This is a post-peer-review, pre-copyedit version of an article published in


The final authenticated version is available online at:

https://doi.org/10.1007/s11747-019-00716-z
Cheaper and smaller or more expensive and larger: How consumers respond to unit price increase tactics that simultaneously change product price and package size

JUN YAO*,

HARMEN OPPEWAL,

DI WANG

Jun Yao (corresponding author), PhD, is a Lecturer in the Department of Marketing of the Macquarie Business School, Macquarie University, Balaclava Road, North Ryde, NSW 2109, Australia (email: jun.yao@mq.edu.au, telephone: +61 2 9850 8489);

Harmen Oppewal, PhD, is a Professor of Marketing in the Department of Marketing of the Monash Business School, Monash University, PO Box 197, Caulfield East, VIC 3145, Australia (email: harmen.oppewal@monash.edu, telephone: +61 3 9903 2360);

Di Wang, PhD, is a Lecturer in the School of Advertising, Marketing and Public Relations of the QUT Business School, Queensland University of Technology, 2 George Street, Brisbane, QLD 4000, Australia (email: di.wang@qut.edu.au, telephone: +61 7 3138 7632).

Acknowledgments: The authors would like to thank the editor, area editor, and reviewers for their invaluable feedback and guidance throughout the revision process. The authors would also like to thank Hyun Seung Jin and Yi Li for their helpful comments on earlier drafts of the article.
Abstract
To increase the unit price of a product, marketers of packaged groceries generally either raise
the retail price or reduce the package size. We describe two unit price increase tactics in
which the retail price and package size of a product simultaneously increase or decrease. Five
studies, including a field study conducted in a grocery store, show that when unit price
information is available, consumer decisions are influenced more by changes in both retail
price and unit price than by changes in package size. Consumers thus respond more favorably
to simultaneous decreases than to simultaneous increases. We further show that when unit
price information is unavailable, consumers focus on the observed retail price increase for
simultaneous increases, whereas they tend to estimate the unit price increase for simultaneous
decreases. Since both forms of processing result in the cognition of an increase in “price,”
consumers respond similarly to the two tactics.

Keywords: Pricing tactics; Unit pricing; Simultaneous changes; Automatic and controlled
processing; Package downsizing; Grocery shopping
Consumers are generally sensitive and averse to price increases. However, to maintain and improve profitability, it may be unavoidable for a firm to increase its product prices, for example, due to inflationary issues or increased costs. When they are required to increase the unit prices of their products, marketers of packaged groceries commonly rely on two tactics: they either (1) raise the retail price without altering the package size or (2) reduce the package size without changing the retail price (Kachersky 2011). Both practices are important and prevalent in consumer packaged goods markets. However, consumer advocates often dispute both tactics, particularly the latter tactic, which is also known as “The Grocery Shrink Ray” (Northrup 2017) (see Web Appendix A for examples of price–size tactics).

One additional way to increase the unit price of a product is to change both the retail price and the product size simultaneously and in the same direction but at disproportional rates. We conceptualize and distinguish between two tactics: one where price and size simultaneously increase but the price increase is greater in magnitude than the size increase, and one where price and size simultaneously decrease but the size decrease is greater in magnitude than the price decrease. For example, for a product priced at $10.00 for 1 liter, a price increase of 15% combined with a volume increase of 10% results in a new retail price of $11.50 for 1.1 liters, or $10.45 per liter, representing a 4.55% increase in unit price. This increase in unit price can also be achieved by combining a price decrease of 10% with a size decrease of 13.92% (the new retail price will be $9.00 for 861 mL, or $10.45 per liter).

Simultaneous changes in price and package size appear less common in the marketplace than single price increases or single size decreases (i.e., package downsizing), and to the best of our knowledge, they have received limited to no media attention. One example of simultaneous changes can be found in Nielsen Homescan data (reviewed in Çakır and Balagtas 2014). It was reported that from 2001 to 2002, Breyers decreased its “half-gallon” ice cream average package size from 63.07 to 57.02 ounces (a 10% decrease) while at
the same time reducing its price from $3.44 to $3.20 (a 7% decrease). These changes resulted in an increase in its unit price from $0.054 to $0.056 (a 3% increase). Thus, simultaneous changes in price and packaging size are of great practical importance to price competition and product profitability; however, they have not been addressed in the literature.

Apart from the direction of change, another important factor influencing consumer responses to simultaneous changes is the role of the unit price. It has been shown that the presence of unit prices increases consumer price sensitivity (Yao and Oppewal 2016a). Hence, in addition to explicitly informing consumers of changes in value, the presence of unit prices is likely to drive consumers to process changes in both retail price and unit price over changes in package size. We propose that the joint effect of changes in retail price and unit price results in more positive perceptions of value and higher purchase intentions for simultaneous decreases than for simultaneous increases.

In contrast, when unit prices are not available, consumer processing of simultaneous changes is likely to focus on identifying the effective change in value. We propose that in the absence of unit prices, consumers adopt different cues to identify the value change. Specifically, in the simultaneous increases condition, consumers tend to engage in more automatic processing as they focus on the observed retail price increase, thereby discounting the corresponding size increase. In the simultaneous decreases condition, consumers tend to engage in more controlled processing as they estimate the change in unit price, thereby taking both the retail price decrease and the package size decrease into account. As both forms of processing result in the cognition of an increase in “price,” consumer responses are similar between the two conditions.

In establishing these effects and their boundary conditions, this work joins an emerging research stream examining consumer responses to various price–size tactics. In particular, we focus on the situation where the price or size changes are relatively small. This
is a managerially relevant scope because in real market situations, the typical range for price increases and package downsizing of packaged consumer goods is between 5% and 20% (Çakır and Balagtas 2014; Gupta et al. 2007; Yonezawa and Richards 2016).

**Conceptual background**

**Consumer responses to price increases**

Consumers are generally averse to price increases and fond of price decreases. It is noteworthy that consumers have been found to react more negatively to price increases than positively to price decreases (Hardie et al. 1993; Kalwani et al. 1990; Mayhew and Winer 1992). This is because while magnitudes of price changes are perceived independently of their directions (e.g., a 10% price change is perceived to be similar in magnitude for an increase and a decrease), consumers have lower reaction thresholds for price increases than for price decreases, making them more sensitive to the former than the latter (Cheng and Monroe 2013).

While price increases are generally undesirable to consumers, they are sometimes unavoidable for firms in order to retain and improve their profitability in times of inflation or increased labor costs (Marn and Rosiello 1992). Moreover, for high-end products, price increases may be advisable to signal a premium brand image (Homburg et al. 2005). Since price increases may lead to negative consequences for a firm—such as reduced consumer within- and cross-category spending (Janakiraman et al. 2006), boycotts (Sen et al. 2001), and lower consumer perceived trust, price fairness and repurchase intentions (Grewal et al. 2004)—a range of tactics are implemented to alleviate the negative effects of price increases. These include framing a price increase in absolute terms rather than in percentage terms (Homburg et al. 2010), presenting a single larger price increase (e.g., $900) rather than multiple smaller increases (e.g., $750 + $150) (Mazumdar and Jun 1993), using a series of
percentage increases (e.g., 30% + 25%, which together tends to be perceived as 55%) rather than a single equivalent real net increase (62.5%) (Chen and Rao 2007), associating price increases with a company’s donations to charity (Koschate-Fischer et al. 2016), increasing prices based on the timing of a purchase (e.g., buying a ticket later) rather than on consumer identification (e.g., being a frequent flyer or a new consumer) (Grewal et al. 2004), and, last but not least, downsizing packages (Çakır and Balagtas 2014). Table 1 provides an overview of relevant price increase literature.

In essence, prior research investigating consumer responses to price increases has exclusively focused on changes in a single attribute at a time, examining either increases in retail price or decreases in package size. No research effort has been devoted to understanding the effects of changing price and size together. The lack of research on this topic is remarkable, as it appears that mixing in a small increase in product size may help mitigate the negative effect of a raise in price and that mixing in a small reduction in price may help mitigate the negative effect of a reduction in product size. These effects are in line with the “silver lining effect” (Thaler 1985), whereby a mixed outcome consisting of a small gain and a larger loss is perceived more favorably than a net outcome consisting of a smaller loss. Consequently, consumers should respond more favorably to tactics changing two attributes than to tactics changing a single attribute.

**Consumer responses to simultaneous changes in price and size**

Household panel data (Çakır and Balagtas 2014) suggest that consumers are more responsive to retail price increases than to package downsizing. This is possibly because consumers do not consciously notice decreases in size as much as increases in price (Kachersky 2011).
Gourville and Koehler (2004) argue for a greater sensitivity to price than to size and attribute this heightened sensitivity to an anchoring and adjustment process: consumers fully adapt to changes in price but inadequately adapt to changes in size.

For conditions where price and size change simultaneously, a similar dominance of price may be expected. Due to the greater complexity of the changes, the role of the unit price may become even more important. The presence of unit prices makes the effective changes in value transparent. Moreover, displaying unit prices has been shown to increase consumer price sensitivity because it highlights the “cost role” of price in decision making (Yao and Oppewal 2016a). The presence of unit price information not only explicitly reveals the increase in unit price but also motivates consumers to focus more on the cost aspect (i.e., price) and less on the benefit aspect (i.e., size) of the changes to the product. Due to this motivation, consumer decisions tend to be influenced more by both the change in retail price and the change in unit price than by the change in package size. Consequently, a decrease in retail price combined with an increase in unit price has a higher net effect on value perceptions than an increase in retail price combined with an increase in unit price. Therefore, we predict that consumers respond more favorably to a unit price increase when it is implemented as simultaneous decreases in price and size than when it is implemented as simultaneous increases in price and size. As such, we propose the following:

**H1:** Relative to simultaneous increases in price and size, simultaneous decreases in price and size lead to (a) higher value perceptions and (b) higher purchase intentions.

**H2:** The effect of simultaneous decreases (relative to simultaneous increases) in price and size on purchase intentions is mediated by value perceptions.
In addition, this greater sensitivity to simultaneous decreases in price and size is expected to be enhanced for consumers who have high levels of price consciousness (Lichtenstein et al. 1993). This is because they are more concerned about the costs of products and are keener to pay low prices. Therefore, we propose the following:

\[ H3: \text{The effect of simultaneous decreases (relative to simultaneous increases) in price and size on purchase intentions is moderated by price consciousness (through value perceptions); specifically, the effect is stronger for consumers with a high than for those with a low level of price consciousness.} \]

The role of unit pricing

The unit price is the price per standard size, for example, the price in dollars per liter. Providing consumers with unit prices (i.e., unit pricing) allows consumers to easily identify the value of competing products and make informed purchases (Aaker and Ford 1983), hence reducing their grocery expenditure (Isakson and Maurizi 1973; Russo et al. 1975). Currently, grocery retailers in most developed countries are required to display unit prices on price tags.

As a transparent indicator of the “real” product cost, unit prices are particularly useful for consumers to cope with pricing tactics such as quantity surcharges (i.e., a larger package comes with a higher unit price than a smaller package of the same brand; Manning et al. 1998) and conflicting price positions between the retail price and the unit price (Yao and Oppewal 2016b). Consumers also use unit prices as a diagnostic cue to infer product quality (Yan et al. 2014) and store price image (Roth et al. 2017). In addition, as noted earlier, unit prices increase consumer price sensitivity by elevating the salience of price in decision making (Yao and Oppewal 2016a), thus inspiring consumers to choose lower unit priced products. Web Appendix B provides an overview of relevant unit pricing literature.
While we have discussed the role of unit pricing in affecting consumer responses to simultaneous changes in price and size, a pertinent question is whether this pattern is applicable when unit prices are not provided. This factor is managerially relevant because in some countries and occasions (e.g., online), grocers are not obligated to display unit prices, and a considerable portion of consumers do not consciously check unit prices when shopping for groceries (Mitchell et al. 2003). This situation may also provide theoretical insights since consumers may process simultaneous changes differently from the situation where unit prices are present. When unit prices are absent, the real change in value is not straightforward, and consumers may adopt other processing strategies to cope with the decision problem.

Consumers have difficulty accurately calculating unit prices (Bagchi and Davis 2012; Friedman 1972); thus, in simultaneous change contexts, unit price changes are presumably hard to calculate precisely. For example, a change in product price and size from $3.67/340 mL to $3.36/300 mL implies a unit price increase from $10.79 to $11.20 per liter, but assessing this change requires effortful mental or externally assisted calculation.

Based on this, we propose that due to people’s inability to precisely compute the change in unit price, they may process simultaneous increases and simultaneous decreases differently. Cognitive processing can be divided into two distinct categories: automatic (nonconscious) and controlled (conscious) (e.g., Fitzsimons and Williams 2000). Automatic processing can be spontaneously and unintentionally activated by the presence of a certain cue in a decision context. Such a cue is usually established as the consequence of a previous associative learning experience (Devine 1989) or existing beliefs (Pham and Muthukrishnan 2002), for example, a stereotype. In behavioral pricing research, Monroe and Lee (1999) suggest that consumers may process price information either consciously or nonconsciously.

Building from this point, for simultaneous increases, an increase in retail price represents an economic sacrifice, and consumers usually make heuristic inferences that the
firm is attempting to increase its profit margins (Bolton et al. 2003). As consumers are greatly averse to increases in retail price, this will be a salient cue that activates automatic processing. As a result, consumers are likely to discount the increase in package size—as suggested by Gourville and Koehler (2004)—but they are unlikely to further consciously and effortfully evaluate the actual change in unit price. That is, in assessing simultaneous increases in price and size, consumers rely on their automatic intuition of the increase in retail price to interpret a decrease in value.

The same does not hold for simultaneous decreases. As consumers are less sensitive to price decreases than to price increases (Cheng and Monroe 2013), a decrease in retail price may not be salient enough to comprise a similar heuristic cue to directly influence consumer judgment. In addition, if they notice decreases in both price and size, consumers may become suspicious if the reason for the decreases is not immediately clear. It has been found that consumers do not feel better off when a warranty claim exceeds a standard they can expect from the product category; this is known as the “too good to be true” effect (Shimp and Bearden 1982). Similarly, consumers are often skeptical about the believability of persuasive advertising claims (Obermiller and Spangenberg 1998) and about the value and expected savings of price promotions (Liefeld and Heslop 1985). Thus, they attempt to defensively challenge the hidden tactics behind those claims (Koslow 2000). Furthermore, consumers often infer marketers’ motives behind price promotions (Mela and Urbany 1996), and they develop knowledge of various price tactics (e.g., “save up to 50%”) from learning long-term patterns of these tactics (Hardesty et al. 2007). Indeed, knowledgeable consumers tend to infer the motive for package downsizing as an attempt to increase the product’s profitability, and they hence develop an unfavorable attitude toward the product (Kachersky 2011).

Drawing on this notion, we posit that in the absence of unit prices, both the direction and the magnitude of change in the unit price are unclear, and consumers may be skeptical
about simultaneous decreases in price and size as a pure price cut. We expect consumers to rely on their knowledge and prior experience with package downsizing as a proximal cue to infer that the unit price has probably increased. They engage in controlled processing to analytically estimate the change in unit price as an indicator of value for money. Note that we do not claim that consumers are capable of precisely computing the product’s unit price in such situations; it is sufficient to assume they can approximate whether the unit price has increased or decreased by comparing the relative percentage changes between price and size. If the magnitude of the decrease in price is larger (smaller) than the magnitude of the decrease in size, the unit price actually decreases (increases). That is, consumers rely on the controlled estimation of the increase in unit price to interpret a decrease in value.

In summary, based on the theorizing of differential processing, we predict that when unit prices are absent, consumer judgment in the simultaneous increases condition is influenced by the observed increase in retail price, while in the simultaneous decreases condition, consumer judgment is influenced by the estimated increase in unit price. As both forms of processing result in the cognition of an increase in “price,” the difference in purchase intentions between simultaneous increases and simultaneous decreases is expected to be smaller. In contrast, as discussed earlier, when unit prices are available, simultaneous decreases (which are processed as a decrease in retail price and an increase in unit price) result in higher purchase intentions than simultaneous increases (which are processed as an increase in retail price and an increase in unit price). As such, we propose the following:

H4: The effect of simultaneous decreases (relative to simultaneous increases) in price and size on purchase intentions is moderated by unit pricing; specifically, the effect is stronger when unit prices are present than when unit prices are absent.
The role of numeracy

When unit prices are absent, the proposed differential processing of simultaneous increases and simultaneous decreases is consistent with the notion of automatic processing as mainly memory based and controlled processing as mainly algorithm based (Tzelgov et al. 1992). Thus, the differences in people’s ability to process numbers, that is, their numeracy levels (Dieckman et al. 2009; Peters et al. 2006), can be expected to influence their controlled processing but not their automatic processing. Specifically, when unit prices are absent and when decreases in price and size occur simultaneously, arithmetic-based processing should be engaged in only by more numerate consumers who are inspired and are capable of applying numerical principles to solve the problem (Guha et al. 2018). They appropriately work out an increase in unit price as the decision cue (i.e., an increase in “price”). In contrast, less numerate consumers who are incapable of such arithmetic processing can rely on only the nominal decrease in retail price as the decision cue (i.e., a decrease in “price”). When unit prices are absent and when increases in price and size occur simultaneously, due to their reliance on their automatic intuition of the increase in retail price (i.e., an increase in “price”), consumers do not spontaneously engage in arithmetic processing, and hence, their decisions are not impacted by their numeracy levels. Accordingly, due to the similar cognition of an increase in “price,” more numerate consumers exhibit smaller differences in purchase intentions than less numerate consumers, who interpret simultaneous decreases as a decrease in “price” and interpret simultaneous increases as an increase in “price.” When unit prices are available, there is no need for consumers to engage in arithmetic processing of unit price changes, and numeracy levels are irrelevant. Therefore, we propose the following:
H5: The effect of simultaneous decreases (relative to simultaneous increases) on purchase intentions is moderated by numeracy levels when unit prices are absent but not when unit prices are present. Specifically, when unit prices are absent, less numerate consumers demonstrate higher purchase intentions for simultaneous decreases than for simultaneous increases; when unit prices are present, purchase intentions are not affected by numeracy levels.

--------------------------------------
Insert Fig. 1 about here
--------------------------------------

Overview of studies

Based on the conceptual framework (Fig. 1), we conducted five studies to test our hypotheses. Study 1a compared four unit price increase tactics and examined H1b in a field setting. Studies 1b–4 were scenario-based, online experimental studies involving Mechanical Turk (MTurk) panel members. Study 1b replicated the findings of Study 1a with product choices in a hypothetical shopping task. Study 2 tested H1–H3 with a moderated mediation analysis and examined alternative explanations for the proposed effects. Study 3 tested the moderating effect of unit pricing (H4) and the moderating effect of numeracy when unit prices were absent (H5). Study 4 investigated a boundary condition by introducing cognitive load. Appendix A presents examples of the stimuli, and Appendix B shows details of the measures. Supplementary materials are provided in the Web Appendix.

Study 1: Examining different unit price increase tactics

Study 1a examined four different unit price increase tactics in a field setting: price increases, size decreases (package downsizing), simultaneous increases in price and size, and
simultaneous decreases in price and size. As prior research suggests that consumers respond more favorably to package downsizing than to retail price increases (Çakır and Balagtas 2014), we expected a similar effect for simultaneous decreases relative to simultaneous increases (H1b). No interaction was expected between the number of attributes changing (one vs. two attributes) and the direction of changes (increase vs. decrease).

**Study 1a**

**Method** We partnered with a supermarket in Australia to conduct a field study. The study used six products, including rice crackers, coconut rolls, confectionary, biscuits, soy milk and coconut water, and ran over six weeks. The study involved six conditions, including four experimental conditions in which unit prices were set to show an increase and two control conditions in which there were no changes in retail price, package size, or unit price. The four experimental conditions comprised a 2 (number of attributes changing: one vs. two) × 2 (direction of changes: decrease vs. increase) design.

In the experimental conditions, to manipulate attribute changes, two sets of information were presented on signage displayed on store shelves: old and new information (as shown in Appendix A). The new information was labeled “New Package” and presented the actual retail price, size, and unit price for a product (e.g., coconut rolls, *New Package*: $5.99/140 grams, 43¢ per 10 grams). The old information was labeled “Was” and displayed the old retail price, size, and unit price, marked with a strikethrough effect. Hence, the different unit price increase tactics were implemented by varying the old information: price increase (e.g., coconut rolls, *Was*: $5.29/140 grams, 38¢ per 10 grams), size decrease (*Was*: $5.99/158 grams, 38¢ per 10 grams), simultaneous increases (*Was*: $4.59/120 grams, 38¢ per 10 grams) and simultaneous decreases (*Was*: $6.89/180 grams, 38¢ per 10 grams). The two control conditions showed only the new (actual) information without the old information, with one condition also displaying the words “New Package” on the signage (*New Package*:...
$5.99/140 grams, 43¢ per 10 grams) and the other displaying the product information on an ordinary price tag or signage without the words “New Package” ($5.99/140 grams, 43¢ per 10 grams).

The six conditions for the six products over the six weeks were counterbalanced following a Latin square design such that after one week, each product was assigned to a different condition and the product–condition combinations rotated across six weeks. In week 3, a nearby grocery store launched a price promotion with a much lower price for the rice crackers used in our study; as such, we excluded the data for this product. The daily unit sales for the remaining five products over the 42 days generated 210 data points.

**Results and discussion** To accommodate the repeated-measures nature of the sales data for each of the five products in the analysis, we estimated a linear mixed-effects model using the SPSS procedure “MIXED.” The model regressed the daily unit sales of the four experimental conditions against the two key independent variables: the number of attributes undergoing changes (one attribute coded as 0, two attributes coded as 1) and the direction of changes (increase coded as 0, decrease coded as 1). The increase or decrease in the condition where one attribute changed represented the price increase or size decrease; the increase or decrease in the condition where two attributes changed represented simultaneous increases or simultaneous decreases. Control variables included the daily unit sales in the two control conditions, daily overall store sales revenue, and dummies for the product, day of the week and week number.

The estimation results reveal that first, the effect of the number of attributes changing was significant and positive ($\beta = 2.24$, SE = 1.07; $t = 2.10$, $p < .05$), showing that compared with price increases and size decreases, simultaneous changes in price and size resulted in higher daily unit sales. Second, the effect of the direction of changes was also significant and
positive ($\beta = 2.00$, SE = .88; $t = 2.27$, $p < .05$), showing that decreases led to higher daily unit sales than increases. Third, the interaction between these two variables was insignificant ($\beta = .48$, SE = 1.09; $t = .44$, $p = .67$), implying that the effect of the direction of changes held constant across the number of attribute conditions (i.e., simultaneous decreases produced more sales than simultaneous increases; size decreases produced more sales than price increases). Although this interaction was not statistically significant, a closer inspection of the results suggests that the effect of the direction of changes was greater when two attributes were changed (see Web Appendix E).

Study 1b
While Study 1a was conducted in a real store setting, its design had two major limitations. First, the signage presented both old and new product information. It does not seem common for retailers to inform customers of price increases in this way, and thus, the observed effects may have been inflated. Second, the same products were used to implement different conditions by varying the old product information on the signage throughout six consecutive weeks in one store. Returning customers may have felt confused or suspicious about the changes in product information in the later weeks of the study. The observed effects on their purchases may therefore have been influenced by the presentation order of the different conditions and the number of repeat purchases for different products. To address these two limitations and replicate the results of Study 1a, we conducted a controlled study in an online setting to examine how different unit price increase tactics nudge consumer product choices.

Method Through MTurk, we recruited 291 participants. One participant failed to answer the attention check question correctly and was discarded; the analysis used the remaining 290 responses (60% female, $M_{age} = 40$ years). As in Study 1a, the experiment employed a 2
between-subjects design. In each condition, participants completed a hypothetical shopping task assuming they were going to purchase a pack of cookies in a grocery store.

We adopted Kachersky’s (2011) protocol such that participants saw two screens displaying product information. They were initially exposed to the first screen presenting information on two unbranded cookies (brand A and brand B), which were defined as the target option and the standard option. The two options had identical retail prices, package sizes, and unit prices. Participants were instructed to suppose that these were products they had seen a few weeks ago and to indicate their pre-change choices. The next screen showed the same two products as seen today, but the target option had changed in price, size, and unit price to manipulate different unit price increase tactics while the standard option was held constant. Participants then indicated their post-change choices. Participants were not allowed to return to the earlier screen during the task. The target (vs. standard) options and brands were counterbalanced such that either brand A or brand B was set as the target option. The stimuli are presented in Web Appendix C.

Results and discussion The pre-change and post-change choices for the target option (i.e., target option coded as 1, standard option coded as 0) were submitted to logistic regressions. Since the brands did not interact with any of the between-subjects factors ($p$s > .10), choices were collapsed across the two brands. A 2 (one attribute changing coded as 0, two attributes changing coded as 1) × 2 (increase coded as 0, decrease coded as 1) binary logistic regression on the pre-change choice of the target option revealed no pre-existing effects ($p$s > .47). We conducted another 2 × 2 binary logistic regression on the post-change choice of the target option and included the pre-change choice as a control variable ($\beta = 1.34$, SE = .33; Wald $\chi^2(1) = 16.76$, $p < .001$). As in Study 1a, both the effect of the number of attributes involving
changes (β = .73, SE = .32; Wald χ²(1) = 5.26, p < .05) and the effect of the direction of changes (β = .73, SE = .32; Wald χ²(1) = 5.29, p < .05) were significant and positive. While the interaction between the two factors was insignificant (β = .67, SE = .64; Wald χ²(1) = 1.10, p = .30), a closer inspection of the results suggests that the positive effect of a decrease (vs. an increase) on product choices was greater in the two-attributes condition (i.e., simultaneous decreases vs. simultaneous increases) than in the single-attribute condition (i.e., size decrease vs. price increase) (see Web Appendix E).

Hence, Study 1b replicates the results of Study 1a in a controlled setting measuring product choices as the dependent variable. In both studies consumers responded more favorably to tactics changing two attributes than to tactics changing a single attribute. Studies 1a and 1b also provide initial evidence supporting H1b: simultaneous decreases led to more sales and higher choice shares than simultaneous increases when unit prices were present.

**Study 2: Testing the underlying process**

Study 2 aimed to examine the psychological process underlying the effect of simultaneous decreases (vs. simultaneous increases) in price and size on consumer purchase intentions, as outlined in H1–H3. Further, we tested some alternative explanatory accounts.

**Method**

**Sample, experimental design, and procedure** We recruited 174 U.S. participants from MTurk (55% female, M_age = 39 years). The online experiment employed a 2 (direction: simultaneous increases vs. decreases) × continuous (price consciousness) between-subjects design and an additional control group that experienced no change in price or size.

The procedure was similar to that of Study 1b. Participants were instructed that they would see two screens of product information for a non–U.S. brand breakfast cereal unfamiliar to U.S. consumers. The product information on the first screen as seen a few weeks
ago was $4.39/23.8 ounces (18.4¢ per ounce). In the condition of simultaneous increases, the product on the second screen as seen today was $4.98/25 ounces (19.9¢ per ounce); in the condition of simultaneous decreases, the product on the second screen as seen today was $4.18/21 ounces (19.9¢ per ounce). In the control cell, only the first set of product information $4.39/23.8 ounces (18.4¢/ per ounce) was presented as seen today.

Measures Using two items (1 = unlikely/impossible, 7 = likely/possible) (Oliver and Swan 1989), we measured pre-change purchase intentions on the first screen for the trip supposedly from a few weeks ago (r = .80) and post-change purchase intentions on the second screen for the trip today (r = .86). Participants then indicated their perceived value of the post-change product (1 = not good value at all/very unfair/very expensive, 7 = very good value/very fair/very cheap; Cronbach's α = .88) (Grewal et al. 1996).

We also measured participants’ perceptions of product quality (1 = very poor quality/very low quality, 7 = very excellent quality/very high quality; r = .94) (Yan et al. 2014), since both price (Monroe 2003) and package size (Yan et al. 2014) may cue product quality and consequently influence consumer responses. Participants’ perceptions of the difficulty of processing were then elicited (1 = very easy/not confusing at all, 7 = very difficult/very confusing; r = .79) (Yao and Oppewal 2016a). As manipulation checks, participants were asked to rate the changes in retail price (1 = lower, 7 = higher) and volume (1 = less, 7 = more) in the experimental conditions. Finally, participants indicated their price consciousness on the 5-item scale developed by Lichtenstein et al. (1993) (Cronbach’s α = .86; M = 5.24). For details of the scale, see Web Appendix D.

Results

Manipulation checks Perceived changes in retail price and package size were as intended. The retail price today was judged as higher in the condition of simultaneous increases
(M\textsubscript{increases} = 5.26, M\textsubscript{decreases} = 3.43; t(116) = 6.37, \( p < .001 \)). The package size today was judged as larger in the condition of simultaneous increases (M\textsubscript{increases} = 4.34, M\textsubscript{decreases} = 3.52; t(116) = 3.46, \( p < .001 \)).

**Purchase intention and perceived value** Analyses of variance (ANOVA) results demonstrated that there were no pre-existing differences in purchase intention across the three conditions (F(2, 171) = 1.31, \( p = .27 \)), but post-change purchase intentions differed significantly (F(2, 171) = 3.69, \( p < .05 \)). Contrast analyses revealed significantly lower purchase intentions in the simultaneous increases cell (M\textsubscript{increases} = 3.57) than in either the simultaneous decreases cell (M\textsubscript{decreases} = 4.25; t(171) = 2.13, \( p < .05 \)) or the control cell (M\textsubscript{control} = 4.37; t(171) = 2.49, \( p < .05 \)) and revealed no significant difference between the simultaneous decreases cell and the control cell (t(171) = .35, \( p = .73 \)). We also performed an ANCOVA in which pre-change purchase intention was included as a control variable (F(1, 170) = 716.22, \( p < .001 \)). The ANCOVA for post-change purchase intention was significant (F(1, 170) = 4.66, \( p < .05 \)). Contrasts again showed significantly lower purchase intentions in the simultaneous increases cell (M\textsubscript{increases} = 3.81) than in either the simultaneous decreases cell (M\textsubscript{decreases} = 4.20; t(170) = 2.81, \( p < .01 \)) or the control cell (M\textsubscript{control} = 4.15; t(170) = 2.39, \( p < .05 \)) and showed no significant difference between the simultaneous decreases cell and the control cell (t(170) = .40, \( p = .68 \)). H1b is supported.

An ANOVA on perceived value revealed a significant effect (F(2, 171) = 4.30, \( p < .05 \)), with simultaneous increases perceived as providing less value (M\textsubscript{increases} = 3.38) than simultaneous decreases (M\textsubscript{decreases} = 4.11; t(171) = 2.89, \( p < .01 \)) and as providing marginally less value than the control cell (M\textsubscript{control} = 3.83; t(171) = 1.79, \( p = .076 \)). There was no significant difference between the simultaneous decreases cell and the control cell (t(171) = 1.08, \( p = .28 \)). H1a is supported.
**Moderated mediation analysis** We used Model 14 of the PROCESS macro (Hayes 2017) to jointly test H2 and H3 using mean-centered price consciousness scores while controlling for pre-change purchase intention. The results indicated a significant moderated mediation effect (95% CI = .0008 to .0536). The Johnson–Neyman analysis showed that the significance region for price consciousness was 3.69 (-1.55 upon mean centering), at which $\beta = .14$, SE = .07, $t = 1.97$, and $p = .05$. Specifically, perceived value significantly mediated the effect of the direction of simultaneous changes on purchase intention for more price-conscious participants (> 3.69) but not for less price-conscious participants. In sum, there was an indirect effect of simultaneous changes in price and size on purchase intentions through perceived value, and this indirect effect was moderated by price consciousness, supporting H2 and H3.

**Ruling out alternative explanations** Separate ANOVAs across the three conditions showed no significant difference in perceived quality ($F(2, 171) = 1.48, p = .23$) or perceived difficulty ($F(2, 171) = 1.60, p = .21$). We thus ruled out alternative explanations based on these two factors.

**Discussion**

Study 2 demonstrates the effect of the direction of simultaneous changes on purchase intentions. It also indicates that simultaneous increases in price and size reduced purchase intentions compared with a situation that did not involve changes in price or package size. In contrast, simultaneous decreases in price and size did not display such a reduction. The results also support value perceptions as the underlying process behind the behavioral effect of simultaneous changes. Further, the moderating effect of individual heterogeneity in price
consciousness underpins consumers’ focus on cost connotations of price as the mechanism for this effect. A supplementary study is reported in Web Appendix F, showing that the effect of simultaneous changes in price and size on purchase intentions is also mediated by perceived changes in value (Coulter and Coulter 2005).

**Study 3: The role of unit pricing and numeracy**

Thus far, we have examined the effect of simultaneous changes in price and size on consumer purchase decisions in a situation where unit prices were provided. Study 3 investigated the condition where unit prices are absent, as proposed in H4 and H5.

**Method**

**Sample, experimental design, and procedure** We recruited 169 U.S. participants through MTurk. One participant whose completion time was substantially longer than the others’ and two participants who failed to correctly answer the attention check question were excluded. This left us 166 participants (51% female, $M_{age} = 41$ years) for analysis. The study employed a 2 (direction: simultaneous increases vs. decreases) $\times$ 2 (unit price: present vs. absent) $\times$ continuous (numeracy) between-subjects design.

The procedure was identical to that of Study 2, but the product involved a non-U.S. brand orange juice. The pre-change product was $4.59/66.5$ fluid ounces (6.9¢ per fluid ounce). The post-change product was $4.99/68.5$ fluid ounces (7.3¢ per fluid ounce) in the simultaneous increases condition, while it was $4.39/60.5$ fluid ounces (7.3¢ per fluid ounce) in the simultaneous decreases condition.

**Measures** Using the same two items as in Study 2, we measured participants’ purchase intentions for the product before the changes ($r = .83$) and after the changes ($r = .87$). To verify our theorizing that when unit prices are unavailable, automatic processing prevails in
the simultaneous increases condition whereas controlled processing prevails in the simultaneous decreases condition, participants reported their post-change purchase decision process based on cognition or affect (1 = my thoughts/the rational side of me, 7 = my feelings/the emotional side of me; r = .69) (Shiv and Fedorikhin 1999).

Participants also indicated the believability of the changes in value (equivalent to skepticism if reverse coded) (1 = not believable at all, 7 = believable) (Obermiller and Spangenberg 1998). To account for perceived novelty as an alternative explanation, we measured the novelty associated with simultaneous changes in price and size (1 = unusual/uncommon/novel, 7 = usual/common/not novel; Cronbach's α = .91) (Kim and Kramer 2006).

As manipulation checks, participants rated the changes in retail price and package size (similar to Study 2). Finally, we elicited numeracy levels using the scale developed by Peters et al. (2006) comprising 11 probability-related questions (see Web Appendix D). The numeracy index score was the count of the correct answers to the questions (M = 9.32).

Results

Manipulation checks Participants rated the retail price as higher (M\text{increases} = 5.43, M\text{decreases} = 3.08; F(1, 162) = 79.36, p < .001) and the package size as larger (M\text{increases} = 4.54, M\text{decreases} = 2.67; F(1, 162) = 81.45, p < .001) in the simultaneous increases condition. These effects held constant regardless of whether unit prices were displayed (ps < .001).

Moderating role of unit pricing The ANOVA results first showed no significant differences in pre-change purchase intentions (ps > .57). Next, pre-change purchase intention was included in an ANCOVA as a control variable (F(1, 161) = 265.65, p < .001) for analyzing post-change purchase intention. The results revealed that there were significant main effects of the direction of the changes (M\text{increases} = 4.19, M\text{decreases} = 4.49; F(1, 161) = 4.07, p < .05)
and of the presence of the unit price (\(M_{\text{unit price absent}} = 4.65, M_{\text{unit price present}} = 4.03; F(1, 161) = 16.23, p < .001\)). The higher purchase intention in the unit price absence (vs. presence) condition can be explained by the fact that the presence of the unit price makes consumers more price sensitive; thus, they become more responsive to the increase in unit price when it is explicit. There was also a significant interaction effect (\(F(1, 161) = 3.95, p < .05\)) (Fig. 2). Simple contrasts showed that in line with Study 2, purchase intention was lower in the simultaneous increases condition when the unit price was present (\(M_{\text{increases unit price present}} = 3.73, M_{\text{decreases unit price present}} = 4.34; F(1, 161) = 8.12, p < .01\)). However, there was no significant difference in purchase intention when the unit price was absent (\(M_{\text{increases unit price absent}} = 4.65, M_{\text{decreases unit price absent}} = 4.65; F(1, 161) = .001, p = .98\)). H4 is supported.

The ANOVA for the decision process based on cognition or affect revealed no significant main effects for the two factors \((ps > .12)\) but revealed a significant interaction effect \((F(1, 162) = 5.23, p < .05)\). Simple contrasts showed that participants’ purchase decisions were driven more by controlled processing in the simultaneous decreases condition when the unit price was absent (\(M_{\text{increases unit price absent}} = 3.81, M_{\text{decreases unit price absent}} = 2.87; F(1, 162) = 7.33, p < .01\)). The means were not significantly different when the unit price was present (\(M_{\text{increases unit price present}} = 2.95, M_{\text{decreases unit price present}} = 3.13; F(1, 162) = .26, p = .61\)).

The ANOVA for believability revealed no significant main effects for the two factors \((ps > .33)\) but revealed a significant interaction effect \((F(1, 162) = 4.51, p < .05)\). Simple contrasts showed that when the unit price was absent, participants perceived the change as less believable (i.e., were more skeptical) in the simultaneous decreases condition (\(M_{\text{increases unit price absent}} = 5.98, M_{\text{decreases unit price absent}} = 5.45; F(1, 162) = 4.75, p < .05\)).
the unit price was present, there was no significant difference ($M_{\text{increases, unit price present}} = 5.60$, $M_{\text{decreases, unit price present}} = 5.80$; $F(1, 162) = .67, p = .42$).

Finally, the ANOVA for perceived novelty indicated no significant main effects for the two factors and no significant interaction effect ($ps > .35$).

**Moderating role of numeracy** To test the moderation effect of participants’ numeracy level in the situation of simultaneous changes in price and size (H5), we regressed post-change purchase intention on the independent variables, including the direction of the simultaneous changes (increase coded as 0, decrease coded as 1), the displaying of the unit price (unit price absent coded as 0, unit price present coded as 1), mean-centered numeracy scores, and their interactions while controlling for pre-change purchase intention. The results revealed the same main effects as obtained in the ANCOVA as well as a marginally significant interaction effect between direction of changes and numeracy ($\beta = -23, SE = .13; t = -1.86, p = .065$).

To explore these effects, two separate regressions were conducted. In the unit price presence condition, the results showed significant effects of pre-change purchase intention ($\beta = .84, SE = .08; t = 10.77, p < .001$) and direction of changes ($\beta = .59, SE = .24; t = 2.52, p < .05$). Neither the effect of numeracy nor its interaction with direction of changes reached significance ($ps > .66$). In the unit price absence condition, the effect of pre-change purchase intention was significant ($\beta = .92, SE = .08; t = 12.06, p < .001$). The results did not show significant effects for direction of changes or numeracy ($ps > .63$). There was, however, a significant interaction ($\beta = -23, SE = .11; t = -2.08, p < .05$) between them. The Johnson–Neyman analysis showed that the significance region for numeracy was 4.98 (–4.36 upon mean-centering), at which $\beta = 1.04, SE = .52, t = 1.99, \text{and } p = .05$. Specifically, less numerate consumers ($< 4.98$) displayed significantly higher purchase intentions in the simultaneous decreases condition than in the simultaneous increases condition. For more
numerate consumers, there was no significant difference in purchase intentions between the two conditions. Collectively, H5 is supported.

Discussion
Study 3 demonstrates the moderating role of the presence of unit price information when price and size were simultaneously changed to increase the unit price. When unit price information was unavailable, simultaneous decreases no longer resulted in a higher purchase intention than simultaneous increases. The invariance can be explained by the differential processing when unit prices are not displayed. We provide evidence supporting this theorizing by showing that in the simultaneous decreases condition, participants were more skeptical about the change in value, which drove them to deliberately estimate the unit price increase to make purchase decisions. In the simultaneous increases condition, they were less skeptical about the change in value, which drove them to automatically respond to the retail price increase to make purchase decisions. The two aligned cues of “price increase” resulted in similar effects on purchase intentions.

By showing that less numerate participants displayed higher purchase intentions, we provide further evidence of consumer processing of simultaneous decreases based on the estimation of unit price increases. The inability to estimate the change in unit price made these participants rely on the observed decrease in retail price; in this case, they showed higher purchase intentions. Conversely, in the simultaneous increases condition, less numerate participants relied on the observed increase in retail price; in this case, they showed lower purchase intentions. More numerate participants were able to estimate the increase in unit price in the simultaneous decreases condition, eliciting purchase intentions similar to participants in the simultaneous increases condition who did not engage in computation and relied on the increase in retail price. Moreover, when the unit price was provided,
participants’ purchase decisions were unaffected by numeracy levels, suggesting that consumers are unlikely to process any arithmetic operations in this context.

Finally, the differential effects of simultaneous changes in price and size revealed in Studies 1 and 2 could be argued to result from the processing of only the retail price change instead of both the retail price change and unit price change. However, the disappearance of the effects after the removal of unit prices from the shopping task refutes this speculation.

**Study 4: When cognitive resources are restricted**

Study 4 aimed to delve deeper into the mechanism underlying consumer processing of simultaneous changes in price and size and to identify a theoretically derived boundary condition where people’s cognitive resources are restricted. This condition is managerially relevant since in real shopping environments, consumers tend to be overwhelmed and overloaded by the amount of information available to them (e.g., Chernev 2003).

Conceptually, we argue that when the unit price is provided, consumers become more price-sensitive and thus process both retail prices and unit prices. Prior literature suggests that if people’s cognitive resources are restricted, cue diagnosticity will prevail (e.g., Yan et al. 2014) such that their decisions are expected to be dominated by the more diagnostic cue. It has been shown that when there is time pressure, unit price acts as a more diagnostic cue of product cost than retail price to influence consumer purchase decisions (Yao and Oppewal 2016b). Likewise, when there is cognitive load, consumers rely only on the unit price change and neglect the retail price change in processing. The effect on consumer purchase intentions in favor of simultaneous decreases over simultaneous increases is predicted to disappear since both tactics present an identical increase in unit price.

We also argue that when the unit price is unavailable, controlled processing prevails in the simultaneous decreases condition, whereas automatic processing prevails in the
simultaneous increases condition. Prior literature suggests that if people’s cognitive resources are restricted, their decisions will be dominated by automatic processing (Fitzsimons and Williams 2000). In light of this notion, when there is cognitive load, an automatic response to the retail price change is expected to prevail. This results in a higher purchase intention in the simultaneous decreases condition than in the simultaneous increases condition. In sum, we expect the effects on purchase intentions found in Study 3 to reverse if there is cognitive load.

**Method**

**Sample, experimental design, and procedure** Another 303 U.S.-based participants were recruited through MTurk. One participant who failed to correctly answer the attention check question and 39 participants who reported using a tool/device (e.g., screen shooting or taking pictures, even though we had reminded them not to use any tools/devices at the beginning) to help themselves memorize the product features in the manipulation of cognitive load (which is explained below) were discarded. The analysis used the remaining 263 responses (62% female, M\textsubscript{age} = 40 years). The study used a 2 (direction: simultaneous increases vs. decreases) × 2 (unit price: present vs. absent) × 2 (cognitive load: high vs. low) between-subjects design. The experimental stimuli comprised a non–U.S. brand laundry detergent with commensurate retail prices and volumes. The pre-change product was $4.49/59 fluid ounces (7.6¢ per fluid ounce). The post-change product was $5.19/64 fluid ounces (8.1¢ per fluid ounce) in the simultaneous increases condition and was $3.89/48 fluid ounces (8.1¢ per fluid ounce) in the simultaneous decreases condition.

The procedure was identical to that of Study 3, except for the inclusion of a manipulation of cognitive load. In line with Kramer and Block (2008), before the main task, participants were asked to study a list of either 20 features (high cognitive load) or one feature (low cognitive load) of two lawn mowers. After the main task, they were asked to recall which features had differed between the two products.
Measures Using the same two items as in Study 2, we measured participants’ purchase intentions for the product before the changes ($r = .72$) and after the changes ($r = .83$). Manipulation checks required participants to evaluate the changes in retail price and package size and to rate the difficulty of the cognitive load task after they recalled the names of product features ($1 = $not challenging at all/$very easy, 7 = $very challenging/$very difficult; r = .82$) (McFerran et al. 2010).

Results

Manipulation checks Participants judged the retail price to be higher ($M_{inCREASES} = 5.70, M_{DECREASES} = 2.22; F(1, 255) = 309.72, p < .001$) and package size to be larger ($M_{inCREASES} = 5.25, M_{DECREASES} = 2.83; F(1, 255) = 182.81, p < .001$) in the simultaneous increases condition. Participants also judged the recall task to be more difficult in the high cognitive load condition than in the low cognitive load condition ($M_{HIGh LOAD} = 5.19, M_{LOw LOAD} = 2.39; F(1, 255) = 206.80, p < .001$). These effects held constant across all cells ($ps < .001$).

Purchase intention An ANOVA of pre-change purchase intention did not reveal any effects except a marginally significant interaction between the direction of the changes and the displaying of the unit price ($F(1, 255) = 3.05, p = .082$). We then analyzed the post-change purchase intention with an ANCOVA in which pre-change purchase intention was included as a control variable. The effect of pre-change purchase intention was significant ($F(1, 254) = 195.56, p < .001$). The results revealed significant main effects of the direction of the changes ($M_{inCREASES} = 4.27, M_{DECREASES} = 4.87; F(1, 254) = 17.79, p < .001$) and the presence of the unit price ($M_{unit price absent} = 4.79, M_{unit price present} = 4.35; F(1, 254) = 9.81, p < .01$).
A three-way interaction of direction × unit pricing × cognitive load also emerged (F(1, 254) = 8.25, p < .01). The means are shown in Fig. 3. The direction × unit price presence contrast interaction was marginally significant in the low cognitive load condition (F(1, 254) = 3.86, p = .05) and was significant in the high cognitive load condition (F(1, 254) = 3.88, p < .05). Subsequent simple contrast analyses showed that in the low cognitive load condition when the unit price was present, simultaneous decreases elicited a higher degree of purchase intention than simultaneous increases (M_{increases} = 3.93, M_{decreases} = 4.85; F(1, 254) = 10.96, p < .01); when the unit price was absent, there was no significant difference (M_{increases} = 4.69, M_{decreases} = 4.83; F(1, 254) = .26, p = .61). These results replicated the findings of Study 3. However, as expected, the pattern for the low cognitive load condition reversed in the high cognitive load condition: when the unit price was present, there was no significant difference (M_{increases} = 4.19, M_{decreases} = 4.43; F(1, 254) = .69, p = .41); when the unit price was absent, simultaneous decreases elicited a higher degree of purchase intention than simultaneous increases (M_{increases} = 4.28, M_{decreases} = 5.38; F(1, 254) = 14.09, p < .001).

Discussion

Study 4 shows that when participants’ cognitive resources were restricted and the unit price was displayed, the unit price increase was the more diagnostic cue and dominated their decisions, resulting in no differential effect between simultaneous increases and simultaneous decreases on purchase intention. When participants’ cognitive resources were restricted and when the unit price was absent, the retail price change dominated their decisions, resulting in a higher purchase intention for simultaneous decreases than for simultaneous increases. The latter effect aligns with Yan et al. (2014), suggesting that because it is readily available, retail
price tends to prevail over unit price under a cognitively taxing condition that restricts processing when the unit price is not explicitly presented.

In sum, the results of Study 4 reinforce the notion of differential processing of simultaneous changes. When the unit price is present, consumer processing is influenced by the joint effect of retail price and unit price changes. When the unit price is absent, the observed retail price increase dominates consumers’ processing of simultaneous increases, whereas the estimated unit price increase dominates consumers’ processing of simultaneous decreases.

General discussion

The present research describes a novel and dynamic price–size tactic to increase a product’s unit price by simultaneously increasing or decreasing both the retail price and package size. Five studies provide systematic and convergent evidence articulating the robust effects of simultaneous changes in price and size on consumer purchase decisions. The effects were observed across field and online settings, metrics (Studies 1a and 1b) and imperial (Studies 2–4) size units. We ran a field study (Study 1a) and a controlled study (Study 1b) showing, first, that unit price increases implemented through simultaneous changes in price and size result in more sales and product choices than when only package downsizing or only a price increase is implemented and, second, that simultaneous decreases result in more sales and product choices than simultaneous increases. In Study 2, we find that perceptions of value mediate the effects of simultaneous changes in price and size on purchase intentions. We also find that the effect on purchase intention manifests for more price-conscious consumers but not for less price-conscious consumers. In Study 3, we find that the difference in purchase intention disappears when the unit price is absent and that this effect is moderated by numeracy: less numerate consumers display higher purchase intentions for simultaneous
decreases than for simultaneous increases, while more numerate consumers do not display such purchase intention differences. Finally, in Study 4, we identify a theoretically derived boundary condition for the direction of the simultaneous price and size changes and its interaction with unit pricing such that when consumers’ cognitive resources are restricted, there is no differential effect on purchase intention when the unit price is present, and consumers display higher purchase intentions for simultaneous decreases than for simultaneous increases when the unit price is absent.

**Theoretical contributions**

The present research makes several important and insightful contributions. First, this research is the first to systematically study the effects of simultaneous changes in price and package size on consumer perceptions and behavior. While a growing body of work on price–size issues substantively focuses on situations where either price or size varies, our investigation joins and adds to this research trend by showing how price and size changes jointly influence consumer judgments and decisions.

Second, we extend the work of Gourville and Koehler (2004) and advance the knowledge about people’s greater sensitivity to price changes than to size changes. This sensitivity may manifest when only one attribute changes (i.e., price increases or size decreases) or when there is little effort required to assess the change in value (i.e., when unit prices are provided). Nevertheless, we find that when consumers are placed into an environment where directionally coherent price and size changes take place simultaneously and where the actual change in unit price is not easy to identify, consumers seem to process the retail price increase independently of the magnitude of the size increase, while they seem to process both the price decrease and size decrease through the prism of the unit price.

Third, in contrast to the extant literature suggesting that consumers are generally more sensitive to price increases than to price decreases (Cheng and Monroe 2013), we observed a
lack of difference in consumer response between simultaneous increases and simultaneous decreases when the unit price is absent. We presented a novel proposition: that consumers activate automatic processing with a reliance on the retail price for the former condition and activate controlled processing with a reliance on the unit price for the latter condition. Both forms of processing are ultimately associated with an increase in “price” and thus result in invariant responses to the changes. Restrictions of cognitive resources drive consumers to focus on retail price such that they respond to price increases and price decreases differently. Collectively, we empirically and parsimoniously examined the account of differential processing and provided systematic and compelling evidence for it. This account is one of the first to apply cognitive processing theory to the study of consumer responses to price changes and thus deepens our understanding of the psychological mechanisms that underlie people’s cognition of price-related information.

Fourth, we contribute to the unit pricing literature by showing that when price and size change simultaneously, consumers’ judgments and decisions are dependent on the availability of the unit price. Our primary prediction is developed on the framework proposed by Yao and Oppewal (2016a) and extends their work by demonstrating that the availability of the unit price also activates systematic processing of the price information; that is, consumer responses are influenced more by the joint effect of the change in retail price and the change in unit price than by the change in package size. We also demonstrate that when the unit price is not explicitly provided, consumers’ reliance on the unit price versus the retail price to infer product value can be contextually dependent. The unit price appears to be more meaningful in the context of decreasing retail prices, whereas the retail price appears to be more meaningful for making such inferences in the context of increasing retail prices. The differentiation can be attributed to consumers’ greater sensitivity to price increases than to price decreases. The greater sensitivity to price increases makes retail price the most
diagnostic input; it dominates other inputs, including unit price. In contrast, the much weaker sensitivity to price decreases fails to make retail price the most diagnostic input; thus, another, more diagnostic input such as unit price dominates a consumer’s judgment and decision. Our research also expands on Yan et al.'s (2014) findings, which show that consumers can spontaneously estimate unit prices to infer product quality, suggesting that consumers can also spontaneously estimate unit prices to judge product value.

**Implications**

Our findings have important implications for both marketers and policymakers. Consumers appear less responsive to simultaneous changes in price and size than to size decreases (package downsizing) and retail price increases. Thus, changing both price and size in the same direction—particularly decreasing price and size simultaneously—can be a euphemistic pricing tactic for marketers to mitigate the negative impact of a unit price increase, particularly when consumers can process price and size information smoothly.

While package downsizing is often used by firms with the expectation that consumers will not notice or care about a few ounces off the product, they are at a risk of a consumer backlash in an age of social media—similar to what happened to Toblerone when they shrinkflated their chocolate bars by about 10% (Seal 2016). In our Studies 1a and 1b, the sales and product choices were not impaired by the tactic of simultaneously decreasing price and size even though the unit price increase was more prominent than it would be in most real-life settings. Such a tactic is unlikely to contaminate product sales and is helpful to maintain brand image in times of inflation or increased labor costs.

Caution should be exercised in the marketplace where displaying unit prices is mandatory, such as the European Union, the U.K., several states in the U.S., and Australia. Simultaneously increasing the price and size of a product to increase its unit price may backfire on the retailer since consumers would be annoyed by the message that the retail
price and the unit price have both increased (this, however, ascertains the relevance of unit pricing in ensuring consumer protection). On the other hand, simultaneously reducing price and size to increase the unit price may be seen as a cover-up for the increase in unit price, which is to the disadvantage of consumers. To reduce consumer confusion and protect consumer benefits, regulators are advised to formulate policies to restrict or attach conditions for such practices; for example, retailers should display unit prices and clearly notify consumers of an increase in unit price when implementing simultaneous changes.

Additionally, despite the observed lack of a difference in consumer responses to the two tactics in a situation where unit prices are unavailable or likely to be overlooked, simultaneous increases may be more effective to soften price competition, while simultaneous decreases may be more advisable when consumers are in a cognitively demanding context. For example, when consumers are confronted with large assortment sizes and when they are distracted by various external and situational “noise,” such as in-store promotions, loyalty cards, and special offers, a smaller package at a lower price may produce inferences of better value and thus is likely to be preferred.

The other relevant implication is in the context of identical products being sold in different price–size combinations across different retailers (see Web Appendix A). In such a context, a smaller package at a lower price has the advantage over a larger package at a higher price, even though the unit price may be higher and even if the unit price information is provided.

**Limitations and future research**

A limitation of this research concerns the prominence of product information. Our online studies used stimuli that included product size information in a similar font and with similar prominence as price information. In supermarkets, shelf tags typically display weight/volume information less prominently than product prices. In these conditions, quantified (printed)
size information may receive less attention than price information. On the other hand, size information is physically observable on product packages and is visible in many online stores (e.g., Walmart.com).

Another important assumption for establishing the generalizability of our findings is that consumers notice simultaneous changes in both price and size and have relatively strong price knowledge, allowing them to recall the past price and size information. Similar to Kachersky (2011), the present research focuses on how consumers process price–size information rather than on whether consumers notice and are able to process such information. We found that consumers’ chronic characteristics, such as their price consciousness and numeracy level, interfere with the behavioral effects of simultaneous changes in price and size. There are also various possible situational factors, such as time pressure, the store environment, and trust in brands, that create interesting research avenues for further exploration of the boundary conditions of the current findings. Further, prior research suggests that high-quality brands are less vulnerable to the negative effects of price increases (Sivakumar and Raj 1997). In this research, we used mid-priced, less familiar brands that were not necessarily associated with high product quality; hence, future research can also investigate the persistence of our findings with national and well-known brands.

We tested price and size changes of relatively small magnitudes. Small magnitudes of change are nevertheless highly relevant because in real market situations, most price increases and package downsizing for packaged consumer goods range between no more than 5% and 20% in magnitude (Çakır and Balagtas 2014; Yonezawa and Richards 2016). Many other empirical studies have demonstrated the disappearance or reversal of effects when the magnitudes of numerical stimuli become larger (e.g., Hardesty and Bearden 2003). The current research, however, tested relatively large magnitudes of changes by manipulating different leftmost digits (Thomas and Morwitz 2005) of price and size (Study 4) and obtained
findings similar to those of other studies using the same leftmost digits. If the magnitudes of simultaneous changes in price and size increase further, for example, up to 50%, it is reasonable to assume that consumers will become more prudent about the large price and size changes. A controlled process will be more likely to take place than an automatic process.

Finally, simultaneous changes in price and size can result in either a unit price increase, a constant unit price, or a unit price decrease by calibrating the relative magnitudes of changes in price and package size. This paper focused on the situation of increasing unit prices; similar effects of simultaneous changes may also manifest in the situation of decreasing unit prices. This proposition deserves further examination to see how the tactics of simultaneous changes can help improve the effectiveness of unit price reductions.
References


<table>
<thead>
<tr>
<th>Study</th>
<th>Independent variable(s)</th>
<th>Dependent variable(s)</th>
<th>Type of study</th>
<th>Key findings</th>
</tr>
</thead>
</table>
| Koschate-Fischer et al. (2016)    | Company donation amount Timing of donation (the same time as the price increase or 4    | Perceived price fairness                  | Lab and online experiment | • A donation amount equal to the price increase can increase fairness perceptions.  
• Relative to simultaneous timing, non-simultaneous timing (i.e., the price increase occurs later than the donation) does not affect price fairness perceptions. |
|                                   | months before the price increase)                                                     |                                            |                            |                                                                                                                                                                                                              |
| Yonezawa and Richards (2016) JR   | Package size Price                                                                     | Consumer demand Retailer pricing decisions | Quantitative modeling using scanner data | • Package downsizing intensifies price competition, which does not allow manufacturers to raise unit prices through package downsizing.  
• Package downsizing benefits retailers, as it leads to lower wholesale prices and higher category profits.  
• Consumers are less responsive to package downsizing than to price increases. |
| Çakır and Balagtas (2014) JR       | Package size Price                                                                     | Choices of ice cream                      | Quantitative modeling using household panel data |                                                                                                                                                                                                              |
| Calabuig et al. (2014) JBR        | Price increases                                                                       | Perceived service performance Satisfaction Perceived value Future patronage intentions | Survey                     | • Price increases worsen the perceptions of service performance.  
• Price increases decrease satisfaction, perceived value and future patronage intentions.                                                                                                                     |
| Kachersky (2011) JR                | Price increases vs. package downsizing Level of pricing tactic persuasion knowledge (PTPK) | Inferred motives                         | Online experiment          | • High-PTPK consumers infer firm motives to increase profitability for package downsizing and infer firm motives to maintain profitability for price increases, and they thus develop more favorable product attitudes toward price increases than package downsizing.  
• Low-PTPK consumers develop more favorable retailer attitudes toward package downsizing than to price increases.                                                                                     |
<table>
<thead>
<tr>
<th>Authors</th>
<th>Methodology</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homburg et al. (2010)</td>
<td>Lab experiment</td>
<td>- Framing a price increase as a percentage leads to a lower purchase intention than framing it in absolute terms.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Higher-income consumers are less susceptible to price increases than lower-income consumers.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Tenure lowers customer sensitivity to price increases and positively affects retention.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Breadth of relationship lowers customer sensitivity to price increases and positively affects retention but only among newer customers.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Breadth of relationship lowers customer sensitivity to price increases and positively affects retention but only among newer customers.</td>
</tr>
<tr>
<td>Campbell (2007) JMR</td>
<td>Lab experiment</td>
<td>- A price increase is perceived as more unfair when the source is human rather than nonhuman.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Such an effect is mediated by inferred motive and affect.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Sequential increases in prices (e.g., 25% then 30%) lead to a more positive attitude toward the offer and greater purchase intention relative to a single percentage price increase (e.g., 62.5%).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Unexpected price increases or quality decreases reduce total spending across categories, and unexpected price decreases or quality increases raise it.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Such effects are mediated by consumer affective responses (e.g., gratitude, anger).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- A higher satisfaction level mitigates the negative impact of the magnitude of a price increase on repurchase intentions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Perceived fairness of the motive for the price increase positively affects repurchase intentions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Satisfaction positively affects the perceived motive fairness of the price increase.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Relative to the buyer identification tactic to offer different prices to different segments, the purchase timing tactic results in more favorable consumer behavior.</td>
</tr>
</tbody>
</table>

- Dawes (2009) *JSR* (Journal of Services Research)  
- Campbell (2007) *JMR* (Journal of Marketing Research)  
- Janakiraman et al. (2006) *JCR*  
- Homburg et al. (2005) *JAMS* (Journal of the Academy of Marketing Science)  
perceptions of trust, price fairness, and repurchase intentions.

• Such an effect is reduced when firms provide explanations for price differences.
• Consumers view larger price differences as more unfair.

<table>
<thead>
<tr>
<th>Study</th>
<th>Research Design</th>
<th>Perceived Price Fairness</th>
<th>Method</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campbell (1999) JMR</td>
<td>Inferred motive for a price increase</td>
<td>Perceived price fairness</td>
<td>Lab experiment</td>
<td>Inferred increased profit and inferred negative motive decrease perceived fairness of the price increase and, in turn, decrease consumers’ shopping intention.</td>
</tr>
<tr>
<td></td>
<td>Inferred relative profit for a price increase</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Firm’s reputation</td>
<td>Shopping intention</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sivakumar and Raj (1997) JM</td>
<td>Price increase vs. decrease High-quality vs. low-quality brands</td>
<td>Brand choice</td>
<td>Quantitative modeling using scanner panel data</td>
<td>With price decreases, high-quality (national) brands gain more than low-quality (private-label) brands in both brand choice and category choice.</td>
</tr>
<tr>
<td>Mazumdar and Jun (1993) JCR</td>
<td>Price increase vs. decrease Magnitude of price change Imprecise vs. specific price information</td>
<td>Evaluation of price change</td>
<td>Lab experiment</td>
<td>Multiple price increases are evaluated more unfavorably than a single price increase.</td>
</tr>
</tbody>
</table>

Notes: Studies on the effects of price increases are selected from high-quality marketing and marketing-related journals since 1990 and are listed in reverse chronological order.
Fig. 1

Conceptual framework
Fig. 2

Study 3 results

- Simultaneous Increases in Price and Size
- Simultaneous Decreases in Price and Size

<table>
<thead>
<tr>
<th>Purchase Intention</th>
<th>Unit Price Present</th>
<th>Unit Price Absent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simultaneous Increases</td>
<td>3.73</td>
<td>4.65</td>
</tr>
<tr>
<td>Simultaneous Decreases</td>
<td>4.34</td>
<td>4.65</td>
</tr>
</tbody>
</table>
Fig. 3
Study 4 results

Low Cognitive Load

- Simultaneous Increases in Price and Size
- Simultaneous Decreases in Price and Size

<table>
<thead>
<tr>
<th>Purchase Intention</th>
<th>Unit Price Present</th>
<th>Unit Price Absent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.93</td>
<td>4.69</td>
</tr>
<tr>
<td></td>
<td>4.85</td>
<td>4.83</td>
</tr>
</tbody>
</table>

High Cognitive Load

- Simultaneous Increases in Price and Size
- Simultaneous Decreases in Price and Size

<table>
<thead>
<tr>
<th>Purchase Intention</th>
<th>Unit Price Present</th>
<th>Unit Price Absent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.19</td>
<td>4.28</td>
</tr>
<tr>
<td></td>
<td>4.43</td>
<td>5.38</td>
</tr>
</tbody>
</table>
Appendix A

Examples of experimental stimuli – Study 1a

Price increase

Package downsizing

Simultaneous increases in price and size

Simultaneous decreases in price and size

Control – no change in price or size

Control – no change (ordinary signage used by the store)

Notes: Store name and brand names have been obscured.
### Appendix B

**Measures used in all studies**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Measures (all 7-point scales)</th>
<th>Reliability coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-change purchase intention</strong> (adapted from Oliver and Swan 1989)</td>
<td>• How likely are you to buy this product? (unlikely–likely, impossible–possible)</td>
<td>Study 2 Study 3 Study 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( r = .80 ) ( r = .83 ) ( r = .72 )</td>
</tr>
<tr>
<td><strong>Post-change purchase intention</strong> (adapted from Oliver and Swan 1989)</td>
<td>• Based on the product information, how likely are you to buy this product today? (unlikely–likely, impossible–possible)</td>
<td>( r = .86 ) ( r = .87 ) ( r = .83 )</td>
</tr>
<tr>
<td><strong>Perception of value</strong> (adapted from Grewal et al. 1996)</td>
<td>• Based on the product information, is this product good value for the money? (not good value at all–very good value)</td>
<td>( \alpha = .88 ) - -</td>
</tr>
<tr>
<td></td>
<td>• How fair do you think is the price of this product you see today? (very unfair–very fair)</td>
<td>- - -</td>
</tr>
<tr>
<td></td>
<td>• Based on the price you see today, is the product cheap or expensive? (very expensive–very cheap)</td>
<td>- - -</td>
</tr>
<tr>
<td><strong>Perception of quality</strong> (adapted from Yan et al. 2014)</td>
<td>• Based on the product information, how would you rate the quality of the product? (very poor quality–very excellent quality, very low quality–very high quality)</td>
<td>( r = .94 ) - -</td>
</tr>
<tr>
<td><strong>Perception of difficulty</strong> (from Yao and Oppewal 2016a)</td>
<td>• Considering both the price and the volume of the product, was it easy or difficult to rate the value of this product? (very easy–very difficult, not confusing at all–very confusing)</td>
<td>( r = .79 ) - -</td>
</tr>
<tr>
<td><strong>Decision based on cognition/affect</strong> (adapted from Shiv and Fedorikhin 1999)</td>
<td>• My purchase decision made today was driven by _____. (my thoughts–my feelings, the rational side of me–the emotional side of me)</td>
<td>- ( r = .69 ) -</td>
</tr>
<tr>
<td><strong>Perception of believability</strong> (adapted from Obermiller and Spangenberg 1998)</td>
<td>• The information about the change in value to this product is _____. (not believable at all–believable)</td>
<td>- N.A. -</td>
</tr>
<tr>
<td><strong>Perception of novelty</strong> (adapted from Kim and Kramer 2006)</td>
<td>• As shown in the shopping scenario, how usual is it to see the increases (decreases) in both price and volume of a product in supermarkets? (unusual–usual, uncommon–common, novel–not novel)</td>
<td>- ( \alpha = .91 ) -</td>
</tr>
<tr>
<td><strong>Price and size manipulation check items</strong> (adapted from Yan et al. 2014)</td>
<td>• Has the retail price of the product become lower or higher? (lower–higher)</td>
<td>N.A. N.A. N.A.</td>
</tr>
<tr>
<td></td>
<td>• Has the volume of the product become less or more? (smaller–bigger)</td>
<td>- - -</td>
</tr>
<tr>
<td><strong>Cognitive load manipulation check items</strong> (from McFerran et al. 2010)</td>
<td>• How challenging did you find it to read the scenario while trying to remember the product features of lawn mowers? (not challenging at all–very challenging)</td>
<td>- - ( r = .82 )</td>
</tr>
<tr>
<td></td>
<td>• How easy or difficult was it to remember the product features of lawn mowers? (very easy–very difficult)</td>
<td>- - -</td>
</tr>
</tbody>
</table>