J. of the Acad. Mark. Sci. (2010) 38:105–117
DOI 10.1007/s11747-009-0146-0

Marketing at the retail shelf: an examination of moderating effects of logistics on SKU market share

Matthew A. Waller · Brent D. Williams · Andrea Heintz Tangari · Scot Burton

Received: 15 April 2009 / Accepted: 23 April 2009 / Published online: 15 May 2009

Abstract Given that the impact of retail shelf facings and price on a product's market share is of substantial interest to marketing managers in the retail supply chain, we examine whether these relationships may be interdependent with the firm's supply chain activities. We offer predictions regarding the interdependence of the marketing and supply chain variables using monthly in-store observations from 62 different retail stores from five different chains, taken over a 24-month period. The in-store observations included price and number of facings, which is combined with data obtained from the manufacturer on case pack quantity and market share data from the ACNielsen HomeScan consumer scanner panel. Results indicate that shelf facings impact the effects of price and case pack quantity on market share. In addition, we explore the strength of relationships across retailers employing everyday low price versus HiLo pricing strategies. Generally, our findings suggest that retailers and suppliers must work to integrate marketing activities and supply chain processes both within and across firms to most effectively serve the consumer at the retail shelf and increase market share.

Keywords Retail shelf space · Case pack quantity · Retail market share · Supply chain management

The authors express their appreciation to the three anonymous reviewers and the Special Issue Editors for their helpful and constructive comments.

M. A. Waller · A. H. Tangari · S. Burton (✉)
Department of Marketing and Logistics, 302 BA,
Sam M. Walton College of Business, University of Arkansas,
Fayetteville, AR 72701, USA
e-mail: sburton@walton.uark.edu

M. A. Waller
e-mail: mwaller@walton.uark.edu

B. D. Williams
Department of Information Systems and Supply Chain Management,
Texas Christian University,
TCU Box 298530,
Fort Worth, TX 76129, USA

In considering the interrelationship between retail supply chain management and consumer packaged goods (CPG) marketing, a crucial point of interface between retailer and consumer is the retail point-of-purchase. Procter and Gamble calls this the "first moment of truth," the first few seconds after a consumer initially encounters a product on the shelf (Nelson and Ellison 2005). The effectiveness of the retail supply chain becomes evident at this moment because the specific brand and size desired by the consumer must be available on the retail shelf. Further, the retail point-of-purchase is a key linkage between retail marketing management and supply chain management since satisfying the consumer is fundamental to both (Cooper and Ellran 1993; Kohli and Jaworski 1990; Min and Mentzer 2000). Studies have shown that if a product is unavailable on the shelf at the time the consumer needs it, then the consumer could take a number of actions including substituting another viable alternative for the unavailable product, going to another retail store, or delaying the purchase (e.g., Campo et al. 2000; Corsten and Gruen 2003; Fitzsimons 2000). The action taken by the consumer can be detrimental to the sales of the supplier, retailer, or both, and may have both short-term and long-term implications regarding consumer behavior and loyalty.

Marketing management and supply chain management are vital to the success of both the retailer and supplier. The interdependence of these retail marketing and supply chain

processes, however, is not as well-established. Thus, in this study we focus on questions regarding the impact of variables primarily controlled by the retailer (e.g., shelf facings), variables controlled by the supplier (e.g., case pack quantity), variables jointly controlled by the retailer and supplier (e.g., price), and how the interrelationships of these variables influence dollar market share.

There have been a number of studies assessing traditional marketing variables that influence market share. Variables studied have included the effects of price and facings or shelf space for a given stock-keeping unit (SKU) (Corstjens and Doyle 1981; Cox 1970; Dreze et al. 1994; Urban 1998). Less is known about the impact of the number of units per retail shipping container (or *case pack quantity*). We propose that case pack quantity, the pre-determined number of consumer units (e.g., boxes of cereal) that fit into the case shipped from the supplier to the retailer, may be related to the potential effectiveness of the retailer's replenishment operations at the retail shelf.

Traditionally, the number of units per retail shipping container has been viewed by CPG companies as an operational variable. Case pack quantity is considered important to many CPG companies because it determines how the case pack fits on a pallet and how that pallet utilizes the space capacity of a truck. Others simply view case pack quantity as a result of the constraints of current packaging machinery. However, there has been little consideration of how a SKU's case pack quantity may have effects beyond pallets, trucks, and packaging machinery, and how it may impact market share due to effects on store and shelf replenishment processes as well as the number of facings that a SKU is allocated in the retail store. There is even less understanding about the potential interactions between variables such as facings, price, and case pack quantity on retail market share. Beyond potential effects of such variables on retail SKU dollar market share, it is not clear if the strength of such relationships is consistent across retailers that employ different pricing and promotional strategies.

Thus, this paper focuses on the interrelationships between retail supply chain and marketing variables that influence SKU market share using unique data obtained through in-store observations from multiple U.S. retail chains (over a 2 year time period), secondary data obtained from an ACNielsen scanner panel, and data supplied by a major national CPG company. Primary research questions examined include the following:

1. Does the number of retail shelf facings (a retailer controlled variable) mediate any effect that case pack quantity (a supplier controlled variable) may have on retail SKU dollar market share?
2. Does the number of retail shelf facings moderate the effect of price on retail SKU dollar market share?
3. What is the nature of the interrelationship between SKU dollar market share, facings, shelf replenishment frequency and case pack quantity?
4. Do the relationships of facings, price and case pack quantity with SKU share differ across retail stores employing everyday low price (EDLP) versus HiLo pricing strategies?

This paper is organized as follows. First, we present an overview of the literature drawn from both marketing and supply chain management and present our conceptual rationale and specific hypotheses. Then, we discuss the methodology and measures employed. Next, we present results of empirical tests used to assess our predictions, and finally we offer conclusions relevant to the supply chain—retail marketer interface.

Conceptual background and hypotheses

Related literature drawn from supply chain and marketing disciplines

While there has not been a great deal of research regarding the complex interactions of the variables of interest in this study, there are multiple studies from the supply chain management and marketing literatures concerning category management that address the connection between marketing and supply chain variables at the retail shelf. In addition, other studies highlight the supplier/retailer relationship relevant to the roles of shelf space allocation and stockouts, both of which are critical to retailers' and manufacturers' success in the highly competitive retail and consumer goods environment. We provide a brief overview of category management, shelf space/facings allocation and shelf stockouts.

Category management Category management involves a retailer, or a retailer in collaboration with suppliers, managing categories of products as profit centers rather than just managing brands (e.g., Zenor 1994; Basuroy et al. 2001). Category management has received substantial attention in the marketing literature over the past 15 years. Category management is often defined as the process of managing a collection of brands in the same product line. This is in contrast with traditional brand management, where buyers bought diverse products from the same supplier, regardless of the product line.

Dussart (1998) points out that in practice, category management tends to be very focused on costs and profit of a category. Theory development in category management suggests that profit, sales, and market share are influenced by the mix of brands, SKUs and pricing, which may be

customized to match consumer demand at specific stores (Dupre and Gruen 2004). Because preferences may differ across regions in the country, category management strives to match assortments to consumer preferences in different regions. An important consideration in category management is how shelf facings are allocated to SKUs within a category. In this study we postulate and empirically test whether SKU dollar market share also may be impacted by the interrelationship between case pack quantity and facings allocation.[1]

Shelf space allocation The allocation of shelf facings and space on the shelf are important decisions for category managers. Shelf space can be critical because it is often at a premium due to suppliers' competition for space for each SKU on the retail shelf. Allocation of shelf facings can affect consumer product awareness and perceptions, as well as both replenishment and sales. Over the years, the decrease in shelf space for each SKU has been shown to have a negative impact on supplier profitability (e.g., Messinger and Narasimhan 1995).

Retailers historically have had strong incentives to increase assortment. However, Broniarczyk et al. (1998) found that assortment can be reduced without affecting shopper assortment perceptions and store choice, as long as total category space is held constant and products that are 'fast movers' (i.e., the most popular products) are not eliminated. Boatwright and Nunes (2001) found that if slow selling SKUs are eliminated from the category, then sales in the category can actually increase in some cases. This is consistent with Schwartz (2004), who found that people are more likely to make a decision to buy a product when they are not overwhelmed with choices. They argue that this is a result of reducing clutter in the category. Similarly, Gourville and Soman (2005) argue that increasing assortment in some categories may hurt sales due to an 'over-choice effect' that is counter-productive and can sometimes lead a consumer not to buy anything. Zhang and Krishna (2007) examine the brand level effects of SKU reduction and find differences in purchase behavior among consumer groups. Sales of faster selling products often suffer a greater impact from decreases in shelf space than do slower moving products (Curhan 1972). Wilkinson et al. (1981) further note that, in general, increased shelf space positively affects faster selling products. Anderson (1979) addresses the theoretical connection between retail shelf space and market share but ignores the impact of case pack quantity, a key supply chain variable. Campo and Gijsbrechts (2005) have suggested that research should focus on three under-researched areas of category management: assortment, shelf space, and stockouts. We propose that these issues may be related, in part, to case pack quantity.

Shelf stockouts Stockouts can have implications for consumers, retailers and manufacturers. Stockouts can have effects on consumer purchase behavior, including product or store switching, delayed purchase, or not making a purchase (e.g., Corsten and Gruen 2003; Gruen and Corsten 2007). If the consumer finds, tries, and ends up preferring an alternative product, the consumer may be lost forever, resulting in a negative impact on the long-term value of the customer and SKU dollar market share. In addition, if the consumer is loyal to the out-of-stock product, he or she might visit another store to find the desired product, harming the retailer. Thus, repeated stockouts can cause significant negative effects for both the retailer, due to a loss of customers and employee time, and the manufacturer, through lost sales, brand switching and a loss of brand equity (Gruen and Corsten 2007). Such assertions are well-documented by existing studies that emphasize the impact of stockouts on consumer responses and sales (e.g., Corsten and Gruen 2003; Emmelhainz et al. 1991; Fitzsimons 2000; Motes and Castleberry 1985; Sloot et al. 2005; Walter and Grabner 1975; Zinn and Liu 2001). For example, given an out-of-stock product, Corsten and Gruen (2003) found that 31% of U.S. consumers would switch stores, 16% would delay purchase, and 22% would substitute a different brand. For products that are frequently purchased, such as cereal, consumers are more likely to switch to another item (Sloot et al. 2005). Thus, while the manufacturer ultimately is harmed the most by stockouts of its product, the retailer can also feel a negative impact if consumers switch stores.

Hypotheses

Direct effects H1 and H2 concern the direct effects of case pack quantity, facings and price on market share. Case pack quantity is a variable that is controlled by the supplier but has a sequence of effects in the retail supply chain that may be directly or indirectly related to market share. Larger case packs result in the following chain of events. The frequency of store replenishments is reduced because it takes longer to go through the amount of units that were replenished. Fewer store replenishments reduce the exposure to errors in replenishment because, for example, every time the store is replenished there is a possible delay in transportation or a possible error in the distribution center in terms of picking

[1] In this study we focus on retail shelf facings as one key independent variable in predictions, but we also obtained a measure of total shelf capacity. We found that facings and the shelf capacity measure were very highly correlated (r=.92), and when shelf capacity was used instead of facings, it produced identical results for our specific tests of predictions. Because facings are more directly associated with the consumers' exposure to the SKU and perceptual experience at the retail shelf, and given the similarity of findings, we used facings in tests of predictions.

the right product. Fewer exposures to errors in replenishment increase the expected fill rate (i.e., the percentage of demand fulfilled from on-hand inventory), and higher fill rates lead to increased sales and market share. We refer to these effects associated with larger case packs on market share as a "fill rate effect," and, in general, based on these outcomes, we predict that larger case pack quantities will be positively related to market share.

As indicated previously, however, increasing facings can boost retail sales by stimulating demand, thus having a positive effect on retail SKU market share. In addition, an increase in the number of facings can reduce shelf-level stockouts because the shelf needs fewer replenishments and thus facings can also positively impact market share by reducing shelf level stockouts. Given these favorable effects on share, there is competition for retail facings among suppliers within a given category. In contrast to case pack quantity, the number of facings allocated to a SKU is a decision ultimately made by the retailer and not directly under the control of the supplier. In attempting to influence the allocation of a retailer's shelf space, one well-known supplier "lever" is case pack quantity. Accordingly, Gruen and Corsten (2007) note that shelf space allocation decisions are related to case pack quantity.

Many suppliers view the retailer use of shelf space allocation heuristics as an opportunity to influence the facings allocation process. These suppliers assume that as a SKU's case pack quantity increases, the number of facings allocated to the SKU on the retail shelf is likely to increase. Subsequently, the increase in facings will increase sales and ultimately increase the SKU's market share. This suggests that the direct effect of case pack quantity on SKU market share is at least partially mediated through its effect on the number of facings allocated to the SKU.

H1a: Case pack quantity is positively related to retail SKU market share.

H1b: The positive effect of case pack quantity on retail SKU market share is mediated by the number of facings assigned to the SKU.

A number of previous studies have examined the direct effects of retail price and shelf facings at the point of purchase on SKU market share (e.g., Dreze et al. 1994; Urban 1998). In H2, we propose differences in the effects of these retail shelf variables under two different retail strategies, EDLP and HiLo pricing. EDLP is a pricing approach in which the product is offered to retailers and consumers at a consistently low price rather than reducing price periodically through sales promotion activities. In contrast, HiLo is a pricing approach in which retailers and suppliers often use sales promotion activities through frequent price discounts rather than offering a product at a consistent lower price.

We propose that the importance of variables such as facings and price may differ under EDLP and HiLo strategies. HiLo retailers focus more on the use of price discounts and in-store promotion to stimulate consumer demand than do EDLP retailers. Frequent discounts can result in greater variability in sales and can lead to difficulty in maintaining an efficient replenishment process. Higher variability in sales reduces forecast accuracy which increases stockouts for a given level of safety stock (i.e., the expected number of units on hand and available for use when the replenishment arrives). Thus, we hypothesize that the effects of shelf facings, which impact replenishment at the shelf and safety stock level on the shelf, may have stronger effects for HiLo stores.

On the other hand, effects of price may be stronger for EDLP stores which are more likely to attract value conscious shoppers concerned with the overall price of the market basket rather than more deal prone consumers (Lichtenstein et al. 1990). Many highly successful EDLP retailers have developed logistics and operating systems as core competencies, which may be related to the need to more effectively use category low prices to stimulate consumer demand (Hoch et al. 1994). Thus, while effects on SKU share of the number of facings should be positive across pricing strategies, and the effects of price should remain negative, we predict differences in the strength of the effects of facings and price for HiLo versus EDLP stores.

H2a: The positive relationship between the number of facings and retail SKU dollar market share is stronger under a HiLo strategy than under an EDLP strategy.

H2b: The negative relationship between price and retail SKU market share is stronger (i.e., more negative) under an EDLP strategy than under a HiLo strategy.

Moderating effects In this study, we attempt to extend previous findings on direct relationships between SKU share, facings and price (e.g., Bolton 1989; Wilkinson et al. 1981) by focusing on the effect of the interaction between price and facings on share. We propose that the relationship between price and market share is moderated by the number of facings, and this moderating relationship is a result of a supply chain phenomenon relating to stockouts. Specifically, a decrease in price will increase the quantity demanded. Higher demand products tend to have more stockouts than lower demand products (Gruen and Corsten 2007). Additional facings result in more inventory on the shelf, which allows for fulfillment of the increases in demand when prices are lower. However, for products that have fewer facings, differences in price will not be as strongly related to market share because the shelf is only able to handle a certain level of increased demand without restocking. Stockouts are more likely to occur with fewer

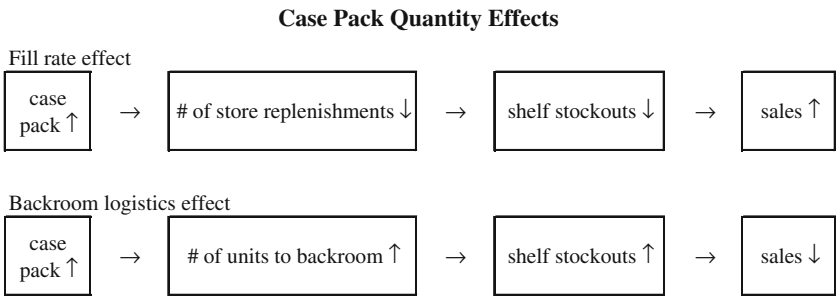


Figure 1 Case pack quantity effects.

facings because the shelf does not have the capacity to cover the demand between shelf replenishments. Thus, H3 addresses this moderating role of facings for the relationship between price and share.

H3: The negative relationship between price and market share is moderated by the number of facings. The negative relationship between price and share will be stronger when there are a higher number of facings than when there are a lower number of facings.

While we anticipate that overall the positive impact that results from the "fill rate effect" generally will be dominant (as indicated in H1), there also is the potential for a second countervailing type of effect of case pack quantity that is negative. Specifically, larger case packs increase the probability that some of the units will need to be stored in the backroom because they do not all fit on the shelf when the case pack arrives at the store. The need to store these excess units in the backroom of the store increases the number of exposures to stockouts due to poor shelf replenishment from the storage area. This negative effect of larger case packs may be attributed to a "backroom logistics effect." Figure 1 depicts the countervailing roles of a "fill rate effect" and a "backroom logistics effect."

Thus, case pack quantity may influence market share specifically through out-of-stock events (Gruen and Corsten 2007), which can occur for several reasons. As suggested above, stockouts may occur even when inventory is in the store, if the units remain in the storage area instead of on the shelves. In general, replenishing shelves from storage areas tends to be less reliable than replenishing them through a delivery from the manufacturer. As noted by Raman et al. (2001), "store salespeople, who often are very busy during high-traffic periods, find it hard to replenish merchandise promptly from the storage areas, and most stores do not organize the inventory in their storage areas very well. Consequently, sales people may not know if merchandise that has stocked out in the selling area is even available." This leads to store employees not being able to locate items up to 10% of the time, even though they are available on store premises (Raman et al. 2001). Even if the inventory is not misplaced in storage, replenishing the shelf from stock remains less reliable because of the lack of available store personnel or due to business processes in general (e.g., McKinnon et al. 2007; Gruen and Corsten 2007).

In sum, although the direct effect of case pack quantity on market share may be positive due to the fill rate effect, our discussion suggests a moderated relationship that is more complex. More facings are associated with increased product availability at the shelf and reduce the frequency with which the shelf must be replenished, thereby reducing the number of stockouts, and thus increasing market share. However, this relationship also is impacted by the frequency of shelf replenishment and the case pack quantity. For items that are frequently replenished, the positive fill rate effect of case pack quantity dominates the negative backroom logistics impact. For the items that cannot be replenished frequently and have few facings allocated to them, the negative impact of the backroom logistics effect will be more influential. Based on the prior discussion, we propose the following interaction between facings, shelf replenishment frequency, and case pack quantity.[2]

H4: The positive relationship between facings and market share is moderated by shelf replenishment frequency and case pack quantity. When the shelf replenishment frequency is low, the strength of the relationship between facings and share is stronger when the case pack quantity is low. However, when the shelf replenishment frequency is high, the strength of the relationship between facings and share is stronger when case pack quantity is high.

Method

Data sources and sample of retail stores

To test predictions, we obtained our data set from three sources. First, 2 years of market share data for the ready-to-

[2] Our focus for these complex interactions is for the overall set of retail stores, but we also explore any potential differences in these interaction effects on market share for stores using the EDLP and HiLo pricing strategies.

eat (RTE) cereal SKUs were compiled from the ACNielsen HomeScan consumer scanner panel data. Second, a leading national CPG company that competes in the RTE cereal category provided case pack quantity information for its selection of RTE cereal SKUs. Third, the remainder of the data (SKU, packed on date, price, and number of facings) came from monthly in-store observations in the cereal aisle of retailers obtained by a third-party data collection company over a 24-month period. The monthly in-store observations consisted of a person going into the cereal aisle of a food retailer and collecting the information mentioned above on the available SKUs.

The sample includes data from 62 different retail stores from five different chains, collected over 2 years (July 2004 to June 2006). As noted above, all stores were visited on a monthly basis during this 2-year period. The store chains were selected due to their national prominence and their geographic dispersion. The 62 stores were located across the U.S. and were grouped into four different regions. There were fifteen stores in the East, eighteen in the Midwest, thirteen in the South, and sixteen in the West. We included dummy variables representing these four regions of the country in our model as control variables.

The retailers included large chains that used either an EDLP or HiLo pricing strategy. Brief descriptions of the retailer chains in the sample are provided in Table 1. As shown in Table 1, there were retail supermarkets and mass merchandisers both with and without supercenters (which we define here as mass merchandisers with full grocery sections rather than only limited grocery sections). Given that the number of stores visited in each region ranged from thirteen to eighteen stores, the sample provides a large, diverse sample of retailers on which to test our predictions. The observations in the data set include information on a specific SKU (e.g., SKU price, SKU facings) at a given store during the monthly visit. The number of observations collected at each store during the monthly visit ranged from 22 to 54 observations, due to the different number of products carried by the individual stores.

Further, we chose to examine SKUs from the RTE cereal category because this category contains many different SKU-level attributes in terms of case pack quantity, size, flavors/types, and prices, which aid in tests of predictions. The category is a highly concentrated and very competitive business in which two manufacturers capture approximately 60% of the market share (Nevo 2001).

Measures of dependent and independent variables

The dependent variable for our analyses is dollar market share for each SKU in the RTE cereal category, which was taken from the ACNielsen data. The independent variables include SKU price, facings, and case pack quantity. Price, packed on date, date of observation, product size (in ounces), and facings were collected through the in-store observations. Price was recorded as the price for each cereal SKU as listed on the shelf tag present on the retail shelf. A facing is a measurement of shelf space and is measured by the number of rows of each cereal SKU visible to the consumer at the front of the shelf; the number of facings ranged from one to nine. Shelf replenishment frequency, which is directly related to a product's shelf turnover, is estimated as the inverse of the difference between the packed on date and the observed date (i.e., the age of the product). The higher the shelf replenishment frequency variable is, the more often product is being replenished on the shelf. Case pack quantity is the number of individual items of the product in each case pack and ranged from seven to sixteen cereal boxes per case pack with an average of approximately fourteen cereal boxes per case pack. Case pack quantities for a given SKU were the same across the 62 retailers. As noted previously, we also included dummy variables representing four different regions of the U.S.

Data from the monthly in-store observations (SKU, price, number of facings), market share data at the SKU level from the ACNielsen HomeScan consumer scanner panel, and case pack quantity information were combined into a single data file to test predictions. The total number of observations on which predictions are tested is 14,172. Means, medians, standard deviations, and correlations between these variables across all stores in the sample are shown in Table 2.

Table 1 Description of retailers

Retail chains	Pricing strategy	Retailer type	Retail locations
Retailer 1	HiLo	Supermarket	South, West
Retailer 2	HiLo	Supermarket	Midwest, South
Retailer 3	HiLo	Mass Merchandiser with Supermarket	Midwest, South
Retailer 4	EDLP	Mass Merchandiser	East, Midwest, South, West
Retailer 5	EDLP	Mass Merchandiser with Supermarket	East, Midwest, South, West

Table 2 Descriptive statistics and correlations for model variables

	Mean	Median	SD	Market Share	SRF	Price	Facings	Case pack
Market Share	0.56	0.44	0.48	1.00				
SRF	0.02	0.01	0.09	0.13	1.00			
Price	3.29	3.09	0.83	−0.20	−0.07	1.00		
Facings	2.18	2.00	0.88	0.30	0.06	−0.07	1.00	
Case pack	13.85	14.00	1.89	0.07	0.10	−0.25	0.10	1.00

All correlations are significant at $p<.05$ for a two-tailed test

SRF self replenishment frequency

Results

Test of H1: the effect of case pack quantity and the mediating role of facings

In an initial test for the role of case pack, a series of regressions was performed to test the overall direct effect of case pack quantity on share (H1a) and the potential mediating effect of number of facings on this relationship (H1b). The following conditions are required for mediation: (1) the independent variable (case pack) is related to the dependent variable (market share) in the absence of the mediator; (2) the independent variable (case pack) is related to the mediator (facings); (3) the mediator (facings) has a significant effect on the dependent variable; and (4) the effect of the case pack independent variable on the dependent variable is significantly reduced (partial mediation) or becomes nonsignificant (full mediation) when the mediator (facings) is included in the model with the independent variable (Baron and Kenny 1986). We performed a series of regressions to test the potential mediating role of facings. In terms of conditions 1 and 2, regression results show that case pack quantity is positively related to SKU share ($\beta=.085$; $t=10.3$, $p<.01$) and to the mediator of number of facings ($\beta=.12$; $t=14.3$, $p<.01$). Facings is also positively related to market share ($\beta=.30$; $t=38.7$, $p<.01$), satisfying condition 3. When both the case pack quantity and facings were entered into the regression equation, the standardized coefficient for case pack was reduced (falling from .085 to .052), but remained statistically significant. To test whether this level of reduction in the coefficient was significant, and thus indicating partial mediation, we performed the Sobel test (Baron and Kenny 1986). The test associated with the change in the coefficient was significant ($z=13.0$; $p<.001$), indicating that facings was a partial mediator of the effect of case pack quantity on share.[3]

Tests of H2-H4: direct and moderating effects on market share

Tests for H2-H4 extended these initial findings by assessing direct and moderating effects of price, facings and case pack quantity on market share, using both hierarchical ordinary least squares (OLS) regression and two-stage least squares (to account for potential endogeneity of some predictors) as the analytical approaches for testing these predictions. This hierarchical approach permits an assessment of: (1) the incremental direct effects of facings, case pack quantity, and price beyond the effects of control variables entered in the initial stage of the modeling procedure, and (2) the effects of the interactions beyond the combined effects of the control variables and direct effect predictors. Prior to creating the interaction terms, the independent variables were mean-centered (Aiken and West 1991; Cohen et al. 2003).

Results in Table 3 show OLS results, and Table 4 presents 2SLS results. Each of these hierarchical analyses offers findings for three models, a model including all stores in the sample, a model for EDLP retailers only, and one for HiLo retailers only. We first address results for the OLS hierarchical regression.

Ordinary least squares (OLS) results For each of the three OLS models, in the first stage, dummy variables representing regions of the country are entered as initial control variables. As shown in the left-hand upper portion of Table 3, the control dummy variables representing regions of the country have a significant effect on SKU share for all retailers but explain only a small amount of the variance. In the next stage, the price, facings and case pack predictors are entered. As anticipated, SKU price has a negative effect across all three models ($p<.01$ for all), including both the EDLP and HiLo stores.[4] However, the difference in coefficients for

[3] We also ran these meditational tests including the controls and other independent variables shown in Table 3. These findings also revealed partial mediation of facings. In a separate test, we assessed whether the effect of shelf replenishment frequency (SRF) on share was mediated by facings. Although not as strong as the meditational role of facings for case pack, this test also revealed that facings acted as a partial mediator of the effect of SRF on share (Sobel test z = 7.14, $p < .01$).

[4] We also collected information on price per ounce for each SKU. Regression analyses using price per ounce rather than absolute price produced consistent results in our tests of H2–H4. Because we use product size (in ounces) as an instrumental variable for price in 2SLS models, we focus on analyses utilizing absolute price rather than price per ounce.

Table 3 Market share OLS regression results

	All retailers	HiLo	EDLP
Stage 1			
Region 1	0.09(9.58)***	0.03(2.04)*	0.11(8.01)***
Region 2	0.01(1.48)*	0.01(0.77)	0.02(0.50)
Region 3	0.01(1.41)*	0.03(2.26)*	−0.02(−0.27)
F-value	34.84***	2.36	33.08***
R^2	.01	.00	.01
Stage 2			
Region 1	0.09(10.00)***	0.06(4.36)***	0.14(10.94)***
Region 2	−0.01(−1.42)*	0.00(−0.36)	0.02(1.37)*
Region 3	−0.02(−1.52)*	0.04(2.79)***	−0.02(−1.35)*
Price	−0.18(−21.67)***	−0.10(−7.82)***	−0.30(−29.07)***
Facings(FC)	0.26(32.89)***	0.37(30.16)***	0.23(23.05)***
Case pack(CP)	0.03(3.29)***	0.03(2.83)***	0.00(−0.47)
F-value	332.77***	186.44***	265.46***
F change	626.09***	370.07***	491.93***
R^2	.12	.16	.16
Stage 3			
Region 1	0.09(9.83)***	0.06(4.50)***	0.13(10.26)***
Region 2	−0.02(−1.43)*	−0.01(−0.80)	0.01(1.10)
Region 3	−0.02(−1.87)**	0.04(2.52)***	−0.02(−1.71)**
Price	−0.17(−20.92)***	−0.11(−8.72)***	−0.26(−24.73)***
Facings(FC)	0.16(15.42)***	0.34(28.48)***	0.02(0.98)
Case pack(CP)	0.01(1.49)*	0.01(0.91)	−0.02(−1.60)*
SRF	0.13(13.60)***	0.13(9.91)***	.12(9.41)***
FC*Price	−0.17(−17.12)***	−0.19(−16.12)***	−0.26(−14.11)***
SRF*FC*CP	−0.06(−6.07)**	−0.05(−4.15)***	−0.06(−4.85)***
F-value	283.46***	171.51***	216.17***
F change	162.15***	119.34***	98.68***
R^2	.15	.21	.19

All coefficients in the table are standardized. Values in parenthesis are *t*-values. SRF stands for shelf replenishment frequency. HiLo includes three different grocery retailers who employ a HiLo strategy. EDLP includes two grocery retailers who employ an EDLP strategy
***$p<.01$, **$p<.05$, *$p<.10$ (one-tailed test)

price is stronger for EDLP versus HiLo stores ($z=20.6$, $p<.01$). Facings have a substantial positive effect on share in all models, but tests of differences in the coefficients for facings indicate a stronger effect for the HiLo than the EDLP stores ($z=12.7$, $p<.01$). These findings are consistent with H2a and 2b. There also is a positive direct effect of case pack size for models for all retailers and HiLo stores, (consistent with the test for H1a), but case pack is not significantly related to share for EDLP stores (z for difference in coefficients = 2.12, $p<.05$).

The first two hierarchical models show that for EDLP stores, price is a more important predictor than for HiLo stores, but both facings and case pack size are stronger predictors of share for HiLo than for EDLP stores. Differences in the strength of these effects across the two store types appear to counterbalance one another in the second stage, resulting in R^2's that are similar for the HiLo ($R^2=.16$) and the EDLP ($R^2=.16$) stores. Given the differences in store types, the R^2 for the model including all stores is somewhat lower ($R^2=.12$).

To test predictions in H3 and H4, Stage 3 of our hierarchical model adds the predicted two and three-way interactions. As can be seen for the F-change values in Table 3, the addition of these terms has a significant effect beyond the Stage 2 model including only the direct effects (F-change = 162.2; $p<.01$). The inclusion of the facings*price two-way interaction results in a coefficient that is negative and significant ($p<.01$) for the all stores model, offering support for H3. A plot of the interaction, based on using values one standard deviation above and one standard deviation below the mean (Aiken and West 1991; Cohen et al. 2003), is shown in Fig. 2. As suggested in H3 and by the negative interaction coefficient, the (negative) relationship between price and share shown in the plot appears much weaker when there are fewer shelf facings. Both the slopes for higher and lower facings are

Table 4 Market share model results using 2SLS regression

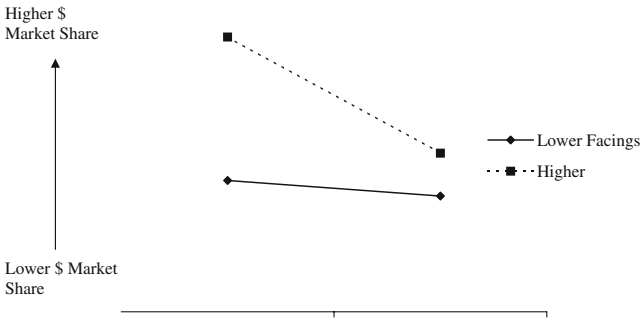
	All retailers	HiLo	EDLP
Stage 1			
Region 1	0.09(9.58)***	0.03(2.04)*	0.11(8.01)***
Region 2	0.01(1.48)*	0.01(0.77)	0.02(0.50)
Region 3	0.01(1.41)*	0.03(2.26)*	−0.02(−0.27)
F-value	34.84***	2.36	33.08***
R^2	.01	.00	.01
Stage 2			
Region 1	0.10(10.80)***	0.04(2.77)***	0.13(10.17)***
Region 2	0.01(1.50)*	0.03(1.86)**	0.02(1.89)**
Region 3	0.02(1.98)**	0.09(5.48)***	0.00(−0.05)
Price	−0.03(−1.58)*	0.06(1.93)**	−0.07(−3.46)***
Facings(FC)	0.28(24.21)***	0.38(30.48)***	0.25(23.58)***
Case pack(CP)	0.04(5.30)***	0.05(4.14)***	0.03(3.08)***
F-value	253.02***	174.50***	122.09***
F change	448.56***	815.15***	350.94***
R^2	.10	.15	.08
Stage 3			
Region 1	0.10(10.63)***	0.04(2.78)***	0.11(8.57)***
Region 2	0.02(2.33)**	0.03(1.95)**	0.02(1.48)*
Region 3	0.03(2.50)**	0.09(5.65)***	−0.01(−0.40)
Price	0.02(0.90)	0.06(2.18)**	0.04(2.02)**
Facings(FC)	0.18(17.32)***	0.36(28.82)***	−0.08(−3.74)***
Case pack(CP)	0.03(4.05)***	0.03(2.18)**	0.03(2.88)***
SRF	0.14(14.53)***	0.14(10.46)***	0.15(10.64)***
FC*Price	−0.17(−17.01)***	−0.18(−14.61)***	−0.39(−18.55)***
SRF*FC*CP	−0.06(−6.28)***	−0.06(−4.29)***	−0.08(5.38)***
F-value	226.51***	158.53***	135.15***
F change	164.00***	111.57***	147.47***
R^2	.13	.19	.13

All coefficients in the table are standardized. Values in parenthesis are *t*-values. SRF stands for shelf replenishment frequency. HiLo includes three different grocery retailers who employ a HiLo strategy. EDLP includes two grocery retailers who employ an EDLP strategy ***$p<.01$, **$p<.05$, *$p<.10$ (one-tailed test). Ounces was entered as an instrument variable for price for these analyses

significantly different from zero, but the magnitude of the slope for higher facings is greater ($t=34.66$, $p<.001$) than the slope for lower facings ($t=8.75$, $p<.001$). Stage 3 in Table 3 also reveals a significant impact from including the interaction terms for both the (1) HiLo stores (<.01), and (2) EDLP stores ($p<.01$). However, the coefficients shown in Table 3 indicate that while the interaction between facings and price is negative and significant ($p<.01$) for both the EDLP and HiLo stores, the relationship between the interaction term and market share is stronger ($p<.01$) for the EDLP stores.

H4 concerned the three-way interaction between case pack quantity, shelf facings, and shelf replenishment frequency. The bivariate correlation for this three-way interaction term is positive and significant ($p<.01$) for each of the all stores, EDLP and HiLo stores models, but in each of the cases the correlations are not strong. However, as can be seen in the model results in Table 3, the coefficients for all models are low but switch signs; i.e., while the bivariate correlations between the three-way interaction terms and SKU share are positive, the regression coefficients in Table 3 are negative.[5] However, regardless of these findings for these coefficients, the relatively low bivariate correlations between the proposed three-way interaction and market share offer only very limited support for H4. In

[5] Multicollinearity often will result from including two similar interaction terms in a model combined with the original variables used to form the interactions and the reversal of signs is a classic problem associated with multicollinearity (e.g., Hair et al. 2006; Mason and Perreault 1991). Further, we also performed this regression when excluding the SRF direct effect as a predictor, but including the two and three-way interaction terms. When the direct effect of SRF is not included in the model, the three-way interaction is positive and significant (but not large relative to the other coefficients), consistent with the bivariate correlation.



	Low Price	High Price
Lower Facings	0.355	0.313
Higher Facings	0.743	0.429

Figure 2 Plot of the joint effect of facings and price on market share. Note: The figure was plotted by using procedures recommended by Aiken and West (1991), Cohen et al. (2003), and Dawson (2007) to aid in the interpretation of interactions in regression. This figure has been plotted based on values that are one standard deviation below the mean (low facings) and one standard deviation above the mean (high facings) for the facings variable across different levels of price.

sum, these findings provide support for H2 and H3 but offer little support for H4.[6]

Two-stage least squares (2SLS) results Due to concern over potential endogeneity of the predictor variable of price in our model (i.e., share may potentially affect price, raising questions regarding simultaneous causation and the direction of the effect),[7] we also estimated the model using two-stage least squares (2SLS) to address this issue. Endogeneity of predictor variables may cause OLS parameter estimates to be unreliable due to the fact that an endogenous predictor variable may be correlated with the disturbance term of the regression model (Wooldridge 2002, p.50). Estimation using 2SLS overcomes this issue by utilizing instrumental variables, which are highly correlated with the endogenous predictor variable and not highly correlated with the dependent variable. Accordingly, we used SKU size (in ounces) as an instrument for price, and we estimated a 2SLS model that treats price as endogenous. In Table 4, notice that the significance and direction of the parameter estimates, and specifically those of all interaction terms, are unchanged in the 2SLS models. Therefore, we find that the 2SLS results for our hypotheses are consistent with the OLS estimates presented in Table 3, offering further support for our tests of predictions.

Discussion and conclusions

The purpose of this paper is to gain a better understanding of the interface of CPG marketing and supply chain management at the "first moment of truth" (Nelson and Ellison 2005) by examining the direct effects and interactions of retail shelf variables on dollar market share in the grocery aisles for both EDLP and HiLo stores. Our examination of retail shelf variables that help drive market share focuses on two well-known marketing levers, price and facings, as well as a lesser known supply chain lever, case pack quantity.

Our results show that case pack quantity, a supplier-controlled variable, appears to have at least some positive relationship with market share. We attribute this positive effect to be a result of case pack's role in the replenishment process that results in some improvement in the availability of the product for consumers. Larger case packs reduce the number of store replenishments over a given time period and subsequently reduce the store's exposure to stockouts, leading to a relatively small but positive relationship between case pack quantity and market share. Other research has indicated that case pack quantity is one determinant of the number of facings on the shelf space allocated to a product (Gruen and Corsten 2007). Consistent with research, our results show that a portion of the impact of case pack quantity on market share is due to the number of facings (i.e., facings partially mediate the effect of case pack), and number of facings is a variable ultimately controlled by the retailer.[8]

Beyond these effects, our findings also show the direct impact of traditional marketing levers of facings and price are consistent with those from the literature. However, we find the strength of these effects likely depends on the pricing strategy employed by the retailer. As expected, we found that price has a negative effect on a product's market share, but we found support for the prediction that the direct effect of price on market share is stronger under the EDLP strategy than the HiLo strategy. In addition, we found differences among retailers in the strength of the effect of the number of facings and case pack quantity on market share. In stage 2 of the hierarchical analyses, the direct effects of facings and case pack quantity are stronger when a retailer employs a HiLo strategy. These results for facings and case pack size, combined with the increased assortment

[6] To test if there were influential effects related to outliers, we also ran models in which both smaller case pack sizes and larger number of facings were omitted from the data set. The coefficients for all direct and moderating relationships with share were consistent with those shown in Table 3, offering further support for predictions related to the predicted direct and moderating effects.

[7] We formally tested for the endogeneity of price, using the two-step Hausman test (Wooldridge 2002, pp. 118–120). From the Hausman tests, we conclude that price is an endogenous ($p<0.01$) predictor variable. We also tested facings for endogeneity using the same method as we used for price. Unfortunately, due to a lack of a suitable instrument in our data set, we were not able to test facings using the same method used to test price in the 2SLS.

[8] We thank an anonymous reviewer for suggesting this mediation test and point regarding this relationship.

available in most HiLo stores, suggest that the allocation of shelf space and replenishment practices may offer greater opportunity as levers to impact market share. We believe that replenishment effectiveness may be particularly important for these stores based on the following rationale. First, HiLo stores change their prices more often, resulting in greater variability in sales. This in turn necessitates greater safety stock at the shelf and requires more cautious store replenishment strategies. Additional shelf space provides more safety stock for in-store shelf replenishment for two possible reasons. First, if the shelf is replenished on a regular basis, then the expected number of units on the shelf when the next replenishment arrives is higher and results in more safety stock (i.e., safety stock is simply the expected number of units on hand and available for use when the replenishment arrives). If demand increases unexpectedly, but the expected number of units on the shelf is higher, this greater demand is more likely to be covered. Second, larger case packs reduce the frequency of store replenishment, increasing the store fill rate. When the store has a higher fill rate, then there is additional inventory in the store to cover demand at the shelf, assuming the shelf has been replenished appropriately.

Further, we find that the direct effect of price, a lever that is jointly controlled by the retailer and supplier, on market share is moderated by the number of facings allocated to the product on the retail shelf. While marketers in consumer goods companies and retailers have long used product price as a lever to stimulate consumer demand at the shelf, findings from our study suggest that marketers may benefit from simultaneously considering the amount of shelf space allocated to the product when making pricing decisions. Misalignment of retail shelf space and demand will dampen the impact that a lower price may have on demand at the shelf, thus mitigating the intended effects of increased sales and store traffic.

There was only limited support for our hypothesis that case pack quantity and the frequency of shelf replenishment of a product moderate the effect of facings on market share. The overall pattern of findings shows that the variables generally controlled by the retailer, facings and price at the shelf, dominate the effects of case pack size, the one variable directly controlled by the supplier. There is a positive relationship between case pack and share that is only partially mediated by the number of facings, but this effect of case pack is relatively small compared to the direct effects of price, facings, and the price by facings interaction. Taken in sum, the results suggest that some effect of case pack quantity is present and has some impact at the retail point-of-purchase, but this effect does not appear strong for these retailers overall, and the effect for case pack appears somewhat stronger for HiLo than EDLP stores.

While currently many suppliers base case pack quantity either on competitive merchandising or operational costs, our findings suggest that there may be a limited benefit to this self-serving behavior. Given a statistically significant but relatively limited relationship between case pack quantity and market share, it seems possible that the retailer may be affected at least as much as the supplier by case pack quantity, due to the relationship of case pack to the retailer's ordering frequency. Our results suggest that there appears to be little downside risk to the supplier collaborating with the retailer to determine a case pack quantity that jointly minimizes cost to the supplier and is most efficient for the retailer. Since ultimately the success of the supplier is contingent upon the success of the retailer, greater collaboration on case pack quantity may actually offer the most substantial and sustainable long-term benefits to both parties.

Additionally, our findings highlight the importance of retail shelf space allocation, which is largely controlled by the retailer. While it has long been established that increased shelf facings can positively impact SKU market share, our study finds that facings moderates the effect of price and mediates the effect of case pack quantity. Thus, CPG suppliers and retailers may often fail to recognize that this shelf facing impact on market share appears to be most effectively utilized when fully aligned with other retail shelf decisions made by both the retailer and supplier. Additional studies regarding interactions between various retailer and supplier controlled variables under different market and contextual conditions seem warranted.

General implications for consumer-oriented CPG marketers

In a more general sense, the findings in this paper suggest that the integration of retail marketing and supply chain management decisions are important to the success of customer-oriented organizations, such as retailers and CPG firms. Effective supply chain management allows a firm to follow through on its customer orientation in a cost effective manner through decisions, such as shelf space allocation and case pack quantities. While market oriented firms outperform their competition, one would expect that market oriented firms that implement superior supply chain management practices gain an additional competitive advantage. This conclusion is consistent with recent literature that indicates that supply chain orientation and management constructs mediate the effect of marketing orientation on measures of firm performance (Mentzer et al. 2001; Min et al. 2007) and is consistent with the intent of the efficient consumer response (ECR) initiative, which calls for integration of supply chain processes with activities, such as store assortment decisions (Whipple et al. 1999; Frankel et al. 2002).

Limitations and future research

This paper employs observational data obtained in the field over a 2 year period with secondary data from both

manufacturer and scanner based sources to address predictions related to the influence of a combination of retail shelf variables and manufacturer controlled variables on SKU dollar market share. The non-experimental nature of these data restricts the ability to draw causal inferences concerning relationships between the variables of interest. While it is extremely difficult to jointly manipulate many of these independent variables in natural retail store environments, longitudinal field experiments would complement these data and would provide further insights. Also, while we address relatively complex interrelationships between variables not examined previously in the extant literature, there are many other variables which were not examined in this study (e.g., point-of-purchase displays and other promotions, customized store-level assortments, atypical merchandising such as selling products directly off the pallet) that influence SKU dollar market share. For example, for stores that sold a substantial amount of its category sales directly off pallets in a center aisle, findings may change and further research for variables reported here may be examined for different formats and contextual conditions.[9] Another interesting avenue for future research could be to examine the role of case pack on market share in greater detail. In this study, case pack results have been obtained from a single category (cereal) and a large CPG company, and across a set of major retail chains. Future research may explore the generalizability of findings for different categories, SKUs across both larger and smaller companies, and sets of smaller retailers for which category management may be less sophisticated.

Despite limitations and opportunities to extend these findings, this study employed a large set of observations and the combination of data sources used extends the current understanding of the complex relationships between supply chain and retail shelf variables that impact SKU dollar market share. It incorporates variables such as case pack quantity that generally have been ignored in prior research, and it has attempted to extend our conceptual understanding of factors impacting the in-store shelf replenishment process. A precise alignment of marketing and supply chain activities within the retail supply chain is necessary to offer "the right product in the right place at the right time for the right price", which Fisher et al. (2000) have called retailing's formula for perfection. In this paper, we have shown that variables traditionally considered as only relevant to operational supply chain activities can be related to marketing activities at the shelf. We hope that these findings lead to future studies addressing these complex relationships that pertain to the intersection of supply chain management and marketing at the retail shelf.

[9] For our study, we interviewed an executive for the manufacturer participating in this study who has worked in the RTE cereal industry for the past 38 years, and he estimated that some 2% to 3% of cereal sales in participating stores are sold in the center aisle. Based on this information, we believe our results are not significantly impacted by center aisle sales for these participating chains and this category, but findings for other categories, stores, and contextual market conditions remain of interest.

References

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, CA: Sage.

Anderson, E. E. (1979). An analysis of retail display space: Theory and methods. *Journal of Business, 52*(1), 103–118. doi:10.1086/296036.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research. *Journal of Personality and Social Psychology, 51*(6), 1173–1182. doi:10.1037/0022-3514.51.6.1173.

Basuroy, S., Mantrala, M. K., & Walters, R. G. (2001). The impact of category management on retailer prices and performance: Theory and evidence. *Journal of Marketing, 65*(4), 16–33. doi:10.1509/jmkg.65.4.16.18382.

Boatwright, P., & Nunes, J. C. (2001). Reducing assortment: An attribute-based approach. *Journal of Marketing, 65*(3), 50–63. doi:10.1509/jmkg.65.3.50.18330.

Bolton, R. (1989). The relationship between market characteristics and promotional price elasticities. *Marketing Science, 8*(2), 153–170. doi:10.1287/mksc.8.2.153.

Broniarczyk, S. M., Hoyer, W. D., & McAlister, L. (1998). Consumers' perceptions of the assortment offered in a grocery category: The impact of item reduction. *JMR, Journal of Marketing Research, 35*(2), 166–176. doi:10.2307/3151845.

Campo, K., & Gijsbrechts, E. (2005). Retail assortment, shelf and stockout management: Issues, interplay and future challenges. *Applied Stochastic Models in Business and Industry, 21*(4/5), 383–392. doi:10.1002/asmb.574.

Campo, K., Gijsbrechts, E., & Nisol, P. (2000). Towards understanding consumer response to stock-outs. *Journal of Retailing, 76*(2), 219–243. doi:10.1016/S0022-4359(00)00026-9.

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences*. Mahwah, NJ: Erlbaum Associates.

Cooper, M. C., & Ellram, L. (1993). Characteristics of supply chain management and the implication for purchasing and logistics strategy. *The International Journal of Logistics Management, 4*(2), 13–24. doi:10.1108/09574099310804957.

Corsten, D., & Gruen, T. (2003). Desperately seeking shelf availability: An examination of the extent, the causes, and the efforts to address retail out-of-stocks. *International Journal of Retail & Distribution Management, 31*(12), 605–617. doi:10.1108/09590550310507731.

Corstjens, M., & Doyle, P. (1981). A model for optimizing retail space allocations. *Management Science, 27*(7), 822–833. doi:10.1287/mnsc.27.7.822.

Cox, K. K. (1970). The effect of shelf space upon sales of branded products. *JMR, Journal of Marketing Research, 7*(1), 55–58. doi:10.2307/3149507.

Curhan, R. C. (1972). The relationship between shelf space and unit sales in supermarkets. *JMR, Journal of Marketing Research, 9*(4), 406–412. doi:10.2307/3149304.

Dawson, J. F. (2007). Interpreting interaction effects. Available at: http://www.jeremydawson.co.uk/slopes.htm. Accessed 18 July 2007.

Dreze, X., Hoch, S. J., & Purk, M. E. (1994). Shelf management and space elasticity. *Journal of Retailing, 70*(4), 301–326. doi:10.1016/0022-4359(94)90002-7.

Dupre, K., & Gruen, T. W. (2004). The use of category management practices to obtain a sustainable competitive advantage in the fast-moving-consumer-goods industry. *Journal of Business and Industrial Marketing, 19*(7), 444–459. doi:10.1108/08858620410564391.

Dussart, C. (1998). Category management: Strengths, limits and developments. *European Management Journal, 16*(1), 50–62. doi:10.1016/S0263-2373(97)00073-X.

Emmelhainz, M. A., Emmelhainz, L. W., & Stock, J. R. (1991). Logistics implications of retail stockouts. *Journal of Business Logistics, 12*(2), 129–142.

Fisher, M. L., Raman, A., & McCelland, A. S. (2000). Rocket science retailing is almost here: Are you ready? *Harvard Business Review, 78*(4), 115–124.

Fitzsimons, G. J. (2000). Consumer response to stockouts. *The Journal of Consumer Research, 27*(2), 249–267. doi:10.1086/314323.

Frankel, R., Goldsby, T. J., & Whipple, J. M. (2002). Grocery industry collaboration in the wake of ECR. *International Journal of Logistics Management, 13*(1), 57–71. doi:10.1108/09574090210806360.

Gourville, J. T., & Soman, D. (2005). Overchoice and assortment type: When and why variety backfires. *Marketing Science, 24*(3), 367–381. doi:10.1287/mksc.1040.0109.

Gruen, T. W., & Corsten, D. (2007). A comprehensive guide to retail out-of-stock reduction in the fast moving consumer goods industry. Grocery Manufacturers Association (GMA), Food Marketing Institute (FMI), National Association of Chain Drug Stores (NACDS), The Procter & Gamble Company (P&G), the University of Colorado at Colorado Springs.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R., & Tatham, R. L. (2006). *Multivariate data analysis* (6th ed.). Upper Saddle River, NJ: Prentice Hall Pearson.

Hoch, S. J., Dreze, X., & Purk, M. E. (1994). EDLP, Hi-Lo, and margin arithmetic. *Journal of Marketing, 58*(3), 16–27. doi:10.2307/1251913.

Kohli, A. K., & Jaworski, B. J. (1990). Market orientation: The construct, research propositions, and managerial implications. *Journal of Marketing, 54*(2), 1–18. doi:10.2307/1251866.

Lichtenstein, D. R., Netemeyer, R. G., & Burton, S. (1990). Distinguishing coupon proneness from value consciousness: An acquisition-transaction utility theory perspective. *Journal of Marketing, 54*(3), 54–67. doi:10.2307/1251816.

Mason, C. H., & Perreault, W. D. (1991). Collinearity, power, and interpretation of multiple regression analysis. *JMR, Journal of Marketing Research, 28*(3), 268–280. doi:10.2307/3172863.

McKinnon, A. C., Mendes, D., & Nababteh, M. (2007). In-store logistics: An analysis of on-shelf availability and stockout responses for three product groups. *International Journal of Logistics: Research & Applications, 10*(3), 251–268. doi:10.1080/13675560701478075.

Mentzer, J. T., DeWitt, W., Keebler, J. S., & Min, S. (2001). Defining supply chain management. *Journal of Business Logistics, 22*(2), 1–25.

Messinger, P. R., & Narasimhan, C. (1995). Has power shifted in the grocery channel**?**. *Marketing Science, 14*(2), 189–224. doi:10.1287/mksc.14.2.189.

Min, S., & Mentzer, J. T. (2000). The role of marketing in supply chain management. *International Journal of Physical Distribution & Logistics, 30*(9), 765–787. doi:10.1108/09600030010351462.

Min, S., Mentzer, J. T., & Ladd, R. T. (2007). A market orientation in supply chain management. *Journal of the Academy of Marketing Science, 35*(4), 507–522. doi:10.1007/s11747-007-0020-x.

Motes, W. H., & Castleberry, S. B. (1985). A longitudinal field test of stockout effects on multi-brand inventories. *Journal of the Academy of Marketing Science, 13*(4), 54–68. doi:10.1007/BF02737199.

Nelson, E., & Ellison, S. (2005). Shelf promotion: In a shift, marketers beef up ad spending inside stores; *Wall* Street Journal, September 21 (Eastern Edition), A.1.

Nevo, A. (2001). Measuring market power in the ready-to-eat cereal industry. *Econometrica, 69*(2), 307–342. doi:10.1111/1468-0262.00194.

Raman, A., DeHoratius, N., & Ton, Z. (2001). Execution: The missing link in retail operations. *California Management Review, 43*(3), 136–152.

Schwartz, B. (2004). *The paradox of choice: Why more is less*. New York, NY: Collins.

Sloot, L. M., Verhoef, P. C., & Franses, P. H. (2005). The impact of brand equity and the hedonic level of products on consumer stock-out reactions. *Journal of Retailing, 81*(1), 15–34. doi:10.1016/j.jretai.2005.01.001.

Urban, T. L. (1998). An inventory-theoretic approach to product assortment and shelf-space allocation. *Journal of Retailing, 74*(1), 15–35. doi:10.1016/S0022-4359(99)80086-4.

Walter, C. K., & Grabner, J. R. (1975). Stockout cost models: Retail situation. *Journal of Marketing, 39*(3), 56–60. doi:10.2307/1250902.

Whipple, J. S., Frankel, R., & Anselmi, K. (1999). The effect of governance structure on performance: A case study of efficient consumer response. *Journal of Business Logistics, 20*(2), 43–62.

Wilkinson, J. B., Paksoy, C. H., & Mason, B. J. (1981). A demand analysis of newspaper advertising and changes in space allocation. *Journal of Retailing, 57*(2), 30–49.

Wooldridge, J. M. (2002). *Econometric analysis of cross section and panel data*. Cambridge, MA: MIT.

Zenor, M. J. (1994). The profit benefits of category management. *JMR, Journal of Marketing Research, 31*(2), 202–213. doi:10.2307/3152194.

Zhang, J., & Krishna, A. (2007). Brand-level effects of stockkeeping unit reductions. *JMR, Journal of Marketing Research, 44*(4), 545–559. doi:10.1509/jmkr.44.4.545.

Zinn, W., & Liu, P. C. (2001). Consumer response to retail stockouts. *Journal of Business Logistics, 22*(1), 49–72.