical averaging, which occurs when consumers form an overall impression of items from opposite price tiers.
Together, the first two studies document the subtraction effect in a variety of product categories and are consistent with our explanation that thinking in categorical terms can influence consumers’ valuation of combinations of items with disparate prices. While Study 1 uniquely demonstrates the subtraction effect in the context of joint versus separate evaluation, Study 2 contributes to an understanding of the underlying processes by showing that the subtraction effect is moderated by whether consumers think of adjacent items individually or as a combination.

By presenting items side by side, Study 2 shows that the subtraction effect can occur independently of contagion. It also extends prior literature on joint versus separate evaluation, which shows that willingness to pay is a function of whether items are evaluated separately versus jointly (Hsee and Leclerc 1998). We extend this finding 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. Furthermore, because the number of items presented to participants was held constant across conditions in Study 2, the subtraction effect cannot be explained by the assumption that consumers are willing to pay less for two items because they perceive a cost associated with disposing of the unwanted item.

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 bundle (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 bundle, 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 bundle’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. 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 2, in which all participants evaluated the same two products side by side.

Building on Study 2, 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. Our theory suggests that a decrease in the perceived expensiveness of an offering will translate into a lower willingness to pay. If this theorizing is correct, the subtraction effect is more likely to be observed when both categorical and numeric evaluations occur along the same dimension. Thus, consumers who classify items in a way that focuses attention on a dimension other than expensiveness should be less likely to use their categorical valuation of the combination as a basis for numeric judgments. The next experiment tests this aspect of our theory by manipulating the dimension along which items are classified.

**STUDY 3**

The goal of Study 3 was to further document the role of categorization in forming 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 test
whether the subtraction effect persists when an alternative means of categorization (e.g., functionality) is salient.

**Method**

Respondents were 166 undergraduates at a large Midwestern university who participated in exchange for class credit. 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 evaluation target was manipulated in the same way as in Study 1, in which participants evaluated either an expensive item alone, an inexpensive item alone, or a combination of the two items. In addition, to prompt categorization on a non-price 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 indicate the expected thickness of the soles of the target brand of shoes relative to a typical brand. This functionality question was omitted for the other half of 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 non-monetary 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 bundle, 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 = $79; N = 112$) was judged to be less than that of the expensive item alone ($M = $123; $SD = $140; N = 104$). This represents a 43% decrease in perceived value when the inexpensive item was bundled with the expensive item. However, after functionality-based categorization, the perceived value of the combination ($M = $149; $SD = 157; N = 108$) was higher than that of the expensive item alone ($M = $135; $SD = $141; N = 112$).

We tested the significance of this data pattern using an ANOVA that modeled 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 bundle 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
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 non-price dimension.

Figure 1

The observed data pattern was consistent across categories: the subtraction effect was observed within each of the four categories when participants categorized the items on the basis of price. Relative to willingness to pay for the expensive item alone, the bundle’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).

Table 3

A consistent pattern of results was observed for each product category: the subtraction effect was observed only when the categorical evaluation of a bundle focused on the same dimension as the numerical evaluation (i.e., value) rather than a different dimension (e.g., functionality). For example, participants in the price-focused condition were willing to pay $152 for the Gucci shoes and $24 for the Payless shoes. However, for the combination of Gucci and Payless shoes, they were willing to pay only $88, a reduction of 42% from what they were willing to pay for the Gucci shoes alone. In contrast, although participants in the functionality-focused condition were
willing to pay similar amounts for the individual shoes ($122 and $27), they were willing to pay $181 for the two pairs combined, which is 48% more than they were willing to pay for the Gucci shoes alone. These findings demonstrate the importance of the dimension along which categorization occurs.

Discussion

Consistent with our theory that categorical reasoning can account for the observed subtraction effect, results from Study 3 provide further evidence of the role of categorization by showing that in addition to whether people categorize, how they categorize options can change the likelihood that the subtraction effect will occur. These findings provide converging evidence that the subtraction effect can occur independently of contagion, since it is not clear why categorizing items on the basis of functionality rather than price prior to articulating willingness to pay would affect the contamination of an expensive item by an inexpensive item.

We argue that the effect observed in the first three studies is a function of classifying options into opposite categories. The next study aims to test this claim more directly by manipulating the likelihood that consumers will classify 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 context effects can alter an item’s classification as expensive or inexpensive, we reason that exposure to an extremely high reference price prior to evaluation should change the criteria people use to classify options in terms of expensiveness. Consistent with this reasoning, prior research shows that 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 external reference prices can alter the internal reference prices consumers use to categorize options (Adaval and Monroe 2002; Urbany and Dickson 1991). Therefore, introducing an extremely high reference price should reduce the likelihood that high- and low-priced items are classified into opposite categories and increase the likelihood that both items are perceived as inexpensive. Thus, Study 4 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 4**

The goal of Study 4 was to show that the subtraction effect is a function of polarized categorization and is weakened when items are classified into the same category rather than opposite categories. We used reference prices to alter individuals’ tendency to classify individual items into opposite categories.

**Method**

Study 4 was conducted with 189 participants from an online subject pool. This study employed a 2 (evaluation mode: holistic vs. piecemeal) x 2 (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 4 measured fair price perceptions in addition to willingness to pay.

To maximize the likelihood that participants would categorize the target evaluation items into the same category versus different categories, we manipulated an external reference price. We did this by asking participants to estimate the likely price of a reference item prior to evaluating the target items. All participants saw the same picture of a yacht for the reference
item—only the label varied across conditions. Specifically, the picture was labeled “Five-Inch Toy Yacht” in the low-reference condition and “Fifty-Foot Luxury Yacht” in the high-reference condition. The label of the reference item was intended to evoke a price that was either similar to the prices of the target items or much higher. After indicating the likely price of the yacht, participants evaluated the target items, which were a “High Resolution Digital Camera” and a “Disposable Camera.” While bundled products in earlier studies were substitutes, in Study 4 the products were chosen to be complements, such that although they belong to the same product category, they are intended for different usage occasions.

Evaluation mode was manipulated in the same way as in Study 2 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, participants in each condition also indicated their willingness to pay for the offering. These measurements of fair price and willingness to pay constituted the dependent variables.

**Results**

Our manipulation of the reference price was successful: participants in the high reference condition perceived the reference item to be much more valuable than 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. By comparison, participants who saw the picture described as a toy yacht estimated its price to be only $25.

Consistent with our prediction that the subtraction effect would be attenuated following exposure to an extremely high reference price, our analysis found the subtraction effect among
participants in the low reference price condition but not among participants in the high reference price condition. Specifically, participants in the low reference condition who evaluated the cameras holistically perceived the fair price of the two cameras to be $256, whereas those who evaluated the cameras in piecemeal fashion perceived the fair price of the digital camera alone to be $463. This suggests that adding an inexpensive camera valued at an average of $26 decreased the perceived fair price of the offering by 45%.

In contrast, participants exposed to an extremely high reference price exhibited a superadditive effect, whereby the estimated fair price of the offering increased from $355 for the digital camera alone to $526 for the combination when a camera valued at $20 was included in the offering. In other words, adding the inexpensive camera increased the perceived fair price of the offering by 48% in the high reference condition. The fact that the digital camera (when evaluated piecemeal) was valued less in the high rather than low reference condition is consistent with our expectation that it would be perceived as less expensive following exposure to a high rather than low reference price, leading consumers to classify both target items as inexpensive rather than classifying them into polarized categories.

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 using an ANOVA. 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 impact the classification of target items, and that the subtraction effect is likely to occur when items are
classified into opposite categories but is likely to be attenuated when items are classified into the same category.

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Figure 2
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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 $379 for the digital camera alone but only $218 for the two cameras together, even though they were willing to pay $20 for the disposable camera alone. In contrast, participants in the high reference condition formed a supperadditive value judgment, indicating a willingness to pay $264 for the expensive camera alone and $390 for the combined offering, despite the fact that they were only willing to pay $14 for the inexpensive camera. An ANOVA showed that reference price moderates the impact of evaluation mode on willingness to pay, such that the subtraction effect is 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 impact the likelihood of classifying items into opposite categories, thus moderating the subtraction effect.

Discussion

Results from Study 4 demonstrate the importance of polarization in price-based categorization. The subtraction effect was not observed following exposure to a high reference price, which is consistent with our reasoning that a high reference price should cause both high- and low-priced items in a combination to be classified as inexpensive. In addition, Study 4 shows that the subtraction effect can occur for items that are complements as well as substitutes. Although substitutability is subjectively defined and depends on individuals’ perception of the
functionality of each item, most consumers would likely have different usage occasions in mind when purchasing a high-end digital camera versus a low-priced disposable camera.

Study 4 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 decreases the impact of idiosyncratic factors, such as the perceived necessity of purchasing the items. Because fair price implies that buyers already have a relevant usage occasion, we were able to measure perceived value independently of personal need. The fact that the subtraction effect was observed on this measure is inconsistent with an argument that the subtraction effect is due to the lack of need for one or both of the items in a combination.

**GENERAL DISCUSSION**

This research examined how consumers determine the monetary value of a combination of items from different price tiers. In contrast to prior research suggesting that bundle valuation is additive (i.e., perfectly additive or subadditive), we show that when high- and low-priced items are bundled together, subtractive judgments may occur. We attribute this effect to categorical averaging and show that altering categorization can mitigate the subtraction effect.

Four studies document the subtraction effect and are consistent with our explanation that it occurs as a result of categorical averaging when consumers form an overall impression of bundled items from opposite price tiers. In particular, Study 1 demonstrates the subtraction effect across six different product categories by showing that the subjective value of a combination containing an expensive and an inexpensive item is less than that of the expensive item alone. Study 2 provides further evidence that this effect is driven by consumers’ integration of categorical evaluations of each item by showing attenuation of the effect when juxtaposed items are evaluated in piecemeal fashion rather than holistically. Results of Study 3 lend further
support to the argument that the effect stems from the application of categorical reasoning to numeric expressions of value, showing attenuation of the effect when consumers categorize items on the basis of functionality rather than price. Finally, Study 4 documents that the subtraction effect occurs only when items are classified into opposite categories by showing attenuation of the effect following exposure to an extremely high reference price that encourages same-category classification.

At a conceptual level, this research contributes to the literature in a variety of domains. It contributes to the literature on price perception by showing that the relationship between two fundamentally different representations of value—categorical and numeric—can impact consumers’ price perceptions. Combining items from different price tiers increases the likelihood that individuals will process value-related information categorically, which can lead to subtractive judgments when value is expressed numerically. Categorical processing may also impact perceptions of price fairness, since consumers who systematically undervalue a combination are more likely to feel that its market price is unfair.

In addition, we contribute to the literature on information integration by showing that individuals who process categorically tend to average rather than add when integrating value-related information. This extends prior research (Anderson 1965; Gaeth et al. 1991) by showing that integrated evaluations of combined products can be impacted not only by quantitative value judgments of individual items, but qualitative evaluations, as well. Furthermore, we identify moderators of categorical averaging that enable us to predict when the subtraction effect is likely to be observed. In particular, we show that averaging is likely to occur when consumers jointly evaluate items classified into opposite categories on a given dimension. However, the effect 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. Our studies lend empirical support to the notion of categorical averaging and provide insight into the underlying mechanisms by which categorization influences numeric estimates of value.

Demonstrating the impact of categorical averaging on value judgments also contributes to research on categorization. Whereas much of the research on categorization focuses on its antecedents, we provide novel insights into the consequences of categorization for consumer judgment and decision-making. In particular, we provide new evidence that categorization can play a key role in how people derive numeric estimates. This evidence corroborates recent findings in the domain of calorie estimation, which show that the numeric calorie content of meals containing both healthy and unhealthy items is often underestimated (Chernev and Gal 2010). The fact that similar effects are observed across domains illustrates the breadth of the phenomenon and adds validity to the theory that categorization can bias numeric estimates. Documenting a subtraction bias in estimates of willingness to pay is particularly noteworthy, given that most consumers have extensive experience with pricing and are less susceptible to bias.

Finally, while our studies contribute to the literature on bundling by showing that adding an inexpensive item to an offering can decrease its perceived value, we also identify boundary conditions in which bundling items from opposite price tiers may enhance valuation. First, the subtraction effect is likely to be attenuated when consumers psychologically partition combinations and think of each item individually. This suggests that the subtraction effect may not occur for combinations in which both items are extremely attractive, since people generally prefer to separate gains (Thaler 1985) and are more likely to process the items in piecemeal
fashion. Second, the subtraction effect is likely to be attenuated when the basis of classification is altered in a way that focuses categorical evaluations on a non-price dimension or results in combined items being classified into the same rather than opposite categories.

The notion that thinking categorically about a product’s value can influence price judgments has important implications for marketers. Because bundling is an increasingly common practice among retailers and manufacturers (Shankar et al. 2009; Stremersch and Tellis 2002), knowing how consumers determine the value of product bundles can help practitioners make better decisions. Often, marketers bundle inexpensive items together with expensive items 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.
REFERENCES


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.


TABLE 1: THE SUBTRACTION EFFECT IN WILLINGNESS TO PAY
FOR COMBINED VERSUS INDIVIDUAL ITEMS (STUDY 1)

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

Note.—The subtraction effect is calculated as the percentage by which including an inexpensive item in a bundle decreases willingness to pay for the offering.
### TABLE 2: WILLINGNESS TO PAY AS A FUNCTION OF EVALUATION MODE (STUDY 2)

<table>
<thead>
<tr>
<th>Category</th>
<th>Piecemeal evaluation</th>
<th>Holistic evaluation</th>
<th>Subtraction effect (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Expensive Item ($)</td>
<td>Inexpensive Item ($)</td>
<td>Expensive + Inexpensive ($)</td>
</tr>
<tr>
<td>Watches</td>
<td>387</td>
<td>32</td>
<td>226</td>
</tr>
<tr>
<td>Shoes</td>
<td>121</td>
<td>25</td>
<td>84</td>
</tr>
<tr>
<td>Luggage</td>
<td>225</td>
<td>54</td>
<td>165</td>
</tr>
<tr>
<td>Bikes</td>
<td>479</td>
<td>150</td>
<td>425</td>
</tr>
<tr>
<td>Overall</td>
<td>303</td>
<td>66</td>
<td>225</td>
</tr>
</tbody>
</table>

*Note.*—The subtraction effect 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).
TABLE 3: WILLINGNESS TO PAY AS A FUNCTION OF CATEGORIZATION TYPE (STUDY 3)

<table>
<thead>
<tr>
<th>Category</th>
<th>Price-based categorization</th>
<th>Functionality-based categorization</th>
<th>Categorization Effect (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Expensive item alone ($)</td>
<td>Inexpensive item alone ($)</td>
<td>Expensive + Inexpensive ($)</td>
</tr>
<tr>
<td>Wine</td>
<td>34</td>
<td>12</td>
<td>19</td>
</tr>
<tr>
<td>Luggage</td>
<td>214</td>
<td>45</td>
<td>118</td>
</tr>
<tr>
<td>Shoes</td>
<td>152</td>
<td>24</td>
<td>88</td>
</tr>
<tr>
<td>Sunglasses</td>
<td>89</td>
<td>7</td>
<td>56</td>
</tr>
<tr>
<td>Overall</td>
<td>123</td>
<td>22</td>
<td>70</td>
</tr>
</tbody>
</table>

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 bundle decreases willingness to pay for the offering. 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. Results indicate that the subtraction effect is more likely to be observed when products are categorized on the basis of price rather than functionality.
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.
FIGURE 2: FAIR PRICE ESTIMATION AS A FUNCTION OF REFERENCE PRICE (STUDY 4)

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 were likely to make superadditive value judgments, such that they estimated the fair price of a combination to be higher than the total fair price of both its components.
APPENDIX A: EXAMPLE STIMULI (STUDY 4)

Note.—In this task, the yacht was framed as either a “Fifty-Foot Luxury Yacht” or a “Five-Inch Toy Yacht” so that participants would generate a high or low reference price before evaluating the target combination, which consisted of an expensive digital camera and an inexpensive disposable camera.