Do Shoppers Like Electronic Coupons?
A Panel Data Analysis

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Abstract
Past research has yielded valuable insights into the drivers of traditional coupon redemption, but the applicability of these results to electronic coupons remains an open question. We investigate the determinants of electronic coupon redemption, employing a large panel dataset for five product categories (detergent, milk, cookies, shampoo, and orange juice) for the period 2003–2005. Our findings reveal that education and employment positively influence redemption rates and our analysis indicates that these findings are not due to unobserved individual effects. The focus is on comparing coupon-use discrepancies between national and private label brands when the characteristics of coupons are taken into account. A higher face value appears to be a critical element in electronic coupon format, and this gives rise to more purchases for nonperishables (shampoo and detergent). Results also show significant seasonal variations in milk and orange-juice coupon usage. Furthermore, the distance of consumers from the redemption location has a significantly negative effect, whereas the expiration date has no evident effect. The implications for electronic coupon research and practice are discussed.

Keywords: Electronic coupons; Coupon usage; Count panel data; The generalized method of moments

Introduction
In this study we focus on the determinants of coupon usage by one of the fastest-growing types of promotion in Taiwan – couponing at the store or at home electronically through shopping cards. In Taiwan, fierce competition has resulted in retailers exerting a tremendous amount of effort in providing incentives to consumers. The electronically linked coupon distribution network is a byproduct of this competition. According to a national survey conducted by Retailing Services (2005), the use of this technology has risen from 8 percent in 2003 to 17 percent in 2004 throughout supermarkets in Taiwan. What distinguishes electronic from traditional couponing is that electronic couponing provides a far more direct and convenient vehicle than the traditional coupon modes of free-standing inserts, on-pack coupons, and mail-in coupons.

Shoemaker and Tibrewala (1985) and Swaminathan and Bawa (2005) argue that the time lag between the consumer's exposure to coupons at home and redemption in store might attenuate redemption rates. They also argue that phenomena such as misplacing and forgetting to use coupons, or stock-outs of the couponed brand often result in fewer coupons used. However, those barriers can be overcome with the aid of an electronic distribution network that gives customers convenient ways to retrieve coupons. Further, some of the relationships identified in prior research may not hold for this new coupon distribution technology. For example, easier use may offset the typical expiration date effect (e.g., Inman and McAlister 1994). Therefore, researchers need to revisit behaviors surrounding coupon redemption.

In the context of electronic couponing, consumers browse the Web at home for any suitable coupons available on the store coupon pages and print them out. In the case of forgetting and/or misplacing, they can also get access to the coupon pages by running their shopping cards through terminals at the store and printing out the coupons. Electronic couponing also allows for the development of a detailed coupon redemption database, which managers can use to better understand the nuances of coupons’ effectiveness. Access to such a database frees us from the shortcomings of self-report coupon redemption measures used in previous studies.

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Previous research has employed cross-sectional approaches, yet has generally been unable to identify consumers’ shopping patterns during the promotional period. To illustrate this point, suppose consumers do not favor a certain product brand, but that they choose to purchase more of the sponsored product earlier than do brand-loyal consumers. A positive relationship between coupon use and demographic characteristics would then appear in the cross-sectional data even if individual consumers did not increase their coupon use over time (sample attrition bias). Researchers such as Neslin and Clarke (1987), Mägi (2003), Patterson and Smith (2003), Bhatnagar and Ghose (2004), and Meyer-Waarden (2007) acknowledge the use of cross-sectional data as a limitation in that behavior intentions do not always equate to actual behavior.

In the current study, we address several other interesting issues in couponing. Our target supermarket chain offered store brands in five product categories, allowing comparison between national and store brands. Experiencing increasing success over the past decades, private label brands are normally perceived as lower price and lower quality products than their national brand counterparts, but they have pressured manufacturers to compete more vigorously on price in order to win back market share lost to private label brands (e.g., Cotterill and Putnis 2000; Garretsona, Fisherb, and Burton 2002; Gedenk and Neslin 1999; Sayman and Raju 2004). Another overlooked issue we address is the effect of product category, which may play an important role in response to coupon promotions (Cronovich, Daneshvary, and Schwer 1997; Swaminathan and Bawa 2005).

Finally, we offer an alternative model to the traditionally used Poisson model. Coupon use usually occurs in discrete, non-negative quantities, yet traditional models do not accurately account for such behavior. The Poisson model assumes that the mean equals the variance, so if the mean–variance equality does not hold (known as overdispersion (Winkelmann 1997)), then the model is mis-specified. Further, there are some other intrinsic restrictions embedded in the basic Poisson model when handling a panel dataset, such as the failure to take into account that individual effects may be correlated with the regressors, the assumption of the strict exogeneity of the regressors, and serial correlation not being allowed in the residuals. To address these issues, we employ the generalized method of moments (Hansen 1982) in our estimation.

This article is organized as follows. After a discussion of the coupon usage literature, we lay out several testable hypotheses for electronic coupons. We then discuss data collection and estimation methods, and provide empirical results. The final section offers conclusions and some managerial implications.

Theoretical foundations and hypotheses

Two streams of literature are related to behaviors surrounding coupon redemption. The first focuses on determinants of household coupon usage and examines socioeconomic, demographic, and psychological drivers of coupon/deal redemption (e.g., Bagozzi, Baumgartner, and Yi 1992; Green 1995; Hernandez 1988; Schofield 1994; Tat and Bejou 1994). The second stream emphasizes coupon characteristics and other non-demographic characteristics (product category and market share), as well as coupon attractiveness (monetary value and expiration date) (e.g., Bawa, Srinivansan, and Srivastava 1997; Inman and McAlister 1994; Kumar and Swaminathan 2005; Lichtenstein, Richard, and Burton 1990; Mittal 1994; Neslin and Clarke 1987; Raghubir, 1998, 2004; Reibstein and Traver 1982).

Most of the above-mentioned studies apply cost–benefit theory, which argues that households use coupons when the monetary savings exceed the time and cost spent in coupon related activities. Variables like family income, employment status, and the presence of young children are usually classified as constraining factors. Under this theory, increases in family income should increase the household’s cost of coupon use and induce the household to reduce its level of coupon-related activity. However, Lee and Brown (1985) found that high-income households were significantly more likely to use coupons, while Narasimhan (1984), Bawa and Shoemaker (1987) and Goodwin (1992) found a positive but statistically insignificant income effect. Employment status is regarded as a time constraint, reducing time for couponing activities (e.g., Mittal 1994). There is, however, little empirical evidence to substantiate this assumption.

Cronovich, Daneshvary, and Schwer (1997) have shown the positive effects from the presence of young children, which is influenced by the contra indicators of tighter budgets (arguably leading to greater coupon use) and less time (arguably leading to lower coupon use). Generally, in the case of children within the home, budget appears to trump time and we see increased coupon usage (Lee and Brown 1985; Narasimhan 1984). Although demographic variables have been well covered in previous work, interactions among variables have been given short shrift. For example, Strober and Weinberg (1980) report that working women in high-income groups are less likely to use coupons than non-working women in the same demographic group. Product type may also complicate matters because most distributed coupons are rendered for families to use on items like dairy products, crackers, and soft drinks. Bawa and Shoemaker (1987) examine coupon use for different types of products and find a positive relationship between income and usage. It is likely that other interactions will arise from interactions that have yet to be studied.

The context of electronic couponing may further complicate matters, diminishing time effects and reinforcing the income effects. The electronic setting provides a more convenient context for consumers, via either a home computer or point of purchase terminal, lifting the traditional time constraint. Lower-income consumers spend a higher percentage of their total earnings on living expenses, leaving them with a smaller budget and less time to acquire extra products and services (Becker 1965; Michael and Becker 1973), which could reduce in-store coupon acquisition. Similarly, Internet acquired coupons require technology ownership and connectivity, as well as basic Web usage skills. These factors could create an income threshold for electronic couponing.

Relatively, education has emerged as a positive driver of usage in many coupon studies. Following the efficiency hypothesis (e.g., Levedahl 1988), better-educated consumers seek more
variety, have lower substitution costs, and thus should use more coupons. Better-educated shoppers are, on average, more intense coupon users (Bawa and Shoemaker 1987; Narasimhan 1984), although Goodwin (1992) find no significant effect. Overall, since factors such as family income, employment status, and education are indicative of household income, we formulate the following general hypothesis:

**H1.** The greater a shopper’s income, the greater his/her propensity to redeem coupons.

Other factors related to a potential threshold effect include age and education, which are related to adoption of new technology (Eilers 1989; Furlong 1989; Loges and Jung 2001). Young people will be more readily exposed to new technologies at school and through other early adopters, so they should be more comfortable with using electronic coupons than those who are older and have relatively less access to new technologies. Thus, we propose that new technology-based coupon use may decrease above a certain age, yielding a non-linear (concave down) relationship between age and electronic coupon use.

**H2.** There is a non-linear (concave down) relationship between coupon use and age.

There are numerous studies incorporating intervening variables to explain the behavior of coupon redemption. Among them, brand loyalty has proven to be significantly and negatively correlated with coupon redemption behavior (Bawa and Shoemaker 1987; Mittal 1994). Nevertheless, in Swaminathan and Bawa (2005) study, the hypothesis is supported in such categories as coffee and beauty salons while not supported in detergent and oil changes. Lichtenstein, Richard, and Burton (1990) and Swaminathan and Bawa (2005) found coupon proneness to be an important antecedent of coupon redemption, while Mittal (1994) and Bawa and Shoemaker (1987) observed that store loyalty is negatively correlated with coupon redemption.

Arguably, a shopper’s frequency of browsing either the online or store coupon page should serve as a good indicator and his/her coupon proneness. The rationale is from Bhattacharjee and Ghose (2004), who find that the more frequently consumers access the Internet for information, the more likely it is that their purchases are influenced by the information obtained on the Web. Likewise, brand loyal customers can be categorized by their brand switching frequency over a certain period. Store loyalty can also be assessed by behavior measures such as frequency of shopping (Olsen 2002). Though not empirically validated, those who frequent a store arguably value that store and should be more likely to respond to store promotions. Thus, we propose a set of three hypotheses, regarding the advantages of electronic metering.

**H3.** The more frequently a shopper browses the coupon page, the greater is his or her propensity to redeem coupons across product categories.

**H4.** Shoppers who switch brands more frequently are more likely to redeem coupons across product categories.

**H5.** Frequent shoppers are more likely to redeem more coupons than less frequent shoppers across product categories.

Higher face value coupons are often associated with higher redemption rates (Bawa and Shoemaker 1987; Reibstein and Traver 1982; Ward and Davis 1978). However, this effect has not been well studied across product categories and brand types (national and store), making it difficult for managers to decipher a consumer’s response to a specific type of coupon, as suggested by Cronovich, Daneshvary, and Scher (1997) and Swaminathan and Bawa (2005). As mentioned earlier, private label brands are often regarded as having lower price and lower quality. Based on attribution theory (e.g., Sawyer and Dickson 1984), a lower price for private label brands may be attributed to some problematic aspect of the product, which is then perceived as being inferior in quality. In comparison, national brands, frequently using a nationwide advertising coverage to reaffirm their positive attributes and quality, are less likely to be considered inferior in quality (Garretsona, Fisherb, and Burton 2002). That is, they should be less susceptible to negative quality attributions from coupons.

Inman and McAlister (1994) use regret theory to explain the relationship between expiration date and coupon redemption behavior. They argue that consumers’ anticipation of feelings of regret at having missed an expired coupon’s savings causes the immediacy of anticipatory regret to increase as the coupon’s expiration date draws closer. However, using regret theory without considering the face value effect provides a incomplete picture of the expiration date effect. We, therefore, posit the following hypotheses.

**H6.** High face value coupons are more likely to induce increased coupon redemptions than low face value coupons across product categories.

**H7.** (a) National brand products, in combination with high face value coupons, are more likely to induce increased redemptions in different product categories, and (b) shoppers are more sensitive to this combination at the day of expiration.

The distance from the redemption location is an important convenience factor in explaining redemption behavior, but little literature addresses this. Greater redemption location distance from the consumers’ residence should concomitantly increase the cost in time (Chiou-Wei 2004; Rhee and Bell 2002). This effect should be more pronounced for consumers with greater time constraints, such as consumers with lower income and more young children, as discussed earlier. Thus, we formulate the following hypothesis:

**H8.** A greater distance from the store will result in lower coupon redemption for families with lower income and more young children at home.

**Data description and estimation method**

Our data consist of more than 160,000 coupon redemption records for a two-year period obtained from a prominent supermarket chain in Taiwan between January 2003 and January 2005 and for which complete demographic profiles of members were available. A total of 24,104 card members were used in the subsequent analysis, 64.3 percent of whom were employed, with an
average age of 27. Almost half (46.2 percent) of the members had more than one child under ten years of age. Nearly two-thirds held a college degree (66.7 percent), and almost that same percentage (65.4 percent) earned between NT$30,000–50,000 per month (approximately US$910–1,515).

In order to test \( H_7 \), we separate the data into two categories – private label brands and national brands. To this end, five product categories are employed: shampoo (three national brands and two private label brands), detergent (two national brands and one private label brand), cookies (five national brands and four private label brands), milk (four national brands and two private label brands), and orange juice (three national brands and two private label brands). In general, the private label brands have lower prices and market shares compared with the national brands.

The sponsoring retailer issued coupons each month in one of four configurations: (1) 5 percent off with three-day expiration; (2) 5 percent off with seven-day expiration; (3) 10 percent off with three-day expiration; (4) 10 percent off with seven-day expiration. Dates for coupon issue and expiration were determined by the retailer with no carry over into consecutive months. Within the shampoo and detergent category, 64 percent of the coupons had a seven-day expiration, with the remaining expiring in three days. Within the food category, 46 percent of the coupons had a seven-day expiration period, with the remaining expiring in three days. Coupons were scanned at check-out and each coupon was redeemable only once for one product. Table 1 describes the coupon face value distribution and the average number of coupons used for each product category during the two-year observation period. Within all product categories, redemption rates experienced an increase or stable growth in the mean coupon use over time (these results are not presented in Table 1), with a spike in January and February for food products (as seen in months 13 and 14) due to New Years and Chinese Lunar New Year celebrations. Second, the redemption rates in the milk and orange juice categories have always been above that of the other categories and seasonal spikes are evident during the summer months (indicated by months 7–9 and 19–21, respectively). Third, high face value coupons and national brands generally captured more coupon use across product categories.

Table 2 provides an overview of the percentage of the sample not using a coupon for each of the 24 months. Two results stand out. First, in relation to adoption (incidence), coupon penetration increased from 26 percent in month 1 to 48 percent by month 24, indicating success in executing the electronic couponing program. Second, the high proportion of non-users supports our use of count models in the analysis, discussed subsequently.

Table 3 gives the definitions of variables. Given that the dependent variable (monthly number of coupons redeemed) in our analysis is a non-negative integer, count data models are the natural choice for our regression analysis. The standard Poisson model is frequently used for such count data. However, this does not allow for individual effects. That is, there may be unobserved specific effects that impact coupon use decisions unique to a given supermarket or the location of products. The failure to include individual specific effects may lead to overdispersion (Winkelmann 1997). The individual effect problem (i.e., unobserved heterogeneity) can be partially solved by including the unobserved individual effect in the Poisson parameter (Hausman and Griliches, 1984). Specifically, Hausman and Griliches (1984) suggest incorporating an overdispersion parameter (\( \delta \)) to account for the form of heteroskedasticity where the conditional variance exceeds the conditional mean. As \( \delta \) approaches infinity, the negative binominal distribution converges to a Poisson function.

There have been many efforts in econometric research to circumvent the problem of correlated individual effects in the basic Poisson model. Among them, both the conditional maximum likelihood (CML) approach (Blundell et al. 1995; Hausman and Griliches, 1984; Montalvo and Yafeh, 1994), and the pseudo-maximum likelihood (PML) method (Gourieroux, Monfort, and Trognon 1984; Wooldridge 1999), have proven useful in obtaining consistent estimates. However, there is a common restriction embedded within these approaches. They both rely on the strong assumption that the original distribution is a Poisson distribution and the explanatory variables are all strictly exogenous, which is often difficult to justify.

To address the problem of violating the strict exogeneity assumption, some economists have argued that the explanatory variables should be considered predetermined rather than strictly exogenous. Among them, Hansen’s (1982) generalized method of moments (GMM) has several advantages over other methods. First, it does not need to be restricted by the equi-dispersion condition. Second, it allows for heteroscedasticity and serial correlation in the error terms. Finally, it relaxes the strict exogeneity assumption of the regressors. We therefore employed GMM in testing our hypotheses.1 In the next section we discuss our estimation results derived from the GMM method.

Results

This section reports the estimation results with respect to the hypotheses in Section ‘Theoretical foundations and hypotheses’. We first estimate the count model – applying the negative binomial and the Poisson distributions. The under-dispersion test (Cameron and Trivedi 1990) consistently rejects the hypothesis of equi-dispersion for our data at the 1 percent significance level. Since the Poisson model is not appropriate for our data, we only report the negative binomial results using the GMM method. In addition, a Hausman test value higher than the 5 percent critical value suggests that the fixed-effects models fit the data better. Table 4 reports the estimation results of the determinants of coupon use from our count panel data econometric model.

In view of hypothesis \( H_1 \), we approximate the effect of a shopper’s labor market income, using control variable indicators: whether the shopper is employed, years of education, and family income, which presents a positive correlation between a shopper’s income and coupon usage. The hypothesis is partially confirmed – we find a statistically significant increase in coupon usage by 2.6 percent for every year of schooling, and those who are employed have significantly more coupon redemption than

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1 Details are available from the first author.
sers experience, and thereby can influence their subsequent shopping behavior.

The current results have several important implications for marketers. First, the concave upward non-linear relationship between coupon usage and age indicates that younger shoppers’ redemptions lag behind those of older shoppers and this difference increases with the shopper’s age. Our results also suggest that a clear presentation of the coupon web page and the inclusion of a greater variety of coupon choices in different product categories would induce more browsing (and greater redemptions). Moreover, costs permitting, a specific location and instructions for point of purchase terminal use could be beneficial. Second, grocery stores that plan to use electronic couponing should expect better results in densely populated metropolitan areas where travel distances are shorter. Third, brand managers for national brands can improve redemption rates by using high face value coupons with less concern regarding expiration date. Given such a strategy, it is important to remember that low priced brands can be at a competitive disadvantage with respect to high value couponing. Fourth, before conducting coupon activity, managers should understand the different nature of product categories. For example, shoppers are likely to redeem coupons on less loyal goods, like cookies and orange juice, which often have more substitutes. For beverage product managers, summer is a better time to allocate coupon dollars. Finally, managers can send coupon updates by e-mail to members so as to solicit more responses.

While the above recommendations follow directly from our empirical results, caution should be exercised in interpretation. Coupon effects can interact with other promotional activities, such as advertising and annual sales. Further, this study is based on a two-year observation sample of Taiwanese shoppers and has a relatively limited range of product categories. Generalization will be increased as our study’s findings are replicated with samples from other populations and other product categories. We hope that our research will encourage further efforts along these lines.

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