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All Numbers Are Not Created Equal: Price Points, Price Processing and Price Rigidity

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Using multiple datasets, we find that consumers are less likely to recognize a larger price or a price increase that ends with 9, but more likely to recognize a price increase from a 9-ending to a non 9-ending. Retailers therefore set 9-ending prices more often after price increases than decreases.

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All Numbers are Not Created Equal: Price Points, Price Processing and Price Rigidity

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EXTENDED ABSTRACT

One common type of price points is *9-ending prices*, also known as *psychological prices* (Kashyap 1995; Levy et al. 2011; Knotek 2010). In the current research, we use data from a lab experiment, a field study, and a large Midwestern US supermarket chain to study the rigidity of 9-ending prices. Our results demonstrate a hitherto undocumented asymmetry in rigidity associated with 9-ending prices, and provide a link between consumers' cognitive costs and pricing policies that have significant effects on demand and inflation.

TESTABLE HYPOTHESES

Empirical evidence suggests that individuals usually process multi-digit numeric information, including numbers and prices, from left to right (Poltrock and Schwartz, 1984, Stiving and Winer 1997). The marketing literature also suggests that consumers often use 9-endings as a signal for low prices (Schindler 2001, 2006; Thomas and Morwitz 2005). We therefore expect that while consumers will process *numbers* digit by digit, they will use 9-endings as a signal when comparing *prices*. Since relying on 9-endings as a signal interferes with left-to-right processing, we predict that consumers will be less accurate in comparing prices and in judging price changes. We also predict that retailers are likely to respond strategically to these consumer perceptions in setting prices. Specifically, retailers will tend to set 9 ending prices after price increases because the consumers are less likely to recognize a price increase when the new price is 9-ending. Retailers are less likely, however, to set 9-ending prices after price decreases, because price decreases are often promoted by alternative signals of low prices, such as shelf signs and leaflets. Thus, we predict an asymmetry in the price rigidity of 9-ending prices, with 9-ending prices being less likely to increase than, but as likely to decrease as, non 9-ending prices.

3. DATA AND ANALYSIS

3.1. Evidence from a Laboratory Experiment

Participants compared 300 pairs of numbers or prices on lab computers. They were instructed to respond as quickly and as accurately as possible. In addition, they were told that 10 percent of them would be selected at random and paid according to their performance. The results suggest that 9-endings reduce participants' accuracy only for price comparisons but not for number comparisons. In addition, we find that 9-endings reduced accuracy only when the greater of the two prices ended with 9 but not when the smaller of the two prices ended with 9, consistent with our premise that consumers oftentimes mistaken a 9-ending price as being smaller.

3.2. Evidence from a Field Study

We recruited 365 shoppers at three supermarkets located in different cities in Israel. Consumers exiting the three supermarkets were approached, and only those who shopped in the same supermarket also in the previous week were given a questionnaire. The questionnaire was composed of a list of 52 goods in 12 categories. For each good, respondents were asked whether the good's price had increased, decreased or remained the same from the previous week to the current week.

Recall data suggest that 9-ending is associated with a higher probability that a consumer thought that a price had decreased, but does not affect the probability that a consumer thought that the price had increased. We also find that consumers are more likely to associate changes from 9-endings to non-9-ending prices with price increases, and associate changes from non 9-ending prices to 9-ending prices with price decreases.

Analysis of recall accuracy revealed that consumers are less likely to recognize price increases when the new price is 9-ending. At the same time, 9-ending prices do not increase the probability that the consumers correctly recognized a price decrease. This might be because many price decreases are sale prices that are promoted by shelf signs, leaflets, etc., regardless of whether the new prices are 9-ending or not.

3.3. Evidence from a Large U.S. Supermarket Chain

Finally, we use data on price changes in Dominick's Finer Food, a large Midwestern US supermarket chain, to test our predictions concerning retailer's pricing behaviors. We find that retailers are more likely to set 9-endings after price increases than after price decreases. Moreover, the likelihood that the prices will be 9-endings is even lower for sale prices than for regular price decreases, confirming our speculation that price decreases are oftentimes promoted by shelf signs, flyers, etc. rather than by the 9-ending. In addition, when the old price is 9-ending, the retailers are more likely to change it to another 9-ending price than when the old price is non 9-ending.

Addition analyses showed that the right-most digits were less likely to adjust if the previous prices ended with 9, more so following a price increase than following a price decrease; 9-ending prices are significantly less likely to increase than, but as likely to decrease as, non 9-ending prices; non 9-endings transitioned to 9-ending with higher probabilities for price increases than for price decreases; and 9-ending prices, when they did change, had a larger average magnitude of change than non 9-ending prices for increases but not for decreases. These results combined depict a clear pattern for an asymmetry in rigidity, with 9-ending prices being more rigid than non 9-ending prices upward but not downward.

CONCLUSION

We use data from a lab experiment, a field study, and a large Midwestern US supermarket chain to study the rigidity of 9-ending prices. We find that consumers often interpret 9-endings as a signal for low prices and therefore, they are more likely to make mistakes in price comparisons if the greater prices end with 9, and are less accurate in recalling price increases from non 9-ending prices to 9-ending prices. Retailers respond to these consumer perceptions by setting prices at 9-endings more often after price increases than after price decreases.

Thus, it seems that 9-endings as an outcome of retailers' response to consumers' cognitive bias might have significant effects on pricing policies and consequently on market structure, demand and inflation (Basu, 1996, Kehoe and Midrigan, 2008, Knotek, 2010, Eichenbaum et al., 2011).

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