

The Impact and Determinants of Nine-Ending Pricing in Grocery Retailing

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Abstract

Research into nine-ending pricing indicates a clear effect on sales but strong variance, suggesting that their effects are context dependent. This research relates nine-ending effects to a broad set of determinants and investigates the influence of brand, category, store, and store area clientele characteristics. The numerous empirically supported hypotheses indicate that the framework built on level and image effects is well adapted for explaining the effectiveness of nine-endings. They validate that a wide and indiscriminate practice of nine-ending pricing is not effective. The findings show that the impact of nine-endings can lead to sales losses (e.g., premium brands); however, a nine-ending price is more effective for increasing sales of small brands (e.g., low market-share, low price, and new items) that belong to weaker categories (e.g., low price, low budget-share). The effect erodes as the store's nine-ending pricing practices intensify. For category sales, a simulation reveals the existence of a threshold for which overuse is counterproductive.

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Nine-ending pricing is a common, and perhaps overused, marketing technique (Bray and Harris 2006; Ngobo, Legohérel, and Guéguen 2010; Schindler and Kirby 1997), likely because of the traditional belief that price endings can have positive effects on sales. On the one hand, prior research reports an intense practice, with the percentage of prices ending in the digit 9 ranging between 52% (Anderson and Simester 2003a) and 80% (Schindler and Wiman 1989). Thus, determining whether the practice is effective for manufacturers and/or retailers is important. On the other hand, no research has investigated whether the extensive use of nine-ending pricing helps increase sales. Understanding this issue would help retailers make better pricing decisions and avoid a counterproductive pricing policy. Furthermore, many other unsolved questions remain about the effectiveness of the nine-ending pricing practice. For example, is the effectiveness of nine-ending practices similar across items? Across categories? In other words, what are the most responsive items to nine-ending practices? Are there items or categories that retailers should prioritize? If so, what are their characteristics? For example, do stronger effects emerge for brands with higher or lower market share? Are nine-ending prices less effective when more products use them? Are nine-endings as effective in increasing sales in higher-priced categories as in

lower-priced categories? Finally, should retailers adapt their nine-ending practice policies to the stores and the profile of their potential shoppers? For example, what is the impact on sales when younger customers patronize stores, and is there a difference in stores with older clientele?

Identifying the major determinants of the effects of nine-ending prices is fundamental to managerial decisions because it would help retailers set prices in a more effective and structured manner. This is the purpose of the research described herein.

Prior research

As Table 1 displays, prior research reveals strong variance in the impact of nine-endings on demand. Using data aggregated across stores for several large brands, Blattberg and Wisniewski (1988) find that nine-ending pricing (whether accompanied by a deal or not) increases unit sales by 21% on average, and Kalyanam and Shively (1998) propose a sales increase ranging from 12% to 76%. In an experiment in which customers of a mail-order clothing firm randomly received one of two price versions, Schindler and Kibarian (1996) find that the version with prices ending in 99 cents outperforms the version with round-number pricing by only 8%. However, this 99-ending sales advantage appears in comparison with a very small price difference (1 cent). Anderson and Simester (2003b) find remarkable effectiveness of the digit 9 in pricing; for a women's clothing

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Table 1
Impact of nine-endings on demand in previous empirical studies.

Authors	Type of data	Effect
Blattberg and Wisniewski (1988)	Store panel data	Sales increase by 21% on average
Schindler and Kibarian (1996)	Experiment	+8% sales increase
Stiving and Winer (1997)	Consumer panel data	Positive effect of nine-endings on brand choice for yogurt data, negative effect for tuna sales
Kalyanam and Shively (1998)	Store panel data	Sales increase between 12% and 76%
Anderson and Simester (2003a)	Experiment	Increase in demand of approximately 35%
Anderson and Simester (2003a)	Experiment	5–8% increase in sales
Bray and Harris (2006)	Store-based experiment	Odd prices are less effective than round price, with trial sales, in nine of ten products
Ngobo et al. (2010)	Consumer panel data	Significant, positive impact on the percentage of buyers

catalog, sales of a dress originally priced at \$34 rose by one-third when the price increased to \$39. In another study, Anderson and Simester (2003a) find a 5–8% increase in sales. Stiving and Winer (1997) also find a positive effect of nine-endings for yogurt data, but they report a negative effect for tuna sales. Bray and Harris (2006) report sales growth through the rounding up of prices previously set with nine-endings in nine of ten products included in a store experiment.

Thus, prior findings indicate great variability in the impacts of nine-ending prices on sales, including effects that are substantial, medium, weak, or even negative. There is a compelling need to explain such variability. A recent stream of research investigates the context dependency of nine-ending prices but is weak in scope because it incorporates only a few explanatory factors. Some factors, founded on neither theory nor empirical verification, simply seem subject to conjecture, such as category price (Gendall, Holdershaw, and Garland 1997), or are situational factors, such as shopping time pressure (Schindler and Warren 1988). More recent research (Anderson and Simester 2003a; Baumgartner and Steiner 2007; Ngobo et al. 2010) investigates a few factors that might explain the variability in the impacts of nine-ending prices. Table 2 provides an overview of their conjectures and the empirical findings. Baumgartner and Steiner (2007) claim that the inconsistent empirical results for nine-ending effects reflect consumer heterogeneity in preferences for odd and even price endings. In their analysis of the influence of three consumer characteristics (gender, individual involvement, and time pressure) on preferences for odd prices, their findings vary across categories (chocolate drinks and notebooks), suggesting the need to account for the influence of other covariates. Ngobo et al. (2010) investigate the cross-category effects of nine-ending pricing on consumer brand choice. They find that 99-ending prices attract more buyers in more concentrated and higher-promoted categories but fewer buyers in more expensive categories. Anderson and Simester (2003a) alone investigate moderating factors using actual sales; they find that the nine-ending effect is stronger for new items that customers have seen less frequently in the past but less effective when retailers use sale cues.

Research overview

Knowledge of the effectiveness of nine-endings and their impact on actual sales remains limited. This research attempts

to fill this important research gap. It provides the first systematic, broad explanation of variance among nine-ending price effects and identifies multiple context variables that may determine the effectiveness of nine-ending pricing. More broadly, this study investigates whether the effectiveness of nine-ending prices varies across items, categories, stores, or store clientele area characteristics. A conceptual framework built on level and image effects (Stiving and Winer 1997) helps predict the impact of seventeen determinants. The numerous empirically supported hypotheses indicate that both level and image effects are well adapted for explaining the effectiveness of nine-endings.

Specifically, this research considers grocery goods whose price includes two digits after the decimal. A nine-ending price means that the last digit in the price, the cent, is 9 (e.g., \$XX.X9). The empirical analysis uses store-level scanner data from the Dominick's Finer Food grocery chain database, pertaining to ten product categories across 83 stores, which offers several advantages.

First, use of store-level scanner data enables the assessment, at a detailed stockkeeping unit (SKU) level, of the impact of nine-ending prices on the sales of thousands of items. In general, previous research focuses on three or four top brands in a category; in contrast, this study includes all SKUs in each category. Therefore, it can capture greater variability in SKU characteristics and contribute to better knowledge of smaller brands (Slotegraaf and Pauwels 2008).

Second, store panel data provide broad information about the product categories, store locations, and observations. Thus, this approach encompasses a large set of determinants, most of which prior research on odd price endings has not addressed (see Table 2). Therefore, this research deepens insight into the drivers of nine-ending effects. This study investigates seventeen determinants selected because they are key factors for both retail managers and academics. These determinants are related to the characteristics of (1) the product (i.e., SKU price, market share, maturity, and private label), (2) the category (i.e., budget share and category price), (3) the store (i.e., assortment size, innovation level, differentiation level, and overall nine-ending practice), and (4) the profile of the store's trading clientele (i.e., age, education, working women, income, and household size).

The research findings offer marketing practitioners easily applicable guidelines for making better pricing decisions. They validate that a wide and indiscriminate practice of nine-ending pricing is not effective. For example, premium brand manufacturers should be suspicious of the nine-ending pricing practice

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