Journal of Business Research xxx (2017) xxx–xxx

Contents lists available at ScienceDirect

Journal of Business Research

Presenting comparative price promotions vertically or horizontally: Does it matter?

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ARTICLE INFO

Available online xxxx
Keywords:
Comparative price promotions
Working memory
Math anxiety
Spatial price presentation

ABSTRACT

This research examines whether spatial differences in presentation of comparative price promotions (vertical vs. horizontal) affect consumers' assessment of price discounts. Results show that when comparative price promotions are presented horizontally, consumers take longer to compute the monetary discount and are less accurate than when such prices are presented vertically. This suggests that cognitive constraints exhibit a larger detrimental effect on performing computations when prices are presented horizontally than vertically. In addition, a constraint on visual resources impacts vertical presentations more while a constraint on verbal resources influences price computations that are presented horizontally.

1. Introduction

Consumers' price evaluations are subject to how retailers present their promoted prices. Recent research shows that consumers' assessment of sale price is influenced by color (Puccinelli, Chandrashekaran, Grewal, & Suri, 2013), and type and size of the fonts (Coulter & Coulter, 2005; Motyka, Suri, Grewal, & Kohli, forthcoming) used to present prices. Use of comparative price promotions that contrast regular with promoted sale prices to increase the likelihood of sale are also popular. A comparative price promotion relies on the regular price to act as a reference for evaluating the promoted price or discount (e.g., Regular Price (RP): $20, Sale Price (SP): $16; Regular Price: $20, Discount 20%). Such promotions have been shown to engender higher willingness to purchase than an offer that simply uses a sale price, primarily due to consumers' assessment of the price reduction and the computed discounted price (Compeau & Grewal, 1998; Della Bitta, Monroe, & McGinnis, 1981).

Recently Biswas, Bhowmick, Guha, and Grewal (2013) shows that comparative price promotions could be affected by the spatial location (left vs. right) of a sale price vis-à-vis its regular price. The location of a sale price in reference to its regular price assumes importance as it influences consumers' ability to compute the depth of a discount when performing calculations (Alba, Mela, Shimp, & Urbany, 1999; Biswas et al., 2013; Lichtenstein, Burton, & Karson, 1991). Generally, in a comparative price offer (RP – SP), the regular price (RP) will be the minuend, while sale price (SP) the subtrahend. However, in addition to determining the arithmetic difference between prices, the perceived difference between prices will also depend on the ease or difficulty with which consumers could compute price information (Thomas & Morwitz, 2009). When a comparative price conforms to a normative presentation that people expect to see when performing mathematical computations (RP – SP and not SP – RP; Biswas et al., 2013), it tends to make computations easier, and influences consumers' assessment of the discounted offer (Thomas & Morwitz, 2009). In a subtraction task for instance, Biswas et al. (2013) show that consumers find a larger minuend (regular price) displayed to the left of a smaller subtrahend (sale price) is easier to process as "people expect the 'normal' format to be one in which the smaller number appears to the right of the larger number" (pg. 51).

However, several retailers also offer comparative price promotions where a regular price is presented vertically above or below its sale price (e.g., macys.com; Amazon). So far research does not inform us if consumers will evaluate a comparative price promotion that is presented horizontally differently than if it was presented vertically. Hence, the research issue is whether a spatial difference in presentation of comparative price promotions (vertical vs. horizontal) affects consumers' perception of discounts and if so when?

This research builds upon the literature in education on students' approach to solving computation problems (Fuson & Briars, 1990) and the findings from Trbovich and LeFevre (2003) that participants tend to solve addition problems presented in a vertical format significantly faster and more accurately than problems presented in a horizontal format. Based on this literature it is proposed that when comparative price

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http://dx.doi.org/10.1016/j.jbusres.2017.01.003
0148-2963/

promotions are presented horizontally, consumers will compute monetary discounts less accurately than if such prices were presented vertically. Hence, consumers' assessments of discounts presented vertically will lead to a more accurate computation of the discount while a horizontally presented comparative price promotion will be perceived harder to process and will lead to lower perceived economic value (Thomas & Morwitz, 2009). Theoretical predictions are developed based on research on numerical processing and consumer learning of mathematical operations which suggests that people solve mathematical problems more accurately when the operands are presented vertically than horizontally. Further, since cognitive resources play a significant role in arithmetic computations (Ashcraft & Kirk, 2001; DeStefano & LeFevre, 2004) this research proposes the moderating effects of working memory and cognitive constraints on computation of discounts in comparative price offers. The following sections present a review of the literature on processing of numerical information leading to the predicted effects of spatial presentation of comparative price offers. These predictions are tested in five studies.

2. Conceptual development

In a comparative price promotion, consumers assess the promoted discount by relying on arithmetic calculation principles to mentally compute net prices and guide their price perceptions (Biswas et al., 2013; Grewal, Marmorstein, & Sharma, 1996). Increase in complexity of price presentations may reduce consumers' ability to systematically evaluate the discounts and form perceptions of the promoted offers and discounts (Estelami, 1999, 2003). However, computing the discount is only one way by which consumers may assess the attractiveness of an offer. Thomas and Morwitz (2009) report that a lack of processing ease also causes people to perceive the magnitude of the difference between two values as smaller. Consequently, assessment of comparative price promotions will depend not only on the arithmetic difference between prices but also on the ease or difficulty with which people process this difference.

Research suggests that numerical computations appear easier if their presentation formats conform to common norms as that makes such formats familiar and hence easier to process (Biswas et al., 2013; Yip, 2002). The issue then is whether certain numerical formats follow the norms and might allow a greater ease with which consumers can perform a subtraction task. Generally, when numbers are presented along a horizontal line, consumers expect to visualize a series of numbers with smaller numbers to the left while larger numbers towards the right (Dehaene, 1989). However, Biswas et al. (2013) observed results to the contrary when they compared the effectiveness of two types of horizontally presented comparative price displays. These displays differed in their presentation of the regular price (larger number) to the right (as a subtrahend) versus to the left (as a minuend) of the comparative sale price (smaller number; i.e., RP: $20, SP: $18 vs. SP: $18, RP: $20). Their studies found that presentations where the regular price appeared as a minuend was perceived easier to process and was preferred by consumers than when it appeared as a subtrahend. The contrast between vertical and horizontal presentation of comparative price promotions is discussed next.

2.1. Horizontal vs. vertical comparative price promotions

Interestingly, past research on the effectiveness of comparative price promotions has not only used stimuli where comparative prices were presented horizontally (e.g., Barone, Manning, & Miniard, 2004; Biswas et al., 2013) but also vertically (e.g., Coulter & Coulter, 2007; Thomas & Morwitz, 2009). However, in the extensive research on comparative price promotions, we know of no study that has examined whether comparative price promotions when presented vertically are evaluated differently than if they were presented horizontally. Dehaene's (1989); (Dehaene, Bossini, & Giraux, 1993) spatial-numerical association of response code (SNARC) effect on numerical processing discussed earlier was extended by Ito and Hatta (2004). These researchers observed a vertical SNARC with larger numbers occupying the top and smaller numbers the bottom of an internal representational space. Consistent with expectations from vertical SNARC, a study on merchandizing by Valenzuela and Raghubir (2015), shows that consumers expect higher (vs. lower) priced brands to be merchandized on the top (vs. bottom) shelves in retailing settings. Similarly, in numerical processing research, it is found that people generally expect to see large numbers at a higher elevation and small numbers at a lower elevation in the visual field (Gevers, Lammertyn, Notebaert, Verguts, & Fias, 2006; Schwarz & Keus, 2004). Therefore, when two numbers are presented vertically, like in a vertical comparative price display, the larger number (regular price) is expected to be on top of the smaller number (sales price). Though research on SNARC effects provides insights on suitable placement of numbers in space, it provides only limited insights into the effects of presentation of comparative prices. This research indicates that people expect a smaller number to appear below a larger number. If it meets this expectation then vertically presented comparative price promotions should be perceived easier to compute when the minuend is larger (i.e., regular price) and placed above the subtrahend (i.e., sale price).

The literature on education and numeric processing provides further understanding of how different comparative price presentations (vertical vs. horizontal) will impact consumers' computations of the final price or the discount. Arithmetic problems in school texts are often presented vertically (Fuson & Briars, 1990). For instance, when asked to solve addition and subtraction problems presented vertically or horizontally, some children found it necessary to rewrite in vertical form for problems presented horizontally (Goodrow, 1998). By recording eye movements, research on individuals' reading speed for horizontal and vertical English texts suggest that the reading speed is significantly higher in the horizontal direction than in the vertical direction (Schmidt, Ullrich, & Rossner, 1993; Yu, Park, Gerold, & Legge, 2010). Though easier to read, horizontal direction is more difficult to scan than vertical direction and this is because all items are aligned to the same line in a vertical presentation but do not match up in a horizontal presentation. Such a match helps in computing differences between two numbers or performing computations as is often the case involving comparative price promotions. Hence, when numbers are arranged in a horizontal line, consumers may find it harder to process them accurately than for numbers that are aligned vertically.

Consistent with the above conclusions, Trbovich and LeFevre (2003) found that participants solved addition problems presented in a vertical format significantly faster and more accurately than problems presented in a horizontal format. Heathcote (1994); (Brysbaert, Fias, & Noël, 1998) further suggests that an alignment of the unit digits in vertical presentations will result in shorter response latencies and higher accuracies for vertical presentations. Using both subtraction and multiplication operations, Imbo and LeFevre (2010) found support for the computation results observed by Trbovich and LeFevre (2003).

Since people are cognitive misers (Taylor, 1980) and solving arithmetic problems requires cognitive resources (DeStefano & LeFevre, 2004), comparative price presentations that are perceived difficult to process due to a lack of spatial alignment of numbers will require more cognitive resources leading to their computations to contain more errors (Baddeley, 1992, 2001; Miyake & Shah, 1999). In essence, when consumers compute comparative price promotions, cognitive resources are required to perform a series of mental computations, including calculating operands at the units, tens and hundreds places, borrowing, retention of the intermediate result, and generation of a phonological code (Widaman, Geary, Cormier, & Little, 1989). The ability to perform these mental activities depends on how a comparative price promotion is presented (Vanhuele, Laurent, & Dreze, 2006). Due to previous math learning habits and the differences in alignment of digits in vertical and horizontal price presentations, a vertical

Please cite this article as: Feng, S., et al., Presenting comparative price promotions vertically or horizontally: Does it matter?, *Journal of Business Research* (2017), http://dx.doi.org/10.1016/j.jbusres.2017.01.003