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CARROT OR STICK: NUDGING CONSUMERS TOWARDS HEALTHIER CHOICES THROUGH CUSTOMIZED PRICE INCENTIVES

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ABSTRACT

In a market where consumers are increasingly concerned with maintaining a healthy diet and demand healthier foods, the role of retail grocery stores has been highlighted, as they exert a powerful influence on food choices. To increase more healthful food purchases, some food retailers have implemented marketing efforts to influence consumer food decision-making. However, due to the mixed findings on the effect of existing marketing interventions on improving purchasing of healthier foods, it is unclear which interventions work best to shift purchasing and what benefits they can bring to the retailer.

A promising approach to nudge healthy purchases with behavioral science is to incentivize healthy products according to individual customers' preferences. Based on customization theory and findings from existing studies on customer choice behavior, we expect this approach to be more effective and bring higher profit to the retailer. On the one hand, customizing offerings to the needs and preferences of a given individual improves marketing effectiveness and cost savings. On the other hand, retailers may also benefit from customization through enhanced customer attitude and loyalty, which serve as key indicators of the long-term success of a marketing program.

The effect of customized incentives is investigated using an existing panel database collected from a generic coupon campaign (Manuscript1) and supplemented by a real-world randomized control trial, in which coupons are designed for health purposes (Manuscript2). Manuscript1 focuses on the effect of targeted coupons on food purchases and demonstrates that while targeted coupons positively influence food purchasing patterns, unhealthy food purchases are more responsive to targeted coupons than healthy

food purchases. Manuscript1 leaves some questions unanswered, such as if targeting similarly impacts healthy food categories and whether a customized couponing campaign affects customer attitude and loyalty. Manuscript2 extends manuscript1 by focusing on different groups of consumers and retailer-relevant metrics. Manuscript2 uncovers segment-level differences in coupon response and demonstrates that the difference in response patterns is driven by consumers' characteristics. Manuscript2 also shows that customized coupon programs will generate several favorable relationship outcomes, including customer attitude, customer satisfaction, and customer loyalty. These findings offer practical implications for retailers who want to implement such a program to support healthy eating.

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PREFACE

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Manuscript 1

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Targeted Retail Coupons Influence Category-Level Food Purchases Over 2-years

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Manuscript I - Targeted Retail Coupons Influence Category-Level Food Purchases Over 2-years[1]

Abstract

Background: Targeted coupons strongly influence purchasing behavior and may represent an innovative approach for improving dietary behaviors.

Methods: The retail analytics firm, Dunnhumby, provided secondary retail data containing grocery transactions, targeted coupon exposures, and coupon use for 2500 households over 2-years. The USDA Quarterly At-Home Food Purchasing Database was used to categorize individual foods into 52 categories and combined into 12 food groups. Mixed effects linear models estimated the difference-in-difference effects of coupon exposure on category-level purchase rate/wk. pre- and post-campaign; models also tested effect modification by food category.

Results: Category-level food purchases significantly increased post-campaign. Mean (SD) food purchases/wk. Among exposed households (17.34 (13.08) units/wk) vs. unexposed households (3.75 (4.59) units/wk) were higher ($p < 0.001$). Difference-in-difference effects of coupon exposure showed a higher increase in purchase rate among exposed vs.unexposed households (5.73 vs. 0.67, $p < 0.001$). Food category significantly modified the association between coupon exposure and coupon campaign. Category-level purchase rate among exposed vs. unexposed households was relatively higher in less healthful (e.g. convenience foods) vs. more healthful categories (e.g. nuts) with a 1.17 unit/wk. increase in convenience foods purchase ($p < 0.001$) vs. a 0.03 unit/wk. increase in nuts ($p < 0.001$). Exploratory analyses suggested that price elasticity of food categories

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for targeted coupons (1.02–2.81) was higher than previous estimates for untargeted coupons.

Conclusion: Across food categories, coupon exposure increased category-level purchase rate, with a relatively larger effect size for less healthful than more healthful categories. Promising results from this preliminary study suggest that experimental research is warranted to determine whether targeting with the explicit purpose of improving dietary quality can more effectively influence diet, and whether it can do so more cost effectively.

Keywords: Retail purchase quality, Grocery purchases, Longitudinal, Incentives, Dietary pattern, Intervention, Targeted coupon, Healthful food purchase, Difference-in-difference

1.1 Background

High quality dietary patterns are important for promoting health and preventing chronic disease, yet most U.S. adults have a dietary pattern poorly aligned with the Dietary Guidelines for Americans. National data suggest that more than 75% percent of US adults consume a diet that is low in fruits, vegetables, and other more healthful food groups while simultaneously exceeding recommendations for saturated fats and added sugar [1]. This pattern of purchasing and subsequent food consumption is a primary risk factor for most leading causes of death and disability in the US [2]. Although nutrition education, nutrition labeling, taxes, and bans have been proposed to improve diet quality [3–6], research generally finds that these approaches are costly and have mixed effectiveness [7–10]. Therefore, innovative strategies to shift people's food purchasing habits are warranted.

Price incentives are increasingly being proposed as potential interventions to promote healthier dietary patterns, and to date, they have enjoyed moderate success [11, 12]. In a meta-analysis of price elasticity, a 10% price increase was associated with a 2.7% to 8.1% reduction in food purchases, with some foods such as sugar sweetened beverages (SSB) particularly responsive to price change [13]. Similarly, Geliebter et al. [14] found that a 50% discount on fruits and vegetables led to three times more purchases per week, a meaningful change that was sustained 4 weeks after discounts were discontinued. Furthermore, a recent systematic review and meta-analysis found that a smaller 10% subsidy was associated with a 14% increase in fruit and vegetable purchases and a 16% increase in other more healthful foods [15]. Evidence from the Healthy Incentives Pilot study further supported the efficacy of subsidies among 7500 low-

income households in Massachusetts, and found that a $0.30 cent incentive for every dollar spent on fruits and vegetables resulted in a 0.24 cup increase in fruit and vegetable intake per day during the 12-month study [16, 17]. Despite the modest improvements in diet quality achieved with existing strategies, opportunities exist to further improve population -level dietary quality with greater consideration for cost effectiveness.

Compared to a standardized, “one size fits all approach,” customization is often effective at influencing consumer purchasing behavior because interventions are optimized at the individual level [18, 19]. Customized incentives, unlike uniform incentives, provide different interventions to customers based on their current purchasing patterns, and constitute a key element of many firms’ strategies to influence consumer behavior [20]. For example, when CVS’s loyalty program began using customer purchase history to promote products that each customer was probabilistically more likely to purchase, CVS’s total sales increased 10% within the first year [21]. Despite evidence that targeting incentives is an effective marketing practice to promote long-term profitability, targeted incentives have not been applied toward the goal of promoting more healthful food purchases. Furthermore, existing untargeted interventions generally subsidize only fruits and vegetables, so it is not clear how robustly targeted incentives will influence food purchasing across different food categories.

The objective of this study is to understand the influence of individually-targeted coupons on consumer purchasing patterns among households unexposed vs. exposed to targeted coupons for less healthful and more healthful dietary purchases. Specifically, this study compares the effect of targeted coupon exposures among products that belong to 12 less healthful and more healthful food groups. Using existing panel data, the present

study aims to examine: 1) whether targeted coupon exposures affect category-level food purchase rates, and 2) whether the relationship between coupon exposure and product-category level purchases differs between less healthful and more healthful product categories. This project will provide insight into relationship between targeted coupons and food purchases, help identify whether more healthful foods can be encouraged through targeted coupons, and inform how much to incentivize more healthful food relative to less healthful foods. Such information may provide key insights into a novel strategy to promote people's food purchases in a more cost-effective and sustainable manner in order to improve population-level dietary quality.

1.2 Methods

Data

De-identified, household-level publicly-available data from a 2-year longitudinal study were obtained from the retail analytics firm, Dunnhumby [22]. Dunnhumby collected information in 2007 on the product transactions, targeted coupon exposures, coupon usage and demographics of a convenience sample of 2500 households who completed 2.5 million item -level transactions in 5 unique stores belonging to a single chain retailor, which were selected to represent nearly all food purchases. The coupons were only redeemable in the 5 stores. All coupon offers were associated with the customer's past purchase behaviors. Customers were selected to participate in the study based on their propensity to purchase the specific product, brand, or category. Households had varied purchasing habits, coupon usage histories and backgrounds, including age, marital status, household income, composition, household size, home

ownership and number of children. In order to examine the effect of coupon exposure on food purchases, the raw data was restructured as follows. Data were analyzed in 2017.

Stage 1: Cleaning of raw databases

15.2% of item level transactions containing no food items were excluded.

Stage 2: Aggregating food products in all raw datasets

In order to examine the effect of targeted food coupons across categories, 56,009 individual food items were first categorized into 52 categories delineated in the USDA'S Quarterly Food-at Home Price Database (QFAHPD) [23]. Next, kindred categories were combined into 12 food groups (See Additional file 1: Table 1.S1), which included: (1) fruit, (2) vegetables, (3) SSB, (4) non-SSB (including milk), (5) other added sugars, (6) dairy excluding milk, (7) meat, poultry, fish, and eggs, (8) added fats, (9) whole grains, (10) nuts, (11) convenience foods and (12) refined grains.

Exposure variable

An indicator variable was created to denote whether a household received (yes/no) any of the 748 food-related coupons over the 2-year study period.

Outcome variable

Purchase rate was computed as the average number of items a household purchased per week (# items/(days in period/7)).

Other variables

Food category: Food category describes which of the 12 categories each household purchased during 2 years.

Coupon campaign period: In order to examine change in purchase rate over time, a binary variable was created (pre-campaign /post-campaign) to indicate whether the

purchase occurred prior to receiving a coupon or after receiving a coupon. During the study period, households received 30 campaigns, with an average of 31 unique food coupons per campaign. Coupons were sent to customers as part of the campaign with a specified beginning date (day 224- day 659) and end date (day 264- day 730). Therefore, the start date of each coupon corresponded to the date the campaign was initiated. Using the raw data, the earliest validity date (day 223) and the latest expiration date (day 642) were selected to determine the campaign period (pre-campaign, day< =223; post-campaign, 223< day< 642). Because there were few observations after the last expiration date (days 642–730), this analysis exclusively focused on the pre- and post-campaign periods.

Data transformation

All raw data was examined for normality. The distribution of food purchases was not a simple parametric distribution, and contained a high proportion of zero-quantity values with a long right tail, potentially biasing statistical analyses [24, 25]. Therefore, in order to estimate changes in rate due to coupon exposure, zero-quantity purchase data was eliminated after validating that dropping this data to normalize the distribution would not bias the sample in the direction of the hypothesis that targeted coupons increase category-level purchase rate.

Additional file 2: Figure 1.S1 compares how dropping zero-quantity purchases influenced mean purchase rates among the unexposed and exposed group in the pre- and post-campaign periods. Dropping zero transactions attenuated the observed relationship between targeted coupon exposure and purchase rate, indicating that an analysis excluding zero-quantity purchases provides a stricter test of whether targeted coupon

exposure increases category-level purchase rate. Similarly, Additional file 3: Table 1.S2 presents zero transaction distributions for each food category. Because there was generally a higher prevalence of zero purchases across food categories (excluding SSB) prior to when coupons could be utilized, dropping zeros suppressed the observed relationship between coupon exposure and purchase rate for all foods and inflates estimates for SSB. Therefore, excluding SSB, the estimated parameters can be considered conservative estimates for the relationship between targeted coupons and category-level purchases.

Statistical methods

A difference-in-difference analysis was used to examine whether changes in food purchases in the pre- and post-campaign periods among exposed households were significantly different from the pre- and post- purchasing patterns among unexposed households. This approach allowed for assessing whether the changes in purchasing rate were due to targeted coupon exposures rather than other temporal trends that may have influenced the purchasing patterns in each household [26, 27].

Rate of category-level food purchases per week was modeled as a function of coupon campaign period, coupon exposure, food category and their interactions. The results were analyzed via SAS using a two-way and a three-way mixed ANOVA design with campaign period as the grouping variable and coupon exposure as the within-subjects variable. The effect of targeted coupon exposures on the average category-level food purchase rate, across all food categories and all households was first evaluated. The rate of category-level food purchases per week was empirically modeled as a function of coupon exposure in that category, campaign period, and their interaction. Whether

categories differed in how targeted coupons influenced category-level purchases was then considered by modeling category-level purchase rate as a function of coupon exposure, campaign period, food category, and two-way and three-way interactions between each of these factors. The interaction between food category, coupon exposure and campaign period tested whether coupons had different effects among different food categories.

In exploratory analysis, elasticity of coupon redemption was also calculated by dividing percent change in quantity by percent change in price to see how customers responded to price reductions through targeted coupons. First, average weekly purchase quantity across all households at the food category level was calculated. Percent change in quantity was calculated by dividing the product category-level difference-in-difference estimates by the number of units purchased by the exposed households in the pre-campaign period. Including only the exposed households in the denominator is a conservative assumption, since exposed households had higher pre-campaign purchases than the unexposed households. Second, the sticker price of each food purchased and the discount price (in dollars or unit of currency), excluding loyalty discounts (i.e. the discount viewable by the consumer) were calculated. This allowed us to calculate the average percent change in price across all items purchased at the category- level when coupons were applied, including transactions with a coupon and transactions without a coupon. For example, if a person received a $0.50 coupon for one product that cost $1, and applied the coupon to only one of two purchases of that product, the average discount for that product would be $0.25, leading to a 25% discount overall.

1.3 Results

Overall, 2,201,815 food transactions including 56,009 unique foods products occurred over the two-year study period from 2003 to 2005 (average of 0.88 food purchasing trips and 8.24 food products per week for each of the 2500 households). In total, 1,746,594 food coupons (748 unique) were sent out and 77,929 (393 unique) were redeemed by targeted households. Of the 2500 households, 1584 received at least one food coupon and 916 households were consistently not exposed to coupons (See Additional file 4: Table 1.S3). Because demographic data were available for roughly 35% of the sample, it was not included in the resulting analysis.

Coupon exposure and category-level purchase rate

Table 1.1 and Fig. 1.1 show the effect of coupon exposures and campaign period on food purchases among unexposed households and exposed households. The two-way mixed ANOVA yielded significant main effects of coupon exposure and campaign period. In Fig. 1.1, households exposed to coupon campaigns consistently purchased more food per week than households unexposed to coupon campaigns ($p < 0.001$). Food purchases among unexposed households vs. exposed households also differed significantly in the pre- and post-campaign periods ($p < 0.001$). Mean food purchases per week among unexposed households increased from 3.08 units/week to 3.75 units/week in the post-campaign period. The mean food purchase rate among exposed households was 11.61 units/week in the pre-campaign period and increased to 17.34 units/week in the post-campaign period. The 5.06 units difference-in-difference increase indicated that exposed households purchased 5.06 units more per week than unexposed households in

the post-campaign period, relative to each group's pre-campaign purchase rates ($p < 0.001$).

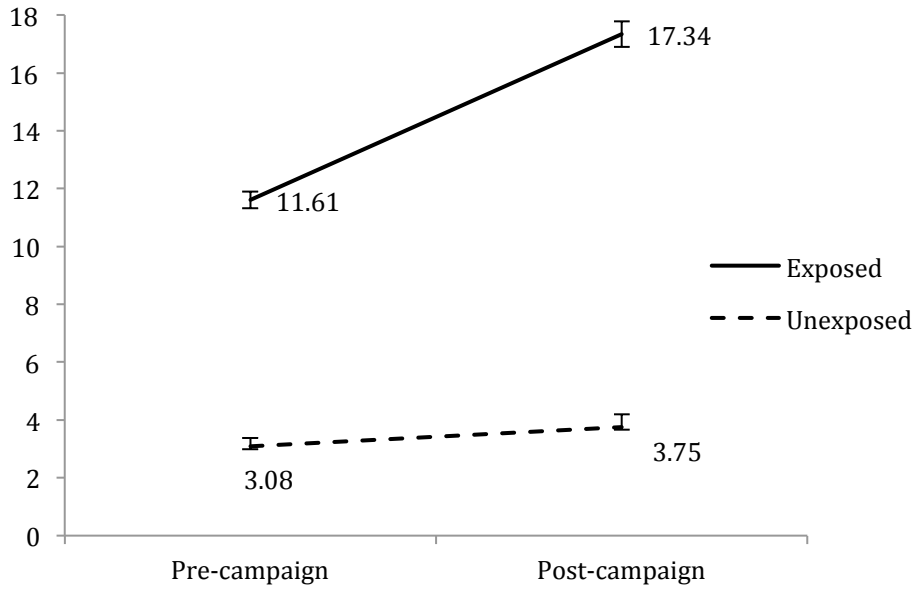
Table 1.1 Effect of Targeted Coupons on Purchase Rate for All Foods and Each Food Category

Food category†	Coupon exposure/Campaign period				Difference In Difference Increase	Significance§				
	Without coupon exposure		With coupon exposure			Pre	Post	Un-exposed	Ex-posed	Difference in Difference
	Pre Mean (SD)	Post Mean (SD)	Pre Mean (SD)	Post Mean (SD)						
All Foods										
	3.08 (3.63)	3.75 (4.59)	11.61 (9.57)	17.34 (13.08)	5.06	***	***	***	***	***
Unhealthful foods										
Convenience Foods	0.71 (0.93)	0.86 (1.11)	2.67 (2.50)	3.99 (3.42)	1.17	***	***	***	***	***
Other added sugar	0.30 (0.46)	0.38 (0.54)	1.12 (1.24)	1.69 (1.64)	0.49	***	***	***	***	***
SSB	0.36 (0.55)	0.40 (0.59)	1.31 (1.56)	1.81 (2.00)	0.46	***	***	***	***	***
Refined grains	0.28 (0.52)	0.34 (0.53)	1.01 (1.07)	1.52 (1.38)	0.45	***	***	***	***	***
Dairy excluding milk	0.22 (0.36)	0.29 (0.51)	0.88 (1.11)	1.37 (1.43)	0.42	***	***	***	***	***
Added fat	0.04 (0.07)	0.05 (0.08)	0.13 (0.16)	0.22 (0.22)	0.08	***	***	***	***	***
Healthful Foods										
Vegetables	0.33 (0.49)	0.42 (0.60)	1.37 (1.42)	2.08 (1.99)	0.62	***	***	***	***	***
Meat poultry and fish	0.42 (0.56)	0.49 (0.65)	1.53 (1.42)	2.20 (1.82)	0.60	***	***	***	***	***
Fruit	0.20 (0.31)	0.25 (0.40)	0.82 (0.96)	1.23 (1.35)	0.36	***	***	***	***	***
Non-SSB	0.17 (0.29)	0.21 (0.42)	0.61 (0.63)	0.95 (0.92)	0.30	***	***	***	***	***

Whole grains	0.03 (0.02)	0.04 (0.03)	0.10 (0.04)	0.17 (0.01)	0.06	***	***	***	***	***
Nuts	0.02 (0.06)	0.03 (0.10)	0.08 (0.15)	0.12 (0.22)	0.03	***	***	***	***	***

*P<0.05; **p<0.01; ***p<0.001.
SD: Standard Deviation.
[§]Test of significance between unexposed group v. exposed group before coupon period; unexposed group v. exposed group during coupon period at each food category.
Difference in difference analysis. The reference group is households not exposed to coupons. Standard errors were clustered.
† Food categories are grouped from 53 USDA'S Quarterly Food categories including Fresh/frozen fruits; Canned fruits, Fresh/Frozen dark green vegetables; Fruit juice; Canned dark green vegetables; Fresh/Frozen orange vegetables; Canned orange vegetables; Fresh/Frozen starchy vegetables; Canned starchy vegetables; Fresh/Frozen select nutrient vegetables; Canned select nutrients vegetables; Fresh/Frozen other vegetables; Canned other vegetables; Frozen/Dried Legumes; Canned Legumes; Whole grain bread, rolls, rice, pasta, cereal; Whole grain flour and mixes; Whole grain frozen/ready to cook; Other bread, rolls, rice, pasta, cereal, other flour and mixes; Other frozen/ready to cook grains; Low fat milk; Low fat cheese; Low fat yogurt & other dairy; Regular fat milk; Regular fat cheese; Regular fat yogurt & other dairy; Fresh/frozen low fat meat; Fresh/frozen regular fat meat; Canned meat; Fresh/frozen poultry; Canned poultry; Fresh/frozen fish; Canned fish; Raw nuts and seeds; Processed nuts, seeds and nut butters; Eggs, oils, solid fats, raw sugars; Non-alcoholic non-diet carbonated beverages; Non-carbonated caloric beverages; Water, Ice cream and frozen desserts; Baked good mixes; Packaged sweets/baked goods; Bakery items, ready to eat; Frozen entrees and sides; Canned soups, sauces, prepared foods; Packaged snacks; Ready to cook meals and sides; Ready to eat deli items (hot and cold); Non-alcoholic diet carbonated beverages; Unsweetened coffee and tea; Alcohol

Figure 1.1 Effect of Targeted Coupons on Purchase Rate for All Foods



Category differences in coupon exposures and purchase rates

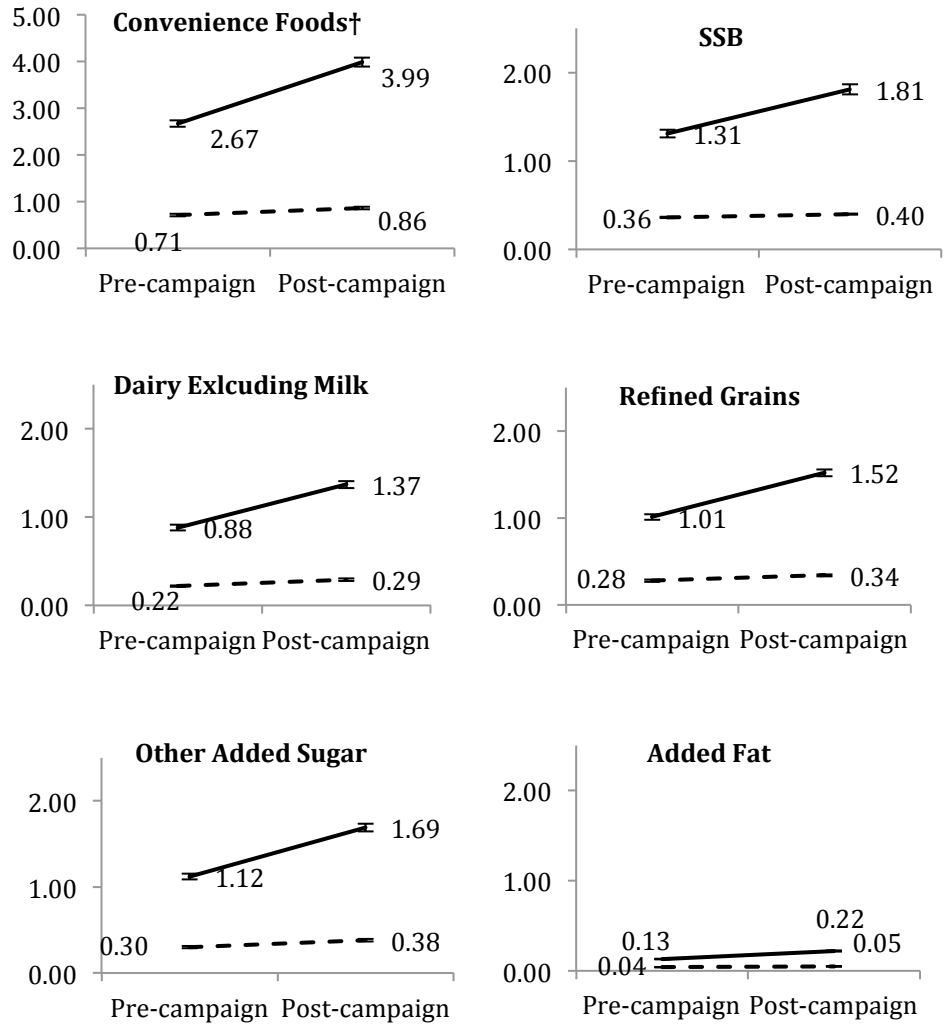
Table 1.1 and Fig. 1.2 present differences in purchases rate among all 12 foods categories between unexposed households and exposed households in the pre- and post-campaign periods.

Main effects of coupon exposure and campaign period remained significant in the same direction, with higher food purchases in the post-campaign period ($p < 0.001$) and exposed households consistently purchasing more food per week than unexposed households ($p < 0.001$). Significant three-way interactions among campaign period, coupon exposure and food category were detected, as differences in purchase rate existed among 12 food categories. The greatest increase was among less healthful foods like convenience foods, where the purchase rate among exposed households was 1.17 units greater ($p < 0.001$) in the post-campaign period than the change among unexposed households. The purchase rate of nuts among exposed households was 0.03 units greater ($p < 0.001$) in the post-campaign period than the change among unexposed households, which was lowest among 12 food categories.

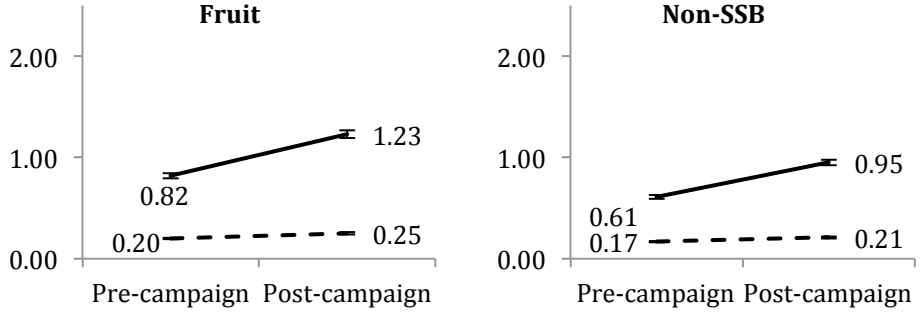
In sensitivity analyses, we examined whether coupons encouraged non-purchasing households to start buying a product or whether it only encouraged households who were already buying a product to purchase more. Although our results primarily show that coupons encouraged households who were already purchasing a product to buy more, Additional file 5: Figure 1.S2 shows that the strength of the coupon effect was similar among the smaller proportion of households who were not purchasing a product pre-campaign.

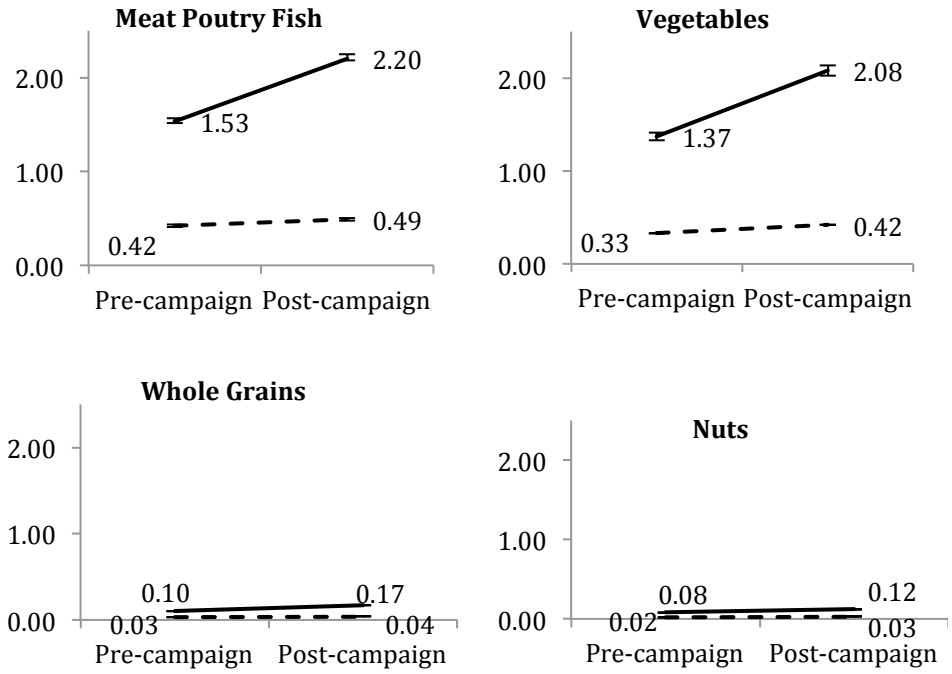
Figure 1.2 Effect of Targeted Coupons on Purchase Rate for Each Food Category

Unhealthful Foods



Healthful Foods





† Different vertical axis scales were given to convenience food because of high purchase rate increases.

Elasticity of coupon redemption

Results from the exploratory analysis examining price elasticity are presented in Table 1.2. Absolute value of coupon redemption elasticity ranged from 1.02 to 2.81, with vegetable purchases least responsive and fruit purchases most responsive to coupons. Households receiving a 10% discount increased vegetable purchases by 10.2% and increased fruit purchases by 28.1%.

Table 1.2 Adjusted Coupon Redemption Elasticity at the Food Category Level

Food Category†	Average quantity per unit	%Δ Q	§Sticker price per unit	Discount per unit	% ΔP when coupon applied	% purchases using coupon	Adjusted % ΔP	Elasticity
Unhealthful Food								
Added fat	0.22	55%	2.08	-0.78	38%	56%	21%	2.59
Convenience								

Foods	3.99	44%	2.24	-0.91	41%	51%	21%	2.10
Refine Grain	1.69	44%	1.98	-0.94	48%	58%	28%	1.58
Dairy excluding milk	1.52	45%	1.84	-0.86	47%	62%	29%	1.54
Other added sugar	1.18	35%	2.34	-1.11	47%	57%	27%	1.32
SSB	1.37	48%	1.62	-0.85	53%	70%	37%	1.30
Healthful Food								
Fruit	1.23	45%	2.12	-0.85	40%	40%	16%	2.81
Whole grains	0.95	50%	3.08	-1.06	34%	57%	19%	2.56
Nuts	2.20	44%	2.80	-1.02	36%	62%	22%	1.97
Non-SSB	2.08	46%	1.65	-0.89	54%	45%	24%	1.87
Meat poultry and fish	0.12	48%	2.12	-0.93	44%	64%	28%	1.71
Vegetables	0.17	51%	1.43	-0.99	69%	72%	50%	1.02

§Prices for the food items were discounted from the list price from 3 sources: a loyalty card discount extended to loyalty cardholders, a manufacturer's coupon paid to the retailer by the manufacturer's margin, and a retailer match coupon paid out of the retailer's margin.
† Food categories are grouped from 53 USDA'S Quarterly Food categories including Fresh/frozen fruits; Canned fruits, Fresh/Frozen dark green vegetables; Fruit juice; Canned dark green vegetables; Fresh/Frozen orange vegetables; Canned orange vegetables; Fresh/Frozen starchy vegetables; Canned starchy vegetables; Fresh/Frozen select nutrient vegetables; Canned select nutrients vegetables; Fresh/Frozen other vegetables; Canned other vegetables; Frozen/Dried Legumes; Canned Legumes; Whole grain bread, rolls, rice, pasta, cereal; Whole grain flour and mixes; Whole grain frozen/ready to cook; Other bread, rolls, rice, pasta, cereal, other flour and mixes; Other frozen/ready to cook grains; Low fat milk; Low fat cheese; Low fat yogurt & other dairy; Regular fat milk; Regular fat cheese; Regular fat yogurt & other dairy; Fresh/frozen low fat meat; Fresh/frozen regular fat meat; Canned meat; Fresh/frozen poultry; Canned poultry; Fresh/frozen fish; Canned fish; Raw nuts and seeds; Processed nuts, seeds and nut butters; Eggs, oils, solid fats, raw sugars; Non-alcoholic non-diet carbonated beverages; Non-carbonated caloric beverages; Water, Ice cream and frozen desserts; Baked good mixes; Packaged sweets/baked goods; Bakery items, ready to eat; Frozen entrees and sides; Canned soups, sauces, prepared foods; Packaged snacks; Ready to cook meals and sides; Ready to eat deli items (hot and cold); Non-alcoholic diet carbonated beverages; Unsweetened coffee and tea; Alcohol

1.4 Discussion

To our knowledge, this is the first longitudinal study using consumer purchasing data to examine whether targeted coupons influence food purchasing patterns and

whether differences exist in the strength of this relationship by food category. In this study, households who received targeted coupons significantly increased food purchases, including more healthful foods, more than households who did not receive coupons. Although targeted coupons were not sent with goal of influencing dietary quality, our results revealed that more healthful food purchases, including fruits and vegetables, whole grains, meat fish and poultry, non-SSB, and nuts, were sensitive to targeted coupons. Price elasticities ranged from 1.02 to 2.81, which was notably greater than Andreyeva et al.'s estimates (0.27–0.81), suggesting that people respond more sensitively to targeted coupons than to untargeted coupons.

Nonetheless, it is critical to comprehensively evaluate the feasibility of using targeted coupons to promote the purchase of more healthful foods. To date, most coupons have been applied to unhealthy purchases. In a content analysis of 1056 online store coupons from 6 national grocery chains, researchers noted that snack foods, prepared meals and sodas comprised a large portion of the coupon distribution (41%). In contrast, only 5% coupons were available for more healthful alternatives, such as milk, eggs or yogurt, fresh, frozen or canned fruits and vegetables [28]. However, food shoppers today are becoming more health conscious, and consumers are more interested in dietary improvements that promote health [29]. Thus, companies increasingly need to incentivize more healthful foods to both cater to customers and to have a positive association with their brands- particularly as customers increasingly weigh corporate social responsibility in their purchasing decisions [30]. As consumer demands change, companies will experience pressure to provide monetary incentives for healthful offerings as well in order to increase long-term brand loyalty [29].

Also, targeted coupons may have advantages for increasing dietary quality compared to taxes, bans and uniform incentives. Although more research is needed to understand the effect of targeting coupons to promote more healthful food purchases, and to examine substitution effects, our preliminary results are promising because targeted coupons are theoretically easier to implement, more efficient and sustainable, and more cost-effective. Sugar taxes and bans on less healthful foods are controversial and potentially less effective as they are often perceived as paternalistic and regressive [31]. For example, even though SSB consumption in Berkeley reduced by 10% 1-year following a city-wide soda tax going to effect, sales of SSB in nearby cities rose 7% as people turned to cheaper SSB resources [7]. In school settings, soda bans have similarly had a limited influence on students' drinking patterns, as students consumed more servings of other soda substitutes such as sports drinks or energy drinks [32]. While less controversial, uniform incentives have generally only experienced modest success and are too costly to implement in the long- term. In the present study, the estimated elasticity for vegetables was 1.02 while fruit was 2.81, suggesting that to achieve same purchasing quantity increase, a lower discount is needed for fruits as fruits are more sensitive to price changes. Such results suggest that targeted coupons are potentially less controversial tools for improving more healthful food purchases in a sustainable and cost-effective manner, warranting further investigation.

Additionally, the potential benefits of targeted coupons are further reflected by their cost-effectiveness when compared against other health promotion programs. A recent systematic review evaluating the cost effectiveness of workplace weight loss programs found that such programs are modestly cost-effective, with a cost ranging from

$1.44 to $4.17 per pound of loss in body weight [33]. However, the authors highlighted that a major limitation of existing approaches is that it is not clear whether these interventions reach the highest risk individuals [33], who tend to require more healthcare spending. Based on the higher point elasticities observed in the present study, it is likely that targeting coupons to increase healthful food purchases could be substantially more cost effective by requiring a comparable level of investment while achieving a larger effect size and reaching individuals at the highest risk. Moreover, a recent meta-analysis evaluating the influence of a price decrease on healthful foods estimated that a non-targeted 10% discount on healthful foods would result in a 12% increased consumption of those foods, which would meaningfully influence diet-related morbidity and mortality and associated healthcare costs [15]. In theory, if subsidies on healthful foods are tailored toward the needs of a given individual, the effect size of the intervention and cost savings could improve further, and make it an appealing investment for workplace wellness programs and insurance companies.

Some limitations of the present study must be noted. Demographic data were missing for most households, which limited our understanding of relationships between demographics, coupon exposure and purchase behavior, and may have introduced some selection bias. Additionally, per personal communication with Dunnhumby, most coupons were targeted based on past purchasing behaviors, which suggests that our estimates of the effect of coupon targeting might be confounded with preexisting increases and bias estimates upward; issues pertaining to selection bias should be addressed in future intervention studies. Finally, by dropping observations with zero purchase rates, it is possible to introduce some bias on a category-by-category level.

However, sensitivity analyses identified a floor effect and the effect of targeted coupons on food purchases is likely stronger than estimates from the present analysis.

Some strengths of the present analysis are also worth noting. First, this study utilized a unique longitudinal data set to examine the effect of targeted coupons on food purchases across both less healthful and more healthful categories. Companies infrequently release this proprietary information, making it challenging to investigate the effects of targeted marketing in a real-world setting. Additionally, this large sample of 2500 households was monitored over a 2-year period, and generally represented differing income levels, and shopping patterns, which increased the robustness and generalizability of these findings.

Taken together, additional research examining the effect of targeted coupons is warranted. Future research should explore whether there is additional individual-level variability in responsiveness to coupons across differing household characteristics such as household income, as such information may provide insight about when, how, and how much to use targeted incentives to improve eating patterns among diverse groups-particularly economically disadvantaged households at higher nutritional risk [34]. This may help to develop and refine health-promotion targeting practices by using purchase and survey data to improve individual-level health.

1.5 Conclusion

Public health advocates remain concerned about the high rate of less healthful food purchases due to the association between excess consumption and chronic disease. Existing nutrition interventions are often costly, have mixed effectiveness, or meet consumer resistance, necessitating the adoption of novel strategies to combat less

healthful dietary practices. The present study provides promising preliminary evidence that individually- targeted coupons effectively increase category-level food purchases in both less healthful and more healthful categories. The relative cost-effectiveness of this approach warrants further investigation as it may be an efficient and cost-effective lever to improve population-level dietary quality.

Supplemental Tables and Figures

Table 1.S1 Food Classification According to USDA'S Quarterly Food Categories

	USDA'S Quarterly Food Categories
Fruit	Canned fruit; Fresh/frozen fruit; 100% Fruit juice
Vegetables	Canned select nutrients vegetables; Fresh/frozen dark green vegetables; Fresh/frozen green vegetables; Fresh/frozen other vegetables; Fresh/frozen select nutrient vegetables; Fresh/frozen starchy vegetables; Frozen/dried legumes; Canned legumes; Canned other vegetables; Canned starchy vegetables
Sugar Sweetened Beverages	Non-alcoholic and non-diet carbonated beverages; Non-carbonated caloric beverages
Non-Sugar Sweetened Beverages (Including Milk)	Low fat milk; non-alcoholic diet carbonated beverages; Regular fat milk; Non-sweetened coffee or tea; Water
Other Added Sugars	Bakery items, ready to eat; Ice cream and frozen desserts; Packaged sweets/baked goods; Baked good mixes; Raw sugars
Dairy (excluding milk)	Regular fat cheese; Regular fat yogurt; Other dairy
Meat, Poultry, Fish and Eggs	Fresh/frozen low fat meat; Fresh/frozen poultry; Fresh/frozen regular fat meat; Canned fish, Canned meat; Eggs
Added Fat	Solid fats; Oil
Refined Grain	Other bread, rolls, rice, pasta, cereal; Other flour and mix; Other frozen/ready to cook grains
Whole Grain	Whole grain bread, rolls, rice, pasta; Whole grain flours and mixes
Nuts	Processed nuts, seeds and nut butter; Raw nuts and seeds
Convenience Foods	Canned soups, sauces, prepared foods; Frozen entrees and sides; Packaged snacks; Ready to eat deli items; Ready to cook meals and sides

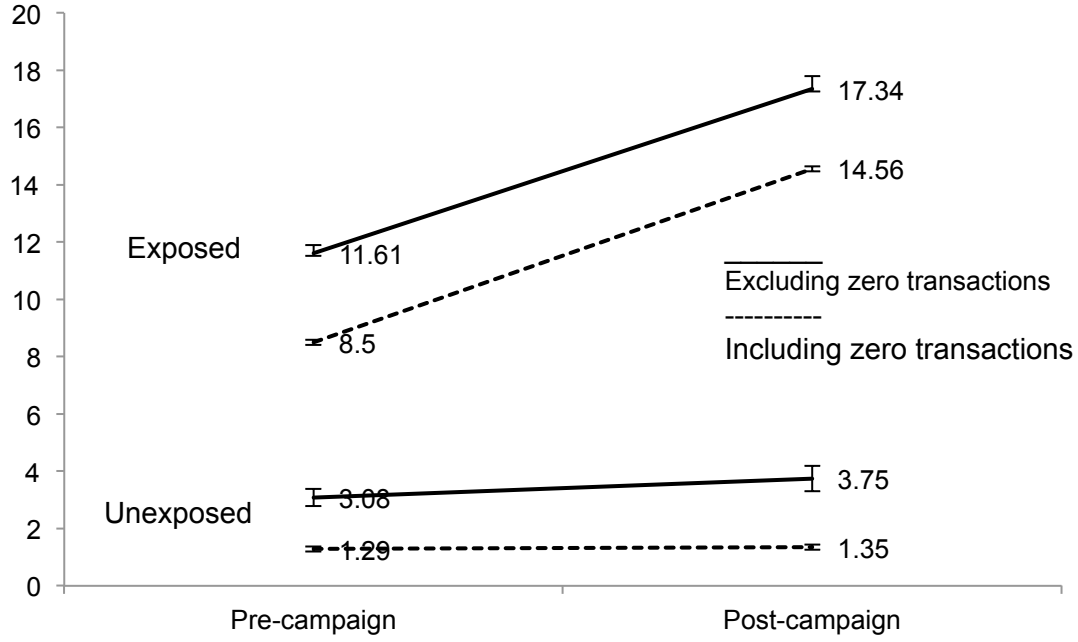
Table 1.S2 Zero Transactions of Each Food Category before and during Coupon Time

	Pre-campaign period				**Post-campaign period**			
	Unexposed		Exposed		Unexposed		Exposed	
	Zero	Nonzero	Zero	Nonzero	Zero	Nonzero	Zero	Nonzero
Convenience foods	275	662	78	1485	173	764	18	1545
Dairy excluding milk	362	595	126	1417	239	718	35	1508
Refine grains	183	743	36	1538	106	820	12	1562
Other added sugar	443	505	264	1288	300	648	72	1480
SSB	272	660	112	1456	167	765	33	1535
Added fat	805	183	727	785	643	345	350	1162
Fruit	767	206	767	760	616	357	355	1172
Vegetables	866	103	1042	489	754	215	689	842
Nuts	720	248	647	885	568	400	316	1216
Whole grains	757	475	377	891	524	708	153	1115
Non-SSB	943	2	1545	10	939	6	1518	37
Meat poultry fish eggs	745	205	776	774	606	344	414	1136

Table 1.S3 Descriptive Statistics of Product Information and Coupon Uses

Descriptive statistics	Total
Number of households	2,500
Transactions (Transactions containing at least one food item)	2,595,732 (84.8%)
Products (food)	92,339 (60.7%)
Coupon exposures (food coupon exposures)	1,135 (42%)
Coupon redemptions (food coupon redemptions)	556 (70.7%)

Figure 1.S1 Comparison on Purchase Rate between Transactions Including Zero and Transactions Excluding Zero



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Manuscript 2

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Nudging Consumers Towards Healthier Food Choices: How Consumers Respond to A Retailer-Initiated Customized Incentive Campaign

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Manuscript 2 - Nudging Consumers Towards Healthier Food Choices: How Consumers Respond to A Retailer-Initiated Customized Incentive Campaign

Abstract

While customized price incentives have been found to positively influence healthy food purchases, many food retailers remain reluctant to promote healthier foods because of the concern about the cost of these programs as well as the potential negative effects due to consumer skepticism toward company's motivation for engaging in such strategies.

By analyzing the results of a randomized control trial, this study identified three latent classes of consumers participating in a customized healthy food incentive campaign. Consumers' campaign response patterns informed three class profiles: Slow-going, Moderate and, Enthusiastic. Age and perceptions of healthy eating were predictive of consumers' response patterns. Study also identified a significant association between the latent profiles and customer loyalty. Findings may help health advocates, policymakers, and food retailers to design food retail environments and improve the allocation of budgets that promote healthy choices while generating returns to the retailer.

2.1 Introduction

Grocery retailers are increasingly concerned about the competing demands from consumers for food that is both healthy and tasty. Behavioral economics research has shown that customers' decision-making on food choices can be "nudged" through marketing approaches. Marketing efforts to improve consumption and purchases of healthier foods are characterized by the 4Ps of marketing (product, place, price, promotion), such as increasing stocking of healthier products, changing the shelf placement of healthy items, posting health and nutrition shelf labels, and offering special deals for healthier products (Karpyn et al. 2020; Mah et al. 2019). Despite the popularizing practice of marketing interventions, previous research analyzing these efforts yields mixed findings (Karpyn et al. 2020), with some research identifying the positive effect related to healthier product purchasing, while others reporting the effect to be null or even negative. As a result, it remains uncertain what is the best practice for implementing effective marketing interventions. Moreover, existing research suggests that food retailers are challenged by higher costs, limited demand, few supplier incentives for more healthy foods, and consumer skepticism towards the retailer's motivation for engaging in such activities, which make them reluctant to promote healthier foods (Andreyeva et al. 2010; Ayala et al. 2017; Bae 2018; Pinard et al. 2016).

The core of the marketing concept is profitability through the satisfaction of consumers' needs and desires (Peter and Donnelly 2007). Because each consumer is unique, maximum satisfaction would be achieved if firms could address those wants and needs individually rather than treating everyone the same. On the basis of information provided by the consumer when participating in the store's loyalty program or collected

by the marketer, many firms can now make individualized offerings - messages or products that are optimized for the individual. Empirical findings imply that both firms and consumers would appear to benefit from customization - Firms reduce their selling costs, increase sales, and bolster relationships; Consumers get the products they want, when and where they want to buy them, and the communications they want to receive (Lampel and Mintzberg 1996; Obermiller et al. 2012). Based on this concept, we propose that customized healthy food coupons will be more effective in improving customer decision-making on food choices without raising customer skepticism and generating high implementation costs.

According to most models of consumer choice (e.g., utility theory), consumers respond to coupons when they perceive the cost of using coupons as lower than the benefits obtained. Multibenefit theory also proposes that benefits that promotions provide can be categorized into utilitarian benefits (e.g., savings and quality) and hedonic benefits (e.g., value expression and fun) (Chandon et al. 2000). Customized coupons should improve both utilitarian benefits and hedonic benefits. Customized coupons are selected by the retailer to match consumers' food preferences, and therefore have lower search costs than traditional incentives. Additionally, healthy foods are often sold at a higher price. Thus, consumers are more likely to perceive the costs of redemption as lower than the savings obtained when receiving coupons for healthy foods. Customized coupons will also improve hedonic benefits because buying healthy food on sale can provide shoppers with a higher level of satisfaction (e.g. being smart and thrifty shoppers). Since customized coupons not only help consumers increase the acquisition utilitarian of their purchase and give them intrinsic rewarding but also reduce both search cost and decision

cost, they should be more effective than uniform discounts at improving customer decision-making. Furthermore, consumers may feel gratitude towards the retailer when receiving coupons aligning with their preferences, as it reduces their search cost and also shows that the retailer understands their individual preferences. Consumers may therefore reciprocate by increasing their purchases. Finally, customized coupons will influence decision-making through increasing elaboration of the communication. Consumers will perceive coupons that match their preferences as being relevant to them. According to the elaboration likelihood model, increasing perceived self-relevance is a well-established means of increasing message elaboration, and the increased elaboration could increase evaluations and associated behaviors (Petty et al. 1983, 2009). Taken together, we expect customized coupons to be effective at improving customer decision-making on healthy food choices.

Consumers' responses to customized healthy food coupons can directly affect the cost and benefit of such an intervention program, thus how to develop effective strategies with the help of behavior analysis of consumers is an important problem concerned by retailers. The availability of daily purchasing data collected through loyalty cards promotes the development of descriptive models of customers' responses to the store's promotional activities. Among descriptive models, customer segmentation and clustering techniques can discriminate among different purchasing patterns. Researchers and practitioners have found competitive advantages by segmenting the mass market. For example, studies have recently used customer segmentation analysis to identify consumers' water and electricity demand patterns and found that by targeting the group of high consumers with coordinated water-electricity demand-side management

interventions, costs can be reduced (Cominola et al. 2016, 2018). Although competitive advantage was found, research also argues that segmentation trades off some consumer satisfaction for efficiency, since most segmentation schemes may present a single offering to consumers all with slightly different desires (Obermiller et al. 2012).

We propose that customer segmentation, combined with coupon customization, can yield higher profits to retailers (Jiang 2000). Empirical evidence on segment-based mass customization lends support to this approach. For example, Yang et al. (2018) investigate the problem of customizing electricity retail prices for different residential users with distinct load patterns and find that by offering different customized retail price plans to different end-user categories, the profit for a retailer can be maximized (Yang et al. 2018). While no research currently discusses how to develop customized pricing strategies to influence food purchases of different customer segments, Yang et al. explicitly suggest that when customizing retail prices, the retailer should try to classify individuals into the most distinct clusters.

Couponing literature also emphasizes the importance of accounting for segment-level differences in coupon responsiveness in order to avoid biased estimates in aggregate coupon redemption models (Ramaswamy and Srinivasan 1998). Previous couponing research has segmented consumers by price sensitivity and the ability to find and redeem coupons, as well as their coupon-proneness and non-coupon-proneness, and identified segments including “activists shoppers”, “coupon chasers”, “routinized shoppers”, and “picky couponers”, etc. (Dhar and Hoch 1996; Garver et al. 2014; Guimond et al. 2001; Ramaswamy and Srinivasan 1998). Following this rationale, we expect that rather than behaving as a single homogenous group, consumers are likely to be composed of several

distinct underlying segments exhibiting varying response patterns towards customized coupon campaigns.

H1: Distinct customer response subgroups exist within individuals participating in a customized coupon campaign.

Unlike the previous coupon-proneness- or purchase-based profiling studies, we believe that it is vital to include various behavioral responses to describe segment-level differences in coupon response. Redemption effects have dominated researchers' and practitioners' assessments of coupon programs for a long time (Venkatesan and Farris 2012), although academic studies have proposed that consumer responses to coupons may include brand switching, stockpiling, purchase acceleration, product trial, and spending larger (Obeid 2014; Shi et al. 2005). In fact, several previous studies tend to support the presence of mental processing by consumers as the initial stage of response to sales promotions (Laroche et al. 2001, 2003). As described in these studies, it can be an active information search about potential sales promotions, which has been found to positively influence consumers' liking of deals and be associated with increased quantity and with shorter inter-purchase time. However, such behavior has never been used to segment customers. The choice of outcome measures is rather subjective in nature. Research on evaluating the effectiveness of customized coupons in healthy food retailing is limited, but purchase-related behaviors, such as purchases or expenditures, store sales, or intent to purchase, were generally used to indicate customers' responsiveness towards healthy retail initiatives (Karpyn et al. 2020). Meanwhile, research on customized price promotions have reported that consumer's response to the customized price promotions is associated with both behavioral and attitudinal reactions

of customers such as consumers' information search about promotions, the number of items purchased, amount of money spent in the store, and inter-purchase time (Barone and Roy 2010; Laroche et al. 2001; Venkatesan and Farris 2012). Additionally, literature on cause-related marketing (CRM) has claimed that the success of CRM campaigns reflects the favorability of consumer responses to a company's support of a cause, culminating in the choice of that company's products or services (e.g., R. S. Kumar et al. 2013; Westberg and Pope B 2014). Since consumers' responses to a campaign may reflect in both purchase behavior and non-purchase activities, we expect the different response patterns to be shown in spending, shopping frequency, inter-purchase time, and information search about healthy food promotions. Therefore, we hypothesize that distinct customer response subgroups exist within individuals participating in a customized coupon campaign, and two typical subgroups will be:

H1a: A high response subgroup, which is indicated by the highest increase in spending, shopping frequency, and email open times, and decrease in inter-purchase time during the campaign period;

H1b: A low response subgroup, which is indicated by decreased spending, shopping frequency, and email open times, and increased inter-purchase time during the campaign period.

Furthermore, previous research on price promotions suggests that customer response to promotions varies widely due to differences in demographic and psychological factors such as age, household income, self-perceptions, social norms, and price consciousness (Kitchen et al. 2014). In the food sector, however, the characteristics of different consumer attitudes and consumption habits are often used as the basis for

segmentation (Müller and Hamm 2014). Thus, we expect that the varying response patterns will be driven by consumers' demographic and psychological characteristics.

H2: Consumers' demographic and psychological characteristics can predict their response patterns.

Consumers may perceive incentivizing healthy foods as the retailer's contribution to the social issue of obesity. Literature on CRM suggests that supporting a social issue may increase consumers' evaluation of the company (Hildebrand et al. 2017). However, studies also argue that consumers may become suspicious of the motives behind firms' supporting a cause. Such skepticism can discredit the firm (Bae 2018), making retailers reluctant to promote healthy foods.

We propose that customized coupon programs will generate several favorable relationship outcomes, including customer attitude, customer satisfaction, and customer loyalty, without raising suspicions of retailers' motivation to promote healthy purchases.

Research in customer advocacy proposes that customers are suspicious of any incentives that a seller might have, and they are unlikely to trust a company fully unless they are confident that the relationship will be mutually rewarding and long term (Urban 2004). Providing coupons aligning with customers' preferences can be seen as a partnership between the retailer and its customers to the mutual benefit of both. When consumers perceive that the firm is helping them make the best choice, they may develop a more favorable attitude, and consequently, become more loyal towards the firm (Hartemo 2016; Micheaux 2013). In line with this view, consumers may feel the retailer is helping them to make better choices for the sake of their health when they receive

coupons that match their preferences. As a result, consumers may develop more favorable attitudes towards the retailer.

Empirical evidence for a positive influence of customization on customer satisfaction stems from service customization research, which has suggested how well the service fit the customer's personal requirements plays an outstanding role when predicting customer satisfaction(Srinivasan et al. 2002); and through adjusting service for different customers, employees can better meet individual consumer's expectations and thereby create customer satisfaction (Coelho and Henseler 2012; Solomon et al. 1985). Despite no research has investigated the relationship between customized coupons for healthy foods and customer satisfaction, based on the findings in service research, we propose that customized coupons are likely to satisfy a customer more than standardized coupons would, because customized coupons facilitate a real match between customers and products.

Participating in a customized coupon campaign will also lead to higher customer loyalty, since receiving customized coupons increases switching costs and reduces the attractiveness of alternatives. Social exchange theory states that individuals maintain a relationship as long as the attractiveness of alternatives does not exceed the attractiveness of the current offer for more than the switching costs induced from switching relationship partners (Coelho and Henseler 2012; Kenkel et al. 1959). First, the time and effort a customer spends providing his or her personal information when participating in the store's loyalty program, coupled with the discounts, may increase the perceived and actual cost of switching. Second, consumers may view receiving coupons aligning with their preference as the confirmation that the retailer understands their food preferences,

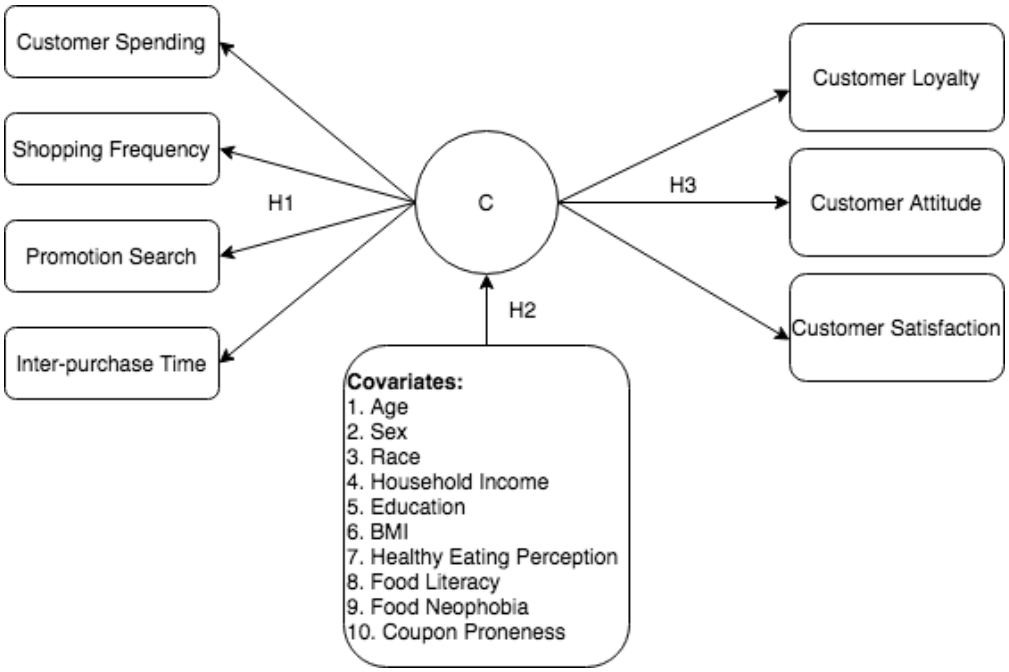
which will increase the attractiveness of such offerings. The higher attractiveness of a customized coupon means at the same time a decrease in the attractiveness of competing offerings ceteris paribus (Coelho and Henseler 2012). Furthermore, affective (emotions) mechanisms have also been found to account for the effects of customization on loyalty (Bock et al. 2016). Customized coupons for healthy foods increase benefit value by providing an offering that matchs customers' personal preferences and also good for their health. The benefit will be appraised as valuable, eliciting customer gratitude (Wood et al. 2008). Enhanced customer gratitude will be considered diagnostic of the retailer's trustworthiness, subsequently producing long-term customer loyalty, as evidenced by relationship marketing research (Şahin et al. 2011; Schwarz and Clore 1983). Taken together, the combination of an increase in switching costs, a reduction in the attractiveness of alternatives, and enhanced emotions will lead to a continuation of relationships and ultimately customer loyalty.

Additionally, as known in previous mere exposure studies, repeated exposure to a stimulus leads to increases in liking, resulting in is capable of making an individual's attitude towards objects more positive and produce greater objects preference (Tom et al. 2007; Zajonc & Markus, H. 1982). Following this logic, consumers with different response patterns, given their varying exposure to, and experience with, the grocery retailer as well as its offerings, may exhibit different degrees of satisfaction and loyalty. Thus, we expect that customized coupons will have a positive long-term impact on customer satisfaction, attitude, and customer loyalty, but a differential impact depending on customer response levels:

H3: Different response patterns lead to variations in consumers' attitudes, satisfaction, and loyalty, with consumers who are more responsive to customized coupons more likely to exhibit a more favorable attitude towards the retailer, become more satisfied with the campaign, and be more loyal towards the retailer.

Figure 2.1 features the research model underlying our study. Overall, we seek to identify patterns in consumer response to a customized healthy food incentive campaign and investigate how these patterns are related to consumer characteristics, and link consumers' response patterns with their post-campaign attitude, satisfaction, and loyalty.

Fig. 2.1 Conceptual Framework



2.2 Methodology

2.2.1 Sample and Procedures

Study findings were based on a primary database collected from the Smart Cart Study, a field experiment conducted by a research team at the University of Rhode Island in cooperation with an independent grocery retailer (Vadiveloo et al. 2020). The objective

of this study was to examine whether customized healthy food incentives improve grocery purchase dietary quality and spending on healthy foods. The Smart Cart Study was a cross-over study (AB| BA design), with participants receiving customized weekly coupons with nutrition education and healthy recipes during the intervention period (A) and generic coupons with nutrition education and healthy recipes during the control period (B). Data were obtained between September 2018 and May 2019 from a sample of 224 participants who spoke English, were non-pregnant, non-retail partner employees, and the primary shopper for the household, and purchased at least 50% of their groceries at the retail partner. During the study period, the research team observed each customer's entire basket's purchases for every store trip, and the price paid, the brand name, the redeemed coupons' face values, and the type of price discount for each product purchased in the basket. Details of the Smart Cart Study sample procedures are available elsewhere (Vadiveloo et al., 2020).

The current study restricted analyses to 206 (92%) participants who made at least two purchases with the store during the study periods, and whose total spending was inside typical spending during the study period (>1% ($21.67- $37.85) and <99% ($4,633- $4,832).

2.2.2 Measures

2.2.2.1 Indicator variables

Customer spending. Customer spending was computed as the average dollar amount spent by an individual with the retailer per week (($ spending/household size)/# of weeks).

Shopping frequency. Shopping frequency was calculated as the average number of shopping trips an individual made per week (# of trips/# of weeks).

Consumers' information search about promotions. In the Smart Cart Study, customized incentives were sent to participants through emails. Thus, consumers' information search about promotions would be reflected in the level of email engagement, which was calculated as the average number of times an individual opened the study email per week (# of open times/(# of weeks)).

Inter-purchase time. Inter-purchase time was computed as the average number of days elapsed between two shopping trips for each individual participant (# of days elapsed between purchases /# of shopping trips).

As we focused on exploring customer responses to customized incentives rather than generic discounts, changes in each indicator variable were calculated by subtracting the measures in the control period from the measures in the intervention period.

2.2.2.2 Outcome variables

Customer attitude. We used a 17-point scale ranging from -8 to 8, with -8 corresponding to "much more negative," 0 to "neutral," and 8 to "much more positive" to measure whether study participants had a positive attitude change towards the retailer as a healthy food provider.

Customer satisfaction. A 7-point scale ranging from 1 to 7, with 1, "very unsatisfied," and 7, "very satisfied," was used to measure study participants' overall satisfaction with the study.

Customer loyalty. Customer loyalty was measured by asking participants to use a 7-point scale ranging from 1 to 7 with 1 corresponding to "strongly disagree", and 7,

"strongly agree", to indicate whether they were more likely to continue to choose the retail partner over a competitor after the campaign.

These three scales were developed using measurement items drawn from the literature (Boysen and Vogel 2008). Item wording was modified to reflect the study's context.

2.2.2.3 Covariates

The following socio-demographic and psychological variables were selected as indicator covariates in the latent profile analysis: age, sex, race, household income, education level, BMI, food literacy, healthy eating perception, food neophobia, and coupon-proneness. All of these factors have been reported in prior food consumption and nutrition studies, coupon user profiling studies, as well as CRM research to influence food choice, coupon usage, and customer perception and evaluation of CRM campaigns.

Food literacy. Food literacy is regarded as a key factor influencing nutrition behavior and well-being (Colatruglio and Slater 2016). A validated Short Food Literacy Questionnaire (SFLQ) with 15 questions was used to assess participants' food literacy levels in the Smart Cart Study (Gréa Krause et al. 2018), for example, "When I have a question on healthy nutrition, I know where I can find information on this issue," and "I know the official US recommendations for fruit and vegetable consumption." Depending upon the question, participants answered via four- or five-point Likert scales including the choices "very bad" to "very good", "disagree strongly" to "agree strongly", "very difficult" to "very easy", "very hard" to "very easy", or "never" to "always". Scores were summed within each scale to form overall food literacy scores. The range of food literacy scores is from 0 to 52, with higher scores indicating higher levels of food literacy.

Healthy eating perception. Healthy eating perception is understood as beliefs as well as consciousness/knowledge of food composition and has been found to affect attitude towards food consumption. In the Smart Cart Study, the healthy eating perception was assessed using a validated screening questionnaire-NPSQ9 (San-Cristobal et al. 2017). It included 9items rated on 4- or 5-point Likert scales (1=Very uncertain, 4=Very certain; 1=Completely disagree, 5=Completely agree). Ratings were summed to form overall healthy eating perception scores, providing a plausible range of scores from 0 to 40. Higher ratings represent higher levels of healthy eating perception.

Food Neophobia. Food neophobia is defined as a reluctance to eat unfamiliar foods and has been widely discussed in health behaviors research as researchers found it hinders people from consuming a variety of healthy foods (MacNicol et al. 2003). Consumers high in food neophobia might respond differently to the customized health food incentives than consumers consuming a variety of food because of the unwillingness to change their dietary patterns and try unfamiliar foods. Food neophobia was assessed using a validated food variety seeking questionnaire with 8 items rated on a 5-point scale (1=Completely disagree; 5=Completely agree) (Damsbo-Svendsen et al. 2017). Food neophobia was determined by summing up the scores from all these item ratings, with higher scores suggesting lower food neophobia and lower scores indicating higher food neophobia.

Coupon-proneness. Coupon-proneness has been widely used in couponing research to measure the propensity to use coupons or to positively respond to a purchase offer because of a coupon. In the current study, coupon-proneness was assessed by using a five-item scale (1=Strongly disagree; 7=Strongly agree) validated by Lichtenstein et al.

(1993). Item scores were summed to create a single score for coupon proneness, with higher scores indicating more coupon-prone and lower scores indicating less coupon-prone.

2.2.3 Statistical Analyses

Latent profile analysis

Latent profile analysis was first executed to identify latent subgroups based on the four customer response measures. Latent profile analysis was selected for a variety of reasons including 1.) it is a person-centered statistical technique that can identify the existence of subpopulations that differ in their combined responses to the customized healthy food incentive campaign (Oberski 2016); 2.) fit indices allow comparison of different models to make decisions regarding the number of underlying classes (Marsh et al. 2009); 3.) it allows the use of continuous dependent variables, such as the four customer response measures, to define classes via maximum likelihood estimation (Lubke and Neale 2006).

When conducting Latent profile analysis, we first identified a sequence of latent profile models ranging from one to four classes by using Latent GOLD® 5.3 (Vermunt and Tran 2008). To determine the optimal number of classes for the sample, each model was evaluated using the Bayesian Information Criterion (BIC), Akaike Information Criterion (AIC), Bootstrapped Likelihood Ratio Test (BLRT), sample size-adjusted Bayesian information criteria (aBIC), and the Entropy (accuracy of cluster membership based on the manifest indicators) (e.g. Masyn, 2013; B. O. Muthén, 2003; Yang 2006; Nylund et al. 2007). We used BIC, AIC, and aBIC as descriptive fit indices with smaller values indicating better model fit. High Entropy values indicate greater classification

accuracy. The BLRT compares the fit of a target model (e.g., 4-class model) to a comparison model that specifies one less class (e.g., 3-class model). The p-value generated for the BLRT indicates whether the solution with more classes ($p < .05$) fits better. In addition to these indices, each model was evaluated on its interpretability to determine whether the classes truly represented different categories.

After identifying latent subgroups and assigning subjects to classes based on probability of membership, we developed multinomial regressions to examine how a set of consumer characteristics was associated with the probability of characterizing one of the latent classes. Consumers in the different classes were compared on socio-demographic (i.e., age, race, educational, household income, and BMI), and psychological characteristics (i.e., food literacy, healthy eating perception, food neophobia, and coupon proneness). Beta coefficients, Relative risk ratios (RRs), and 95% confidence intervals (CI) were estimated. In the case of multinomial regression with latent classes, RRs refer to the likelihood of membership in a particular class versus a specified reference class. A 0.05 level of significance was applied to evaluate the statistical significance and class membership was based on the highest profile probability. Statistical procedures involving multinomial regression models were conducted using SAS 9.4.

Finally, we used the Step3 submodule to examine the relationship between the response categories and our outcome variables: customer satisfaction, customer attitude, and customer loyalty. Latent GOLD® 5.3 Step3 submodule takes uncertainty in the prediction of class membership into account to prevent bias and can accommodate distal

outcomes (Bakk et al. 2013). Results are presented in Tables 2.5, with the class that had the highest class probability as the reference category.

2.3 Results

2.3.1 Descriptive Statistics

Table 2.1 presents the characteristics of the analytic sample. The average age of the study sample was 56 years. Nearly 50% of the participants had a postgraduate degree. About 90% of the respondents were Non-Hispanic white and women, and more than half of the sample had household incomes >$100K. The mean (SD) BMI was 25.4 (4.96) for all participants, and the average healthy eating perception score was 30.8 (6.16). Participants had an average food literacy score of 24.0 (6.03), and the mean (SD) score for food neophobia was 28.6 (6.11) and 19.8 (6.95) for coupon proneness.

Table 2.1 Profile of Shoppers in the Analytic Sample (N = 206)

	Overall (N=206)
Age, Mean (SD)	56.2(13.9)
Female, N (%)	184 (90.2)
Non-Hispanic White, N (%)	191 (95.5)
>Bachelor's degree, N (%)	99 (48.3)
Household Income ≥$100k, N (%)	81 (51.3)
BMI, Mean (SD)	25.4 (4.96)
Healthy eating perception, Mean (SD)	30.8 (6.16)
Food Literacy, Mean (SD)	24.0 (6.03)
Food Neophobia, Mean (SD)	28.6 (6.11)
Coupon Proneness, Mean (SD)	19.8 (6.95)

2.3.2 Latent Profile Analysis

Next, we conducted the latent profile analysis. We began by fitting models identified between one and four latent classes. The model fit indices for each latent profile analysis are available in Table 2.2. While the 4-class model had a significant BLRT value, the lowest AIC, BIC, and aBIC, and the highest Entropy value, this solution yielded two classes with similar characteristics so that can be combined into one class.

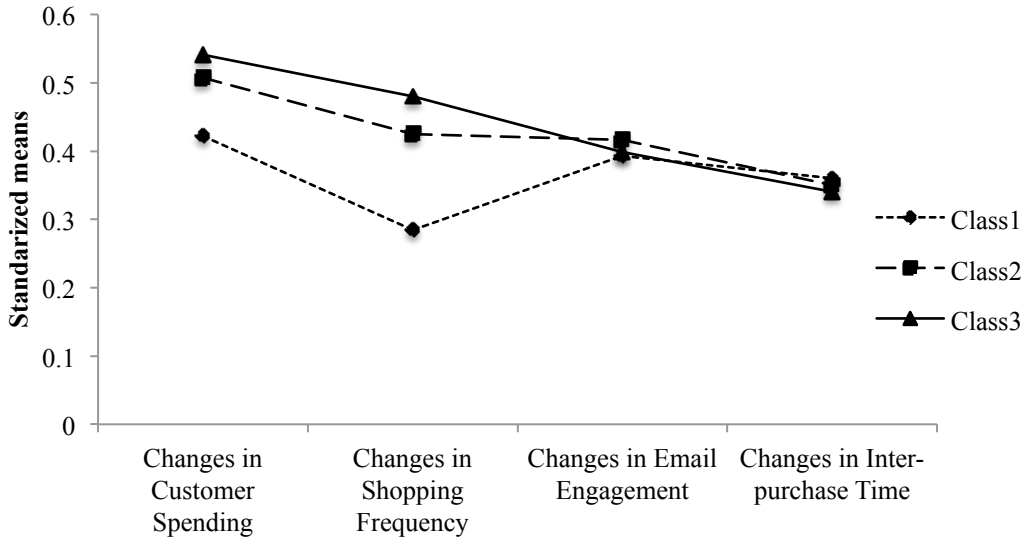
Therefore, the 3-class solution was considered optimal. Figure 2.2 presents the item-profile plot from the 3-class model. This figure displays the standardized mean values for each of the indicator variables across the 3 latent classes. Class size and class-specific means of the response indicators are displayed in Table 2.3 and Figure 2.3. These 3 profiles were distinguishable and conceptually interpretable.

Table 2.2 Fit Indices for Profile Structures

	AIC	BIC	aBIC	BLRT (*p*)	Entropy
1-class	4733.6	4760.3	4734.9	0	N/a
2-class	4136.3	4192.9	4139.0	462.3 (<.001)	18.5
3-class	4038.8	4125.4	4042.9	110.2 (<.001)	41.1
4-class	3958.3	4074.8	3963.9	81.2 (<.001)	52.7

Note: AIC = Akaike's Information Criterion, BIC = Bayesian Information Criterion, aBIC = Sample Size-Adjusted Bayesian Information Criterion, BLRT=Bootstrapped Likelihood Ratio Test, n/a = Not Applicable.

Figure 2.2 Latent Profiles for Different Customer Response Segments



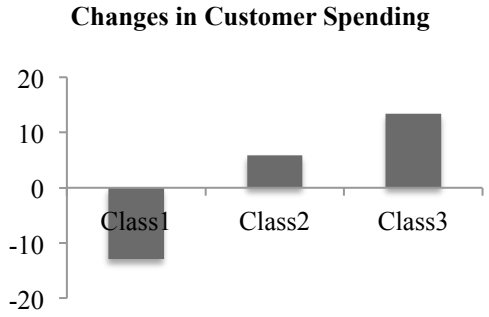
Note: The figure presents the standardized mean values for each of the indicator variables across the three latent classes. Three classes are clearly distinguishable and conceptually interpretable.

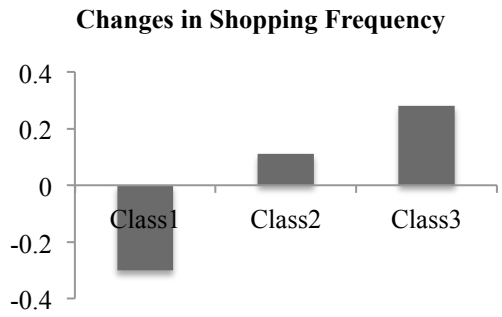
Table 2.3 The Class Specific Means of Response Indicators

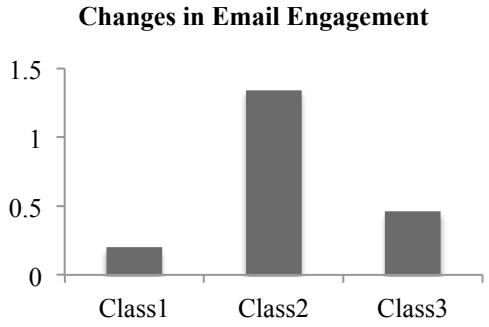
	Class 1: Slow-going consumers	Class 2: Moderate consumers	Class 3: Enthusiastic consumers	Overall
Cluster Size, N (%)	90 (43.7%)	41 (19.9%)	75 (36.4%)	206 (100%)
Indicators, Mean				
Changes in Customer Spending	-12.91	5.93	13.38	0.54
Changes in Shopping Frequency	-0.30	0.11	0.28	-0.01

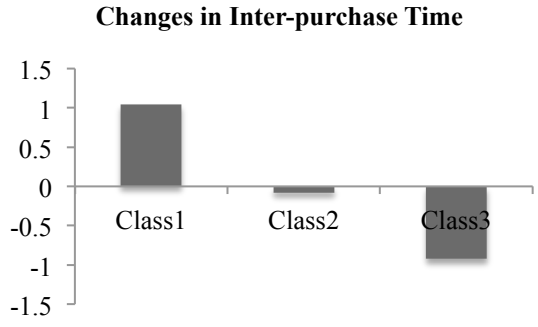
Changes in Email Engagement	0.20	1.34	0.46	0.54
Changes in Inter-purchase Time	1.04	-0.08	-0.92	0.13

Figure 2.3 The Class Specific Means of Response Indicators









Note: Customer spending represents the average dollar amount spent by an individual with the retailer per week. Shopping frequency is the average number of shopping trips an individual made per week. Email

engagement represents the average number of times an individual opened the study email per week. Inter-purchase time represents the average number of days elapsed between two shopping trips for an individual. The range of Changes in customer spending was from -105.8 to 114.47 ($); The range of Changes in shopping frequency was from -1.14 to 1.81 (times), The range of Changes in email engagement was from -19.67 to 30.82 (times); The range of Changes in inter-purchase time was from -35 to 65.1 (days).

Class 1 comprises 43.7% of the sample (n=90). Although consumers in this class were slightly more active in opening emails (0.2 unit increase) when receiving customized coupons, they spent $12.91 less and shopped 0.3 times less per week, and their inter-purchase time was increased by 1.04 days per week on average during the intervention period, compared to the control period. It seems that consumers in Class 1 became light buyers when receiving customized coupons, and therefore is named "Slow-going" class.

Class 2 represents 19.9% of the sample (n = 41) and is termed "Moderate" because they reported a moderate decrease in inter-purchase time (0.08 day decrease per week), and a moderate increase in spending ($5.93 increase per week) and shopping frequency (0.11 unit increase per week), but highest increase in email engagement (1.34 units increase per week). While these respondents seemed to be highly interested in discounts and health information, it did not result in a higher purchase rate.

Class 3 constitutes 36.4% of the sample (n = 75). This class represents participants with the highest increases in spending and shopping frequency and the highest decrease in inter-purchase time during the intervention period. Specifically, compared to members of the Moderate class, member of Class 3 spent more (Increase in spending: $13.38 vs. $5.93), and shopped more frequently (Increase in shopping frequency: 0.28 unit vs. 0.11 unit; decrease in inter-purchase time: 0.92 unit vs. 0.08 unit) during the intervention period, relative to the control period. Although this class was not as active as the Moderate class in opening emails (Increase in email engagement: 0.46 vs.

1.34), members of this class had the highest increases in spending and shopping frequency, and therefore is referred to as "Enthusiastic" class.

2.3.3 Characteristics of Latent Profiles

Table 2.4A shows the socio-demographic and psychological characteristics across three latent classes, including mean values for age, BMI, healthy eating perception, food literacy, food neophobia, and coupon proneness as well as the percentages for sex, race, household income, and education level. Age, BMI, healthy eating perception, food literacy, food neophobia, and coupon proneness were further grouped into categories (i.e. low, medium, high) for comparison and interpretation purposes.

Table 2.4A. Descriptive Statistics of Consumer Characteristics Across Three Latent Groups

	Class 1: Slow-going consumers (N=90, 43.7%)	**Class 2: Moderate consumers (N=41, 19.9%)**	**Class 3: Enthusiastic consumers (N=75, 36.4%)**
	Mean (SD)	**Mean (SD)**	**Mean (SD)**
Age	54.32 (13.1)	56.05 (15.3)	58.43 (13.9)
Sex			
Female, n (%)	80 (90.9)	37 (90.2)	67 (89.3)
Race			
Non-Hispanic white, n (%)	80 (94.1)	39 (95.1)	72 (97.3)
Education			
>Bachelor's degree, n (%)	42 (46.7)	18 (43.9)	39 (52.7)
Household income			
>$100k, n (%)	36 (53.7)	18 (51.4)	27 (48.2)
BMI	25.45 (5.48)	25.43 (4.81)	25.41 (4.43)
Healthy eating perception	31.20 (5.86)	29.07 (6.36)	31.36 (6.23)
Food Literacy	23.47(6.19)	23.28 (5.06)	24.17 (5.56)
Food Neophobia	28.60 (6.38)	29.00 (6.00)	28.27(5.90)
Coupon Proneness	20.24 (6.77)	20.20 (6.63)	19.16 (7.36)
	n (%)	**n (%)**	**n (%)**
Age[1]			
<48	25 (28.4)	11 (27.5)	19 (25.3)
48-66	48 (54.6)	17 (42.5)	30 (40.0)
>66	15 (17.0)	12 (30.0)	26 (34.7)
Sex			
Male	8 (9.1)	4 (9.8)	8 (10.7)
Female	80 (90.9)	37 (90.2)	67 (89.3)
Race			
Non-Hispanic white	80 (94.1)	39 (95.1)	72 (97.3)
Other	5 (5.9)	2 (4.9)	2 (2.7)

Education			
<=Bachelor's degree	48 (53.3)	23 (56.1)	35 (47.3)
>Bachelor's degree	42 (46.7)	18 (43.9)	39 (52.7)
Household Income			
<=$100k	31 (46.3)	17 (48.6)	29 (51.8)
>$100k	36 (53.7)	18 (51.4)	27 (48.2)
BMI[2]			
Underweight (<18.5)	3 (3.33)	1 (2.44)	1 (1.33)
Normal weight (18.5-24.9)	47 (52.2)	20 (48.8)	40 (53.3)
Overweight (25-29.9)	25 (27.8)	13 (31.7)	24 (32.0)
Obesity (>29.9)	15 (16.7)	7 (17.1)	10 (13.3)
Healthy eating perception[1]			
<28	21 (23.3)	14 (34.2)	18 (24.0)
28-34	37 (41.1)	21 (51.2)	37 (49.3)
>34	32 (35.6)	6 (14.6)	20 (26.7)
Food Literacy[1]			
<20	26 (34.7)	7 (22.6)	13 (21.3)
20-27	29 (38.7)	16 (51.6)	29 (47.5)
>27	20 (26.6)	8 (25.8)	19 (31.2)
Food Neophobia[1]			
Low (>34)	12 (15.0)	6 (16.7)	11 (17.4)
Medium (26-34)	46 (57.5)	21 (58.3)	33 (52.4)
High (<26)	22 (27.5)	9 (25.0)	19 (30.2)
Coupon Proneness[1]			
<16	23 (25.6)	9 (22.0)	21 (28.0)
16-23	40 (44.4)	21 (51.2)	35 (46.7)
>23	27 (30.0)	11 (26.8)	19 (25.3)

[1]Age, BMI, healthy eating perception, food literacy, food neophobia, and coupon proneness categorizations were determined by Tertiles;
[2]Commonly accepted BMI ranges (underweight, normal weight, overweight, obesity) were used for BMI categorization (https://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html).

Consumers across clusters were not significantly different from one another. Descriptively, it appears that Slow-going consumers were predominantly younger consumers ($M_{Slow\text{-}going}$=54.32 vs. $M_{Moderate}$ =56.05 vs. $M_{Enthusiastic}$ =58.43), mostly with slightly higher household income (53.7%>$100k). Compared to the other segments, they had an average healthy eating perception and food literacy but were most coupon-sensitive ($M_{Slow\text{-}going}$=20.24 vs. $M_{Moderate}$ =20.20 vs. $M_{Enthusiastic}$ =19.16). Compared to Slow-going consumers, a majority of consumers in the Moderate group didn't have postgraduate education (43.9%>Bachelor's degree). They scored lowest on healthy eating perception ($M_{Moderate}$ =29.07 vs. $M_{Slow\text{-}going}$ =31.20 vs. $M_{Enthusiastic}$ =31.36), and food literacy $M_{Moderate}$=23.28 vs. $M_{Slow\text{-}going}$ =23.47 vs. $M_{Enthusiastic}$ =24.7), but reported

relatively higher food neophobia ($M_{Moderate}$ =29.0 vs. $M_{Slow\text{-}going}$ =28.60 vs. $M_{Enthusiastic}$ =28.27). Enthusiastic consumers were mainly older and had received higher education (52.7%>Bachelor's degree), although household income was not as high as Slow-going and Moderate consumers (48.2%>$100k). Compared to the other segments, more respondents in the Enthusiastic group were knowledgeable of foods and healthy eating and were more likely to accept new and unfamiliar foods. This group had the lowest propensity to respond to coupons of all groups identified.

Next, we conducted multinomial regressions to determine whether selected covariates could provide a useful classification and statistical evidence of significant differences among latent classes.

We first ran a multinomial regression with all covariates estimated simultaneously. Results are shown in Table 2.4B. With all covariates entered, we found membership in the Moderate group and Enthusiastic group relative to Slow-going group membership significantly related to age and healthy eating perception. Membership in the Enthusiastic group relative to the Slow-going group membership was also found to be significantly related to coupon proneness.

Table 2.4B Multinomial regression with all covariates estimated simultaneously

	Class 2: Moderate consumers (N=41, 19.9%)	**Class 3: Enthusiastic consumers (N=75, 36.4%)**
	Beta/ Sig	**Beta/ Sig**
Age	0.05*	0.06*
Education		
<=Bachelor's degree	-	-
>Bachelor's degree	-0.62	0.27
Household Income		
<=$100k	-	-
>$100k	0.24	-0.26
BMI	-0.13	-0.09
Healthy eating perception	0.05*	0.16*
Food Literacy	-0.01	0.04

Food Neophobia	0.07	-0.03
Coupon Proneness	0.03	-0.04*

Note: Reference class is Class 1; "-" indicates the reference group for categorical covariates.
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

RRs were calculated to further test the strength of the association between these covariates and the class membership. Due to insufficient subgroup sizes and limited statistical power, exploratory analyses were conducted to evaluate the individual contribution of selected covariates. Table 2.4C summaries the results of individual multinomial regressions.

Table 2.4C. Individual multinomial regressions predicting latent class membership[1]

	Class 2: Moderate consumers (N=41, 19.9%)	**Class 3: Enthusiastic consumers (N=75, 36.4%)**
	RR (95% CI)	**RR (95% CI)**
Age		
<48	1.61 (0.96, 2.69)	0.70 (0.45, 1.11)
48-66	**0.79 (0.51, 0.96)**	**0.64 (0.43, 0.86)**
>66	-	-
Education		
<=Bachelor's degree	1.07 (0.78, 1.46)	0.84 (0.58,1.21)
>Bachelor's degree	-	-
Household Income		
<=$100k	0.91 (0.63, 1.31)	1.13 (0.74, 1.72)
>$100k	-	-
BMI[2]		
Normal weight (18.5-24.9)	0.94 (0.61, 1.44)	1.20 (0.68, 2.11)
Overweight (25-29.9)	0.86 (0.53, 1.39)	1.24 (0.68, 2.26)
Obesity (>29.9)	-	-
Healthy eating perception		
<28	0.72 (0.48, 1.08)	0.98 (0.69, 1.65)
28-34	1.13 (0.73, 1.75)	**0.71 (0.50, 0.99)**
>34	-	-
Food Literacy		
<20	1.33 (0.87, 2.02)	0.70 (0.39, 1.24)
20-27	0.92 (0.60, 1.43)	0.97 (0.62, 1.52)
>27	-	-
Food Neophobia		
Low (>34)	1.06 (0.62, 1.81)	1.00 (0.56, 1.80)
Medium (26-34)	1.11 (0.69. 1.80)	0.87 (0.51, 1.50)
High (<26)	-	-
Coupon Proneness		
<16	0.92 (0.61, 1.38)	1.19 (0.72, 1.95)
16-23	0.88 (0.61, 1.26)	1.09 (0.70, 1.72)
>23	-	-

*Note: Reference profile is Class 1; "-" indicates the reference group for each covariate.
[1]Individual multinomial regressions instead of a multivariable multinomial logistic regression were conducted because of the insufficient sample size. RRs and 95% CIs in bold are significant at $p < .05$.
[2]"Underweight" was not included because of the ineffective subcategory sizes.

As shown in the table, significant differences between the Enthusiastic group and the Slow-going group were observed for age, with participants aged between 48 and 66 approximately 40% less likely than participants over 66 to be categorized in the Enthusiastic group relative to the Slow-going group (RR: 0.64, 95% CI:0.43, 0.86). Membership in the Moderate group relative to the Slow-going group membership was also significantly related to age, with participants aged between 48 and 66 approximately 20% less likely than participants over 66 to be categorized in the Moderate group relative to the Slow-going group (RR: 0.79, 95%CI: 0.51, 0.96). We also observed significant differences with respect to healthy eating perception between the Enthusiastic group and the Slow-going group, with participants having a middle level of healthy eating perceptions approximately 30% less likely than participants having a high level of healthy eating perceptions to be members of the Enthusiastic group relative to the Slow-going group (RR: 0.71, 95% CI: 0.50-0.99).

2.3.4 Latent Class Relationship with Outcomes

Finally, customer satisfaction, attitude, and loyalty were regressed on the latent class membership using Latent GOLD® 5.3 Step3 submodule. As shown in Table 2.5, significant between-group differences were observed for customer loyalty. While the magnitude of the effect was generally moderate, consumers in the Enthusiastic group demonstrated significantly the strongest customer loyalty, followed by Moderate consumers, compared to Slow-going consumers.

Customer attitude and satisfaction were not significantly different across classes. However, descriptively, it appears that consumers were generally satisfied with this program and had a positive attitude towards the retailer.

Table 2.5 Relationship Between Latent Class Membership and Outcomes Compared to the Slow-going Group (n = 206)

Outcome	**Class 1: Slow-going consumers (N=90, 43.7%)**		**Class 2: Moderate consumers (N=41, 19.9%)**		**Class 3: Enthusiastic consumers (N=75, 36.4%)**	
	Mean (SD)	Beta/Sig.	Mean (SD)	Beta/Sig.	Mean (SD)	Beta/Sig.
Satisfaction	6.4 (0.8)	-	6.5 (0.8)	0.16	6.5 (0.9)	0.25
Attitude	11.8 (3.4)	-	12.4 (3.3)	0.03	12.0 (3.2)	0.04
Loyalty	5.9 (1.2)	-	6.2 (1.0)	0.17*	6.4 (0.8)	0.40*

Note: Reference class is Class 1
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

2.4 Discussion

Though retailers have adopted various marketing tools to nudge consumers towards healthier choices, the effectiveness of those tools is mixed (Karpyn et al. 2020). We aimed to bridge gaps in the knowledge base by addressing four questions. First, how did grocery shoppers respond to a customized healthy food incentive campaign with respect to their spending, shopping frequency, email engagement, and inter-purchase time? Second, whether heterogeneous response patterns existed among grocery shoppers? Third, how did response patterns correlate with shopper characteristics? Fourth, how was the campaign responsiveness correlated with satisfaction consequences and retailer's long-term profitability? Our findings, though exploratory in nature, shed light on the heterogeneity of shoppers' behaviors during the campaign, as well as the links between shoppers' during-campaign behaviors and their overall satisfaction, attitude, and loyalty after campaign completion.

Using a latent profile analysis, we came up with three distinct patterns that characterize shoppers of a grocery retailer, focusing specifically on their four behavioral responses to the campaign: spending, shopping frequency, retailer's email engagement, and inter-purchase time. The groups identified— Slow-going group, Moderate group, and Enthusiastic group —indicate the various patterns of shopper's responses during the

campaign. Thus, hypotheses 1a and 1b were supported. The Enthusiastic group increased their spending and shopping frequency, and paid more attention to emails when receiving customized incentives, and demonstrated the highest loyalty towards the retailer and noticeably higher satisfaction after campaign completion. We did not observe significant between-group differences in attitude and satisfaction. Thus, hypothesis 3 was partially supported. However, we observed overall high ratings across the three groups, which suggests that participants were generally satisfied with the program, and their attitude towards the retailer has become more favorable as well. Our findings also suggest a positive relationship between email open frequency and customer attitude, as we observed the Moderate group tended to hold the most favorable attitude towards the retailer after campaign completion. It appears that repeat exposure to the promotional email with customized nutrition information and healthy recipes may translate into higher recognition of the retailer's effort to promote healthy eating, leading to a more favorable attitude towards the retailer.

Hypothesis 2 was also supported since the identified consumer subgroups were different in some socio-demographic and psychological characteristics. Consumers in the Enthusiastic group tended to be older and had a higher level of healthy eating perceptions. One possible explanation for this is that those health messages, healthy recipes and healthy food incentives included in emails might match Enthusiastic consumers' perception of healthy eating and their healthy living habits. Thus, they might be more inclined to respond to this campaign. This group could be an ideal target market for such a health promotion program. Consumers in the Slow-going group spent more when receiving generic discounts but reduced spending when receiving a discount for healthy

products, indicating that education alone plays a limited role in promoting behavior change (Nutbeam 2000), confirming that offering customized incentives a promising approach to the promotion of healthy food choices.

From a theoretical standpoint, our study contributes to customer segmentation and customization research by applying these marketing strategies to the healthy promotion domain. The use of customer segmentation technique also adds to previous research that focuses on the linear relationship between predictors and outcomes to model marketing effectiveness. By identifying customer segments that differ in combined responses to the campaign and testing the relationship between segment membership and three relationship outcomes: satisfaction, customer attitude, and customer loyalty, we demonstrate that if a customized pricing strategy is applied to the best prospects, it will improve customer well-being while generating returns to the retailer.

Our findings also broaden the scope of previous work on CRM and more broadly, CSR by examining the effectiveness of a marketing campaign in improving healthy purchasing, a CSR domain that very little attention has been paid to by previous CSR researchers. While previous work has shown that in general, CRM campaigns result in more positive consumer attitudes toward a company and greater purchase likelihood for its product, some studies argue that CRM campaigns can foster customers' negative perceptions of a company's motivation for engaging in such activities (Pracejus and Olsen 2004; Robinson et al. 2012). Our study identifies highly engaged customer segments and observes that campaign participants generally had a favorable attitude, high satisfaction, and enhanced loyalty towards the retailer. Such finding suggests that in the CSR domain of healthy eating, implementing a customized couponing campaign could be

one of the best strategies to generate consumers' favorable relationship outcomes, without raising suspicions about retailers' motivation to promote healthy purchases.

Our findings further contribute to the couponing literature by demonstrating that the benefit of couponing is not limited to the increased sales and purchasing intentions - as assumed by most prior research (Obeid 2014) - and that couponing can also enhance customer loyalty when being customized to individual's preferences. We also identify consumer segments with higher rates of customer loyalty. This finding is consistent with findings from mere exposure and customer engagement research that the more exposed to retailer's offerings and engaged consumers are, the more positive evaluation and attitude they will develop towards the company, brand, or product they associate with the engagement and consequently, feel more loyal towards the company (Fernandes and Esteves 2016; Tom et al. 2007). Furthermore, prior couponing research suggests estimating category-level coupon proneness when modeling coupon redemption behaviors, since an individual's coupon usage behavior depends both on his or her inherent coupon proneness and on the attractiveness of the coupons encountered (Swaminathan and Bawa 2005). Consistent with these studies, our study demonstrates that an individual's inherent coupon proneness did not necessarily predict his or her responsiveness to customized healthy food coupons. Clearly, an individual's responsiveness to customized healthy food coupons was more influenced by his or her beliefs, consciousness, and knowledge of food.

2.5 Limitations and Future Directions

Due to its exploratory nature, this research has several limitations, which provide a platform for the undertaking of further theoretical and empirical research in this area.

Our sample was limited to shoppers who were affluent, educated, and had low variability in their socio-demographic and psychological characteristics. Therefore, a more heterogonous sample may be tested in the future to explore the effect of customized incentives and the generalizability of our results.

Second, since this was a secondary analysis, we weren't powered to explore the interrelationships between covariates of interest. Thus, larger sample size is needed in the future study to explore how these covariates jointly predict class membership, and whether these classes are stable and if other subgroups exist in different populations.

Third, customer attitude, satisfaction, and loyalty were only measured at study completion. Although the wording of the questions has been modified to measure "changes" as much as possible, regression analyses examining the relationship between the latent classes and these outcomes might still not reflect changes in these measures. A better study design can be developed in the future to overcome this limitation.

Forth, we identified three latent classes different in campaign responsiveness. Future empirical research is needed to understand what factors drive differences in customer response outcomes. For example, previous CRM research suggests that consumers' responses to a CRM campaign are likely to be driven by the perceived fit between a CSR issue/cause and a company's actions toward it. When perceiving a greater fit, consumers will greater liking for the company, and higher brand credibility and purchase intentions (Gupta and Pirsch 2006; Hildebrand et al. 2017). Although incentivizing healthy foods to promote healthy purchasing is a high fit case per se, is it possible that perceiving a low contribution-cause fit from the consumer's viewpoint renders consumers less responsive to the campaign? Further empirical work can test

whether the intentions to open the retailer's messages and/or purchase its products are explained by consumers' perception of fit. Such results would have managerial implications, since it may tell retailers how to modify coupons to make them more attractive to "slow-going" consumers. Sohn et al. (2012) explore communication strategies that help elevate the perceived fit between the firm and its CSR activity (Sohn et al. 2012). Specifically, they find that a relational (vs. elaborational) communication strategy which highlights the association between the firm and CSR is more effective for the high-fit case (Aaker and Keller 1990; Bridges et al. 2000; Sohn et al. 2012). Following this logic, future research can modify customized coupons, making them emphasize both the positive attributes of the targeted healthy foods as well as the retail partner's supporting of healthy eating, and then test the indirect effect through enhanced perceptions of fit to cause consumers to respond positively to the campaign. Furthermore, the characteristics of consumers in each segment deserve further investigation. For example, would, for instance, consumers who may not perceive a need to improve their diet (i.e. Precontemplation stage of change) be less responsive to customized incentives, compared to consumers who have made plans to improve their diet (i.e. Preparation stage of change)? Transtheoretical model of behavior change (TTM) identifies factors that can facilitate movement from one stage to the next (Prochaska and Velicer 1997). Therefore, the effectiveness of customized coupons may be further improved by identifying the link between stages of change and consumers' responsiveness and integrating constructs of TTM into the coupon.

Fifth, the decision to invest in customized coupon campaigns also requires evidence related to their economic benefits. While research related to the effectiveness of

healthy food retail interventions is growing, the primary outcome measure is generally the purchase of the targeted foods (Cameron et al. 2016; Mah et al. 2019). However, the purchase of the targeted foods itself is not enough to provide an indication of intervention effectiveness; the evaluation of an intervention should also assess whether it provides good "value for money" by evaluating its cost-effectiveness of price reductions in improving overall health outcomes. Prior systematic reviews suggest several economic evaluation methods, which include cost-effective analysis and cost-utility analysis (Ball et al. 2016; Cobiac et al. 2010). Intervention cost components have also been suggested, which include staff time including overhead, participant time, purchase of intervention food products, participant travel expenses, intervention materials, and monetary incentives (Ball et al. 2016; Cobiac et al. 2010; Le et al. 2016). Further research can incorporate an economic evaluation in order to build evidence of the cost-effectiveness of customized price incentives. Evaluation can focus on outcome metrics of cost per increased serving of targeted foods purchased (Le et al. 2016), cost per BMI unit change, or health care costs (Gortmaker et al. 2015). Health care costs associated with obesity in the United States are estimated to increase by $48 - $66 billion per year (Chu et al. 2018). Employers are faced with rapidly escalating health insurance premiums and therefore would be in a position to motivate health promotion intervention programs in retailers. If customized incentives saved more in health care costs than they cost to implement, it will be an appealing investment for employers and insurance companies.

Finally, customer purchase, shopping frequency, email engagement, and inter-purchase time may not fully represent how shoppers respond to a retailer's effort to promote healthy choices. Previous studies on relationship marketing suggest that firm

profitability is influenced by various customer interactions with the firm, including purchases, word of mouth, customer feedback/comments, etc. Future research can extend this study by examining the implications of customized incentives on other connections customers make with a firm. Such results may help the firm to develop stronger customer relationships and greater loyalty and advocacy.

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