# Analysis of Retailer Pricing in the Presence of Coupons: An Examination of Breakfast Cereal Industry

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## Introduction

A coupon is a ticket or document that can be exchanged for a direct financial discount when purchasing a specific product, or a total amount of goods in a certain store. Grocery coupons are usually issued by manufacturers of packaged goods or by retailers, to be used in retail stores as a part of sales promotions. Grocery coupons are widely distributed through mails, coupon envelopes, magazines, newspapers, the internet, mobile devices such as cell phones, and directly from retailers through fliers and deal book inserts.

The first food and beverage coupon[1] is believed to be issued by Coca-Cola Company in 1888 to help promote the drink sales, which was a ticket for a free glass of Coca-Cola. By 1913, the company had redeemed 8.5 million tickets (Geuss, 2010). The widespread use of coupon emerged later in the middle of the 20$^{th}$ century and it grew rapidly by the end of the century. It was reported that in 1996, packaged goods manufacturers issued 268.5 billion coupons, and 5.3 billion of them were redeemed (NCH Marketing Services, 1997). By 2003, it was estimated that shoppers saved $3 billion dollars by redeeming 3.8 billion coupons, and the number of households estimated using coupons stood at 77% (Tuttle, 2010). Coupons are commonly used as marketing instruments in food industries, as more than 2,800 consumer packaged goods companies offer coupons for discounts on products. In 2011, U.S. consumers used coupons to save 4.6 billion dollars on their purchases of consumer packaged goods (NCH Marketing Services, 2012).

Coupons are an effective marketing device that offers both a price discount as well as a product specific advertisement (Dong and Leibtag, 2010). As such, coupons are extensively adopted by manufacturers and retailers to enhance consumer demand and to compete for market share. Further, coupons have drawn considerable attention in the food marketing and industrial organization literature.

[1] For the remainder of the manuscript, grocery coupon will be referred to as coupon.

One of the main areas of research examines, the use of coupons as a way to engage in price discrimination strategies, which can increase brand market share, strengthen brand loyalty, and expand a product's market by sorting and attracting consumers with low reservation prices and high price elasticity. Based on a price theoretic model under a monopoly framework, Narasimhan (1984) found that consumers using coupons are more price elastic than nonusers of coupons. The author offers a price discrimination theory of coupon distribution, which is empirically supported by various studies. For instance, Levedahl (1986), Larson (1997), Ben-Zion, Hibshoosh, and Spiegel (2000), Jackson (2002), Price and Connor (2003), and Nevo and Wolfram (2002) provide complementary perspectives by theoretically modeling and empirically analyzing coupons as price discrimination tools. Most of these works focus on coupons' price discrimination effects on maximizing profits and competing for market share.

Another relevant area of the literature has focused on the use of coupons and pricing strategy. Krishnan and Rao (1995) use a game theoretic model to study the effects of double couponing policy and examine how retailers' pricing decision varies according to the adoption of this policy. The authors find that if a retailer decides to implement the double couponing policy on a product, it will lower the price for another product in the same category, and the amount lowered is less than the face value of the coupon issued. Nevo and Wolfram (2002) explore the relationship between shelf prices and the presence of manufacturer' coupons for 25 ready-to-eat breakfast cereals. Empirical analysis shows that shelf prices are lower during periods when coupons are available, which is inconsistent with static monopoly price discrimination theory. Although no theoretical support is provided, the authors argue that possible reasons are because of competition, and retailers may use the couponed product as a loss leaser and even price it lower to inspirit store traffic.

To date, most existing studies focus only on manufacturer coupons; however, retailer coupons are also prevalent and can also affect market share competition and firms' pricing decisions. Hu, Chiou, and Hwang (2004) analyze the different effects of non-cooperative and cooperative strategies with respect to manufacturer and retailer

coupons. The authors conclude that firms can achieve different levels of profits in non-cooperative and cooperative mechanism by distributing various types of coupons. They find that compared with single coupon issuance by only one party, cooperatively distributed manufacturer and retailer coupons can eliminate double marginalization, achieve the vertical integration effect, and lead to higher profits, consumer and social surplus.

The objective of this study is to examine how coupons impact retailers' pricing decisions. Specifically, this study explores how retailer pricing and couponing change based on competitor's coupon issuance; and whether different types of coupons (manufacturer verses retailer) have different impacts on retailer's pricing.

This study contributes to the literature in several ways. First, although much research has been done in the area of coupon effects, the majority of the research examines coupon's effects attributing it as a third-degree price discrimination device, and most of the analyses are performed in the assumption of a monopoly setup. However, competition should be considered in the analysis of coupon effects, which may fundamentally change firms' behaviors. Second, few studies examine how coupons affect retailer's pricing decision, and existing studies fail to distinguish the effect among different types of coupons. This study helps to better understand how retailers compete simultaneously using pricing and couponing strategies in a competition context. Almost all the studies pay attention solely to manufacturer coupons, and very few of studies distinguish from retailer coupons. Retailer coupons are extensively distributed by stores as a vehicle not only to stimulate storewide purchases, but also to compete with national brands. Hence, retailer coupons may impact consumers' brand choice decisions differently from manufacturer ones, and the differences have important managerial implications. In this study, effects of retailer coupons are examined separately from manufacturer coupons, which fill up the research blank regarding the coupon effects in last twenty years. Third, firms' pricing decision is examined and compared under non-cooperative and collusive mechanisms, which helps better understand firm's behaviors from a managerial perspective, as well as provides consumers welfare implications.

## Model Specification

*Motivation*

The use of coupons by manufacturers can be attributed to marketing strategies that compete for market share. Manufacturers offer coupons through various channels, and consumers redeem coupons at the cash counters in the retailer stores to get a face value discount. Retailers then get the loss reimbursed from manufacturers as well as some handling fees. Manufacturer coupons not only generate a price discount, but also advertise the products to the whole market. Retailers also benefit from this marketing mechanism because a coupon encourages consumers to purchase the item in the store that allows for redemption, and therefore incremental traffic may occur when consumers search for the couponed item.

Studies find that in some cases coupons can increase consumers' shopping baskets. For instance, Heilman, Nakamoto, and Rao (2002) examine the effect of coupons on stimulating purchases using both experimental and actual transaction data. They find that the use of a surprise coupon will increase the size of the shopping basket and the number of unplanned purchases made on the trip. Milkman and Beshears (2009) find that compared to their conventional consumption baskets when there is no coupon available, consumers will spend more when there is a coupon present. They further find that the extra spending associated with coupon redemption focuses on groceries that a customer does not typically buy.

In light of the multiple functions of a coupon, retailers have incentive to distribute retailer ones to maintain market share of certain products and to attract consumers to make greater store-wide purchases. Products that are regularly purchased or frequently couponed by manufacturers are possible options for store managers to issue a retailer coupon. Sometimes, it is observable that both manufacturer and retailer coupons are available in the market, and are allowed to be redeemed simultaneously in a same store. Effects of a manufacture and a retailer coupon may be the same to the consumers' end. However, retailer coupons involve an additional cost to the store, while manufacturer coupons do not. Moreover,

manufacturer coupons usually are market-wide available, while retailer coupons are only usable in the store issuing them.

For various reasons, retailers may simultaneously employ multiple marketing mechanisms such as issuing coupons, strategic pricing, and advertising, etc. Further, decisions on performing these practices are influenced by each other. More specifically, retailer coupon issuance may have an effect on pricing strategy. A retailer's pricing strategy on a product might differ if that product is couponed in a neighbor store. Prices in a same store might be various from time to time if there are coupons available towards a close substitute. As a result, to compete for market share and maximize profits, retailers may price differently when there is a manufacturer coupon, a retailer coupon, or no coupon present in the market.

This study is interested in obtaining insights about the retailer's pricing policy when different types of coupons are present in the market, as well as in different competition mechanisms. In particular, we examine how one retailer's pricing and couponing are affected by coupons issued by other competing stores and the manufacturer. Questions are examined in a competition setup, cases of non-cooperative as well as collusive pricing are considered.

*Model Specification*

The model starts with two stores in the market, *i* and *j,* which carry one product line. The manufacturer charges the same wholesale price $w$ to both retailers. Other than the wholesale price, no additional cost involving in carrying the line is assumed for setting up the model. The retailers choose prices and retailer coupon values, denoted as $p_i$, $c_i$ respectively, to maximize profits. The manufacturer distributes coupons $c_m$ to the market. Some additional assumptions are:

$A_1$: $c_m$, $c$, and $c_i$ are allowed to be present in the market simultaneously.

$A_2$: Coupons are accessible to all consumers in the market.

Following Gasmi, Lafeont, and Vuong (1992), the demand specification of the couponed product line is written using a simple linear functional form:

$$Q_i = Q^i + \alpha_{ii} p_i + \alpha_{ij} p_j + \beta_{ii} c_i^{\theta_i} + \beta_{ij} c_j^{\theta_j} + \gamma c_m \quad with \quad i = 1,2; j = 1,2 \tag{1}$$

Where $Q_i$, $p_i$, and $c_i$ represents retailer $i$'s quantity, price, and coupon values, respectively. $c_m$ is the value of coupon issued by the manufacture. $\alpha$'s, $\beta$'s, and $\gamma$ are unknown parameters. Economic theory suggests that $\alpha_{ii}<0$, $\alpha_{ij}>0$, $\beta_{ii}>0$, $\beta_{ij}<0$, and $\gamma>0$. $\theta_i$ and $\theta_j$ are assumed to range from 0 and 1 to imply diminishing returns in coupons' advertising effects. The term $Q^i$ can be decomposed into a linear function of demographic information, such as average real household disposable income, household size, store loyalty, and coupon proneness.

*Firm's Profit Maximization*

Breakfast cereals are heavily purchased. The substantial diversity of cereal products makes it easy to compare prices across stores, and lead to intense price competitions. Regional markets may adopt various mechanisms to attract consumers and maximize own profits; instead, they may also observe others' behaviors and make decisions of achieving a joint profit. Hence, firms' profit maximization procedures are analyzed under two scenarios: non-cooperative, and cooperative.

*[Non-cooperative]*

Retailers compete in prices and coupons to maximize their profits. Because $w$ is the only cost for retailers carrying the product, the profit function of retailer $i$ is thus written as

$$\pi_i = (p_i - w - c_i) Q_i$$

$$= (p_i - w - c_i) * (Q^i + \alpha_{ii} p_i + \alpha_{ij} p_j + \beta_{ii} c_i^{\theta_i} + \beta_{ij} c_j^{\theta_j} + \gamma c_m) \tag{2}$$

Differentiation of $\pi_i$ with respect to $p_i$ and $c_i$ and setting them equal zero lead to the optimal values of $p_i$ and $c_i$:

$$p_i^* = \frac{(c_i + w)\alpha_{ii} - Q^i - \alpha_{ij} p_j - \beta_{ij} c_j^{\theta_j} - \beta_{ii} c_i^{\theta_i} - \gamma_i c_m}{2\alpha_{ii}} \tag{3}$$

$$G(c_i^*(c_j), c_j) = (p_i - w)\beta_{ii}\theta_i c_i^{*(\theta_i - 1)} - c_i^{*\theta_i}\beta_{ii}\theta_i - Q^i = 0 \tag{4}$$

Equation (3) and (4) represent retailer *i*'s Bertrand reaction functions responding to its competitor's optimal choices of prices and coupon values, i.e. $p_j^*$ and $c_j^*$. Solving the equation system of $p_i^*$, $c_i^*$, $p_j^*$ and $c_j^*$ gets to the Bertrand equilibrium and the settled optimal prices and coupon values. Differentiation of $p_i^*$ and $c_i^*$ with respect to $c_j$ to see how an incremental change in competitor's coupon values affects retailer *i*'s pricing and couponing

$$\frac{\partial p_i^*}{\partial c_j} = -\frac{1}{2\alpha_{ii}} \beta_{ij}\theta_j c_j^{\theta_j - 1} \tag{5}$$

[2] $$\frac{\partial c_i^*}{\partial c_j} = \frac{\theta_j \beta_{ij} c_j^{\theta_j - 1}}{(p_i - w)\beta_{ii}\theta_i(\theta_j - 1)c_i^{\theta_i - 2} - \theta_i c_i^{\theta_i - 1}\beta_{ii}\theta_i - c_i^{\theta_i - 1}\beta_{ii}\theta_i}$$

$$= \frac{\theta_j \beta_{ij} c_j^{\theta_j - 1}}{[\frac{(p_i - w)(\theta_j - 1)}{c_i} - \theta_i - 1] * c_i^{\theta_i - 1}\beta_{ii}\theta_i} \tag{6}$$

As $\alpha_{ii}<0$, $\alpha_{ij}>0$, $\beta_{ii}>0$, and $\beta_{ij}<0$, the sign of $\frac{\partial P_i^*}{\partial c_j}$ is negative, indicating that an incremental increase in one store's coupon values associates with a price cut in its competing store. In contrast, $\frac{\partial c_i^*}{\partial c_j}$ is positive, saying that regarding the couponing policy, retailers react in the same direction if their competitors increase coupon values or distribute more coupons. In summary, due to competition and to maximize individual profits, retailers' non-cooperative responses to others' couponing are in the following manners

$$\frac{\partial p_i^*}{\partial c_j} < 0; \quad \frac{\partial c_i^*}{\partial c_j} > 0$$

[2] The derivative of $c_i^*$ over $c_j$ is obtained through: $\frac{\partial c_i^*}{\partial c_j} = -\frac{\partial G}{\partial c_j} / \frac{\partial G}{\partial c_i}$

*[Cooperative]*

Instead of maximizing individual profits, $R_1$ and $R_2$ may alternatively take cooperative actions to achieve a maximized union profit. The union profit can be defined as a weighted average of both firm's profits with respect to prices and coupons. Weight between two firms is denoted as $\lambda$, which is between 0 and 1, and determined by the data.

$$\Pi = \lambda\pi_i + (1-\lambda)\pi_j \qquad with \quad i=1,2;\ j=1,2 \tag{7}$$

Substitute equation (1) and (2) into (7) and differentiate $\Pi$ with respect to $p_i$, $c_i$, $p_j$, and $c_j$ to get optimal values of $p_i^*$, $c_i^*$, $p_j^*$ and $c_j^*$. Take retailer *i* as an example, optional values of $p_i$ and $c_i$ can be written as

$$p_i^* = \frac{\lambda\alpha_{ii}(c_i + w) - (1-\lambda)\alpha_{ji}(p_j - c_j - w) - \lambda(Q^i + \alpha_{ij}p_j + \beta_{ii}c_j^{\theta_j} + \gamma_i c_m)}{2\lambda\alpha_{ii}} \tag{8}$$

$$G(c_i^*(c_j), c_j) = \lambda(p_i - c_i - w)\beta_{ii}\theta_i c_i^{*(\theta_i - 1)}$$

$$+(1-\lambda)(p_j - c_j - w)\beta_{ji}\theta_i c_i^{*\theta_i - 1} - \lambda Q_i(c_i^*) = 0 \tag{9}$$

Differentiation of $p_i^*$ and $c_i^*$ with respect to $c_j$ reflects how one retailer responses regarding its cooperator's coupon strategy to maximize the union profits

$$\frac{\partial p_i^*}{\partial c_j} = \frac{1}{2\lambda\alpha_{ii}}[(1-\lambda)\alpha_{ji} - \lambda\beta_{ij}\theta_j c_j^{\theta_j - 1}] \tag{10}$$

$$\frac{\partial c_i^*}{\partial c_j} = \frac{\lambda\theta_j\beta_{ij}c_j^{\theta_j - 1} + (1-\lambda)\theta_i\beta_{ji}c_i^{\theta_i - 1}}{\theta_i(\theta_i - 1)c_i^{\theta_i - 2}[\lambda\beta_{ii}(p_i - c_i - w) + (1-\lambda)\beta_{ji}(p_j - c_j - w)] - 2\lambda\beta_{ii}\theta_i c_i^{\theta_i - 1}} \tag{11}$$

Imposing the sign constrains of unknown parameters, $\frac{\partial P_i^*}{\partial C_j}$ is found to be negative, while the sign of $\frac{\partial c_i^*}{\partial c_j}$ is indeterminate. This implies that when firms cooperate, one firm's price is still negatively related with other's coupon values. However, how one retailer's couponing policy is impacted by other's coupons is ambiguous.

In summary, to maximize individual profits and under the assumption of linearity, retailers will lower prices or increase coupon values in response to an increase in their competitors' coupon values. However, if cooperation exists, retailers' couponing strategy is ambiguous.

**Data**

The study focuses on the firm behavior in ready-to-eat cereal market. Breakfast cereal is a relevant product to study for several reasons. For one, cereal is regularly consumed in the U.S. and is a popular choice for breakfast among children and adults, which well represents various types of households' daily food consumption. Second, previous studies have concluded that ready-to-eat cereal industry is a classic example of industry with intensive non-pricing competition, such as distributing coupons (Nevo, 2001). Breakfast cereal is generally purchased only at grocery stores, not from convenience stores or vending machines, which are the main channel for manufacturers and retailers distributing coupons to compete for market shares. Therefore, cereal market can provide relatively accurate information on coupon distribution, redemption and how it impacts individuals' behaviors.

We use household level AC Nielsen data which includes household level daily grocery purchases of breakfast cereals in the New York DMA from 2006-2008, as well as detailed household demographic information. Demographic information includes gender and age of the primary shopper, educational level and employment status of household members, household size and the number of children in the household, region and race, etc. In addition to household demographics, information on household coupon use frequency, types of coupon redeemed (manufacturer and retailer), as well as redemption values are also provided. Because of the lack of data on the distribution of manufacturer and retailer coupons, coupon redemption is used as a proxy. We choose brands and stores that purchase and visit frequency is greater than 100 throughout the sample period, and thus 51 store chains and 557 unique brands are kept for the analysis. The study focuses on cereal brands belonging to 11 individual manufacturers, including the four largest: General Mill's, Kellogg, Post,

and Quaker. For the empirical analysis, brands are aggregated at the manufacturer level. Products belonging to one manufacture are defined as a product line. Private label cereals are also included as one product line.

Table 2 describes the market composition from the perspectives of cereal manufacturers and store chains. In terms of product lines, the most purchased is General Mill's (GM), which has 33.20 percent of market share. Kellogg's (KEL) has 28.12 percent of market share, followed by Post (13.38 percent), and Quaker (QKR, 5.61 percent). These four manufacturers make up 80.32 percent of the total market share. Private label cereals (PL) also play a significant role in this market, which has a share of over 11 percent. Among all product lines purchased, both manufacturer and retailer coupons are most frequently redeemed for General Mill's, followed by Kellogg and Post. Only retailer coupons are distributed for private labels.

Store chains are divided into three classes according to sales volumes on cereals. Shoprite, Stop & shop, and Pathmark are the first three major store chains that take up to a share of 51.62 percent of the total market, and they fall into the first class. All the other retailer chains are grouped in to the second and third classes.

Table 3 presents average prices and coupon values across product lines and retailers. In terms of product lines, GM has the highest weighted average price of 21.47 cents/oz, and PL's prices are the lowest. On average, the value of redeemed retailer coupons is greater than that of manufacturer coupon across all product lines. GM has the highest redemption frequency for both retailer and manufacturer coupons. 15 percent of transactions made on GM involve a manufacturer coupon, and 13 percent of them are done with a retailer coupon. No manufacturer coupons are redeemed towards PL, but 3 percent of them are associated with a retailer coupon. Retailers carry similar cereal prices, and Stop & Shop exceeds a little comparing to others. Values of redeemed retailer and manufacturer coupons are higher in the first class store chains. Coupon redemption frequency declines along with the stores' sales volumes.

**Empirical Analysis**

Based upon the conceptualization of retailers' pricing and couponing policies described in the model section, expression (12) depicts the determinants of the price of a couponed product line. Economic theory indicates that prices and coupon levels influence each other. To account for the bidirectional causality between coupon values and prices, a simultaneous equation system is employed, and the determinants of coupon values are simultaneously identified as equation (13).

$$P_{ijt} = f(C_{ijt}, C_{imt}, \frac{1}{J-1}\sum P_{ij-t}, \frac{1}{J-1}\sum C_{ij-t}, \frac{1}{J-1}\sum C_{im-t,} PW_{ijt}, Kid_{ijt}, f_t, f_p) \quad (12)$$

$$C_{ijt} = f(P_{ijt}, C_{imt}, \frac{1}{J-1}\sum P_{ij-t}, \frac{1}{J-1}\sum C_{ij-t}, \frac{1}{J-1}\sum C_{im-t,} PP_{ijt}, FEmp_{ijt}, PL_{ijt}, f_t, f_R) \quad (13)$$

$P_{ijt}$ and $C_{ijt}$ are the prices and coupon values for product line *i* in store *j* at time *t*, respectively. $C_{imt}$ is the weighted average manufacturer coupons towards product line *i* in the whole market at time *t*. $\frac{1}{J-1}\sum P_{ij-t}$ , $\frac{1}{J-1}\sum C_{ij-t}$ , $and$ $\frac{1}{J-1}\sum C_{im-t}$ represent the weighted average price , retailer and manufacturer coupon values of that product line in all the other stores at time *t*, respectively. $Kid_{ijt}$ identifies whether the product purchased is a kid cereal, and $PL_{ijt}$ is a dummy showing whether it is a private label cereal. *F*ixed effects are included for different product lines ($f_p$), retailers ($f_R$), and time ($f_t$).

Problems of endogeneity can arise because other factors which impacts prices and coupon values are omitted from the estimation due to the data availability. For instance, consumers' price elasticity, store and brand loyalty also play a role when retailers determine the shelf prices and coupon values, which are included in the error term. To some extent, the inclusion of fixed effects will help account for time invariant characteristics. To account for endogeneity of prices and coupons, exclusion variables are employed in the estimation. We consider ingredient costs as potential candidates, and wheat prices ($PW_{ijt}$) are included in equation (13). Because prices of industrial printing paper may influence the distribution of coupons while have little effects on cereal prices, paper costs ($PP_{ijt}$) are used in equation (14). Additionally,

employment status of the primary shopper may also determine coupon redemption rate and values, but have little impact on prices. As a result, households' female head employment status ($FEMP_{ijt}$) is also included.

Equation (12) and (13) are estimated using the following simultaneous, two-equation, fixed-effects, panel-data model

$$P_{ijt} = \alpha_i + \beta_0 C_{ijt} + \beta_1 P_{ij-t} + \beta_2 C_{ij-t} + \beta_3 C_{imt} + \beta_4 C_{im-t} + \beta_5 PW_{ijt} + \beta_6 Kid_{ijt} + f_t + f_P + \varepsilon_1 \quad (14)$$

$$C_{ijt} = \gamma_i + \omega_0 P_{ijt} + \omega_1 P_{ij-t} + \omega_2 C_{ij-t} + \omega_3 C_{imt} + \omega_4 C_{im-t} + \omega_5 PP_{ijt} + \omega_6 FEmp_{ijt} + \omega_7 PL_{ijt} + f_t + f_R + \varepsilon_2 \quad (15)$$

**Results**

The results from the estimation are provided in Table 4. For the pricing equation, own retailer coupon values and prices of the product line in other stores are positively related to the price changes, which means retailers will increase cereal prices if it issues a retailer coupon toward that product, and if its competitors raise prices on the same products. Own manufacturer coupons also positively influence cereal prices, meaning that retailers tend to increase cereal prices if a manufacturer coupon present in the market. This is consistent with the argument that firms may use coupon as a price discrimination tool, which is supported by many studies.

Our interest is with how a retailer decides on pricing if its competitors issue a retailer coupon toward the same product line. Results indicate a significant negative relation between the two, which is consistent with the theory. More specifically, a retailer will decrease the cereal price by 6.685 cents if its competitor increases the retailer coupon by 1 cent. This suggests that because both cereal prices and retailer coupon values are close across stores, consumers may be better off comparing prices between stores if there are retailer coupons available in the market. Wheat prices are

significant at 10 percent level, and positively related to cereal prices. Whether it is a kid cereal or the transaction occurs during summer time is not statistically significant.

For the couponing equation, own retailer prices and values of retailer coupons in other stores are positively related to the coupon value, which means retailers compete in prices and coupon values to attract consumers. The positive relation between own and cross retailer coupon values suggests that retailers compete over cereals, and they may also cooperatively decide prices and coupon values. The employment status of female head is significant at 5 percent level, which has a positive impact on retailer coupon values. This implies that the more likely the female head is unemployed, the greater the possibility that she collects and redeems a coupon. Whether the cereal is a PL is significant in determining the retailer coupon value. However, seasonality has no effects here.

**Discussion**

The literature on coupon distribution and redemption is substantial. In general, coupons are widely observed as effective price discrimination tools that are prevalently adopted by firms to compete for market shares, introduce new products to the market, and attract new and retain old customers. The exploration of the relationship between retailer price and coupons is scarce, however. This study contributes by focusing on how coupon availability influences retail pricing decisions as well the competitive coupon behaviors.

This study also contributes to the literature by distinguishing the effects of different types of coupons. In terms of face value discount, manufacturer and retailer coupons may lead to the same effect to consumers' end. However, they may result in different marketing mix for competing retailers, and consumers may consequentially receive different welfare. This study adds to the literature by expanding the analysis into a more detailed scope, which helps retailers to better react to competitors' marketing practices, as well as helps consumers better understand the effects of coupons and rationally behave on shopping trips.

*Limitation and Further Work*

Retailers are assumed to offer a coupon which is lower than the minimum markup to cover the cost and maintain the profitability. However, Strategies may vary if players decide to take cooperative actions and maximize a union profit instead of individual ones. Firms may strategically charge a price lower than the cost or issue a coupon with a value higher than the markup. In this case, it is more challenging and interesting to model the profit maximization procedure.

The assumption that each store carries one product line is restrictive. In reality, retailers in contrast carry numbers of product categories, and multiple brands for each category. Therefore, analysis on retailers' pricing strategies in the presence of coupons towards a certain product becomes more complicated. Clifford (2012) reports that Kroger, Giant, Safeway and Acme Markets stores double or triple coupon face values in some states, usually on specific days and to specific limits, and most of these promotions are targeting on increasing sales on other products in the store. As such, the couponed product acts as a loss leader for the store (Kopalle et al, 2009). Modeling the retailer as maximizing profits across all product lines could provide more insights as well.

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## Tables

Table 1. Abbreviation Descriptions

| | | | |
|---|---|---|---|
| Variables | WAvg Price | Weighted average cereal price | |
| | WAvg MC | Weighted average value of redeemed manufacturer coupons | |
| | WAvg RC | Weighted average value of redeemed retailer coupons | |
| | MCFreq | Redemption frequency of manufacturer coupons | |
| | RCFreq | Redemption frequency of retailer coupons | |
| Manufacturers | GM | General Mill's | |
| | KEL | Kellogg's | |
| | POST | Post | |
| | QKR | Quaker | |
| | Other | All the other manufacture products | |
| | PL | Private label cereals | |
| Retailers | 1st Class | Shoprite<br>Stop & Shop<br>Pathmark | First three major store chains that take percent of up to 50 percent of the market share. |
| | 2nd Class | Retailers that sales volume fall into the small category. Visit frequency of these stores is less than 1000, and the total share of these stores is around 30 percent. | |
| | 3rd Class | Retailers that sales volume fall into the small category. Visit frequency of these stores is less than 1000, and the total share of these stores is about 20 percent. | |

Table2. Market composition of breakfast cereals

| | Share by Sales Volumes (%) | Purchase Frequency (%) | Cum.(%) |
|---|---|---|---|
| | Product Line | | |
| GM | 36.61 | 33.2 | |
| KEL | 27.96 | 28.12 | |
| POST | 13.77 | 13.38 | |
| QKR | 5.85 | 5.61 | 80.32 |
| Other | 8.37 | 11.21 | |
| PL | 7.43 | 8.47 | |
| | Retailer Chain | | |
| Shoprite | 24.07 | 26.21 | |
| Stop & Shop | 13.6 | 12.82 | |
| Pathmark | 12.34 | 12.59 | 51.62 |
| 2nd Class | 17.29 | 18.63 | |
| 3rd Class | 32.7 | 29.75 | |

Table 3. Average prices and coupon values across product lines and retailers

| | WAvg Price (cents/oz) | WAvg MC (cents/oz) | WAvg RC (cents/oz) | MCFreq (%) | RCFreq (%) |
|---|---|---|---|---|---|
| | Product Line | | | | |
| GM | 21.47 | 0.87 | 1.16 | 15 | 13 |
| KEL | 20.89 | 0.42 | 1.03 | 6 | 9 |
| POST | 17.7 | 0.56 | 0.9 | 9 | 10 |
| QKR | 20.32 | 0.41 | 0.75 | 7 | 3 |
| Other | 17.62 | 0.64 | 0.42 | 11 | 5 |
| PL | 16.46 | 0 | 0.12 | 0 | 3 |
| | Retailer Chain | | | | |
| Shoprite | 19.42 | 1.06 | 0.94 | 15 | 11 |
| Stop & Shop | 22.26 | 0.58 | 0.93 | 9 | 10 |
| Pathmark | 20.29 | 0.65 | 1.01 | 10 | 10 |
| 2nd Class | 18.74 | 0.31 | 0.93 | 7 | 9 |
| 3rd Class | 20.3 | 0.19 | 0.62 | 4 | 6 |

Table 4. Simultaneous Equation System Results

| | WPrice | | WRETCpn | |
|---|---|---|---|---|
| Endogenous Variable | WRETCpn | 25.998*** | WPrice | 0.003*** |
| | | 2.205 | | 0 |
| Common Variable | OtherWPrice | 0.193*** | OtherWPrice | -0.0008*** |
| | | 0.013 | | 0 |
| | OtherWRETCpn | -6.685*** | OtherWRETCpn | 0.278*** |
| | | 1.004 | | 0.012 |
| | WMFGCpn | 6.116*** | WMFGCpn | -0.073*** |
| | | 1.151 | | 0.018 |
| | OtherWMFGCpn | -0.222 | OtherWMFGCpn | 0.008 |
| | | 1.837 | | 0.028 |
| Exogenous Variable | WheatPrice | 0.068* | FEmp | 0.006** |
| | | 0.041 | | 0.003 |
| | | | Paperind | 0.012 |
| | | | | 0.018 |
| Fixed Effects | Kid | -0.692 | PL | -0.02*** |
| | | 0.179 | | 0.005 |
| | Season | -0.151 | Season | 0.0002 |
| | | 0.17 | | 0.002 |
| | _Constant | 14.822*** | _Constant | 0.008 |
| | | 1.076 | | 0.03 |

Standard errors provided below estimates

*** p<0.01, ** p<0.05, * p<0.1