Dec 11th, 12:00 AM

Reshaping Loyalty Programs for Sustainability: Harnessing the Power of Mobile Marketing

Cameron McRae
McGill University, cameron.mcrae2@mail.mcgill.ca

Laurette Dubé
McGill University, laurette.dube@mcgill.ca

Reshaping Loyalty Programs for Sustainability: Harnessing the Power of Mobile Marketing

Short Paper

Cameron McRae
Desautels Faculty of Management,
McGill University
Montréal, Québec
cameron.mcrae@mail.mcgill.ca

Laurette Dubé
Desautels Faculty of Management,
McGill University
Montréal, Québec
laurette.dube@mcgill.ca

Abstract

With technologies embedded throughout much of business and society, new pathways are opening to address mounting externalities like climate change. Today, there is an opportunity to leverage ICTs to address sustainability issues head-on through digital marketing and other business activities that go beyond traditional corporate social responsibility (CSR). Across four studies, we instigated how mobile promotions administered via retail loyalty programs impacted the consumption of sustainable products. Multi-level mixed-effect Tobit regression models were used. Data were included for weekly purchases of 21 brands of plant-based beverages made across 242 stores located in Quebec, Canada between 2015 and 2016. Overall, mobile promotions had a positive direct impact on demand (B=0.232, p<0.0001) but increased their price sensitivity (B=-0.898, p<0.0001). Mobile promotions that awarded loyalty points were the most effective at generating demand directly. Advertisements with everyday low pricing increased price sensitivities the most (B=-0.702, p<0.0001). Implications for theory and practice are discussed.

Keywords: Loyalty programs, sustainability, digital marketing, mobile promotions, price sensitivity, food systems

Introduction

Economic and market performance and growth have been the core foci of business since the 1st Industrial Revolution, with a clear divide from human health, environmental, and social development, which were under the purview of government and civil society. While bringing wealth to many, this focus has led to a linear economy with detrimental consequences for the environment (Dubé et al. 2014; Dubé et al. 2012). With the impact of climate change reaching a critical point (World Meteorological Association 2022), there is a need to place environmental, social, and health outcomes as upfront drivers of business strategy and operations on par with efficiency, market share, and financial outcomes. Present efforts by businesses to mitigate some of these adverse consequences through Corporate Social Responsibility (CSR) projects fail to reach the scale needed for societal-scale transformation toward a healthy, sustainable, equitable, and prosperous future for all (Dubé et al. 2014). This vision has been referred to as a convergence economy (Dubé et al. 2022).

Information and Communication Technologies (ICTs) can take a central position in the sustainability transition by building demand for sustainable products. With ICTs already pervasive in the everyday lives of consumers, digital loyalty programs are well-positioned as a point of entry for system transformation. Loyalty programs sit at the nexus of omnichannel touchpoints, both physical and digital, that connect consumers to products and retailers (Berman 2006). About 72% of the adult population had used one or

more loyalty programs in Canada during 2021 (Mintel 2021), demonstrating their vast scale. While such programs offer clear advantages to consumers (e.g., loyalty points, coupons, discounts), they also allow businesses to track and analyze consumer behaviors by linking data from physical and digital interactions to a unique identification number. Each interaction can be linked to contextual data that is geographically and temporally linked. Loyalty programs also leverage ICTs to administer product promotions to consumers, which are predominantly delivered through mobile apps. Several studies have found that loyalty program app adoption can increase consumers' interest and purchase intentions (Bellman et al. 2011) and increase real-world purchases and point redemption (Kim et al. 2015; Son et al. 2020). However, the impact of mobile promotions delivered within such apps remains under-investigated.

Studies evaluating the impact of mobile promotions have traditionally been contained within a specific channel (e.g., online shopping), neglecting how they can also impact consumer behaviors across other channels like in-store. Examples of mobile promotions include in-app advertisements, coupons, or bonus points for specific products. In one study of a mobile e-book platform, mobile promotions had heterogeneous effects depending on whether the promoted product was similar to something the consumer bought before or not (Fong et al. 2019). Mobile ads can be more effective in crowded areas (Andrews et al. 2016) or while consumers are on public transit (Ghose et al. 2019), but it depends on competitive dynamics at their location (Fong et al. 2015). Other related research has found that SMS messages can be effective (Luo et al. 2014), but it also depends on the time, location, and redemption timeline (Danaher et al. 2015). Notably, each of these prior studies evaluated mobile promotion effectiveness in isolation from other marketing activities. This body of research has also not yet delved systematically to disentangle the impact of mobile promotions relative to those that can be deployed in a physical retail channel like in-store promotions or weekly flyers. Flyers are often printed on paper and left at the store entrance, with the products advertised in the flyer often also having a signal on the shelf to further denote the weekly special. In-store promotions would only be advertised on the shelf. Mobile promotions can be delivered outside the store before arriving, or if the consumer opens the app in-store, but no physical signal is on the shelf.

Loyalty programs are central to grocery retailing across many parts of the world. They may also be a key to unlocking the sustainability transition through demand generation for sustainable products. The agri-food sector remains one of the largest contributors to greenhouse gas emissions and climate change (Clark et al. 2020). Numerous calls have been made for consumers to decrease meat consumption and boost their consumption of plant-based products (Dubé et al. 2012; Poore and Nemecek 2018; Willett et al. 2019). Compared to animal-based products, plant-based ones require less land and produce about half as much carbon emissions. Despite this evidence, demand for plant-based products remains low with the high price of sustainable products frequently mentioned as a barrier (Aggarwal and Drewnowski 2019; ElHaffar et al. 2020). Price is a core consideration in purchase decisions and is also important when considering affordability and access to sustainable foods from a social and public health perspective.

An opportunity exists to investigate how pricing and mobile promotions, together with physical in-store and flyer promotions, can individually and holistically drive demand for sustainable products. This also has direct managerial implications for how sustainable products are priced and marketed by retailers. Thus, considering the theoretical and societal relevance, we proposed four research questions:

1. How does the impact of mobile promotions on demand for sustainable products compare to flyer and in-store promotions?
2. What types of mobile promotions are most effective in driving demand for sustainable products?
3. How do mobile, flyer, and in-store promotions impact price sensitivity for sustainable products?
4. How do different types of mobile promotions affect price sensitivity for sustainable products?

To answer the research questions, we obtained loyalty program data from a large grocery retailer in Quebec, Canada. The dataset contained sales transactions for all plant-based beverages purchased at one of their 242 stores and was linked to store-level contextual information. A series of four studies were designed to answer each of the four research questions using econometric methods applied to the panel dataset.

Overview of Studies

The conceptual frameworks for the four studies are presented in Figure 1. For the regression models, we

focused on how mobile promotions directly impacted demand, as well as how they interacted with price to impact demand indirectly. Study 1 focused on how mobile promotions overall impacted demand relative to flyer or in-store promotions. Study 2 evaluated the impact of four types of mobile promotions (everyday low-price advertisements, regular advertisements, coupons, or loyalty points). Study 3 evaluated how mobile, flyer, and in-store promotions impacted price sensitivity. Study 4 looked at how four subtypes of mobile promotions impacted price sensitivity.

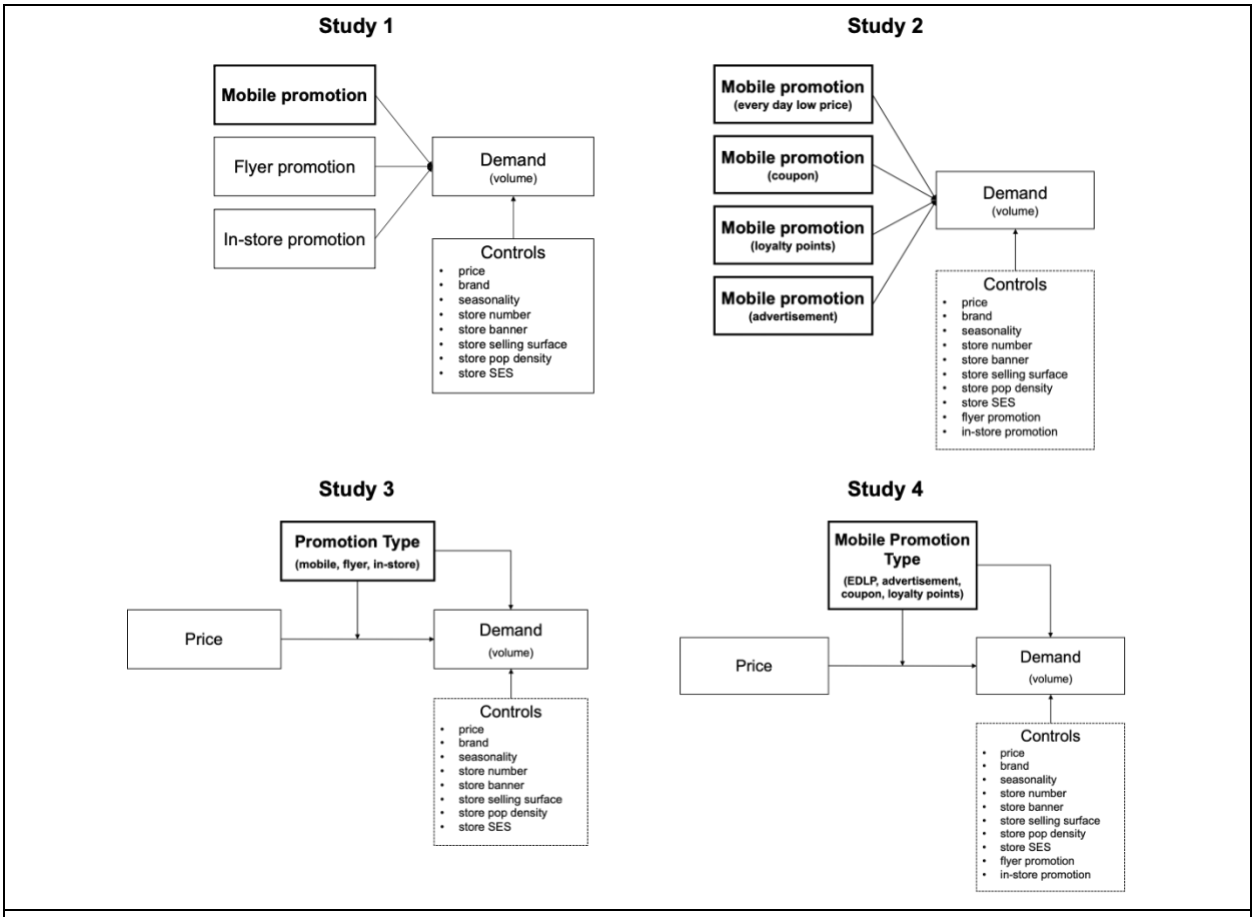

Figure 1. Conceptual Models for Studies 1 to 4

Methods

Data were obtained from a loyalty card program operated by a prominent grocery retailer in Quebec, Canada. The dataset contained transactions for food purchases made by loyalty card members between February 1, 2015, and December 31, 2016. All transactions for plant-based beverages were extracted from the dataset and linked to product and store information. An overview of the variables used, and their definitions, are provided in Table 1. Volume was the dependent variable in all regression models, which was log-transformed. Price was expressed in CAD per gram and also log-transformed to make a log-log model. Note all data were aggregated by brand of plant-based beverage, by store, by week, and by promotion type.

Regarding promotions, each transaction captured detailed information on the type of promotion at check-out including whether it was mobile, flyer, or in-store. Mobile promotions were delivered by the retailer's mobile app, which included whether the consumer was exposed to product advertisements, coded as regular or as with a message of Every Day Low Pricing (EDLP), as well as whether they redeemed a mobile coupon or were awarded bonus loyalty points. At the time, the retailer had reported that about 70% of cardholders had downloaded the app, but specific usage information was not available. Flyer advertisements ran weekly from Thursday to Wednesday, which is why data were aggregated at the weekly level and controls for week

and year were included in the models. In-store promotions were local to one of the 242 stores.

Control variables in the regression models were designed to control for other factors known to influence demand for food products like SES (Aggarwal and Drewnowski 2019), seasonality (Ma et al. 2021), retail banner (Jacob et al. 2022), population density (Ma et al. 2021), the surface area of the selling surface in the store which is a proxy measure for variety (Sevilla et al. 2019), and the brand of food (Akbay and Jones 2005). Using the postal code of the store, we linked neighborhood-level information from the 2016 Canadian Census data for population density and SES measures to characterize the local food environment. Each store was categorized as being located in a neighborhood with high, middle, or low SES using linked census information by postal code (McRae et al. 2022).

Variable	Definition	Type	Reference group	Model			
				1	2	3	4
Volume	Log of the volume of beverage purchased (milliliters), by store and brand	Continuous	n/a	X	X	X	X
Mobile promotion	Indicator for presence of a mobile promotion at store check-out	Binary	No mobile promotion	X		X	
Mobile EDLP	Indicator for presence of an EDLP advertisement prior to store check-out	Binary	No mobile EDLP promotion		X		X
Mobile advertisement	Indicator for presence of a regular mobile advertisement prior to store check-out	Binary	No mobile advertisement promotion		X		X
Mobile coupon	Indicator for redemption of a mobile coupon at store check-out	Binary	No mobile coupon promotion		X		X
Mobile loyalty points	Indicator for accumulation of mobile loyalty points	Binary	No mobile loyalty points		X		X
Flyer promotion	Indicator for presence of a flyer promotion	Binary	No flyer promotion	X	X	X	X
In-store promotion	Indicator for presence of an in-store promotion	Binary	No in-store promotion	X	X	X	X
Price	Log of the average final price paid (dollars per gram), by store and brand	Continuous	n/a	X	X	X	X
Store selling surface	Standardized store selling surface (ft2)	Continuous	n/a	X	X	X	X
Store retail banner	Retail banner; 2 factors for each	Factor	Mid-tier retail banner	X	X	X	X
Store neighborhood SES	Measure of the store's neighborhood SES; 3 factors for low, middle, and high SES	Factor	High SES	X	X	X	X
Store neighborhood population density	Standardized store's neighborhood population density	Continuous	n/a	X	X	X	X
Year	Year of purchase; one factor for the second year of the dataset	Factor	Year 2015	X	X	X	X
Week	Week of purchase; 52 factors for each of the 53 weeks	Factor	Week 1	X	X	X	X

Brand	Brand of beverage; 20 factors for each of the 21 brands	Factor	Brand 1	X	X	X	X
Store ID	ID used to cluster observations by store number	Random effect, levels defined by ID	n/a	X	X	X	X

Table 1. Variable Overview

All statistical analyses were conducted using Stata version 17.0. Two-level mixed-effects Tobit regression models were used in all four studies, which can be generally written for store $i = 1,\ldots,N$ who is observed at several periods $t = 1, \ldots, T$

$$y_{it}^{*} = \alpha + x_{it}'\beta + z_{it}'\gamma + C_i + \varepsilon_{it} \qquad (1)$$

where y_{it}^{*} is the dependent variable, α is the intercept, x_{it}' is a K-dimensional row vector of explanatory continuous variables, β is a K-dimensional column vector of parameters, z_{it}' is a M-dimensional row vector of explanatory factor variables, γ is an M-dimensional column vector of parameters, C_i is a store-specific random effect and ε_{it} is the error term. Here, a random effect for each store was added to obtain standard errors for clustered data, as each store's responses can be correlated over time (Torres-Reyna 2007).

In the mixed-effects Tobit regression models, the values of the outcome variable y_{it}^{*} may be observed or unobserved but known to fall below a given limit (left-censored data). Not all brands in each store had purchases each week under a particular promotion, resulting in zero purchases for many of the observations. A high frequency of zero purchases is a typical censored data problem, and, thus, we employed a Tobit model to deal with the censored nature of the dependent variables (Humphreys 2013). Because we are unable to take the log of zero volume, we added a small constant number (0.001) (Bellégo et al. 2022).

Results

Data were included for all sales transactions of 21 plant-based beverage brands across 242 stores in the province of Quebec across two years and 53 weeks. Notably, about 28% of purchases were made during an in-store promotion, whereas only about 3% were under a flyer promotion and 4% were under a mobile promotion. Of the types of mobile promotions offered, most were under the influence of a mobile advertisement (4%), while fewer were made under a mobile EDLP promotion (1%), mobile loyalty points (1%), or mobile coupon (<1%). 25% of stores were in neighborhoods with high SES, 46% in those with middle SES, and 29% in those with low SES. The average population density of neighborhoods where stores were located was 2,099 people per square kilometer. 63% of the stores were operated under the premium retail banner and their average selling surface was 22,309 square feet.

Study 1

Study 1 sought to evaluate the impact of mobile promotions administered via the retailer's mobile app relative to flyer and in-store promotions. All three promotion types had a direct and significant impact on demand, which is reported in Table 2 (left). Flyers were most influential (B=0.417, p<0.0001), followed by mobile promotions (B=0.232, p<0.0001), and in-store promotions (B=0.073, p<0.0001). Control variables added for week and brand were nearly all significant but are not reported here due to space constraints.

	Study 1			Study 2		
Variable	B	SE	P>|z|	B	SE	P>|z|
promo-flyer	0.417	0.013	0.000	0.413	0.013	0.000
promo-store	0.073	0.005	0.000	0.076	0.005	0.000
promo-mobile	0.232	0.012	0.000	-	-	-
promo-mobilead	-	-	-	0.125	0.014	0.000
promo-mobilepoints	-	-	-	0.776	0.029	0.000

promo-mobilecoupon	-	-	-	0.000	0.126	0.999
promo-mobileEDLP	-	-	-	-0.064	0.029	0.026
price	-1.339	0.008	0.000	-1.337	0.008	0.000
store-sescluster2	-0.105	0.053	0.050	-0.105	0.054	0.051
store-sescluster3	-0.166	0.061	0.007	-0.166	0.061	0.006
store-sellsurface	0.157	0.031	0.000	0.158	0.031	0.000
store-popdensity	0.326	0.024	0.000	0.327	0.024	0.000
store-banner	0.016	0.063	0.800	0.016	0.063	0.801
year	-0.219	0.005	0.000	-0.231	0.005	0.000
week x 52	(results omitted due to space)			(results omitted due to space)		
brand x 20	(results omitted due to space)			(results omitted due to space)		
log pseudo-likelihood	-346,865			-346,654		
n observations	237,971			237,971		
n clusters	242			242		

Table 2. Study 1 and 2 Results

Study 2

The objective of Study 2 was to evaluate the direct effects of four subtypes of mobile promotions while adding controls for flyer and in-store promotions. The results are reported in Table 2 (right). Mobile loyalty points offerings had the greatest impact on demand (B=0.776, p<0.001). Mobile advertisements also had a significant effect (B=0.125, p<0.001), but the magnitude of the coefficient is several folds smaller than that of loyalty points. Mobile advertisements with EDLP messaging had a very small, but still significant, impact on demand (B=-0.064, p-0.026). Mobile coupons did not have a significant effect (p=0.999). Again, controls for week and brand were significant but not reported here.

Study 3

After observing that mobile, flyer, and in-store promotions had significant direct effects on demand, Study 3 was designed to look at their interaction effects with price. The results are reported in Table 3 (left). Overall, price had a negative, direct, and significant effect on demand (B=-1.069, p<0.0001). The interaction between price and the three types of promotion reveals that all three significantly increased price sensitivity. Flyer promotions were most impactful at increasing price sensitivity (B=-1.556, p<0.001). Mobile promotions (B=-0.898, p<0.0001) and in-store promotions (B=-0.468, p<0.0001) also increased the price sensitivity to a lesser extent. Controls for week and brand were significant but not reported here.

	Study 3			Study 4		
Variable	B	SE	P>|z|	B	SE	P>|z|
price	-1.069	0.011	0.000	-1.315	0.009	0.000
price*promo-flyer	-1.556	0.054	0.000			
price*promo-store	-0.468	0.016	0.000			
price*promo-mobile	-0.898	0.036	0.000			
price*promo-mobilead				-0.330	0.044	0.000
price*promo-mobilepoints				-0.394	0.230	0.087
price*promo-mobilecoupon				0.450	0.359	0.210
price*promo-mobileEDLP				-0.702	0.088	0.000

promo-mobile	-5.161	0.219	0.000			
promo-mobilead				-1.861	0.265	0.000
promo-mobilepoints				-1.716	1.447	0.236
promo-mobilecoupon				2.701	2.152	0.210
promo-mobileEDLP				-4.211	0.527	0.000
promo-flyer	-9.121	0.333	0.000	0.419	0.013	0.000
promo-store	-2.691	0.097	0.000	0.077	0.005	0.000
store-sescluster2	-0.104	0.054	0.051	-0.104	0.054	0.052
store-sescluster3	-0.166	0.061	0.007	-0.166	0.061	0.007
store-sellsurface	0.158	0.031	0.000	0.158	0.031	0.000
store-popdensity	0.328	0.024	0.000	0.327	0.024	0.000
store-banner	0.017	0.063	0.791	0.016	0.063	0.802
year	-0.225	0.005	0.000	-0.228	0.005	0.000
week x 52	(results omitted due to space)			(results omitted due to space)		
brand x 20	(results omitted due to space)			(results omitted due to space)		
log pseudo-likelihood	-345,959			-346,536		
n observations	237,971			237,971		
n clusters	242			242		

Table 3. Study 3 and 4 Results

Study 4

Study 4 was designed to evaluate if and how different types of mobile promotions interacted with price to impact demand. The results are reported in Table 3 (right). Again, the price had a negative and significant impact on demand (B=-1.315, p<0.0001). Interestingly, mobile advertisements with EDLP increased price sensitivity the most (B=-0.702, p<0.0001). General mobile advertisements also increased price sensitivity (B=-0.330, p<0.001). Mobile loyalty points increased price sensitivity, but borders on significance (B=-0.394, p=0.087). Mobile coupons did not have a significant interaction with price (p=0.210). Controls for week and brand were significant but not reported here.

Discussion

Harnessing the power of mobile marketing to affect behavior changes in physical retail settings holds much potential. With the majority of consumers already adopting loyalty program apps, offering mobile promotions for sustainable products can reach the population at scale. For example, the data used in this study spans 242 stores and can reach over one million members. Mobile promotions administered via digital loyalty card programs can directly boost sustainable purchasing behaviors, as was shown. These findings indicate that an omnichannel approach to promotions, together with in-store and flyers, can help build demand for sustainable products like plant-based beverages. Among the mobile promotions studied, economic incentives like awarding loyalty points were the most effective at generating demand directly. However, a simple advertisement with no direct economic incentive also worked to a lesser extent.

High prices are frequently mentioned as a barrier to the consumption of sustainable products, leaving a gap between consumer attitudes, intentions, and behaviors (ElHaffar et al. 2020). Understanding how to price and market products is essential to any marketing mix. In Study 1, we observed elastic prices such that a one-dollar price increase resulted in a 133% decrease in purchasing volume. Then, in Study 3, we observed how all promotions (mobile, flyer, and in-store) further increased price sensitivity. Specific to mobile promotions, all but mobile coupons increased price sensitivity. These findings are surprising; research in behavioral economics may help provide some perspective on why promotions can increase price sensitivity.

One possible behavior mechanism relates to reference prices and price anchoring (Mazumdar et al. 2005; Tversky and Kahneman 1974). About 34% of the purchase transactions in the dataset were made when a promotion was present. The large proportion of sales with a promotion suggests that consumers could be using lower promotional prices as an anchor or reference price. Particularly when a promotion ends, consumers may be reluctant to pay the regular price and either wait for the next promotion or purchase an alternative product. Habituation related to promotional purchases may also play a role, as consumers with high loyalty app adoption can over-rely on promotions (Son et al. 2020). Future research may seek to disentangle how reference prices, price anchors, and habits can impact sustainable consumer choices.

This study makes several contributions. First, we contribute to IS literature on mobile loyalty program applications by evaluating the impact of a dimension of their features – mobile promotions. We found that mobile promotions directly increased purchases for sustainable products when shopping in a physical store, demonstrating the effectiveness of a promotion delivered by a digital channel on shopping behaviors in the physical world. Second, this contributes to marketing literature on price sensitivity by showing how all three types of promotions (in-store, flyer, and mobile) increased price sensitivity for sustainable products, as well as the differential impacts of different subtypes of mobile promotions. Last, we contribute to practice by pointing to features that Product Managers can incorporate in strategic roadmaps for the mobile apps they manage. This research is also relevant to Marketing Managers working on pricing and omnichannel promotion planning for sustainable products.

Limitations

Like other research, some limitations merit discussion. First, we were not able to study the link between ICT use and purchasing behavior as we only had access to retailer data regarding the promotion at the time of purchase. Second, we only studied one product category here which limits generalizability. Future work may explore other sustainable product categories. Third, we only studied aggregate sales at the level of the store which neglects individual-level heterogeneity in response to promotions. Last, our dataset pre-dates the COVID-19 pandemic and consumer behaviors may have evolved with the rapid digitalization that occurred across the grocery retail sector. Future research may delve into changes pre- and post-pandemic.

Acknowledgments

The authors thank the grocery retailer who provided access to the dataset. The authors also acknowledge support from the Canadian Institutes of Health Research (CIHR) [Grant No. 02083-000, 2021-2027] and Public Health Agency of Canada (PHAC) [Grant No. 1516-HQ- 000069, 2016-2019]. C.M. also thanks the Centre de développement de la formation et de la main-d'œuvre Huron-Wendat (CDFM) and Social Sciences and Humanities Research Council (SSHRC) [grant number 752-2021-2688, 2021-2024].

References

Aggarwal, A., and Drewnowski, A. 2019. "Plant-and Animal-Protein Diets in Relation to Sociodemographic Drivers, Quality, and Cost: Findings from the Seattle Obesity Study," *The American journal of clinical nutrition* (110:2), pp. 451-460.

Akbay, C., and Jones, E. 2005. "Food Consumption Behavior of Socioeconomic Groups for Private Labels and National Brands," *Food Quality and Preference* (16:7), pp. 621-631.

Andrews, M., Luo, X., Fang, Z., and Ghose, A. 2016. "Mobile Ad Effectiveness: Hyper-Contextual Targeting with Crowdedness," *Marketing Science* (35:2), pp. 218-233.

Bellégo, C., Benatia, D., and Pape, L. 2022. "Dealing with Logs and Zeros in Regression Models," *arXiv preprint arXiv:2203.11820*).

Bellman, S., Potter, R. F., Treleaven-Hassard, S., Robinson, J. A., and Varan, D. 2011. "The Effectiveness of Branded Mobile Phone Apps," *Journal of interactive Marketing* (25:4), pp. 191-200.

Berman, B. 2006. "Developing an Effective Customer Loyalty Program," *California management review* (49:1), pp. 123-148.

Clark, M. A., Domingo, N. G., Colgan, K., Thakrar, S. K., Tilman, D., Lynch, J., Azevedo, I. L., and Hill, J. D. 2020. "Global Food System Emissions Could Preclude Achieving the 1.5 and 2 C Climate Change Targets," *Science* (370:6517), pp. 705-708.

Danaher, P. J., Smith, M. S., Ranasinghe, K., and Danaher, T. S. 2015. "Where, When, and How Long: Factors That Influence the Redemption of Mobile Phone Coupons," *Journal of Marketing Research* (52:5), pp. 710-725.

Dubé, L., Jha, S., Faber, A., Struben, J., London, T., Mohapatra, A., Drager, N., Lannon, C., and McDermott, J. 2014. "Convergent Innovation for Sustainable Economic Growth and Affordable Universal Health Care: Innovating the Way We Innovate," *NYAS* (1331:1), p. 119.

Dubé, L., Pingali, P., and Webb, P. 2012. "Paths of Convergence for Agriculture, Health, and Wealth," *Proceedings of the National Academy of Sciences* (109:31), pp. 12294-12301.

Dubé, L., Silveira, P. P., Nielsen, D. E., Moore, S., Paquet, C., Cisneros-Franco, J. M., Kemp, G., Knauper, B., Ma, Y., and Khan, M. 2022. "From Precision Medicine to Precision Convergence for Multilevel Resilience—the Aging Brain and Its Social Isolation," *Frontiers in Public Health*), p. 1930.

ElHaffar, G., Durif, F., and Dubé, L. 2020. "Towards Closing the Attitude-Intention-Behavior Gap in Green Consumption: A Narrative Review of the Literature and an Overview of Future Research Directions," *Journal of cleaner production* (275), p. 122556.

Fong, N., Zhang, Y., Luo, X., and Wang, X. 2019. "Targeted Promotions on an E-Book Platform: Crowding out, Heterogeneity, and Opportunity Costs," *Journal of Marketing Research* (56:2), pp. 310-323.

Fong, N. M., Fang, Z., and Luo, X. 2015. "Geo-Conquesting: Competitive Locational Targeting of Mobile Promotions," *Journal of Marketing Research* (52:5), pp. 726-735.

Ghose, A., Kwon, H. E., Lee, D., and Oh, W. 2019. "Seizing the Commuting Moment: Contextual Targeting Based on Mobile Transportation Apps," *Information Systems Research* (30:1), pp. 154-174.

Humphreys, B. R. 2013. "Dealing with Zeros in Economic Data," *University of Alberta, Department of Economics* (1), pp. 1-27.

Jacob, J., Vieites, Y., Goldszmidt, R., and Andrade, E. B. 2022. "Expected Ses-Based Discrimination Reduces Price Sensitivity among the Poor," *Journal of Marketing Research* (59:6).

Kim, S. J., Wang, R. J.-H., and Malthouse, E. C. 2015. "The Effects of Adopting and Using a Brand's Mobile Application on Customers' Subsequent Purchase Behavior," *Journal of Interactive Marketing* (31:1), pp. 28-41.

Luo, X., Andrews, M., Fang, Z., and Phang, C. W. 2014. "Mobile Targeting," *Management Science* (60:7), pp. 1738-1756.

Ma, Y., McRae, C., Wu, Y.-H., and Dubé, L. 2021. "Exploring Pathways of Socioeconomic Inequity in Vegetable Expenditure among Consumers Participating in a Grocery Loyalty Program in Quebec, Canada, 2015–2017," *Frontiers in Public Health* (9).

Mazumdar, T., Raj, S. P., and Sinha, I. 2005. "Reference Price Research: Review and Propositions," *Journal of marketing* (69:4), pp. 84-102.

McRae, C., Nie, J.-Y., and Dubé, L. 2022. "Heterogeneity in Feature Importance and Prediction Performance for Sales at the Market and Store Levels: The Case of Branded Yogurt Products in Quebec," *2022 IEEE International Conference on Big Data (Big Data)*: IEEE, pp. 4088-4096.

Mintel. 2021. "Loyalty Programs - Canada - 2021."

Poore, J., and Nemecek, T. 2018. "Reducing Food's Environmental Impacts through Producers and Consumers," *Science* (360:6392), pp. 987-992.

Sevilla, J., Lu, J., and Kahn, B. E. 2019. "Variety Seeking, Satiation, and Maximizing Enjoyment over Time," *Journal of Consumer Psychology* (29:1), pp. 89-103.

Son, Y., Oh, W., Han, S. P., and Park, S. 2020. "When Loyalty Goes Mobile: Effects of Mobile Loyalty Apps on Purchase, Redemption, and Competition," *Information Systems Research* (31:3), pp. 835-847.

Torres-Reyna, O. 2007. "Panel Data Analysis Fixed and Random Effects Using Stata (V. 4.2)," *Data & Statistical Services, Priceton University*), pp. 1-40.

Tversky, A., and Kahneman, D. 1974. "Judgment under Uncertainty: Heuristics and Biases," *Science* (185:4157), pp. 1124-1131.

Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., Garnett, T., Tilman, D., DeClerck, F., and Wood, A. 2019. "Food in the Anthropocene: The Eat–Lancet Commission on Healthy Diets from Sustainable Food Systems," *The Lancet* (393:10170), pp. 447-492.

World Meteorological Association. 2022. "State of the Global Climate 2021."