Inference not Reference:

The Price Image Heuristic as an Alternative to Reference Price Theories

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Reference price theories have dominated research into how consumers evaluate prices and make price-based choices. Given the widespread acceptance of reference price theories, it is notable that so little consideration has been given to what happens when the central assumption of these theories is violated: how do consumers evaluate prices when they do not have stable, well-defined reference prices? The authors propose an alternative to reference price theories, in which consumers instead use a general cue, specifically, a retailer's price image, or overall reputation for charging high or low prices, as a top-down inferential heuristic. This alternative account predicts a pattern of price perceptions, price estimates, and choices that cannot be accounted for using prevailing reference price theories. In each of the domains, reference price theories either predict no differences based on retailer price images or predict the *opposite* of the reported findings. These predictions are tested against those of prevailing reference price accounts in a series of nine empirical studies that offer converging evidence in support of the proposed theory.

Imagine a consumer standing in a store, considering the price of a particular bottle of wine. How does the consumer go about evaluating this price? The overwhelming consensus of previous research is that consumers evaluate prices by comparing them to a reference price, frequently an internalized summary of experience with past prices (for a recent review see Mazumdar, Raj and Sinha 2005). Reference price theories have dominated research on consumer price evaluations for several decades—and for good reason. Statistical models that include a reference price have generally been found to predict brand choice (Winer 1986; though see Bell and Lattin 1998), purchase quantity (Krishnamurthi, Mazumdar and Raj 1992), and purchase timing (Bell and Bucklin 1999) better than models that don't include a reference price factor. Furthermore, reference price theories have the advantage of being well-grounded in more general psychological theories that explain how people evaluate stimuli of all kinds (Helson 1964; Kahneman and Tversky 1979; Volkmann 1951).

While reference price theories differ in their particulars, they all share the foundational assumption that consumers have access to (or can easily construct) a reference price upon which to base their evaluations. Thus, the wine consumer in our example would retrieve or construct a reference price relevant to the specific bottle of wine, updated to account for the latest information, and should compare the shelf price to this reference point. However, the sheer volume of choice options available to consumers should call into question this "bottom-up" assumption that consumers can access relevant, up-to-date, well-defined, product-specific reference prices for all the individual items they consider purchasing. In fact, some prior research has shown that consumers often engage in very shallow processing when shopping (Hoyer 1984), inconsistent with diligently maintaining reference prices, and frequently evince poor price knowledge (Dickson and Sawyer 1990). A meta-analysis of 297 studies found an average 14% absolute error in

consumers' price estimates, increasing over the last 40 years (Estelami, Lehmann and Holden 2001).

So, what happens when the wine-buying consumer in our illustration has no well-defined reference point against which to evaluate? Given the informational and computational cost of maintaining and updating reference prices, even just for commonly purchased household items, we propose that consumers will frequently consider purchases without having well-defined reference prices to compare them to. In these cases, consumers may instead use a top-down approach, relying on category-specific cues, such as the retailer's general reputation for high or low prices, or *price image*, as a heuristic. This cue-based heuristic would substitute for the widely studied evaluation process that consumers use when they do have well-defined reference prices, yielding outcomes that may diverge dramatically from the predictions of prevailing reference price theories.

In this paper, we articulate a cue-based inference theory of price evaluations, focusing on consumers' reliance on price image. This kind of inferential approach could be interpreted as consumers simply incorporating relevant store-level information to potentially improve their judgments. However, our proposed cue-based heuristic is distinct from a simple Bayesian learning approach, and we will show that it leads to decision biases, very different from those attributable to reference price models. We contrast the predictions of our top-down model with the predictions of bottom-up reference price models in four domains: subjective evaluations of known prices (Experiments 1-4), estimates of unknown prices (Experiment 5), choices among products (Experiments 6-7), and the persistence of price image beliefs (Experiments 8-9).

INDUCTIVE REASONING USING RETAILER PRICE IMAGE

The reasoning processes that give rise to judgments and evaluations have been widely

debated. One view is that when consumers evaluate a stimulus, they aggregate their judgments of the item's components to form a holistic judgment of the option. This bottom-up approach is commonly reflected in the assumptions of conjoint analysis, in which choices or evaluations are understood to be the sum of the utilities of individual features or aspects (e.g., Luce and Tukey 1964). Reference price theories are largely consistent with this bottom-up view, such that reference prices are generally assumed to be some integration of prior prices (Winer 1986). Some papers have extended this framework to account for broader factors, such as the type of store, but have largely done so by assuming that these factors also contribute to a consumer's reference price. For example, Thaler's (1985) Transaction Utility Theory suggests that consumers adjust an existing reference price by incorporating information about the store into the reference price (e.g., adjusting a reference price up when buying a beer from a fancy hotel bar).

The difficulty for consumers in implementing this kind of bottom-up approach is that it requires both ready access to substantial information as well as the cognitive resources to integrate and incorporate the information. As an alternative, top-down heuristics have been documented in a wide range of contexts. For example, Nisbett and Wilson (1977) experimentally manipulated global evaluations of a person and found that participants' evaluations of unrelated attributes were affected, resulting in a halo effect. Meyers-Levy and Sternthal (1993) argue that this kind of assimilation of a target evaluation to a cue is the norm, occurring unless there is both low overlap between the target and cue and high levels of cognitive resources available to the consumer making the evaluation.

How might consumers implement a top-down approach in making price inferences? A large literature on category-based induction has studied how people ascribe the believed general properties of categories to individual instances (see Heit 2000 for a review). The strength of these inductive inferences depend on the similarity of the target instance to the category (Rips 1975), the specificity

of the target (Osherson et al 1990), the logical or causal relationships within the category for the relevant property (Rehder and Hastie 2004), as well as other factors, such as category knowledge (Medin et al 1997). For example, induction of category properties to individual stimuli among non-experts has been found to occur more readily from definitional (or taxonomic) categories than from categories based on other kinds of relations (Shafto and Coley 2003).

Extending the notion of category-based induction to price inferences suggests that the estimated price for a product may be broadly affected by perceptions of prices in categories relevant to the product. Consumers may therefore infer that a product is expensive when it is closely linked to an expensive-seeming category. In this context, the store in which a product is sold serves as a salient category that consumers may use when making heuristic price judgments. While the store-defined category does not necessarily facilitate inferences about incidental product attributes (e.g., color or size), stores do frequently set prices according to clear, coherent, store-specific strategies (e.g., low price leader or prestige pricing). The price perception of the category (store) therefore often provides a logical, relevant, and salient basis for judging product prices. Thus, we focus on the category-level judgment of price at the store level—the *retailer price image* of the store—as a basis for top-down inferences about specific products' prices.

Consistent with prior literature, we define price image as a consumer's qualitative impression of the relative price level of the items sold at a retailer (Brown 1969; Van Heerde, Gijsbrechts and Pauwels 2008). Price image has several specific properties that collectively distinguish it from related constructs: 1) Price image is an aggregate category-level cue and not a numerical estimate; 2) Price image is sensitive to the context in which judgments are made; 3) Price image need not be strictly determined by the quality of goods sold; and 4) Price image need not be an accurate representation of actual prices.

First, price image differs from reference prices in the level and specificity of its conceptual representation. Reference prices have been operationalized in different ways by different authors, including an adaptation-level (Kalyanaram and Winer 1995), an expectation (Monroe 1973), competitors' prices (Bolton, Warlop and Alba 2003), average market prices (Urbany and Dickson 1991), the last price encountered (Mayhew and Winer 1992), cost of goods sold (Bolton, et al. 2003) and as an amount judged to be fair or equitable (Xia, Monroe and Cox 2004). These diverse reference price theories are similar in defining a reference price as a bottom-up numerical price estimate of some kind, either a point (e.g., Briesch, Krishnamurthi, Mazumdar and Raj 1997) or a range (Janiszewski and Lichtenstein 1999).

In contrast, a price image is a top-down evaluation of a retailer as a category, and is not generally maintained in the consumers' mind as a numerical price estimate. For example, a consumer may have the opinion that prices at Walmart are low relative to other stores that sell comparable merchandise, without necessarily having specific price expectations for any of the products at Walmart or at competing stores. Thus, although a price image may influence specific reference prices, price image itself is a generalized, qualitative belief rather than a numerical price expectation. Relying on price image therefore requires consumers to store much less information in memory than does reasoning with references prices (i.e., only a store-level judgment, from which inductive inferences are made, rather than separate reference prices for each product in the store).

Second, unlike reference prices, price image represents a *relative* evaluation of prices at a given retailer, as compared to the perceived price levels of a salient set of competing retailers. Thus, a traditional grocery store may be evaluated both as having a high price image when compared to discount grocers, and as having a low price image compared to convenience stores. People with similar information may differ in their perceived price image of a retailer, depending

on which comparisons come to mind.

Third, price image is multiply determined and is not necessarily a function of the quality of the merchandise sold. Although some higher price image retailers carry higher quality goods (e.g., clothing at Nordstrom vs. Old Navy; jewelry at Tiffany vs. Target), other high price image stores carry merchandise that is identical to that found in lower price-image stores (e.g., DVDs at Suncoast vs. Walmart; milk at 7-11 vs. Food-4-Less), but may compensate by offering better service, more convenience or a more pleasant shopping environment. When competition is limited, high price image retailers may even have a reputation for charging high prices for low quality and poor service. As a result, while consumers' beliefs about the quality differences across retailers may contribute to price image formation, quality beliefs will not, by themselves, determine differences in price image.

Fourth, price image need not comprehensively represent actual prices. Stores often carry large and diverse inventories that only partially overlap with competitors (Stassen, Mittelstaedt and Mittelstaedt 1999), making a large-scale price comparison across retailers effectively impossible for ordinary consumers. Research on induction has shown that people make stronger inferences about properties of categories from individual category elements that are seen as high in typicality, even those that are not necessarily more diagnostic (Rips 1975, Osherson et al 1990). Thus, instead of direct price comparisons, consumers may use the non-representative prices of advertised "loss-leader" items (Simester 1995), along with environmental cues like store décor and layout (Brown and Oxenfeldt 1972), and store policies such as price match guarantees (Srivastava and Lurie 2001) to inform a price image. Thus, the process of price image formation may sometimes yield price images that are only weakly related to actual prices. Empirically, consumers' price image impressions have been shown to sometimes bear little resemblance to price reality (Brown 1969).

In the following sections, we document four domains in which the price image account we propose makes different predictions about consumer behavior than do standard reference price theories. In each domain, we explain the differences between these two accounts and then present experimental evidence in support of consumers' use of price image as an alternative to reference price comparisons. We begin with a discussion of how consumers evaluate individual prices.

PRICE IMAGE AND PRICE EVALUATIONS

We propose that when consumers evaluate a specific price but do not have an applicable reference price, they may instead use the price image of the retailer as an inferential cue. Specifically, they may reason that since prices at this store tend to generally be high (or low), this particular price is also likely to be high (or low). The global evaluation of the price level of a retailer—the price image—would then result in directionally consistent evaluations of individual prices: perceiving prices as high at a high price image store and as low at a low price image store (Nystrom, Tamsons and Thams 1975).

Returning to the example of the wine-buying customer mentioned in the introduction, we propose that she would evaluate a particular price as *less expensive* if she encountered it in a discount wine store (low price image) than if she were to find the same price in a specialty wine store (high price image). This prediction represents a clear contrast with reference-price theories. Most reference price models make no accommodation for the influence of store level effects. This is true for both internal reference price theories, which define reference prices as a function of previous exposure to individual prices (Bell and Bucklin 1999; Kalyanaram and Winer 1995; Mazumdar, et al. 2005; Monroe 1973; Winer 1986), and external reference price theories, which are based on contemporaneous exposure to individual prices (Biswas and Blair 1991; Mayhew and

Winer 1992; Simonson, Nowlis and Lemon 1993). As a result, most theories would predict that for a given internal reference price or set of external reference prices, a particular price would be evaluated as equally cheap or expensive whether it was seen at Walmart or Nieman Marcus.

A few reference price theories do allow for store-level effects on price evaluations. These theories start with the premise that consumers have a well-defined reference price, which is then adjusted based on the particulars of each store: raising the reference prices for stores with a high price image and lowering the reference prices for stores with a low price image (Biswas and Blair 1991; Thaler 1985). As a consequence of these store-specific reference prices, a given price would be evaluated as *lower* at a high price image store than at a low price image store. For example, Mazmudar, Raj and Sinha (2005) predict that "the same price of a bottle of wine could be judged more favorably if it is sold in a specialty wine store [high price image] than if it is sold in a discount wine store [low price image]" (p. 87). Theories based on store-specific adjustments to stable reference prices therefore predict exactly the *opposite* of what we predict based on consumers using price image as a substitute for reference price comparisons.

Although our prediction that a high (or low) price image will lead to a higher (or lower) evaluation of a given price is inconsistent with reference price theories, it is consonant with other top-down processes such as the halo effect (Nisbett and Wilson 1977) and cue assimilation. In the marketing literature, it has been shown that consumers often use an overall positive/negative impression of a brand to infer that unobservable or missing information is also positive/negative (Dick, Chakravarti and Biehal 1990). Likewise, consumers' overall impressions of a store have been found to have a directionally consistent influence on quality perceptions (Wheatley and Chiu 1977) and the believability of advertised prices (Berkowitz and Walton 1980; Fry and Gordon 1974).

We tested our prediction in four experiments. In the first experiment, we asked participants to evaluate the price of a single item, sold either at a store with a high price image or at a store with a low price image. In the second experiment, we held the store constant and manipulated relative price image by asking participants to think of similar stores with either higher or lower price levels. Both experiments also measured participants' price image ratings to allow us to test whether store-level, subjective evaluations of aggregate price level (e.g., price image) mediated the influence of our manipulations on price evaluations. These experiments present a direct test of our proposal that consumers will evaluate prices as consistent with the price image (e.g, less favorably at a high price image store). In contrast, reference price models predict that the same price will be evaluated equally or more favorably at a high price image store than at a low price image store (Mazmudar, Raj and Sinha 2005). Two additional experiments examine a proposed boundary condition on this effect, namely, that price image influences price evaluations only when consumers do not have well defined reference prices.

EXPERIMENT 1: THE SAME PRICE IS EVALUATED AS LOWER AT A LOW PRICE IMAGE STORE THAN AT A HIGH PRICE IMAGE STORE

Method

Ninety-eight adults from an online subject pool were randomly assigned to two conditions. Participants were asked to imagine they were buying a two-pack of pens from either Hudson News, described as a national newsstand chain found in many airport terminals (high price image) or from Walmart (low price image). In both conditions, participants were shown a picture of a Pilot Precise Needle Gel Ink Retractable Pen priced at $2.89 for a two-pack. They were given the brand name and several bullet-points of information about the product, of the type that would be found on the packaging. Participants rated the price of these pens on a scale anchored by 1 = very low

and 7 = very high. On a separate page, they also rated the price image of either Hudson News or Walmart by indicating whether, in general, they considered the prices at that store to be low or high, using the same seven-point scale. They could also check a box indicating that they were completely unfamiliar with the prices at the store, even by reputation. The order of evaluating the price of the pens and rating the price image of the retailer was counterbalanced across participants.

Results

Because we were interested in the influence of price image on price evaluations, we eliminated from the analysis those participants who indicated they were completely unfamiliar with the prices at the store, even by reputation. Including these participants did not change the findings.

Price evaluations. We predicted that the same price would be evaluated as higher at the store with a high price image than at the store with a low price image. Consistent with this prediction, participants shopping at the high price image Hudson News rated $2.89 to be a higher price for the pens than did participants shopping at the low price image Walmart (4.3 vs. 3.7; $F(1,71) = 5.24$, $p < .05$). This result is inconsistent with the predictions of reference price models, which predict either no effect of price image or that prices should be evaluated more favorably at high price image stores (Mazmudar, Raj and Sinha 2005). The order of evaluations (whether the pen or store was evaluated first) was not significant and this factor did not interact with the experimental condition ($ps > .3$).

Mediation through perceived price image. We argued that differences in price evaluations are driven by differences in the perceived price images of the retailers. To test this prediction, we examined the indirect effect of the price image manipulation (Hudson News vs. Walmart) through participants' ratings of the price images of these retailers. A mediation analysis revealed that the

retailer was a significant predictor of both price evaluation ($\beta = .58$, $t = 2.22$, $p < .05$)[1] and our proposed mediator, perceived price image ($\beta = 2.62$, $t = 8.92$, $p < .001$). Price image ratings predicted participants' evaluations of the price of the pens ($\beta = .21$, $t = 2.03$, $p < .05$). As we anticipated, when the price image ratings were included in the model, the influence of the retailer (Hudson News vs. Walmart) was no longer significant ($\beta = .04$, $t = .10$, $p > .90$), showing that perceived price image fully mediated the effect. Mediation was confirmed with a Sobel test ($Z = 1.97$, $p < .05$) and a bootstrap analysis (CI: [.02, 1.14], $p < .05$).

Discussion

This study provides initial support for the idea that consumers may use price image as a heuristic in lieu of reference price evaluations, by revealing price evaluations that are directionally the opposite of those predicted by reference price theories. We can contrast this finding to the predictions of Transaction Utility Theory (Thaler 1985), which assumes that consumers make store-specific adjustment to a stable reference price or price expectation. According to this theory, people are willing to pay more for an item purchased from a high price image store than from a low price image store because they have a higher reference price for the high price image store, due to transaction utility. Thus, in Thaler's (1985) famous "beer on the beach" study, participants were willing to pay almost twice as much for the same beer if it came from a (high price image) hotel bar than if it came from a (low price image) rundown grocery store. Following the logic of this finding, if one expects a beer to cost more at the hotel bar, then a given price should be evaluated as lower at the hotel bar and higher at the grocery store, particularly after accounting for transaction utility. Therefore, if people were making a transaction utility-based adjustment to a stable reference price in our study, they would have perceived the same-priced pen as a better value at Hudson News than at Walmart, which is the opposite of what we found.

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[1] Regression results for all mediations are reported in full in Web Appendix C.

We can also contrast our finding with theories of price fairness, which assume that the fairness of a price is determined by comparing it to some reference point, such as past prices, competitor prices or the cost of goods sold (Bolton, et al. 2003; Xia, et al. 2004). For example, when Bolton et al. (2003, Experiment 2) informed participants that that a manufacturer charged retailers $25 for an item of clothing, participants articulated a higher expected price for a high price image department store than for a low price image discount store ($44.13 vs. $35.14) and a higher fair price at the department store than at the discount store ($35.89 vs. $32.89). Based on their findings, it follows that a given price would be evaluated more favorably in terms of both expectations and fairness at the department store than at the discount store. After all, given a fixed, store-specific reference price, a price of $38 would be higher than the expected price at a discount store, but lower than the expected price at the department store.

Finally, this finding is inconsistent with a scale re-norming interpretation, in which participants interpreted the scale differently depending on the store seen. Participants in the Hudson News condition would presumably have thought of higher prices and therefore would have rated the same price lower, which is the opposite of what we found.

As this discussion illustrates, prior theories based on store-specific reference prices predict price evaluations directionally opposite to what was predicted by a price image account and what was found in Experiment 1. This study manipulated price image by using stores with well-established price images. While this approach benefits from high external validity, Walmart and Hudson News differ on many dimensions other than price image. Furthermore, the results of this study do not address whether using price image as the basis of inference is a normative strategy when constrained by limited information. Assuming that a given item is over-priced when sold at Hudson News, relative to Walmart, might lead to more accurate assessments on average. The

following study presents a more conservative test of our hypothesis by holding the store and the objective information constant across conditions. Instead, price image is manipulated by merely changing the salience of the set of competitors that could influence a consumer's price image evaluation.

EXPERIMENT 2: A PRICE IS EVALUATED AS LOWER WHEN HIGH PRICE IMAGE COMPETITORS ARE SALIENT

Method

Thirty-six adults from an online subject pool evaluated the price of a treadmill at Sears. Participants randomly assigned to the high price image condition listed six stores comparable to Sears but with lower prices than Sears. We anticipated that making lower priced stores more salient would make the prices at Sears seem higher by comparison, thereby leading to a higher price image of Sears. In contrast, participants in the low price image condition were asked to list six comparable stores that have higher prices than Sears.

After the price image manipulation, all participants evaluated a Gold's Gym 450 Treadmill sold at Sears for $377. In addition to the brand name and price, participants were provided with a picture and product information about the treadmill. Participants then rated the price of $377 on a scale ranging from 1 = very low to 7 = very high. After evaluating the price of the treadmill, participants were asked to rate the price image of Sears, by indicating whether, in general, they considered the prices at Sears to be low or high, using the same seven-point scale.

Results

Price evaluations. We had predicted that listing several reference stores more expensive than Sears would lower Sears' relative price image, thereby making the price of the treadmill seem lower, compared to thinking about stores less expensive than Sears. Consistent with our

predictions, and in contrast to the predictions of reference price models, participants in the low price image condition rated $377 as a significantly lower price than did participants in the high price image condition (3.2 vs. 4.3; $F(1,34) = 5.80$, $p < .05$).

Mediation through perceived price image. We conducted additional analyses to examine the mediating effect of perceived price image on price evaluations. Analysis revealed that the experimental condition (listing more vs. less expensive stores) predicted both price evaluations (β = -1.11, t = -2.41, $p < .05$) and perceived price image (β = -.89, t = -2.83, $p < .01$). Perceived price image successfully predicted price evaluations (β = .83, t = 3.90, $p < .001$). When perceived price image was included in the model, it fully mediated the influence of the experimental manipulation on price evaluations (β = -.38, t = -.87, $p > .35$). Mediation was confirmed with a Sobel test (Z = -2.25, $p < .05$) and a bootstrap analysis (CI: [-1.93, -.03], $p < .01$).

Discussion

In this study, merely listing more or less expensive stores influenced judgments of a given price at Sears. The first two experiments demonstrate a pattern of price evaluations that cannot be accounted for using prevailing reference price theories. In fact, theories that include store-specific reference prices predict precisely the opposite of our findings. In our account, this contradiction arises because the prior theories presumed stable reference prices (e.g., Thaler 1985) or examined contexts in which consumers were given reference prices prior to judgment (e.g., Bolton, et al. 2003). In contrast, we posit that price image inference is used in the absence of a stable reference price. Therefore, when a reference price is made explicitly available, we expect that reference price comparisons will trump the use of a price image heuristic, yielding results consistent with prior findings. The next two experiments test this prediction.

EXPERIMENT 3: PRICE IMAGE EFFECTS REVERSE WHEN CONSUMERS HAVE A

SALIENT REFERENCE PRICE

Method

One hundred and sixty-seven adults from an online subject pool were randomly assigned to the conditions of a 2 (price image: high vs. low) x 2 (reference price vs. none) factorial design. Participants were shown a picture and a brief description of a home security system presented as being sold at either Radio Shack (high price image) or Costco (low price image). In the no reference price conditions, participants were given a price of $499 for the security system and asked to evaluate the price on a seven-point scale running from 1 = very low to 7 = very high. In the reference price conditions (adapted from Bolton, et al. 2003, Experiment 2), participants were given a reference price of $200 as the price the retailer paid for the system and were asked how much they expected the retailer to charge customers and also what they considered a fair price.

Results

Price estimates. Consistent with the findings of Bolton, et al. (2003), when participants were given a $200 wholesale price as a reference point, they estimated a higher price for the high price image store than for the low price image store ($412.35 vs. $318.86; $t(79) = 2.58$, $p < .01$, log-transformed to correct for skewness). They also indicated a higher fair price for the high price image store ($302.21 vs. $266.21; $t(79) = 2.33$, $p < .05$).

Price evaluations. If consumers spontaneously used a stable reference price, then we would expect that prices would be more likely to be evaluated as lower, relative to the expected or fair price, at the high price image store. In contrast to this prediction, and consistent with Experiments 1 and 2, when participants were not given a reference price, they rated the price of $499 as higher

at the high price image store than at the low price image store (4.6 vs. 4.0; $t(80) = 1.99$, $p < .05$).

Discussion

Experiment 3 demonstrates that the availability of a reference price, in this case, the cost of goods sold, influences how consumers evaluate prices. When given a reference point and asked to articulate an expected price and a fair price, participants responded as anticipated by reference price models. When not given a reference point, but just asked to evaluate a price, participants' evaluations were inconsistent with these judgments and were instead consistent with the price image account we have advanced. In this experiment we replicated previous findings by Bolton et al. (2003) when reference prices are provided, and then contrasted those judgments with price evaluations, a different dependent variable, in the absence of a reference price. Experiment 4 provides a more conservative test of this boundary condition by holding the dependent measure constant across conditions and only varying the availability of an externally provided reference price.

EXPERIMENT 4: THE EFFECT OF PRICE IMAGE ON PRICE EVALUATIONS IS REDUCED WHEN REFERENCE PRICES ARE PROVIDED

Method

Two-hundred and sixty one adults from a web-based subject pool were randomly assigned to the conditions of a 2 (price image: high vs. low) x 3 (reference price: none vs. low vs. high) factorial design. Participants evaluated the price of speakers at retailers pre-tested as either having a low price image (Walmart) or a high price image (Radio Shack).

In the no reference price condition, participants evaluated a price of $47.99 on a seven point scale anchored by 1 = very low and 7 = very high, based on a picture of the speakers, the brand and model name, and a brief product description. In the low reference price condition, participants also saw six speakers comparable in quality and features, labeled Brand A through

Brand F, priced from $27.99 to $52.99. In the high reference price condition, the six speakers

were priced from $42.99 to $67.99. Thus, in each reference price condition, participants were

given information that would encourage them to form a low or high reference point, relative to

the price they would be evaluating. Participants then evaluated the $47.99 speakers. All

participants then rated the price image of the retailer they had seen (Walmart or Radio Shack) on

the same seven-point scale.

Results

Price evaluations. We had predicted that when consumers do not have a readily available

reference price, they will evaluate prices as consistent with the retailer price image. In contrast,

when consumers do have an available reference price, their price evaluations will be based on a

comparison with the reference price. The price evaluation data support these predictions. An

analysis of variance revealed a significant main effect of reference price condition ($F(2,256) =$

31.21, $p < .001$), a marginal main effect of price image condition ($F(1,256) = 2.45$, $p = .07$), and a

significant interaction between price image and availability of a reference price ($F(2,256) = 3.39$, p

$< .05$).

Planned contrasts reveal that, as predicted, when participants were not given additional price

information with which to form a reference price, they evaluated the prices as consistent with the

price image of the retailer, such that the price was evaluated as higher when it came from Radio

Shack than when it came from Walmart (4.3 vs. 3.6; $F(1,256) = 9.33$, $p < .005$). When

consumers had a reference price, however, the effect of store price image was no longer

significant. Instead, participants evaluated prices as consistent with their reference point. When

the reference price was low, the $47.99 price was evaluated as high at both the high and the low

price image stores (4.7 vs. 4.8; $p > .50$); when the reference price was high, the price was

evaluated as low at both the high and low price image stores (3.5 vs. 3.3; *p* > .45).

Mediation through perceived price image. Consistent with the results of Experiments 1 and 2, in the no reference price condition, the difference in price evaluations was mediated by participants' ratings of the retailer's price image ($Z = -3.27$, *p* < .005; CI: [-1.40,1.26], *p* < .01). In contrast, in the high and low reference price conditions, the price image condition did not predict price evaluations, so there was no mediation by price image rating.

Discussion

The first four studies provide converging evidence that consumers may use a price image heuristic when evaluating prices, with the resulting price evaluations running contrary to the predictions of reference price theories (Bolton, et al. 2003; Mazmudar, Raj and Sinha 2005; Thaler 1985). The results are collectively inconsistent with a normative learning model, in which price image only influences judgments to the degree that it is more diagnostic than other available information. The results are consistent, however, with the notion that consumers often do not spontaneously access a stable reference price, but instead use price images heuristically, inferring that the price seen is consistent with a pre-existing price image.

PRICE IMAGE AND PRICE EXPECTATIONS

Thus far, we have shown that people use price image in the absence of a reference price as a top down cue when judging the prices they see. We contend that this is because consumers are often unable to generate a stable reference price. However, it may be that consumers have a reference price, but simply failed to use it in our studies, perhaps because they find the top-down heuristic easier to apply when evaluating prices. To test this, we can ask consumers to generate store-specific price expectations for a particular item.

When articulating an expected price, a well-informed consumer will likely use a pre-existing

store-specific reference price. For example, a consumer who purchases a carton of Tropicana orange juice every week from the same grocery store may have a well-defined expectation for the price of Tropicana at that store (e.g., based on previously observed prices). For this consumer, the expected price would simply be that consumer's store-specific reference price. Alternatively, a consumer may not have specific expectations of how much a particular store charges for an item, but instead may adjust another reference price, such as the cost of goods sold (as in Experiment 3) or a market-wide reference point. The consumer could adjust this reference price according to the price image of the store when generating the price expectation. So, this consumer may have a general reference price of $3.50 for a carton of Tropicana orange juice, but expect the price to be $3.00 at a particular low price image store and $4.00 at a particular high price image store. Both of these bottom-up accounts predict that consumers will be able to generate stable expectations for the price of a particular item at a particular store, based on reference price reasoning.

In contrast, we propose that when consumers do not have a stable reference price (and do not have the information or cognitive resources to generate one), price image is incorporated into *relative* price expectations between stores, but does not affect *absolute* price expectations at a single store. In other words, consumers can believe that the prices at one store are relatively higher than the prices at another store, without having accessible store-specific reference prices at either store. Once a consumer knows (or has estimated) the price at one store, she may adjust from that initial estimate to generate a logically consistent estimate for a second store with a different price image. However, when estimating a price at any store in isolation, the consumer would not necessarily have a basis of comparison from which to adjust (Hsee 1996). Put another way, price image beliefs allow a consumer to be internally consistent in terms of relative price differences (e.g., this will cost $2 more at Store X than at Store Y), but do not help consumers to produce

individual estimates that are equally sensitive to the store cue in the absence of a well-defined reference price.

The resulting prediction is that consumers' estimates of the prices of the same item at different stores will not be stable, but will instead depend on contextual factors that determine the basis of comparison. Specifically, we predict an order effect on price expectations of an item at stores with different price images: a higher estimate of the price at a low price image store if it is made before estimating the price of the same item at a high price image store, rather than after. Such order effects cannot be accounted for by reference price models, which would predict that both the initial and subsequent price estimates would be based on store-specific or market-wide internal reference prices, and so would be insensitive to the order in which the estimates are made.

Note that we are not merely predicting that consumers will estimate a higher price at a high price image store, a potentially normative inference. Instead, we are predicting estimates that are highly internally consistent (a high price image store is estimated to have a higher price than a low price image store) but have low external consistency (estimates are subject to order effects). In contrast, normative accounts and reference price theories would predict both high internal and external consistency. We test these competing predictions in the following experiment.

EXPERIMENT 5: PRICE IMAGE LEADS TO INTERNALLY CONSISTENT BUT EXTERNALLY INCONSISTENT PRICE ESTIMATES

Method

We recruited participants in the decision lab of a large Midwestern university, as well as on campus, for a total of 215 completed surveys. We chose two grocery chains perceived locally as having a high (Whole Foods) vs. low (Jewel-Osco) price-image. We asked participants to estimate the price of one half-gallon carton of Tropicana orange juice, first at one store and then,

on a subsequent page, at the other store. In the WF-first condition, participants first estimated the price only for Whole Foods, without knowing that they would be asked to make estimates for any other store, and then estimated the price at Jewel-Osco. In the JO-first condition, the order was reversed. For each store, participants were shown a picture of the product, the store name and logo and were asked for their best estimate of the current price.

Results

Manipulation check. Following the price estimates, participants were asked to rate the prices at each store, on a scale from 1 ("lower prices than most stores") to 5 ("higher prices than most stores"). The price-image ratings for Whole Foods were substantially higher than the ratings for Jewel-Osco (4.1 vs. 2.7; $t(183) = 16.2$, $p < .001$).

Price estimation. Averaging across conditions, participants estimated the price as higher at Whole Foods than Jewel-Osco ($3.95 vs. $3.45; $t(214) = 11.0$, $p < .001$). This overall difference in price estimates across stores could have occurred for one of two reasons. People could have stable store-specific reference prices for this product, and might then simply report these reference prices. Alternatively, they could have a stable price image for each store and only a general sense of the typical price of the product. If people are reporting stable store-specific reference prices, then the method of elicitation should not matter. However, if they are constructing an estimate based on differences in store price image, the salience of specific stores in mind may affect their estimates, resulting in low external consistency across conditions.

To test this, we compared the two order conditions, and found that the order of elicitation had a significant effect on price estimates (see Figure 1). The estimated price at Whole Foods was lower in the WF-first condition than in the JO-first condition ($3.79 vs. $4.09; $t(213) = 2.18$, $p < .05$). Conversely, the estimated price at Jewel-Osco was higher in the JO-first condition than

in the WF-first condition ($3.59 vs. $3.30; $t(213) = 2.30$, $p < .05$). If participants had stable store-specific reference prices or general reference prices that they consistently adjusted based on price image, then the order should not have affected the estimates.

As a further test of our account, we examined participants' initial price estimates. We have argued that price image beliefs lead to internally consistent price estimates (i.e., the estimate should be higher at Whole Foods than at Jewel-Osco), but provide little help for consumers in articulating an absolute price. Consistent with this prediction, first prices were only weakly associated with the store (WF = $3.79 vs. JO = $3.59; $t(213) = 1.55$, $p > .1$). In contrast, when participants saw the second store, they attended to the difference in price image and adjusted accordingly, making very different second estimates for the price of the product at the two stores (WF = $4.09 vs. JO = $3.30; $t(213) = 5.90$, $p < .001$). Consistent with this interpretation, the store asked first had no effect on the average differences between the price estimates ($\Delta = \$0.50$ JO-first vs. $0.49 WF-first; $t(213) = .09$). None of the findings could be explained by quality perceptions of Tropicana orange juice, which did not differ across the two stores.

Discussion

Our results suggest that price image alone is not necessarily informative when making an estimate of the price of a product at a single store. As we found, consumers may even initially estimate the same price for a product at a high-price image store as they would for the same product a low-price image store. However, once consumers have articulated a price estimate for one store, our findings suggest that they will evaluate that price as consistent with the store price image (i.e. as expensive at a high price image store or as cheap at a low price-image store). Then, when making another estimate of the product at another store, consumers will accommodate differences in price image by adjusting accordingly, estimating a lower price at the low price-

image store or a higher price at the high price-image store. This instability in price estimates, based on the order of estimation, is consistent with the use of a price image heuristic, but is inconsistent with stable reference prices and cannot be explained by normative models of price learning, such as Bayesian updating.

PRICE IMAGE AND CONSUMER CHOICE

How might making inferences based on price cues affect consumers' choices, such as preferences between more or less expensive offerings? We propose that consumers may use price image cues to aid them in mapping their preferences onto the set of options available at a store. First, consider the predictions of reference price models for a consumer entering a (high price image) specialty wine store. According to prevailing reference price theories, this consumer will adjust her reference price up to accommodate for the high price image of the retailer, meaning she will evaluate any given price she encounters more favorably (Mazmudar, Raj and Sinha 2005). As a result, higher priced options should seem more acceptable (or more justifiable, via transaction utility; Thaler 1985) than they would at a low price image store. Therefore, higher priced options would be more likely to be chosen at a store with a high price image than if the same options were encountered at the same prices at a store with a lower price image. Prevailing reference price theories therefore imply that a consumer would be more likely to select one of the higher priced bottles at a specialty (high price image) wine store than at a discount (low price image) wine store.

In contrast, we propose that when a consumer does not already have a well-defined reference price, the influence of price image on choices will result in the *opposite* effect. In our proposed account, and consistent with the data already presented, when consumers encounter prices at a store with a high price image, they infer that those prices are higher than they would have inferred if they had encountered the same prices at a store with a low price image. We therefore argue that

higher priced options are *less* likely to be chosen at a store with a high price image than if the same options were encountered at a store with a lower price image. As a result, a consumer looking to purchase a moderately priced wine would be more likely to select one of the lower priced bottles at the specialty (high price image) wine store than at the discount (low price image) wine store, holding intentions, prices and options constant.

This process is illustrated in Figure 2. In the first panel, a consumer with a preference for moderately priced wines is considering three options. In order to select a moderately priced wine, the consumer first maps her evaluations of the wines onto a subjective scale and then selects the middle option as best matching her preferences (Prelec, Wernerfelt, and Zettelmeyer 1997; Simonson 1989). In the second panel, the consumer encounters the same options at a high price image retailer. If the consumer takes into account the price image when evaluating the prices, this will shift her evaluations toward the high-price end of the continuum. As a result, she would now consider the lowest priced option the best match for a moderate-price preference. In the third panel, the consumer encounters the same options at a low price image retailer. The low price image of the retailer leads the consumer to conclude these prices are likely to be low priced. In this case, the highest priced option is now considered a moderately priced wine and so is chosen by this consumer.

Experiment 6 examines whether and how consumers' choices of grocery items change as a result of a change in price image, holding options and prices constant. We test these predictions in the context of choices among more and less expensive options in several grocery categories. In Experiment 7, participants chose between a more and less expensive replacement automobile tire at stores with different price images. This experiment also examines consumers' intuitions about the cause of price image differences in order to rule out an alternative explanation based on

differences in perceived quality of the offerings at different stores.

EXPERIMENT 6: LOWER PRICED ITEMS ARE MORE PREFERRED AT A STORE WITH A HIGH PRICE IMAGE

Method

One-hundred and three adults from a web-based subject pool were randomly assigned to either a high price image or a low price image condition. First, all participants were shown the logos of nine national and regional grocery chains (e.g., Food 4 Less, Trader Joe's, Whole Foods, Walmart) and asked to indicate which store they thought had the lowest and the highest prices, overall, on groceries. Whole Foods was the most commonly selected (50.0%) high price image store; Walmart was the most commonly selected (61.7%) low price image store. Next, depending on the price image condition to which they had been assigned, participants were told they would be shopping for several different products at either the store they had indicated as having the highest or the lowest price image. For example, participants randomly assigned to the low price image condition who indicated Food 4 Less had the lowest prices overall were told they would be shopping at Food 4 Less.

Participants were asked to choose from among four options in each of four product categories: frozen pizza, pasta sauce, maple syrup and tuna. All options in each category were national brands. Prices were based on a national Internet grocery store and were identical across price image conditions (see Web Appendix A). For example, in the pasta sauce category, participants were asked to choose among Prego ($3.09), Ragu ($3.29), Barilla ($3.49) and Newman's Own ($3.69).

Results

We report the choice share of the lowest priced option in each set relative to the share of the

other three, higher-priced options. (The lowest priced brand typically had the largest choice share, with more than a 35% share across conditions and product categories, and more than 50% choice share in some cells.) We had predicted that the low-priced option would be chosen more often at a high price image store than at a low price image store. The choice data are consistent with this prediction. Across the four product categories, 29.4% of choices were for the lowest priced brands when participants were shopping in the low price image store. In the high price image store, the choice share of the lowest-priced brands increased to 41.7%—this despite the fact that the prices and products were the same in both conditions. This pattern held across all four product categories: frozen pizza (27.7% vs. 35.7%), pasta sauce (44.7% vs. 54.5%), maple syrup (30.4% vs. 50.0%), and tuna (14.9% vs. 26.8%).

A mixed-model binary logistic regression predicting choice of the least expensive option (vs. one of the other three, more expensive options) as a function of store price image (between-subjects) and product category (within-subject) revealed that price image condition was a significant predictor of the option participants chose ($\chi^2(1) = 3.91$, $p < .05$), as was the product category ($\chi^2(3) = 25.30$, $p < .001$). In a second logistic regression, we added the interaction between product category and price image, which was found to not be significant ($\chi^2(3) = 1.07$, $p > .7$), suggesting that the predicted effect occurred consistently across product categories.

Discussion

This study demonstrates the influence of price image on preference between more or less expensive offerings in frequently purchased grocery categories. Consistent with a price image-based view of price evaluations, we found that participants were more likely to prefer less expensive options when they were shopping at high price image (vs. low price image) stores, despite the fact that the actual prices and products were held constant. Reference price accounts

would predict the opposite pattern (i.e., a stronger preference for less expensive options at the low price image store), while a simple context effect or extremeness aversion account would predict a preference for one of the middle options at both stores.

As an alternative explanation, our findings could be explained by differences in perceived quality of the options at stores with different price images. If consumers believe that a high price image store carries higher quality merchandise, then they may think that a comparable product provides higher quality at a high price image store. For example, consumers might infer that the most expensive item carried by the low price image store is comparable in quality to the cheapest item at the high price image store.

In Experiment 6, we used well-known national brands, which provide clear quality signals to minimize the potential for this alternative explanation. In order for this alternative explanation to hold, participants would have needed to believe that Prego pasta sauce purchased at one store was higher quality than Prego pasta sauce purchased at the same price at another store. In Experiment 7, we directly test this alternative, quality-based account, by using unfamiliar brands and collecting additional data on perceived quality and beliefs about price markups.

EXPERIMENT 7: THE PREFERENCE FOR LOWER PRICED ITEMS AT A HIGH PRICE IMAGE STORE IS DRIVEN BY BELIEFS ABOUT MARKUP NOT QUALITY

Method

Eighty-seven adults from a web-based subject pool were randomly assigned to one of two price image conditions (high vs. low). All participants were asked to imagine that they were on a road trip when their car had a blowout. Participants in the high [low] price image condition were told that the only nearby tire store had a reputation for having high [low] prices. In both conditions, the store carried two tires that would work as a replacement, a $59 Riken brand tire and a $47

Barum brand tire. After choosing one of the two tires, participants were asked to evaluate both prices on a seven-point scale. Finally, participants indicated their beliefs on nine-point scales about the quality of the tires (1 = tires are likely very low quality, 5 = tires are likely average quality, 9 = tires are likely very high quality) and the markup charged by the store (1 = store likely has very low markup, 5 = store likely has average markup, 9 = store likely has very high markup).

Results

Price evaluations. Evaluations were analyzed using a mixed-model ANOVA with price image condition (between-subjects) and tire brand (within-subject) predicting price evaluations. Unsurprisingly, participants rated the higher priced tire as more expensive than the lower priced tire (Table 1; $F(1,85) = 114.66$, $p < .001$). More important, and consistent with the findings of Experiments 1-4, participants evaluated the prices of both tires as significantly more expensive in the high price image condition than in the low price image condition ($F(1,85) = 10.64$, $p < .005$). The interaction between tire price ($59 vs. $47) and price image condition was not significant ($p > .35$), suggesting a consistent effect of price image across tire brands.

Choice. Consistent with the findings of Experiment 6, when participants were told that the store had a reputation for low prices, 23.3% chose the cheaper $47 replacement tire. In contrast, when participants were told that the store had a reputation for high prices, the choice share of the cheaper tire rose to 54.4% ($\chi^2(1) = 8.53$, p $< .005$).

Beliefs about price image. Participants in the high price image condition (those who were told the store had a reputation for high prices) believed the the tires were more likely to be high quality than did participants in the low price image condition (5.8 vs. 4.8; $F(1,85) = 15.93$, $p < .001$). Likewise, participants in the high price image condition also believed the store was more likely to charge a high markup (6.7 vs. 4.4; $F(1,85) = 45.64$, $p < .001$).

If the alternative, quality-inference account holds in this study, then choices should have been driven by differences in perceived quality of the store's offerings. On the other hand, if choice is a function of differences in price perceptions, as we propose, then choices should have been driven by beliefs about the degree to which the store marks up its merchandise, and not by perceived quality differences. Consistent with our price-perception account, beliefs about markups mediated the influence of price image on choice but beliefs about quality did not. Quality beliefs did not predict choice ($p > .35$), and the effect of the manipulation on choice remained significant when quality beliefs were included in the regression ($\beta = -1.20$, $t = -2.39$, $p < .05$), rendering the overall mediation not significant. In contrast, a mediation analysis examining the indirect effect of price image through beliefs about markup revealed that price image predicts choice ($\beta = -1.38$, $t = -2.92$, $p < .005$), price image predicts beliefs about markups ($\beta = 2.29$, $t = 6.76$, $p < .001$), and beliefs about markups predict choice ($\beta = -.33$, $t = -2.04$, $p < .05$). With beliefs about markups included in the model, price image is no longer a significant predictor of choice ($\beta = -.70$, $t = -1.24$, $p > .20$). Mediation was confirmed by a Sobel test ($Z = -1.93$, $p = .05$) and a bootstrap analysis (CI: [-1.97, -.01]; $p < .05$).

Discussion

This experiment provides further evidence that retailer price image influences both consumers' evaluations of prices and their preferences for higher or lower priced offerings within a choice set. Experiment 7 provides direct evidence to rule out a normative quality-based alternative account, by measuring participants' beliefs about the reasons for a store's price image. Although participants in the high price image condition were more likely to believe the merchandise was high quality than participants in the low price image condition, this difference in quality beliefs did not drive choice. Instead, choices were mediated by beliefs about price

differences, specifically, the extent to which the retailer marked up its merchandise. This suggests that, at least in this setting, participants were more motivated by a desire to avoid paying too much than by concerns about product quality.

PERSISTENCE OF PRICE IMAGE BELIEFS

Some of the earliest research on price image documented the fact that price image frequently diverges from price reality. For example, Brown (1969) found that the correlation between a retailer's price image and its actual prices ranged from 1 in some locations to 0 in others. More recently, upscale grocer Whole Foods has engaged in a concerted effort to correct what it insists is a common consumer misperception regarding its price image exemplified by the "Whole Paycheck" nickname. Whole Foods management insists that for comparable merchandise, its prices are not as high as its reputation, and investigations by independent journalists find some support for management's claims (Anderson 2011, Hamstra 2012). Yet despite such creative efforts as offering customers guided tours through its retail stores to point out low prices (Martin 2008), Whole Food's price image remains stubbornly higher than its actual prices.

Stickiness of inaccurate price images is difficult to account for with the prevailing bottom-up reference price theories. According to these theories, consumers should update their price beliefs based on comparing the prices they encounter to stable reference prices. If price evaluations consistently conflict with a retailer's price image (e.g., consumers see low prices at a store believed to have high prices) consumers should update their beliefs accordingly.

In contrast, the top-down price image heuristic account we propose predicts that inaccurate price images are likely to persist for two reasons. First, consistent with the findings of our earlier studies, prices may generally be evaluated as consistent with the retailer's price image—even when those prices are objectively inconsistent. The result is that consumers would be less inclined to correct

errant price image impressions because they would fail to code the inconsistent prices as, indeed, inconsistent. Second, to the extent that consumers use a price image heuristic to guide their decisions about whether to engage in additional price search, they may fail to seek out disconfirming price information in the first place. For example, when shopping at a low price image store, consumers may assume they are unlikely to find lower prices elsewhere and so not bother to look. We test these predictions about the drivers of sticky price image impressions in the following two studies.

EXPERIMENT 8: PRICE IMAGE INHIBITS LEARNING FROM EXPOSURE TO AN INCONSISTENT PRICE

Method

Participants were recruited from the decision lab of a large Midwestern university as well as on campus, for a total of 204 completed surveys. The study consisted of a control condition, in which participants estimated the price of a half-gallon carton of Tropicana orange juice at both Whole Foods and Jewel-Osco stores simultaneously (on the same page, presentation order counterbalanced), and four experimental conditions. In the experimental conditions, participants were shown a hypothetical price for the product at one store and estimated the price of the same product at the other store. We varied the amount of the price shown ($3.00 vs. $4.50) and which store was estimated (Whole Foods vs. Jewel-Osco) in a 2 x 2 between-subjects design. We collapsed the data in the control condition as the presentation order had no effect on estimates.

Results

In the control condition (joint estimation), participants estimated higher prices for Tropicana orange juice at Whole Foods than at Jewel-Osco ($4.09 vs. $3.28; $t(36) = 6.09$, $p < .001$). Thus, when estimating the price at both stores simultaneously, participants expressed the belief that Tropicana would cost, on average, $.81 more at Whole Foods than at Jewel-Osco.

In two of the experimental conditions, the prices presented were broadly consistent with the price expectations we elicited in the control condition ($4.50 at Whole Foods or $3.00 at Jewel-Osco). In these consistent information conditions, both top-down and bottom-up accounts would predict that the new information about the price at one store should not affect the estimated price at the other store, compared to the control condition. Our results were consistent with this prediction. When participants read about Tropicana costing $4.50 at Whole Foods, their price estimate for Tropicana at Jewel-Osco ($3.54) was similar to the price in the control condition ($3.28, $t(70) =$ 1.2, $p > .1$). After they read that Tropicana cost $3.00 at Jewel-Osco, their price estimate for Tropicana at Whole Foods ($3.96) was similar to the control condition ($4.09, $t(81) = .64$, $p > .1$).

In the other two experimental conditions, the prices presented ($3.00 at Whole Foods or $4.50 at Jewel-Osco) were *inconsistent* with the expectations consumers expressed in the control condition. In these inconsistent information conditions, bottom-up accounts predict that while the new information about the price at the first store may affect future price expectations for the product at that store, it should have little effect on the estimated price at the other store. In contrast, our top-down price image account predicts that consumers will interpret the given price as consistent with the store's price image, and will therefore generate price estimates at the second store based on the *differences* in the stores' price images. Our results were consistent with this prediction.

When participants read that Tropicana cost $3.00 at Whole Foods, their average estimate of Tropicana at Jewel-Osco was significantly lower than in the control condition ($2.88 vs. $3.28; $t(84) = 2.1$, $p < .05$). Thus, our data suggests that participants maintained their beliefs about relative differences in price across the two stores and reconciled the inconsistent price information by evaluating $3.00 as a relatively high price for Tropicana and adjusting downward their price expectations of Tropicana at Jewel-Osco. Correspondingly, participants who read that Tropicana

cost $4.50 at Jewel-Osco estimated a higher price at Whole Foods than the control condition estimate ($4.83 vs. $4.09; $t(72) = 3.12$, $p < .01$). Participants appear to have reconciled the inconsistently high price at Jewel-Osco by reasoning that the price must be even higher at Whole Foods, consistent with the difference in price images.

Discussion

These results imply that when consumers do not have stable reference prices, they update their price expectations for other stores to be internally consistent with the relative price image. One implication of this finding is that price changes alone, in the absence of stable reference prices, may be an ineffective means of changing the price image of a store. Thus, when Whole Foods simply lowers it prices, consumers may continue to assume the prices are high, and perceptions of the store as expensive may be slow to change. Instead, for a high price-image store to induce consumers to update their perceived price image may require that the retailer provide a reference price, such as direct price comparisons with lower price-image stores. Similarly, low price-image stores may be shielded from changes in price image when raising prices, to the degree that customers either do not invest time in directly comparing the prices to other stores or find it difficult to do so.

It's important to note that there were bounds on the degree to which participants adjusted their estimates in order to accommodate inconsistent price information. In the consistent price conditions, the implied differences in prices of the orange juice across stores were indistinguishable from the control condition ($\Delta = \$.96$ when Whole Foods price shown, $\$.96$ when Jewel Osco price shown vs. $\$.82$ in the control; all p's $> .40$). However, in the inconsistent price conditions, the implied differences were smaller than in the control condition ($\Delta = \$.12$ when Jewel Osco shown vs. $\$.82$ in the control: $t(84) = 4.4$, $p < .001$; $\Delta = \$.33$ when Whole Foods

shown vs. \$.82 in the control: $t(72) = 2.5$, $p < .05$). It appears that participants were reluctant to provide estimates outside of a fairly broad range of plausible prices.

The degree to which consumers who see the price of a given product in one store are motivated to search for the prices of that product at other stores will be a critical factor in updating their price image. The next study investigates how in-store price image cues can affect the likelihood of searching for direct price comparisons at a competing store.

EXPERIMENT 9: A STORE'S VISUAL CUES OF LOW PRICE IMAGE INHIBIT SEARCH FOR LOWER PRICES AT COMPETING STORES

Method

We collected 185 complete surveys from adults in an Internet panel. Participants were shown one of two pictures of a store, taken from a similar angle above the sales floor (see Web Appendix B). One picture depicted a high-end grocery store, the other a warehouse store. Participants were told to imagine that they were in the store pictured and planned to buy 10 half-gallon cartons of Tropicana orange juice for a picnic. They were told that the juice cost \$3.50 per carton at this store but that there was another store, a BigSave supermarket, across the street. They were asked to rate their likelihood of checking the price at the competing supermarket and their likelihood of buying at the pictured store versus at the BigSave store, on five point scales. They also estimated the price of Tropicana at the pictured store and at BigSave, indicated whether or not they expected BigSave to have lower prices than the pictured store, and rated whether the pictured store would have lower or higher prices than an average store (on a five point scale). Half of the participants were asked to estimate the price of a carton of Tropicana orange juice at a "typical store" before seeing the picture and reading the scenario, while the other half of the participants made the estimate at the end of the task.

Reference price accounts would imply that whether or not people search for a lower price at a

competing store after seeing the same price at one of two stores should depend primarily on the actual price and not on any price image cues. If consumers sufficiently value the transaction utility associated with the higher-end retailer, the listed price is more likely to fall below their maximum willingness to pay at the high-end store than would the same price at the low-end store. Assuming that encountering a higher price than the store-specific reservation price prompts search for alternatives, they would then be *less* likely to search at a competing store after seeing a price at the high-end store than if they saw the same price at a low-end store. In contrast, we argue that when people rely on price image, the same price at high price image stores will be seen as more expensive, yielding a *higher* likelihood of searching at a competing store.

Results

Price estimates and price search. Participants' reactions to the $3.50 price were markedly different, depending on the picture of the store they saw. As expected, the warehouse-picture store was rated as more likely to have lower prices (compared to an average store) than was the upscale-picture store (1.9 vs. 3.5; $t(183) = 12.1, p < .001$). While the other store (BigSave) was described in exactly the same way in all conditions, after seeing the low price-image picture (vs. high price image picture) of the focal store, fewer participants expected the nearby competitor BigSave to have lower prices than the store shown in the picture (39% vs. 97%; $\chi^2 = 71.1, p < .001$).

Likewise, participants' quantitative estimates for the price of a carton of Tropicana orange juice at BigSave were higher after seeing the picture of the up-scale grocer than after seeing the picture of the warehouse store ($3.12 vs. $2.86; $t(183) = 2.84, p < .01$). These differences in price beliefs, in turn, increased the stated likelihood of both checking the price at the competing BigSave store across the street (2.7 vs. 3.3; $t(183) = 2.7, p < .01$) and buying the Tropicana juice there (2.5 vs. 3.1; $t(183) = 3.7, p < .001$), after viewing the high (vs. low) price image store.

Mediation. These results suggest that showing a less expensive-looking interior picture of the focal store decreased the price image of the focal store, which increased the estimated price at Big Save relative to the $3.50 price at the focal store, which in turn reduced consumers' intent to check prices at BigSave and purchase there. Consistent with this interpretation, bootstrap mediation analyses confirmed a significant indirect effect of the focal store picture manipulation on both intent to check prices at BigSave ($\beta = .15$, CI $= [.04,.29]$, $p < .01$) and on intent to buy at BigSave ($\beta = .11$, CI $= [.03,.21]$, $p < .01$), via the effects of the manipulation on focal store price image and of focal store price image on BigSave estimated price.

Alternative explanations. We confirmed that the store picture presented had no effect on either rated quality of Tropicana juice at that store or on the rated importance of price as a factor in deciding where to shop for groceries ($ps > .1$). In additional analyses, we tested for potential moderators of the effect of the price image manipulation (the picture shown) on intentions to check the price at the other store (BigSave) and to buy there. Our results are robust to the time participants spent on the survey, gender, mood, price sensitivity, the tendency to plan purchases, frequency of shopping and self-rated knowledge of prices.

One interpretation of these findings is that participants do have stable reference prices, but are either forgetting to use or choosing not to use their beliefs about the distribution of prices. If that's the case, then helping participants realize that they should compare their known distribution of prices with the price they see at the specific store should reduce the effect. However, we find that asking participants to first think about the price of orange juice does not debias the effect overall. Half of the participants were asked to estimate the price of a carton of Tropicana orange juice at a typical store before encountering the manipulation. We find that making these initial estimates did not significantly moderate any of the results.

Discussion

Experiment 9 shows that low price image beliefs, in particular, can inhibit the motivation to acquire new information that could potentially correct errors in price image beliefs. These findings suggest that once a consumer has settled on a price image impression, even for a store they have just encountered and about which they have little objective information, they may use this impression to guide decisions on purchase likelihood and price search—even affecting the believed likelihood of finding lower prices at an unfamiliar store.

GENERAL DISCUSSION

The overwhelming consensus among behavioral researchers studying price is that consumers evaluate prices by comparing the number they see on the shelf with a reference price. If the price is lower than the reference, then it is evaluated as low, favorable, fair or attractive. If the price is higher than the reference, it is high, unfavorable, unfair or unattractive. As useful as reference price theories have proven in explaining consumer behavior, they all rely on a central assumption that is likely to not always hold: that consumers have an accessible, stable reference price against which to make comparisons.

The research presented in this article advances an alternative approach to price evaluations, one not based on reference prices but based on retailer price image. We identified four domains in which a price image account results in different – and even opposite – predictions from those derived using prevailing reference price theories. Across domains, we demonstrated novel findings that are consistent with the use of a top-down price image heuristic to make inferences, but that could not be accounted for using bottom-up reference price models. In fact, some reference price theories predict effects in the opposite direction to our results (Biswas and Blair 1991; Mazumdar, et al. 2005; Thaler 1985). Our findings were robust across a variety of

different price image manipulations: different stores with existing price image differences (Experiments 1, 3, 4, 5, 6, and 8), the same store with a different salient set of competitors (Experiment 2), hypothetical stores with a stated explicit price image (Experiment 7), and stores identified with nothing but a picture of the interior (Experiment 9).

Our goal in this paper is not to argue against reference price models, but rather to propose and document an alternative, category-based inferential process for situations in which consumers do not have an available reference price. We have argued that consumers use price image cues to reason about prices when they do not have ready access to a well-articulated reference price. Thus, we propose that price image serves as an inferior (but potentially prevalent) substitute for reference prices. We expect that consumers will favor specific category-, brand-, or option-level reference prices over the more aggregate, retailer-level price image when both are available and equally salient. Experiments 3 and 4 empirically support the notion that reference prices, when available, supersede the use of a price image heuristic. Thus, our price image account provides an important and necessary complement to reference price theories.

Particularly since reference price models generally constitute a behavioral departure from rational choice, it is important to highlight that our price image account is not merely a return to normative reasoning in the absence of reference prices. While category-based inference may often be beneficial for making better price judgments, the use of price image is still a heuristic that can be prone to over-generalization. Consistent with this distinction, many of our results are difficult to reconcile with a parsimonious normative account (e.g., the effect of manipulated price image in Study 2, order effects shown in Study 5, shifts in choice unexplained by quality inferences in Study 7, and the asymmetric effect of store décor on search preferences in Study 9).

This article makes several contributions to the theory and practice of price image management.

Our identification of the link between price image and brand choice may provide an important tool for researchers and managers looking to investigate changes in price image using purchase data. To date there has been remarkably little research on price image using statistical models of purchase data (though see Van Heerde, et al. 2008 for an exception), especially when compared to the robust stream of research on reference prices. Part of the reason for this may be that the preferred dependent measure for investigating changes in price image is store choice (e.g., Bell and Lattin 1998; Singh, Hansen and Blattberg 2006), and given all the factors involved in deciding to switch stores, customer defections may not be a very sensitive outcome measure of price image changes. The research presented in this paper suggests that changes in brand choice may serve as an alternative means of measuring changes in price image. To illustrate, if a retailer's price image increases over time (i.e. becomes more expensive-seeming), our findings suggest that the same consumers may begin to purchase less expensive items from the store's assortment. Thus, by using changes in a household's purchase patterns across time as a starting point, future research may be able to use statistical models to increase our knowledge of what factors influence price image.

The research in this article also contributes to the reference price literature by suggesting a new relationship between price images and reference prices. We propose that once a consumer has evaluated a price based on price image, she may use this evaluation to infer a reference price. Returning to the illustration we used in the introduction, a consumer who sees a bottle of wine selling for $32 at a high price image store could deduce that $32 is a high price for this bottle of wine. Based on this conclusion, the consumer could then back-out an inferred reference price using the following logic: If $32 is a high price, then I should expect the market price to be somewhat lower, perhaps closer to $28. This proposed process takes the typical assumptions about the relation between reference prices, price evaluations, and price images and reverses the

directionality. Reference price theories are bottom-up, typically beginning with the assumption of a pre-formed reference price, which consumers use to evaluate the prices they encounter. These price evaluations are subsequently aggregated and combined with other information to form a price image of the retailer. In contrast, we propose that when a reference price is not readily available, consumers may start with a pre-formed price image and use that price image to infer whether encountered prices are high or low. These price evaluations can then be used to construct more general reference prices. Thus, whereas previous research has assumed a bottom-up process that starts with a reference price and ends with a price image (i.e., reference price → price evaluation → price image), we propose a top-down inferential approach in which consumers may start with a price image and end with a reference price (i.e., price image → price evaluation → reference price).

The findings in this article also have important implications for retailers seeking to understand and manage their price images. First, our research helps explain why price image can remain stubbornly divergent from actual price levels (Brown 1969), by revealing the perverse effect of a store's price image. As shown in Experiment 9, when a store perceived as high priced and a store perceived as low priced offer the same product for sale at the same price, consumers' reactions can be very different. At the high price-image store, shoppers behave as if the price is high and therefore assume they could get a better deal at a competing store. At the low price-image store, shoppers believe the same price is a low price. This suggests that stores with a high price-image are in some sense stuck – it may be more difficult for them to convince shoppers that an actual low price really is as cheap as it is. Conversely, stores with a low price-image enjoy the benefit of doubt, such that even a relatively high price will still be assumed to be a good deal by many of their less informed customers, reducing the motivation to search further.

A corollary of this point is that retailers who are seeking to change their price image face an uphill battle. The most intuitive way for a retailer to lower its price image is simply to lower its prices. However, our findings suggest that this intuitive strategy is unlikely to work in many cases. As we have shown, a consumer shopping at a high price image store is likely to assume the prices are high, even if they are not. Thus, a high price image retailer that wishes to lower its price image by lowering prices, may simply be giving away margin without convincing consumers that their prices are, in fact, low. Our findings suggest that such price reductions may need to be accompanied by other cues that help consumers interpret these prices, such as direct price comparisons with other stores, as well as non-price signals of price image, such as store décor. In the absence of such additional cues, stores with high price images might as well charge high prices: consumers are likely to assume their prices are high regardless.

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TABLE 1

EXPERIMENT 6: A LESS EXPENSIVE OPTION IS MORE PREFERRED AND PRICE

EVALUATIONS ARE HIGHER AT A HIGH PRICE IMAGE STORE

Store price image	Relative choice share of less expensive tire	Price evaluations		Perceived quality relative to other stores	Perceived markup relative to other stores
		$47 tire	$59 tire		
High	54.4%	3.4	4.4	5.8	6.7
Low	23.3%	2.5	3.3	4.8	4.4

NOTE.—Price evaluations were measured on a seven-point scale with 1 = very low and 7 = very high. Perceived quality and perceived markup were measured on nine-point scales with 1 = very low, 5 = about the same as other stores, and 9 = very high.

FIGURE 1

EXPERIMENT 5: ORDER EFFECTS IN PRICE ESTIMATES ACROSS STORES
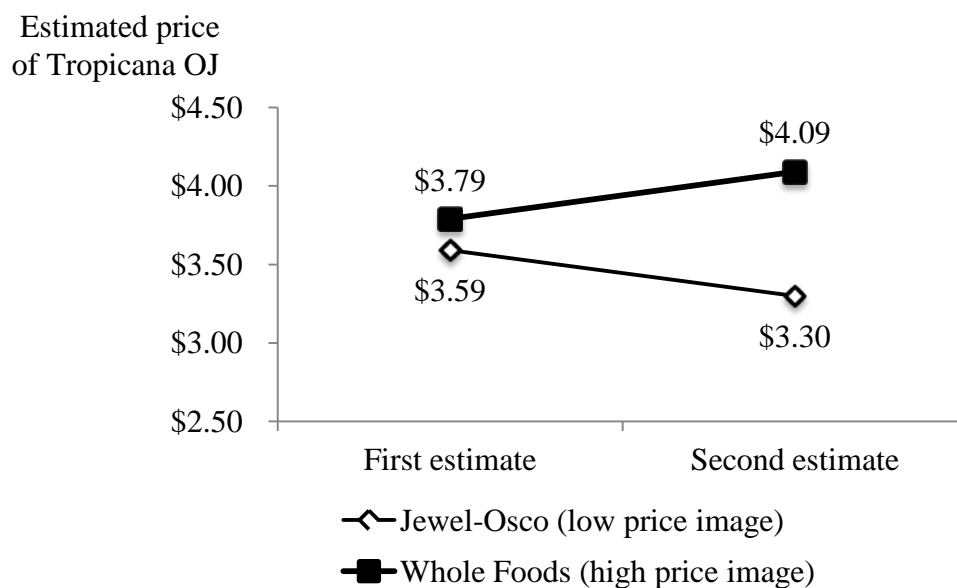
FIGURE 2

THE INFLUENCE OF PRICE IMAGE ON PREFERENCE FOR MORE OR LESS

EXPENSIVE OFFERINGS

(1)

Consumer's preference for
a moderately priced option

Subjective
evaluation

Low   High

$14.99 $21.99 $27.99

(2)

Consumer's preference for
a moderately priced option

Subjective
evaluation

Low   High

High price
image store

$14.99 $21.99 $27.99

(3)

Consumer's preference for
a moderately priced option

Subjective
evaluation

Low   High

Low price
image store

$14.99 $21.99 $27.99
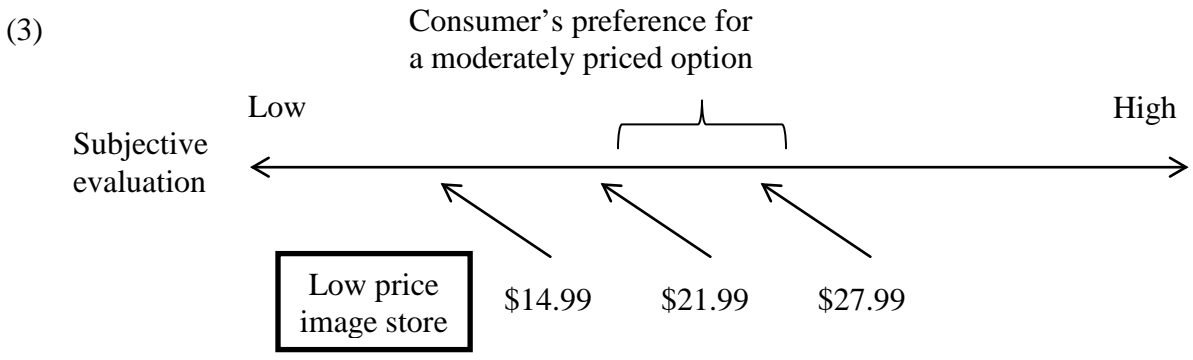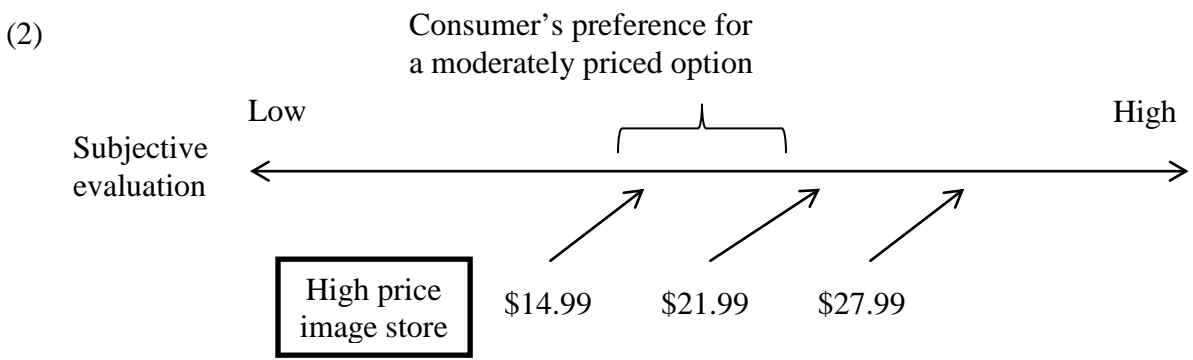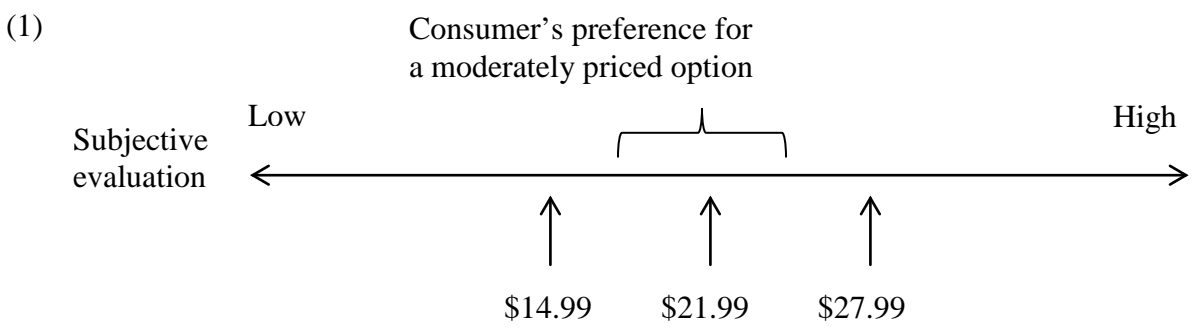
WEB APPENDIX A

EXPERIMENT 6: STIMULI

(A)

(B)

You find the following brands of pasta sauce at Walmart. Which option would you choose?

NOTE.—Participants were first asked to indicate which of the nine regional and national grocery chains shown in panel (A) had the lowest prices and which had the highest prices for groceries. They were then shown four options in each of four categories, as depicted in panel (B): frozen pizza: Jack's ($6.99), Home Run Inn ($7.19), Tombstone ($7.39), and DiGiorno ($7.59); pasta sauce: Prego ($3.09), Ragu ($3.29), Barilla ($3.49), and Newman's Own ($3.69); maple syrup: Log Cabin ($3.39), Hungry Jack ($3.59), Aunt Jemima ($3.79), and Mrs. Butterworth's ($3.99); and tuna: 3 Diamonds ($.69), Bumble Bee ($.89), Chicken of the Sean ($1.09), and StarKist ($1.29).

WEB APPENDIX B

EXPERIMENT 9: PRICE IMAGE STIMULI

(A) Picture of a High Price Image Store

(B) Picture of a Low Price Image Store

WEB APPENDIX C:

SUPPLEMENTAL STATISTICAL RESULTS

Table 1: Regression of Retailer on Price Evaluation (Experiment 1)

Source	β	Std Error	Std β	t	_p_
Constant	3.74	.19		19.57	.000
Retailer	.58	.26	.25	2.22	.029

Table 2: Regression of Retailer on Price Image Rating (Experiment 1)

Source	β	Std Error	Std β	t	_p_
Constant	2.63	.22		12.25	.000
Retailer	2.62	.29	.72	8.92	.000

Table 3: Regression of Retailer and Price Image Rating on Price Evaluation (Experiment 1)

Source	β	Std Error	Std β	t	_p_
Constant	3.20	0.33		9.77	.000
Retailer	0.04	0.37	0.02	0.10	.918
Price Image Rating	0.21	0.10	0.33	2.03	.046

Table 4: Regression of Competitor Retailer on Price Evaluation (Experiment 2)

Source	β	Std Error	Std β	t	_p_
Constant	4.33	.33		13.29	.000
Competitor Retailer	-1.11	.46	-.38	-2.41	.022

Table 5: Regression of Competitor Retailer on Price Image Rating (Experiment 2)

Source	β	Std Error	Std β	t	_p_
Constant	4.17	0.22		18.79	.000
Competitor Retailer	-0.89	0.31	-0.44	-2.83	.008

Table 6: Regression of Competitor Retailer and Price Image Rating on Price Evaluation (Experiment 2)

Source	β	Std Error	Std β	t	p
Constant	0.89	0.92		0.96	.343
Competitor Retailer	-0.38	0.43	-0.13	-0.87	.388
Price Image Rating	0.83	0.21	0.58	3.90	.000

Table 7: Regression of the Interaction between Retailer and Reference Price (None vs. High/Low) Predicting Price Evaluation (Experiment 4)

Source	β	Std Error	Std β	t	p
Constant	3.58	0.19		18.76	.000
Retailer	0.74	0.27	0.29	2.75	.006
Reference Price Salient	0.49	0.23	0.18	2.09	.037
Retailer x Reference Price Salient	-0.74	0.33	-0.28	-2.26	.025

Table 8: Regression of Retailer on Price Evaluation (High/Low Salient Reference Price conditions, Experiment 4)

Source	β	Std Error	Std β	t	p
Constant	4.07	0.14		28.96	.000
Retailer	-0.01	0.20	0.00	-0.03	.975

Table 9: Regression of Retailer on Price Evaluation (No Salient Reference Price condition, Experiment 4)

Source	β	Std Error	Std β	t	p
Constant	3.58	0.16		22.33	.000
Retailer	0.74	0.23	0.33	3.27	.002

Table 10: Regression of Retailer on Price Image Rating (No Salient Reference Price condition, Experiment 4)

Source	β	Std Error	Std β	t	p
Constant	2.55	0.16		16.31	.000
Retailer	2.21	0.22	0.74	10.02	.000

Table 11: Regression of Retailer and Price Image Rating on Price Evaluation (No Salient Reference Price condition, Experiment 4)

Source	β	Std Error	Std β	t	p
Constant	2.61	0.29		8.91	.000
Retailer	0.01	0.30	0.01	0.04	.968
Price Image Rating	0.35	0.10	0.50	3.48	.001

Table 12: Mixed-model Logistic Regression of Retailer and Product Predicting Choice of Least Expensive Option (Experiment 6)

Source	β	Std Error	Wald	p
Constant	1.64	0.31	28.61	.000
Low vs. High Price Image Retailer	-0.57	0.29	3.91	.048
Product = Pasta	-1.32	0.28	21.92	.000
Product = Pizza	-0.56	0.27	4.24	.040
Product = Syrup	-0.96	0.26	13.32	.000

Table 13: Mixed-model Logistic Regression of Retailer and Product and Their Interaction Predicting Choice of Least Expensive Option (Experiment 6)

Source	β	Std Error	Wald	p
Constant	1.74	0.41	18.10	.000
Low vs. High Price Image Retailer	-0.74	0.51	2.10	.147
Product = Pasta	-1.53	0.45	11.71	.001
Product = Pizza	-0.78	0.45	3.05	.081
Product = Syrup	-0.90	0.37	5.87	.015
Retailer * Product = Pasta	0.35	0.58	0.38	.540
Retailer * Product = Pizza	0.36	0.56	0.42	.519
Retailer * Product = Syrup	-0.11	0.52	0.04	.839

Table 14: Binary Logistic Regression of Retailer on Choice of Cheaper Option (Experiment 7)

Source	β	Std Error	Wald	p
Constant	1.19	0.36	10.94	.001
Retailer	-1.38	0.47	8.53	.003

Table 15: Regression of Retailer on Quality Beliefs (Experiment 7)

Source	β	Std Error	Std β	t	p
Constant	4.81	0.18		26.31	.000
Retailer	1.03	.26	.40	3.99	.000

Table 16: Binary Logistic Regression of Retailer and Quality Beliefs on Choice of Cheaper Option (Experiment 7)

Source	β	Std Error	Wald	p
Constant	2.09	1.05	3.93	.047
Retailer	-1.20	0.50	5.73	.017
Quality Beliefs	-0.18	0.20	0.84	.359

Table 17: Regression of Retailer on Markup Beliefs (Experiment 7)

Source	β	Std Error	Std β	t	p
Constant	4.42	0.24		18.36	.000
Retailer	2.29	0.34	0.59	6.76	.000

Table 18: Binary Logistic Regression of Retailer and Markup Beliefs on Choice of Cheaper Option (Experiment 7)

Source	β	Std Error	Wald	p
Constant	2.74	0.88	9.74	.002
Retailer	-0.70	0.57	1.53	.216
Markup Beliefs	-0.33	0.16	4.13	.042

Table 19: Regression of Picture Manipulation on BigSave Purchase Intent Rating (Experiment 9)

Source	β	Std Error	Std β	t	p
Constant	2.54	0.11		22.34	.000
Focal Store Picture	0.59	0.16	0.26	3.68	.000

Table 20: Regression of Picture Manipulation on BigSave Price Image Rating (Experiment 9)

Source	β	Std Error	Std β	t	p
Constant	3.54	0.10		36.62	.000
Focal Store Picture	-1.66	0.14	-0.67	-12.10	.000

Table 21: Regression of Picture Manipulation on BigSave Predicted Price (Experiment 9)

Source	β	Std Error	Std β	t	p
Constant	3.12	0.07		48.11	.000
Focal Store Picture	-0.26	0.09	-0.21	-2.84	.005

Table 22: Regression of Picture Manipulation and BigSave Price Image Rating on BigSave Predicted Price (Experiment 9)

Source	β	Std Error	Std β	t	p
Constant	2.70	0.19		14.60	.000
Focal Store Picture	-0.06	0.12	-0.05	-0.51	.610
BigSave Price Image Rating	0.12	0.05	0.24	2.45	.015

Table 23: Regression of Picture Manipulation, BigSave Price Image Rating and BigSave Predicted Price on BigSave Purchase Intent (Experiment 9)

Source	β	Std Error	Std β	t	p
Constant	5.43	0.43		12.60	.000
Focal Store Picture	-0.11	0.19	-0.05	-0.59	.558
BigSave Price Image Rating	-0.34	0.08	-0.38	-4.32	.000
BigSave Predicted Price	-0.54	0.12	-0.31	-4.61	.000

Table 24: Regression of Picture Manipulation on BigSave Price Search Intent (Experiment 9)

Source	β	Std Error	Std β	t	p
Constant	2.68	0.15		17.54	.000
Focal Store Picture	0.59	0.22	0.20	2.75	.007

Table 25: Regression of Picture Manipulation, BigSave Price Image Rating and BigSave Predicted Price on BigSave Price Search Intent (Experiment 9)

Source	β	Std Error	Std β	t	p
Constant	6.11	0.60		10.22	.000
Focal Store Picture	-0.13	0.27	-0.04	-0.48	.631
BigSave Price Image Rating	-0.32	0.11	-0.27	-2.93	.004
BigSave Predicted Price	-0.74	0.16	-0.31	-4.53	.000