EQUILIBRIUM PROMOTIONAL STRATEGIES UNDER CONSUMER STOCKPILING
AND ITS EFFECT ON FIRM PROFITS

Manish Gangwar¹
Nanda Kumar²
Ram Rao³

¹ Assistant Professor at Indian School of Business, Gachibowli, Hyderabad, India 500032
² Associate Professor at The University of Texas at Dallas
³ Professor at The University of Texas at Dallas
Sales promotion is a well studied topic in economics and marketing (Shilony 1976, Varian 1980, Narasimhan 1988, Rao 1991, Raju, Srinivasan and Lal 1990). The theoretical work mentioned above assumes that some consumers respond to promotions by switching brands, and a firm which offers the lowest price gets all the switchers. This behavior of switchers introduces discontinuity in demand, which results in a mixed strategy equilibrium interpreted as promotions. Early empirical research (Chiang 1991, Chintagunta 1993, Bucklin, Gupta and Siddarth 1998, and Bell, Chiang and Padmanabhan 1999) also found that a large percentage (about 75%) of the demand expansion due to promotions comes from the brand switching and the rest comes from purchase acceleration and quantity increase. However, more recent work (Powels, Hansen and Sidharth 2002, Heerde, Gupta and Wittink 2003, and Steenburg 2007) shows that only one third of the unit sales increase in the promotional period can be attributed to the brand switching. Thus there is evidence that purchase acceleration and quantity effects are substantial and cannot be ignored. Thus in this paper, we develop a model which explicitly accounts for both brand switching and consumer stockpiling behavior in characterizing firm’s optimal pricing strategy.

Hong, McAfee and Nayyar (2002) and Gangwar and Kumar (2011) extend Varian (1980) to accommodate consumer stockpiling behavior. They allow price sensitive consumers to stockpile but price insensitive consumers in their model do not stockpile. If one consider market segmentation based on brand preferences instead of price sensitivity, their formulation is mathematically equivalent to the model where loyal do not stockpiling and only switchers stockpile. While this may be true for several categories, in this paper we explicitly focus on categories where loyal consumers are more likely to stockpile. There is some evidence that in several categories brand loyal consumers are more likely to engage in stockpiling in response to promotions. Krishnamurthi and Raj (1991) finds that loyal consumers although less price sensitive in the choice decision are more price sensitive in quantity decision. Another recent empirical study by Sun, Neslin and Srinivasan (2003) also finds that loyal consumers are more likely to adjust their purchases due to promotions. Intuitively, loyal consumers can benefit more from buying extra units (stockpile) on promotion because of their high preference for the
brand. In contrast, switchers have less to gain from stockpiling because they are not committed to any particular brand and so can also take advantage of promotions by other firms. For example, coke lovers will consider stockpiling only if coke is at low prices. One important finding of models, where only switchers stockpile, is that firm’s equilibrium profits are not affected by consumer stockpiling behavior when firm’s use optimal promotional strategy. This leads to an interesting question whether the same result would hold if consumers with strong brand preferences stockpile?

We follow Narasimhan (1988) in modeling brand loyalty: some consumers in the market are loyal to each of the two brands and the remaining consumers buy the lower price brand. We innovate with respect to Narasimhan by allowing loyal consumers to stockpile. We explicitly model utility maximizing consumers’ decision, to stockpile based on firm’s promotional strategy. In other words, consumers stockpiling price thresholds are endogenously determined in our model. Firms in our model are infinite period discounted payoff maximizers. They do take in to account competition as well as consumer stockpiling behavior in formulating optimal promotional strategies. We solve for firm’s optimal promotional strategy by characterizing a markov perfect equilibrium of the game. Interestingly, we find that profits do depend upon stockpiling, when loyal consumers stockpile. More importantly, we can quantify the extent of losses due to consumer stockpiling. We find that, in the worst case scenario, when all loyals engage in stockpiling, the loss in profit is proportion to \((1-\delta)\), one minus discount factor, of the profit when no consumer engages in stockpiling. In a frequently purchased categories where inter purchase time is small, hence the discount factors \(\delta\), are big the loss due to consumer stockpiling is minimal, when firms adopt optimal promotional strategies proposed in this model.