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Retargeting Using Advertising and Promotions

Abstract

Firms use retargeting to reach out to consumers who abandoned online shopping without making a purchase. In this research, we focus on consumers who abandoned their shopping cart, and empirically explore the effects of retargeting on the purchase funnel in which both advertising and promotions (with varying levels of discount) are considered. Using data from a carefully designed retargeting experiment tracking multiple consumer behaviors along the purchase funnel, we find retargeting advertising had little impact on consumer response relative to the noretargeting control group. By contrast, retargeting promotions lifted the purchase rate compared with retargeting advertising. Only retargeting with a better promotion lifted online activity of consumers (e.g., website revisit, consumer search), with much of the lift in their search attributable to browsing of products they already had in their cart. We also find the lift in website revisit was moderated by the elapsed time since cart abandonment in an inverse U-shaped relationship. Further, those who abandoned more recently and who only had a single category of products in their cart exhibited higher purchase lift. These results suggest stronger retargeting performance for those with a greater purchase interest. We also find exploring heterogeneous treatment effects using prior cart characteristics yields greater insights than past purchase patterns. Finally, we find almost no differences across the experiment conditions in the postcampaign period, suggesting no negative longer-term effects due to the retargeting campaign.

Keywords: Retargeting, Advertising, Promotions, Heterogeneity, Purchase funnel, Field experiment

1. Introduction

Retargeting, also known as remarketing or behavioral retargeting, is a relatively recent form of online marketing in which the firm focuses on past visitors to its online store who have not made a purchase. Because only about 2% of online shoppers convert on the first visit to an online store (e.g., Growcode 2021), the logic behind retargeting is to use previous online consumer behavior as a trigger for the firm to provide personalized communications to consumers who have self-identified as possibly being willing to re-engage. The objective of retargeting is to entice such consumers to revisit the website and/or complete a purchase. Because firms across industries spend a significant portion of their marketing budgets on retargeting due to its potential effectiveness, interest in how best to design retargeting campaigns and to identify the type of consumers who provide the best return on investment from retargeting is growing (Forbes 2020).

Consumers leave a variety of digital footprints while shopping online (e.g., sessions with website visits, product page views, or cart creations). Thus, many forms of triggering behaviors can be utilized for retargeting, and many variants of retargeting exist in practice. Marketing researchers have primarily focused on two forms of triggering behaviors that have become popular in practice. First, retargeting may leverage early-stage consumer activity in the purchase funnel (e.g., website visits) and serve ads (e.g., banner ads) to visitors who have left the website. Alternatively, retargeting may utilize late-stage consumer activity in the purchase funnel, such as creating but abandoning a shopping cart without making a purchase. In this research, we focus on the latter type of retargeting among cart abandoners.

We use the following example to illustrate a variety of decisions an online company can make about retargeting. Consider Alice who has visited ThirdLove.com, an online lingerie company, and added a few items to her shopping cart but abandoned the session without a

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purchase. Generally speaking, managers at ThirdLove have three options to consider in deciding whether and how to retarget Alice. First, ThirdLove could send Alice a retargeting ad that conveys the firm's awareness of her past cart activity at the website with a call-to-action reminder (see Figure 1a). Because exposure to the advertising may improve her top-of-mind awareness of ThirdLove, it could motivate her to revisit the website and potentially make a purchase. Second, ThirdLove could send Alice a retargeting promotion that includes advertising similar to the first scenario, together with a promotional benefit (see Figure 1b). If Alice abandoned her cart due to price concerns, a retargeting promotion may be more effective than retargeting adverting. Although the two examples differ from each other in terms of a promotional offer, both rely on leveraging Alice's past cart activity as a trigger for the firm to communicate with her in a personalized manner. Finally, ThirdLove could opt to do nothing, which is not an unreasonable course of action either for two reasons. Alice may potentially return of her own accord, thus rendering any retargeting unnecessary. Alternatively, Alice may be turned off by ThirdLove's retargeting, because the firm is monitoring her behavior.

Insert Figure 1 about here

What can we learn from the literature with respect to the retargeting dilemma the managers at ThirdLove face in the above example? The literature finds retargeting advertising is effective in increasing online store traffic (e.g., Lambrecht and Tucker 2013, Bleier and Eisenbeiss 2015, Hoban and Bucklin 2015, Sahni et al. 2019). Sahni et al. (2019) find the effects of retargeting advertising vary by the type of triggering behavior: retargeting on early-stage website visits using banner ads drives 14.6% more users to revisit the website, whereas retargeting advertising on late-stage cart abandonment increases website revisits by 5.4%. They also document that the impact of retargeting advertising on website revisits decreases as the time

since the consumer abandoned the website increases. Li et al. (2021) examine the timing of shopping-cart retargeting on an online retailer and report early retargeting ads (e.g., within one hour after cart abandonment) can have negative effects on purchases, whereas late retargeting ads (e.g., one to three days after cart abandonment) have positive effects. In practice, however, an upper bound for days since the triggering behavior is considered to be around 30 days (Instapage 2021). Lambrecht and Tucker (2013) find retargeting ads that reference consumers' past internet behavior may lift purchases but are less effective, on average, than generic ads.

Although the literature has provided important empirical evidence for retargeting advertising affecting website revisits, a dearth of work examines the retargeting dilemma in the example of Alice and ThirdLove.com along the following dimensions. First, a firm could retarget consumers with advertising only or with a promotion (with varying levels of offers) such that understanding how these options perform becomes managerially important. Second, the existing literature examines the effects of retargeting typically using a single outcome variable (e.g., website revisit or purchase) as opposed to multiple measures of consumer behavior along the purchase funnel (e.g., Shankar and Balasubramanian 2009, Seiler and Yao 2017). Third, retargeting is likely to yield heterogeneous treatment effects for subgroups of consumers and such differential effects may be moderated by previous online behaviors at the website (e.g., elapsed time since abandonment, characteristics of abandoned cart) and/or by past purchase patterns (e.g., RFM measures). Understanding these heterogeneous effects will be essential for managers to best design retargeting campaigns for different types of consumers. Finally, whether retargeting may have longer-term ramifications beyond the campaign itself is important to consider, because firms would not want consumers to game retargeting, especially if promotions are offered when certain triggering behaviors are observed (e.g., cart abandonment).

Our goal in this paper is to empirically explore the above four dimensions by designing and implementing a field experiment with an online retailer. The consumers chosen for this retargeting experiment all abandoned their online shopping carts prior to the experiment. Our experiment involved random assignment of these cart abandoners to retargeting and nonretargeting conditions to avoid selection effects that may artificially inflate the effects of retargeting. Our test conditions included both retargeting advertising (i.e., no promotions offered) and retargeting promotions to facilitate a head-to-head comparison. Importantly, we had two different levels of retargeting promotions: a base offer with a typical level of discount and a better offer with a more generous discount. This design allows us to investigate if and how the performance of retargeting promotions relative to retargeting advertising depends on the promotion depth. We also had a control group that did not receive any retargeting message. The online firm in this study was also able to pause customized campaigns to consumers involved in the study after the retargeting campaign to examine the longer-term effects as cleanly as possible. Finally, and importantly, the study tracked several measures of consumer behavior along the purchase funnel, including website revisit, search, and purchase behaviors as well as consumer activities related to online shopping carts at the individual level.

We find that retargeting ads had no effect on any measures along the purchase funnel relative to the no-retargeting control group. However, we do find treatment effects on website revisit for certain subgroups, such as those consumers who abandoned their cart longest ago prior to the experiment. These results speak to a "reminder" effect of retargeting ads for consumers who have taken a hiatus from online shopping. However, we find null effects on purchase for all of these subgroups, such that retargeting ads did not drive any incremental sales.

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Both retargeting promotions lifted the purchase rate relative to retargeting ads, but only the better promotion condition lifted online activity of consumers, such as website revisits and consumer search. Much of the change in consumer search was attributable to consumers browsing products they already had in their cart.

The lift in website revisits for retargeting with the better promotion was moderated by the elapsed time since cart abandonment in an inverse U-shaped relationship; specifically, those with a moderate amount of time since abandonment experienced a revisit lift, whereas those on either side of this "sweet spot" did not.

For both retargeting-promotion conditions, those who abandoned most recently and who had a concentrated cart (e.g., all items belonged to exactly one product category) exhibited higher purchase-rate lift. The difference between the two retargeting-promotion conditions is that the better promotion condition "lifts all boats" such that every subgroup experienced a purchase lift, whereas the ones described above had a higher lift. For the base promotion condition, only those subgroups described above had a significant lift at all in purchases. These findings point to consumers with a stronger purchase intent responding better to a retargeting promotion, as demonstrated by more recent abandonment or a more concentrated cart. We also find exploring heterogeneous treatment effects using prior cart characteristics yields greater insights than past purchase patterns.

Finally, we find in a two-week post-campaign period almost no differences between the groups in terms of website revisits and purchases. The only metric that differed was a reduction in items added to the cart in the post-campaign period for those retargeted with a better promotion. We interpret this result as the absence of a negative longer-term effect due to the retargeting campaign in our study.

The remainder of the paper is organized as follows. In section 2, we connect our study to the existing literature. In section 3, we describe the design of the field experiment. In section 4, we present the results of the experiment. We conclude in section 5 with a discussion of our findings and limitations of this research.

2. Relationship with Prior Literature

Our research connects and contributes to three literature streams in marketing. First, this paper is related to the recent stream of research on retargeting advertising. Because retargeting is commonly associated with online display ads that aim to increase website revisits, most of the research in this area uses randomized field experiments and reports the positive effect of retargeted display ads on consumer response (e.g., Lambrecht and Tucker 2013, Bleier and Eisenbeiss 2015, Hoban and Bucklin 2015, Johnson et al. 2017, Sahni et al. 2019). Sahni et al. (2019) examine the frequency and timing of retargeted ads and find retargeting advertising (with repeated exposure) to be effective in lifting website revisits. A few studies have examined the content of retargeting ads and documented that the effects of ad content vary by the stage of the consumer's decision-making journey (e.g., Lambrecht and Tucker 2013, Bleier and Eisenbeiss 2015). Whereas these studies focus on the efficacy and content of retargeting advertising on single measures (e.g., website revisits or purchase) during the campaign period, our research investigates the effects of retargeting advertising and promotions with varying levels of offers (relative to not retargeting consumers) on multiple measures along the purchase funnel for both treatment and post-treatment periods.

Second, our paper is related to an emerging literature that studies the effects of shoppingcart retargeting (e.g., Luo et al. 2019, Zhang et al. 2020, Li et al. 2021). Zhang et al. (2020)

examine the impact of retargeting promotions on a retailing platform featuring a multitude of sellers and buyers and find such promotions lift sales but create negative longer-term issues of consumers learning to "game" shopping-cart behavior to get more discounts. Li et al. (2021) study retargeting effects when the campaign occurs between 0.5 and 72 hours after cart abandonment and find sending retargeting ads too soon after cart abandonment can backfire in terms of sales lift. Our work complements this literature in that we explore a broader time range for retargeting effects from 4 to 28 days after cart abandonment. We also add to this literature by providing a more comprehensive assessment of retargeting in terms of the effects on the entire purchase funnel when both advertising and promotions are under consideration for retargeting campaigns.

We summarize our paper's relationship to the literature on retargeting advertising and shopping-cart retargeting in Table 1. The papers mentioned above vary by the trigger for retargeting, the type of advertising and promotion in retargeting, outcome measure, and evaluation horizon for the effects. As can be seen, our paper adds to the retargeting literature by considering both advertising and promotions with varying levels of offers, including a range of dependent variables across the purchase funnel from website revisit to purchase, and examining both the short-term and the longer-term effects of a retargeting campaign.

Insert Table 1 about here

Further, we also examine heterogeneous treatment effects based on previous cart and purchase behaviors. Jiang et al. (2021) and Villas-Boas and Yao (2021) show previous online behaviors can be important to improve retargeting performance. We contribute to this literature by providing empirical evidence of past cart activity as an important moderator for retargeting performance using data from a field experiment.

Finally, our paper is related to the literature on behavioral targeting that utilizes past purchase history. Empirical research in this area has used individual-level transaction data to study how to personalize marketing offers using targeted coupons and documents that past purchase characteristics are important to increase the effectiveness of various marketing activities (e.g., Rossi et al. 1996, Anderson and Simester 2004, Kumar and Shah 2004, Blattberg et al. 2008, Venkatesan and Farris 2012, Gopalakrishnan and Park 2021). Our paper differs from this stream of literature by investigating how firms can use past online behaviors (e.g., elapsed time since abandonment, characteristics of abandoned cart), instead of past purchases (e.g., RFM measures), to better retarget consumers with different types of retargeting approaches. Note that past online behavior (e.g., elapsed time since abandonment, characteristics of abandoned cart) deals with a more immediate objective and can induce the consumer to visit and potentially make a purchase given that the consumer has shown some form of recent interest. We also provide empirical evidence that past online behavior can moderate the longer-term effects of retargeting (e.g., Anderson and Simester 2004).

3. Field Experiment

3.1 Experiment Setting

We conducted a longitudinal field experiment in collaboration with an online retailer in Asia that prefers to remain anonymous. The retailer we collaborated with sells products and accessories across categories of personal care products. It is a large retail website and offers a wide assortment of brands and products, ranging from low-end to high-end goods at varying prices. The retailer spends a significant portion of its marketing budget on personalized marketing and retargeting offers. Therefore, we see this setting as appropriate to examine the effects of retargeting advertising and promotions on the purchase funnel.

Our primary criteria for the field experiment included (1) assigning consumers to retargeting groups using advertising and promotions to examine the effects of advertising and promotions in retargeting, (2) having a control group that does not receive any retargeting message to examine the efficacy of any type of retargeting, (3) assigning consumers randomly to avoid biases due to consumer selection, (4) controlling for other marketing efforts both during and beyond the campaign period to assess whether retargeting has any longer-term effects on consumer behavior, and (5) tracking several measures of consumer behavior along the purchase funnel, including consumer actions related to online shopping carts at the individual level. These criteria were fulfilled with our partner retailer, which executed retargeting campaigns on its website and was able to personalize retargeting communications as outlined above.

Retargeting involves delivering reminder messages to consumers based on their previous online behavior. They include content relating to the websites that consumers have visited and products they have viewed. As described previously, popular triggering behaviors for retargeting include previous website visits or shopping cart creations and abandonments. For our study, we chose consumers who created their shopping carts but abandoned them without making a purchase. The reasons for choosing this triggering behavior are twofold. First, website visits typically involve retargeting display ads, because one of the primary goals is to get visitors to return to the website rather than purchase conversion per se. As such, online firms may prefer to avoid allocating their marketing resources to promotional offers to consumers who have only visited the website. Second, because consumers who abandoned their shopping carts indicate

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greater purchase interest, they may provide sufficient statistical power to find the effects of retargeting for consumers along the purchase funnel (e.g., Sahni et al. 2019).

Because the primary objective of the study is to measure the causal effects of retargeting advertising and promotions among cart abandoners on an online retailer, an important consideration is when to retarget them, that is, how long after cart abandonment a consumer may be a fruitful retargeting prospect. A firm that retargets too soon might run the risk that the consumer was still keeping the products under consideration and would have returned of her own accord, whereas a firm that waits too long may risk the consumer already having lost interest in the products, effectively abandoning her cart permanently. Li et al. (2021) examine sending retargeting messages ranging from 0.5 to 72 hours after cart abandonment and suggest retargeting too early (e.g., within one hour after cart abandonment) can annoy consumers and backfire. In discussion with our partner firm, we chose four days as the lower bound on the time elapsed since cart abandonment to allow consumers enough time to return to the website on their own and make the purchase without retargeting. We also decided to explore a broader upper bound than previous studies to examine if retargeting can still have an impact on consumers who abandoned their carts further back in time. We chose 28 days after cart abandonment as this upper limit. That is, consumers in our study have a common triggering behavior of abandoning their carts between four and 28 days prior to the experiment. Because the default upper bound for when a visitor gets added to a retargeting list is set to 30 days in both Google AdWords and Facebook, our choice for a broader range of retargeting timing allows us to investigate boundary conditions for the efficacy of retargeting. It is also conservative for the retail partner because it helps us to avoid the probable annoyance of consumers if retargeted too soon and to explore possible incremental sales through retargeting from those consumers who had abandoned their

cart some time ago. More importantly, it allows us to examine potential moderators through triggering behaviors for the effects of retargeting, because selected consumers differed in terms of their past behaviors related to shopping carts, such as the timing of cart abandonment and the characteristics of abandoned carts.

Our experiment featured an advertising message with/without promotional offers in retargeting consumers. In collaboration with the focal retailer, we chose a price promotion of the type "\$X off for purchases of \$Y or more" for this experiment (e.g., Lee and Ariely 2006). Specifically, the minimum purchase amount to qualify for the retargeting offer was \$20, which was chosen based on the average purchase amount (about \$30) over a period of six months prior to the experiment.¹ We designed the two promotion conditions to offer \$3 off (base offer) and \$6 off (better offer), respectively, where the base offer was a price promotion at a level typically used by the firm in the past. Importantly, whereas consumers were retargeted on the basis of their shopping-cart behaviors prior to the experiment, these retargeting promotions were not exclusive to those products in their shopping carts prior to the experiment. As is common in online retailing, a consumer could select other products in response to retargeting and still get the discount if they met the minimum purchase amount.

3.2 Experiment Design

From the sampling frame described above, we obtained a sample of 14,506 consumers who were randomly assigned to one of four conditions for the retargeting experiment. Figure 2 shows the design of the study and the type of retargeting advertising and promotions across conditions. The first two treatment groups received the retargeting offers: the better-benefit condition (T1) and the base-benefit condition (T2) who were retargeted with offers for purchases of \$20 or higher.

¹ All transactions were recorded in the currency of the country in which the headquarters of the company were located. We converted purchase amount to U.S. dollars using the average exchange rate over the data period.

We also included a third test condition (T3) in which the consumers were exposed to retargeting advertising but excluding any financial offer. The remaining content of the retargeting advertising message was consistent across T1, T2, and T3 to avoid confounds. In addition, we had a control group (CG) that was not retargeted and did not receive any messages. Therefore, our experimental design enables us to identify the causal effects of retargeting advertising and promotions (relative to not retargeting consumers) on consumer behavior and examine how the effects vary by the discount levels in retargeting.

Insert Figure 2 about here

We assigned about 60% of the consumers to the test conditions with promotional offers (T1 and T2), each with an approximately similar number of consumers, and the remaining to the test condition without any offers (T3) and control condition (CG). We randomized all assignments to avoid any bias in selecting participating consumers.

We note that designing a large-scale field experiment in the course of commercial operations at a large firm requires compromise to maximize the value of the field experiment subject to the constraints of the firm's requirements and preferences. We proceeded to implement the experiment because the design was adequate to address our research questions.

3.3 Implementation

The firm contacted all consumers in the test conditions on the same day at the same time via their mobile phones in the summer of 2020 for a retargeting campaign spanning three days. The retargeting message was delivered via mobile SMS and included an encouragement to continue shopping, by reminding the consumer of the products left in the shopping cart prior to the experiment. As an example, the message sent to a consumer in one of the test conditions conveyed the following (translated to English): "We just think that you could be interested in

(item in shopping cart). ... \$3 off with a purchase of \$20 or more." As described earlier, these retargeting promotions were not exclusive to products left in shopping carts prior to the experiment (e.g., Zhang et al. 2020), which could lead to consumer purchases of products beyond those in the shopping carts.

The retargeting promotions were made available to consumers when they shopped (e.g., Andrews et al. 2016). The retargeting advertising (e.g., content, creative) was the same between the three test groups. We controlled for other marketing efforts during the treatment period, because no consumers included in the study were exposed to any other customized marketing and retargeting communications. Moreover, we controlled for customized marketing efforts for a period of two weeks beyond the treatment period to examine the longer-term effect of retargeting advertising and promotions on consumer behavior.² Although other store-wide mass promotions were available to all consumers in the study, the absence of any additional communications about other financial offers to any consumer and the absence of any differential exposure to mass promotions across consumers upon website visit ensure we do not have concerns about the potential interplay of mass promotions with the focal retargeting offers when assessing the postcampaign longer-term effects in the study.

The time window for the data was six months before the experiment, three days for the retargeting experiment, and two weeks for the post-campaign period. Note the consumers in the study had a triggering behavior of abandoning their carts between four and 28 days prior to the experiment. The data consist of three parts: transaction data of consumer purchase behavior, clickstream data of consumer activity, and demographics (e.g., age, gender). The transaction data

 $^{^{2}}$ Although a longer period may be desirable to measure the post-treatment effects in greater depth, our partner firm was only able to pause customized marketing efforts for 14 days as the post-campaign period. We believe this period still provides a reasonable window to study the post-campaign effects of retargeting, because the consumers in the study visited the website once every 15 days, on average, in the six months prior to the experiment.

contain detailed information on each purchase made by a consumer, that is, when a consumer purchased a product and how much she paid for it. These data also include information on the categories of products purchased. We also obtained clickstream data that contain detailed information on each visit to the website and search activity upon visit, that is, when a consumer visited the website and which product pages she viewed. Moreover, they include detailed individual-level information about when a product was added to a shopping cart or removed from the cart, and when the cart was abandoned. Using these micro-level data, we constructed a set of measures associated with consumer purchase and online activity.

4. Results

We begin by presenting randomization checks in Table 2 that we captured for a period of six months prior to the experiment. We included five measures related to online activity: (1) number of website visits by consumers (website visits), (2) number of product pages viewed by consumers (product pages viewed), (3) elapsed time (days) since cart abandonment (recency in cart), (4) number of (unique) products in the cart (products in cart), and (5) number of (unique) product categories in the cart (categories in cart).³ We constructed the first two measures to capture early-stage consumer activity in the purchase funnel, and the next three to reflect late-stage consumer activity in the purchase funnel. Note that because consumers may have had multiple interactions with their shopping cart in the pretest period, the three measures related to cart abandonment correspond to a snapshot of the cart abandoned just prior to the experiment, which was used for retargeting. On average, a consumer visited the retailer's website about 12 times and viewed about three product pages per visit over the pretest six-month period. A

³ Individual order-level data included item descriptions that were classified into five product categories that reflect the major verticals carried by the firm on the website.

consumer had almost six unpurchased items in the shopping cart from a little under two product categories, with the last cart abandonment occurring about 18 days ago.

We also constructed three measures related to consumer purchase behavior: (1) elapsed time (days) since the last purchase (recency) among consumers who had made at least one purchase in the pretest period, (2) purchase amount (monetary value) in the pretest six-month period, and (3) proportion of non-buyers in the pretest period (about 56% of consumers in each group were non-buyers). On average, a consumer who made at least one purchase in the pretest period did so about two months prior to the experiment. The average spend in the pretest period was about \$30. Table 2 demonstrates the face validity of our randomization, because all measures of online activity and purchase behavior in the pretest period were not statistically different across the conditions. We note that all consumers, whether buyers or non-buyers in the pretest period, exhibited cart abandonment prior to the experiment that qualified them to be in the sample.

Insert Table 2 about here

The rest of the section is organized as follows. In section 4.1, we examine the performance of retargeting advertising (relative to non-retargeting) to establish a baseline for the analysis. In section 4.2, we examine how retargeting promotions may differ from retargeting advertising. Both sections explore the effects of retargeting on the purchase funnel during the treatment period. In section 4.3, we consider longer-term effects of retargeting, by examining consumer response in the post-treatment period. In each subsection, we first present average treatment effects and then heterogeneous treatment effects using past cart and purchase behaviors as possible moderators. In the tables, we report absolute lift (difference between treatment and

the appropriate baseline condition), and in the main text, we discuss relative lift (absolute lift divided by baseline measure) to provide more intuition for the magnitude of change.

4.1 Effects of Retargeting Advertising

We begin with an analysis of retargeting advertising (T3) compared with the no-retargeting control group (CG). Our goal in this section is to present how retargeting advertising affects the purchase funnel from website revisit, search, and purchase as well as cart-related activities during the campaign period. We report the results in Tables 3a and 3b.

Insert Tables 3a and 3b about here

In examining the effects of retargeting advertising on purchase behavior during the campaign period, we constructed multiple dependent measures (e.g., Sahni et al. 2017): (1) proportion of consumers who made any purchase (purchase rate) and (2) proportion of consumers who purchased at least one item in the abandoned cart (purchase rate among cart items). In addition, we computed (3) average revenue per consumer (ARPC) and (4) average revenue per buyer (ARPB) for each condition.

We also examine the effects of retargeting advertising on online activity: (1) proportion of consumers who revisited the website (website revisit), (2) product pages viewed, (3) product pages viewed among items in the abandoned cart, (4) number of products added to shopping cart, and (5) number of products removed from the shopping cart. The last three measures reflect how consumers engaged with the online shopping cart during the campaign period.

From Table 3a, we see retargeting advertising (T3), on average, provided no significant lift in purchase and revenue compared with CG. Further, we find no significant difference in the proportion of consumers buying any item from the abandoned cart. Perhaps surprisingly (see Table 3b), retargeting advertising, on average, also did not affect other measures of online activity, for example, website revisit, product search, or cart activity (additions and deletions). Because website revisits are a frequently reported metric in the literature (see Table 1), our null result at first glance contrasts with other work that reports positive effects on website revisits from retargeting advertising.

Sahni et al. (2019) find the lift in website revisits with retargeting ads is lower among cart abandoners (5.4% lift) than website visitors (14.6% lift) in the context of home-improvement products over a period of four weeks. In our setting, the sample was drawn from cart abandoners, and we examine consumer behaviors over a period of three days during the campaign period, which is a shorter duration. Moreover, our retargeting ad was delivered only once to consumers via their mobile devices, and no repeated ad exposures occurred, as is typically the case in banner ads in the literature. Further, because retargeting advertising in our study featured an item from the abandoned shopping cart, our results are related to the findings in Lambrecht and Tucker (2013) that a retargeting ad featuring information related to a product the consumer has browsed may be less effective than a generic one. Additionally, Bleier and Eisenbeiss (2015) report that personalized retargeting ads lose effectiveness as the time elapsed since the consumer's previous visit increases.

Considering these perspectives, our results suggest consumers who have abandoned the cart at the late stage of the purchase funnel were not as likely to be swayed simply by a retargeting ad that restates the products that they have already considered but not purchased. On the other hand, consumers who left the website at an earlier stage of the purchase funnel, as reported in the literature, may be reminded to revisit with repeated banner ads (e.g., Hoban and Bucklin 2015). As such, our result is complementary to prior findings and suggests retargeting campaigns using late-stage triggering behaviors may require more than an ad exposure.

4.1.1 Effects of Retargeting Advertising by Past Cart Characteristics

We explore potential heterogeneous treatment effects of retargeting advertising, though the treatment effects, on average, have a null result. We use the three measures described in the randomization checks relating to the snapshot of the consumer's cart just prior to the experiment: (1) recency in cart, (2) products in cart, and (3) categories in cart. The first two are similar in spirit to the moderators used by Li et al. (2020), and the third is a novel one in which we utilized product classification information in our data.

Cart recency is a measure of consumer interest and can be important due to potential nonlinearity in how consumers respond to retargeting as a function of elapsed time since cart abandonment. The number of products in the abandoned cart can be indicative of how extensively the consumer shortlisted items for potential interest and purchase. A consumer who has a larger number of products in her cart, all else being equal, may be expected to have more interest in the firm's offerings. Finally, the number of product categories in the abandoned cart can reflect the concentration of consumer interest across product categories. The consumer may either be concentrated on a single category in which multiple products have been shortlisted or may have added items across a wide range of categories. These three measures of past cart characteristics based on triggering behaviors for retargeting, put together, are the most salient ones for empirical exploration of the heterogeneity in the treatment effects across consumers.

We focus on website revisits and purchases as the main dependent variables to explore the heterogeneity of the treatment effects and report the results in Figures 3a and 3b.⁴ We find that although the characteristics of abandoned carts in terms of the number of products and categories did not moderate website revisits, recency in cart did have an effect for those

⁴ Web Appendix A provides detailed results in tabular form.

consumers who abandoned their cart more than two weeks prior to the experiment. This subgroup, which abandoned the cart longest ago in our study, had a 22% lift in website revisits relative to the no-retargeting control group. This finding is suggestive of a "reminder" effect of retargeting advertising for these consumers. However, all subgroups under cart recency and cart size in terms of the number of products and categories had null effects for purchase lift.

Insert Figures 3a and 3b about here

4.1.2 Effects of Retargeting Advertising by Past Purchase Characteristics

We next use past purchase patterns to understand the heterogeneity of the treatment effects because past purchase characteristics have been shown to be valuable in increasing the effectiveness of various marketing activities (e.g., Rossi et al. 1996, Kumar and Shah 2004, Blattberg et al. 2008). We use purchase recency and monetary value in the pretest period. Note our data enable this analysis, because we captured a six-month window of past purchase behaviors by consumers prior to the experiment. This is often not available in retargeting experiments because the target population may consist of first-time website visitors with no previous purchase history. As such, we empirically explore how these variables related to past purchase patterns may differentially drive both website revisits and purchases during the campaign period. In this analysis, we divide consumers (for those consumers with at least one purchase in the pretest period) into three subgroups (approximately corresponding to terciles for the measure across the consumers in the experiment) for each of these variables and compute heterogeneous treatment effects to understand how retargeting performance varies across consumers.⁵

⁵ We also analyzed treatment effects for consumers with no purchases in the pretest period and find null results for both revisit and purchase.

As shown in Figure 4a for purchase recency, the first subgroup includes those who purchased within three weeks of the experiment start date; the second subgroup includes those who purchased within three to 10 weeks; the final subgroup includes those who purchased over 10 weeks ago. As shown in Figure 4b for monetary value, the first subgroup had a monetary spend of \$25 or less in the pretest period; the second subgroup had a spend of between \$25 and \$60; the third subgroup spent over \$60.⁶

Insert Figures 4a and 4b about here

We find some heterogeneous effects for website revisits among consumers who were less active in the past. Specifically, the consumers with the lowest monetary value had a significant lift in revisit of about 52%, whereas the consumers with a moderate recency had a lift in revisit of about 41%. These results are consistent with the retargeting ad serving as a reminder for less active buyers to return to the website. However, we find no lift for any of these subgroups for purchase behavior.

4.1.3 Summary of the Effects of Retargeting Advertising

We find retargeting advertising (T3) had no effect on website revisits, search, or purchases relative to the no-retargeting control group (CG). We do find treatment effects on website revisits among less active consumers, such as those with more distant abandonment and those with the lowest monetary value in the pretest period. These results speak to a "reminder" effect of retargeting ads for consumers who have taken a hiatus from online shopping. Those who had abandoned their cart more recently or spent more in the past were seemingly not swayed by a retargeting ad. However, we find null effects on purchase behavior for all of these subgroups,

⁶ Web Appendix A provides detailed results in tabular form.

such that retargeting advertising (relative to not retargeting) did not drive any incremental sales among cart abandoners.

4.2 Retargeting Promotions

In this section, we examine the retargeting promotions (T1 and T2) compared with the retargeting advertising (T3). Because the retargeting conditions with promotional offers contain financial benefits but also the same verbiage as the retargeting advertising, the advertising condition (T3) is the appropriate "baseline" group for the retargeting promotions. On the other hand, the control group of no-retargeting (CG) has two points of difference from T1 and T2: it faced no promotional offers and no retargeting communication. Thus, we compare T1 and T2 with T3 as the baseline, and the analysis aims to uncover if retargeting promotions affected consumer behavior over and above retargeting advertising. The measures reported in this section are the same as those presented in section 4.1.

We report the results on purchase and online activity measures in Tables 4a and 4b. Both retargeting promotions lifted the purchase rate compared with a retargeting ad. T2 (the one with a base offer) lifted the purchase rate by 56% and T1 (the one with a better offer) by 155%. Additionally, T1 significantly outperformed T2 in terms of the purchase rate. On the other hand, ARPC was lifted only for T1 and not T2. ARPB was not statistically different across the conditions. Importantly, we find that over 70% of the purchase-rate lift in both T1 and T2 came from consumer purchase of existing cart items prior to the experiment (by dividing lift in purchase among cart items by overall purchase lift). These results indicate retargeting promotions were more effective than retargeting advertising in driving consumer purchases during the campaign period.

Insert Tables 4a and 4b about here

Several reasons could be behind the lift in consumer purchase. First, retargeting promotions may increase consumer purchases by driving more traffic to the online store, which has been described as an "advertising" effect in the promotions literature (e.g., Venkatesan and Farris 2012, Sahni et al. 2017, Gopalakrishnan and Park 2021). Second, they may serve to effectively engage in search and consideration of the products in the shopping cart. Finally, they may affect purchase conversion due to the financial benefits provided by the promotion in retargeting, which effectively acts as a price discount.

In Table 4b, we closely examine several measures of online activity to parse out which of the above may be at work in lifting the purchase rate. We observe a lift of 17% in the revisit rate for T1 compared with T3, whereas T2 is not significantly different from T3. Noting that our retargeting campaign was a one-time communication through mobile devices, a 17% lift in the revisit rate for retargeting with the better promotion is substantial. It also suggests that for cart abandoners, sending a retargeting advertisement (T3) or a retargeting promotion with a typical offer (T2) did not move the needle to revisit the website in our setting.

We also find only T1 increased the number of product pages viewed (67% lift) compared with T3. When we examine the number of product pages among items in the consumer's abandoned cart prior to the experiment, we find a more substantial lift for T1 (129% lift) and a lift for T2 as well (50% lift). This finding suggests retargeting promotions increased online activity by driving consumers to re-engage with the products already in their cart rather than through searching for other non-cart products available on the website. In the case of T1, overall online activity improved, whereas for T2, more cart-based activity occurred at the expense of other products. Consumers also were more active in adding items to the cart and removing items from their shopping cart under T1 than under T3. However, cart activity under T2 did not change

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during the campaign period. These results provide empirical evidence that the retargeting promotions influenced consumers to re-engage with their existing cart items.

We also note the purchase conversion (percentage of revisits who made a purchase) increased going from T3 (7.2%) to T2 (10.6%) to T1 (15.7%), demonstrating the role of the promotions in the retargeting campaign in driving more purchases among cart abandoners.

Overall, retargeting with the better promotion (T1) lifted ARPC, purchases, revisits, page views, cart activities, and purchase conversions relative to retargeting advertising (T3). The extent of promotional offers made a substantial difference as retargeting with the base promotion (T2) generated a much more modest effect on multiple measures of consumer purchase and online activity, while not affecting website revisits or ARPC.

4.2.1 Effects of Retargeting Promotions by Past Cart Characteristics

We explore potential heterogeneous treatment effects of retargeting promotions using the same three cart-activity measures as in section 4.1.1: recency in cart, products in cart, and categories in cart. Figures 5a and 5b break down the revisit and purchase rates, respectively, as a function of these variables.⁷

Insert Figures 5a and 5b about here

We find no heterogeneous effects from past cart activity on revisits for T2, suggesting none of the purchase lift for T2 arose from increased revisits for certain subgroups of consumers. For T1, by contrast, we find significant lift in website revisits for those with a moderate recency in cart (one to two weeks since cart abandonment), but not for earlier or later abandonment. Our results suggest a possible "sweet spot" for when to retarget consumers to stimulate website revisits but only for an attractive-enough promotion that accompanies this message. With a

⁷ Web Appendix B provides detailed results in tabular form.

broader range for retargeting timing in our field experiment than prior research (e.g., Li et al. 2021), we provide empirical evidence of an "inverse U-shaped" relationship as a function of elapsed time since cart abandonment, which provides an expanded view of how timing affects retargeting performance.

We find heterogeneous treatment effects from past cart activity on purchases for T2. Noting the average purchase lift for T2 was 56%, the purchase lift for those who abandoned their cart less than or equal to one week ago was 132%. Further, the lift for those with a large number of products in their cart (five or more) was 61%. Those with a concentrated cart (i.e., only one category of products in their cart) had a lift of 151% in purchases. Other subgroups did not have a significant effect on purchases from T2. Therefore, the average effect on consumer purchase in T2 stemmed from a fairly heterogeneous set of effects.

These results shed some light on what type of consumers responded to T2. Those who more recently abandoned their cart (one week or less) were more likely to still be considering the items in the cart. Those with a concentrated cart in which all items belonged to the same category may have had a greater purchase intention. Further, those with a large number of items in their cart may have had more opportunities to make use of the retargeting promotion. Overall, with T2 providing a base promotion, our results suggest only those already strongly considering buying from our partner retailer had been persuaded to make a purchase.

For T1, we generally find purchase lift for all subgroups of recency in cart, products in cart, and categories in cart. This finding suggests a broader range of consumers were persuaded to make a purchase when retargeted with the better promotion. However, the effect size varies as a function of each of these variables. For cart recency, those with more recent (one week or less) or distant (more than two weeks) abandonment had a higher purchase lift of 190% and 151%,

respectively. Those with a moderate cart recency (one to two weeks) still made a significant purchase but of lower magnitude with a 117% lift. This result stands in contrast to the finding for T1 on revisit, in which only the moderate cart recency subgroup had a revisit lift. For products in cart, we find the lift was highest for the subgroup with a moderate number of items (three to four products), with a lift of 363%. Those with a lower or higher number of products in cart had a lift of around 130%. For categories in cart, the lift was highest for those with a concentrated cart (one category only)—with a lift of 304%. Those with a less concentrated cart still had a lift in the range of 113% to 131%.

Together, the patterns of results share some similarity with T2 for purchase-rate lift, but with stronger effects across the board. Consumers who recently abandoned their cart, those with a moderate number of items (three to four) in cart, and those with a concentrated cart had the highest purchase lift from T1, and these cart-level characteristics point to those with a greater purchase intention. However, T1 did generate lift even for those with a potentially lower purchase intention, due to the higher financial benefit.

4.2.2 Effects of Retargeting Promotions by Past Purchase Characteristics

We next explore potential heterogeneous treatment effects of retargeting promotions using the same measures as in section 4.1.2: recency in purchase and monetary value. Figures 6a and 6b break down the revisit and purchase rates, respectively, as a function of these variables.

Insert Figures 6a and 6b about here

We find null results for heterogeneous effects on revisits on the basis of purchase recency. However, T1 lifted revisits for those with a past monetary spend of greater than \$60 or no spend at all.⁸

⁸ Web Appendix B provides detailed results in tabular form.

We find some heterogeneous effects on purchase with recency and monetary value. For T2, those with the most distant recency (i.e., purchase was longest ago) or no spend at all in the pretest period had a significant purchase lift. Thus, less active consumers seemed to be persuaded to return and make a purchase under T2. For T1, we find similar results in that consumers with the worst recency or no pretest spend had a significant purchase lift. The difference between T1 and T2 is that all terciles of monetary spend also had a significant purchase lift under T1 (but not under T2).

Our results suggest that although past purchase patterns have been an important moderator of various marketing activities (e.g., Rossi et al. 1996, Kumar and Shah 2004, Blattberg et al. 2008), they may be less appropriate in understanding retargeting performance relative to past cart behaviors leading up to retargeting.

4.2.3 Summary of the Effects of Retargeting Promotions

Both retargeting promotions (T1 and T2) lifted the purchase rate relative to retargeting ads (T3), but only T1 (the one with a better offer) also lifted online activity of consumers, such as revisits and product pages viewed. Much of the change in product pages viewed was attributable to consumers viewing products they already had in their cart. Additionally, over 70% of purchase lift was due to consumers buying products already in their cart.

Revisit-rate lift for T1 is moderated by the elapsed time since cart abandonment in an inverse U-shaped relationship; specifically, those with a moderate amount of time since abandonment experienced a revisit lift, whereas those on either side of this "sweet spot" did not.

For both T1 and T2, those who abandoned most recently (one week or less ago) and who had a concentrated cart (with exactly one product category all items belonged to) exhibited higher purchase-rate lift. Those with the largest number of products in the cart (five or more) also exhibited higher purchase lift under T2. The difference between T1 and T2 is that T1 "lifts all boats" such that every subgroup experienced a purchase lift, whereas the ones described above had a higher lift. For T2, only those subgroups described above had a significant lift at all in purchases. These findings point to consumers with a stronger purchase intent benefiting more from a retargeting promotion, as demonstrated by more recent abandonment or a more concentrated cart. We also find that heterogeneous treatment effects based on past purchase patterns are overall less informative than using past cart behavior.

4.3 Longer-Term Effects of Retargeting

In this section, we examine longer-term ramifications beyond the campaign period. Because retargeting promotions are offered in response to certain triggering behaviors (e.g., cart abandonment), the firm would not want to inadvertently motivate consumers to game how they receive offers. Toward this end, for two weeks after the retargeting campaign, our partner firm paused customized communications to all consumers involved in our experiment. We note the average inter-visit time to the website among consumers in the six-month period before the experiment is about 15 days (roughly two weeks). This two-week pause allows us to examine an "intent-to-treat" analysis of how exposure to a retargeting message may affect consumer behavior beyond the campaign period. One possibility, described in Zhang et al. (2020), is that consumers learn the firm is monitoring their cart activity and become strategic in adding items to their cart without purchase in the hope of receiving additional promotions. This type of gaming may especially affect the retargeting conditions with promotion (T1 and T2), because retargeting advertising (T3) did not include any promotional offers. We begin with the average treatment effects in the two-week post-campaign period and then examine any heterogeneous effects on the basis of past cart or purchase characteristics.

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In Tables 5a and 5b, we show visit, search, and purchase measures for each group in the post-campaign period. For the most part, the measures are not statistically different. The only measure in which the groups differed is the number of items added to shopping cart. T1 had fewer cart additions than T2 or CG, suggesting consumers in the retargeting condition with the better offer were less inclined to add items to shopping cart. This finding is the opposite of Zhang et al.'s (2020)—rather than strategic behavior of adding items to the shopping cart, we observed a slight drop-off for T1, perhaps due to the higher purchase rate during the campaign period. Similar to Zhang et al. (2020), we also constructed a cart-to-view ratio (dividing cart additions by the number of products viewed) and did not find significant differences across groups. From this perspective, we find no evidence of negative consequences from retargeting in our setting.

Insert Tables 5a and 5b about here

That the other measures had null effects also suggests consumers continued to revisit, search, and make purchases at roughly the same rate in the post-campaign period, regardless of the conditions they were assigned to. Although these results could of course be different if examined over a longer post-campaign period, we suggest the likelier explanation is that the impact of retargeting may dissipate the longer the time since the campaign.

We now consider if the longer-term effects of retargeting are moderated by past cart characteristics (as we did for the effects during the campaign period). Importantly, these cart characteristics are the same ones used earlier and are based on pre-campaign cart patterns. We find null effects for revisit lift across all measures of pretest cart characteristics. In Figure 7, we report the longer-term effects on consumer purchase by past cart activity.⁹ We find the subgroup

⁹ Web Appendix C provides detailed results in tabular form.

with the fewest cart items (one to two products) had a significantly lower purchase rate under T1 than under T2 or T3. That is, those retargeted with the better promotion and who had only one or two items in their cart before the campaign slowed down their purchases in the post-campaign period. This observation is consistent with an intertemporal substitution effect (e.g., Neslin et al. 1985) in which these consumers, having had an uptick in purchases during the campaign period, compensated with less purchase activity in the period afterwards. We note other subgroups did not exhibit the same type of intertemporal substitution effect. Additionally, we find no evidence for moderation by cart recency or cart categories on consumer purchase in the post-campaign period.

Insert Figure 7 about here

We do not find any moderation of longer-term effects on either revisit or purchase behavior by past purchase characteristics (i.e., purchase recency and monetary value in the pretest period).

5. Conclusions

In this study, we provide a comprehensive assessment of the effects of retargeting advertising and promotions on consumer behavior throughout the purchase funnel, from website revisits to purchase. We do so with a retargeting campaign that is triggered for consumers of our partner firm that abandoned their shopping cart without a purchase between four and 28 days prior to our experiment. In addition, by observing consumer data for the six months prior to the experiment, we identify both online cart behaviors and past purchase behaviors that could moderate treatment effects. Finally, we examine the longer-term effects of retargeting for a two-week period after the experiment. We find a null result for the effect of retargeting ads on the purchase funnel. This result fills a gap in the literature relating to early-stage versus late-stage trigger behaviors for retargeting. Much of the prior work on retargeting is based on consumers exiting after a website visit or product-page viewing, but limited research has examined the impact of retargeting among consumers who abandoned their shopping cart. Sahni et al. (2019), who study retargeting ads with repeated exposures in the context of home-improvement products over a period of four weeks, show a smaller but positive effect of retargeting ads for cart abandoners with a lift of 5.4% in website revisits (as opposed to a 14.6% lift for website visitors who exit). Li et al. (2021) find the effect of retargeting advertising depends on the timing of retargeting when the campaign occurs between 0.5 and 72 hours after cart abandonment. Our result suggests retargeting ads among cart abandoners may be less effective in driving behavioral changes when a broader time range is considered for retargeting.

Retargeting promotions lifted the purchase rate relative to retargeting ads. However, only retargeting with the better promotion increased online activity, for example, website revisits and search activity. Increased search was primarily due to consumers viewing pages of products they already had in the cart. In this sense, retargeting with the better promotion delivered lift across the purchase funnel. Over 70% of the purchase lift in both retargeting promotion conditions was due to consumers buying products already in their cart.

Our study provides novel evidence for the effect on website revisit from retargeting with the better promotion. We further find this revisit lift to be moderated by elapsed time since cart abandonment in an inverse U-shaped relationship. Consumers with a moderate amount of time since cart abandonment experienced a revisit lift, whereas others who abandoned more recently or longer ago did not. For both retargeting promotions, those who abandoned more recently and who had a concentrated cart exhibited higher purchase-rate lift. The difference between the two retargeting-promotion conditions is that the better promotion "lifts all boats" such that every subgroup experienced a purchase lift, whereas the ones described above had a higher lift. For the base promotion, only those subgroups described above had a significant lift at all in purchases. These findings point to consumers with a stronger purchase intent benefiting more from a retargeting promotion, as demonstrated by more recent abandonment or a more concentrated cart. Perhaps surprisingly, we also find that heterogeneous effects based on past purchase patterns (e.g., recency and monetary value) are overall less informative than using past cart behaviors.

Our findings suggest practitioners can focus on those consumers with the stronger purchase intent, as demonstrated by their past cart behaviors, and offer them appropriate promotions to stimulate purchase. Optimizing promotion offers was not part of our study; however, further work should examine how to balance promotions to obtain sales lift without sacrificing excessive margin.

Our study did not find negative lingering effects of retargeting in the post-campaign period, unlike Zhang et al. (2020), who found retargeting promotions taught consumers to become more strategic in adding items to the cart in the hope of future offers. One point of difference between our study and Zhang et al.'s is that their work is based on an online platform with a large number of sellers making their retargeting decisions, whereas our setting involves a single e-commerce firm that controls its marketing decisions. Because retargeting with the better promotion results in higher website revisits, search, and purchases than our other conditions during the experiment, we find in the post-campaign period that those in this condition added

significantly fewer items to their cart and also had a lower purchase rate (though not statistically significant).

5.1 Limitations and Future Work

We acknowledge a number of limitations that lend themselves to future research. First, in our experiment, we manipulated whether retargeting involved an ad or a promotion but did not change the content of the message beyond the presence or absence of a promotional offer. Additional dimensions could impact retargeting's treatment effects, such as the ad content (e.g., informative vs. persuasive) and the level of personalization (e.g., Lambrecht and Tucker 2013, Bleier and Eisenbeiss 2015). These possible dimensions could be fruitful directions for future research in retargeting.

Second, our experiment focused on retargeting based on cart abandonment, which is a late-stage behavior in the purchase funnel. That is, a consumer has gone as far as to add a product to their shopping cart. Although our primary motivation for using cart abandonment as the trigger was to make the use of promotions in retargeting managerially relevant and viable, replicating our experiment design for early-stage triggers such as website visit without a purchase (i.e., without having cart activity) would be valuable. Treatment effects may differ for early-stage triggers, because consumers may not have invested much in searching and considering products.

Finally, we note our findings are based on a single firm and a single retargeting campaign. To generalize findings on retargeting performance, our experiment can be replicated across a variety of firms and industries, and we hope our design is useful for researchers and practitioners to do so.

References

Anderson, Eric T. and Duncan I. Simester (2004), "Long-Run Effects of Promotion Depth on New Versus Established Customers: Three Field Studies," *Marketing Science*, 23 (1), 4-20.

Andrews, Michelle, Jody Goehring, Sam Hui, Joseph Pancras, and Lance Thornswood (2016), "Mobile Promotions: A Framework and Research Priorities," *Journal of Interactive Marketing*, 34, 15-24.

Bleier, Alexander and Maik Eisenbeiss (2015), "Personalized Online Advertising Effectiveness: The Interplay of What, When, and Where," *Marketing Science*, 34 (5), 669-688.

Forbes (2020), "What is Retargeting and Why is it Important?," (May 20), <u>https://www.forbes.com/sites/forbesagencycouncil/2020/05/20/what-is-retargeting-and-why-is-it-important</u>.

Gopalakrishnan, Arun and Young-Hoon Park (2021), "The Impact of Coupons on the Visit-to-Purchase Funnel, *Marketing Science*, 40 (1), 48-61.

Growcode (2021), "12 Ecommerce Conversion Rate Statistics," (Jan. 21), https://www.growcode.com/blog/ecommerce-conversion-rate/.

Hoban, Paul R. and Randolph E. Bucklin RE (2015), "Effects of Internet Display Advertising in the Purchase Funnel: Model-Based Insights from a Randomized Field Experiment," *Journal of Marketing Research*, 52 (3), 375-393.

Instapage (2021), "Retargeting 101: Everything You Need to Achieve Greater ROI," (May 21) <u>https://instapage.com/blog/what-is-retargeting</u>.

Jiang, Zhenling, Tat Chan, Hai Che, and Youwei Wang (2021), "Consumer Search and Purchase: An Empirical Investigation of Retargeting Based on Consumer Online Behaviors," *Marketing Science*, 40 (2), 219-240.

Johnson, Garrett A., Randall A. Lewis, and Elmar I. Nubbemeyer (2017), "Ghost Ads: Improving the Economics of Measuring Online Ad Effectiveness," *Journal of Marketing Research*, 54 (6), 867-884.

Kumar, V. and Denish Shah (2004), "Building and Sustaining Profitable Customer Loyalty for the 21st Century," *Journal of Retailing*, 80 (4), 317-330.

Lambrecht, Anja and Catherine Tucker (2013), "When Does Retargeting Work? Information Specificity in Online Advertising," *Journal of Marketing Research*, 50 (5), 561-576.

Lee, Leonard and Dan Ariely (2006), "Shopping Goals, Goal Concreteness, and Conditional Promotions," *Journal of Consumer Research* 33 (1), 60-70.

Li, Jing, Xueming Luo, Xianghua Lu, and Takeshi Moriguchi (2021), "The Double-Edged Effects of E-Commerce Cart Retargeting: Does Retargeting Too Early Backfire?," *Journal of Marketing* (forthcoming).

Luo, Xueming, Xianghua Lu, and Jing Li (2019), "When and How to Leverage E-commerce Cart Targeting: The Relative and Moderated Effects of Scarcity and Price Incentives with a Two-Stage Field Experiment and Causal Forest Optimization," *Information Systems Research*, 30 (4), 1203-1227.

Neslin, Scott A., Caroline Henderson, and John Quelch (1985), "Consumer Promotions and the Acceleration of Product Purchases," *Marketing Science*, 4 (2), 147-165.

Rossi, Peter E., Robert E. McCulloch, and Greg M. Allenby (1996), "The Value of Purchase History Data in Target Marketing," *Marketing Science*, 15 (4), 321-340.

Sahni, Navdeep S., Dan Zou, and Pradeep K. Chintagunta (2017), "Do Targeted Discount Offers Serve as Advertising? Evidence from 70 Field Experiments," *Management Science*, 63 (8), 2688-2705.

Sahni, Navdeep S., Sridhar Narayanan, and Kirthi Kalyanam (2019), "An Experimental Investigation of the Effects of Retargeted Advertising: The Role of Frequency and Timing," *Journal of Marketing Research*, 56 (3), 401-418.

Seiler, Stephan and Song Yao (2017), "The Impact of Advertising along the Conversion Funnel," *Quantitative Marketing and Economics*, 15 (3), 241-278.

Shankar, Venkatesh and Sridhar Balasubramanian (2009), "Mobile Marketing: A Synthesis and Prognosis," *Journal of Interactive Marketing*, 23 (2), 118-129.

Venkatesan, Rajkumar and Paul W. Farris (2012), "Measuring and Managing Returns from Retailer-Customized Coupon Campaigns," *Journal of Marketing*, 76 (1), 76-94.

Villas-Boas, J. Miguel and Yunfei (Jesse) Yao (2021), "A Dynamic Model of Optimal Retargeting," *Marketing Science* (forthcoming).

Zhang, Dennis J., Hengchen Dai, Lingxiu Dong, Fangfang Qi, Nannan Zhang, Xiaofei Liu, Zhongyi Liu, and Jiang Yang (2020), "The Long-Term and Spillover Effects of Price Promotions on Retailing Platforms: Evidence from a Large Randomized Experiment on Alibaba," *Management Science*, 66 (6), 2589-2609.

Table 1: Related Literature

Trigger	Article	Advertising	Promotion	Dependent Variable	Longer-Term Effect
Early-stage activity	Lambrecht and Tucker (2013)	Banner ads	No	Purchase	No
(e.g., website visit)	Bleier and Eisenbeiss (2015)	Banner ads	No	Click-through	No
	Hoban and Bucklin (2015)	Banner ads	No	Website revisit	No
	Johnson et al. (2017)	Banner ads	No	Website visit	No
	Sahni et al. (2019)	Banner ads	No	Website revisit	No
Late-stage activity	Luo et al. (2019)	Cart ads	Yes	Purchase	No
(e.g., cart abandonment)	Zhang et al. (2020)	Cart ads	Yes	Purchase	Yes
	Li et al. (2021)	Cart ads	No	Purchase	No
	Our study	Cart ads	Both Yes	Website revisit,	Yes
			and No	search, and	
				purchase	

Table 2: Randomization Checks

							Diffe	rence		
	T1	T2	T3	CG	T1-T2	T1-T3	T1-CG	T2-T3	T2-CG	T3-CG
Online activity										
Website visits	12.46	12.53	12.47	12.28	-0.06	-0.00	0.18	0.06	0.24	0.18
					(0.67)	(0.71)	(0.67)	(0.73)	(0.69)	(0.73)
Product pages viewed	37.64	38.46	38.21	37.45	-0.82	-0.57	0.19	0.25	1.01	0.76
					(1.92)	(1.94)	(1.90)	(1.91)	(1.87)	(1.88)
Recency in cart (days)	17.85	17.81	17.93	17.99	0.04	-0.09	-0.14	-0.12	-0.18	-0.05
					(0.16)	(0.17)	(0.17)	(0.18)	(0.17)	(0.19)
Products in cart	5.73	5.84	5.98	5.67	-0.12	-0.25	0.06	-0.14	0.18	0.31
					(0.14)	(0.16)	(0.15)	(0.16)	(0.15)	(0.17)
Categories in cart	1.77	1.77	1.80	1.77	-0.00	-0.03	0.00	-0.03	0.01	0.04
					(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Purchase behavior										
Recency (days)	61.75	61.25	62.52	60.49	0.50	-0.76	1.26	-1.26	0.76	2.03
					(1.77)	(1.99)	(1.91)	(1.97)	(1.90)	(2.10)
Monetary value (\$)	28.33	30.89	30.00	29.13	-2.56	-1.67	-0.80	0.90	1.76	0.86
					(1.46)	(1.62)	(1.45)	(1.70)	(1.54)	(1.69)
Non-buyers (%)	57.23	56.09	56.20	55.98	1.14	1.03	1.25	-0.11	0.11	0.22
					(1.07)	(1.20)	(1.16)	(1.21)	(1.16)	(1.28)
Observations	4,279	4,229	2,813	3,185						

			Difference
	Т3	CG	T3-CG
Purchase (%)	1.21	1.41	-0.20
			(0.29)
Purchase among cart items (%)	0.85	0.75	0.10
			(0.23)
ARPC (\$)	0.38	0.45	-0.07
			(0.12)
ARPB (\$)	31.56	31.69	-0.13
			(5.73)
Observations	2.813	3,185	

Table 3a: Effects of Retargeting Advertising on Consumer Purchase

Observations2,8133,185Notes: *** p < 0.001; ** p < 0.01; * p < 0.05. Standard errors appear in parentheses. The number of observations for
APRB is the number of customers who make a purchase, i.e., purchase (%) × observations.

Table 3b: Effects of Retargeting Advertising on Online Activity

			Difference
	Т3	CG	T3-CG
Website revisit (%)	16.82	15.48	1.34
			(0.95)
Product pages viewed	0.39	0.32	0.07
			(0.05)
Product pages viewed	0.24	0.21	0.03
among cart items			(0.05)
Products added to cart	0.17	0.15	0.02
			(0.03)
Products removed from cart	0.10	0.08	0.02
			(0.02)
Observations	2,813	3,185	

					Difference	e
	T1	T2	T3	T1-T2	T1-T3	T2- T3
Purchase (%)	3.09	1.89	1.21	1.19***	1.88^{***}	0.68^{*}
				(0.34)	(0.34)	(0.29)
Purchase among cart items (%)	2.22	1.40	0.85	0.83**	1.37***	0.54^{*}
				(0.29)	(0.28)	(0.25)
ARPC (\$)	1.05	0.56	0.38	0.49^{**}	0.67^{***}	0.18
				(0.15)	(0.15)	(0.11)
ARPB (\$)	34.10	29.57	31.56	4.53	2.54	-1.99
				(3.52)	(5.48)	(5.14)
Observations	4.279	4.229	2.813			

Table 4a: Effects of Retargeting Promotions on Consumer Purchase

Observations4,2/94,2292,813Notes: *** p < 0.001; ** p < 0.01; * p < 0.05. Standard errors appear in parentheses. The number of observations for
APRB is the number of customers who make a purchase, i.e., purchase (%) × observations.

Table 4b: Effects of Retargeting Promotions on Online Activity

					Difference	e
	T1	T2	Т3	T1-T2	T1-T3	T2- T3
Website revisit (%)	19.70	17.83	16.82	1.87^{*}	2.89**	1.01
				(0.85)	(0.93)	(0.91)
Product pages viewed	0.64	0.49	0.39	0.16**	0.26***	0.10
				(0.06)	(0.06)	(0.06)
Product pages viewed	0.55	0.36	0.24	0.19*	0.31***	0.12*
among cart items				(0.07)	(0.07)	(0.05)
Products added to cart	0.25	0.16	0.17	0.09***	0.09**	-0.01
				(0.03)	(0.03)	(0.02)
Products removed from cart	0.16	0.09	0.10	0.07^{***}	0.06^{**}	-0.01
				(0.02)	(0.02)	(0.02)
Observations	4,279	4,229	2,813			

T	al	ole	5a:	Lon	ger-	Term	Eff	fects	of	Reta	arget	ing	on	С	onsum	ıer	Purc	hase
_			~						· · ·		- 5		· · · ·	~				

					Difference					
	T1	T2	T3	CG	T1-T2	T1-T3	T1-CG	T2-T3	T2-CG	T3-CG
Purchase (%)	6.47	7.07	7.00	6.91	-0.60	-0.53	-0.43	0.07	0.16	0.10
					(0.55)	(0.61)	(0.59)	(0.62)	(0.60)	(0.66)
ARPC (\$)	2.35	2.43	2.47	2.46	-0.08	-0.12	-0.11	-0.04	-0.03	0.01
					(0.25)	(0.28)	(0.28)	(0.28)	(0.27)	(0.30)
ARPB (\$)	36.28	34.34	35.25	35.54	1.95	1.04	0.74	-0.91	-1.20	-0.29
					(2.40)	(2.61)	(2.68)	(2.45)	(2.53)	(2.73)
Observations	4,279	4,229	2,813	3,185						

Notes: *** p < 0.001; ** p < 0.01; * p < 0.05. Standard errors appear in parentheses.

Table 5b: Longer-Term Effects of Retargeting on Online Activity

					Difference					
	T1	T2	T3	CG	T1-T2	T1-T3	T1-CG	T2-T3	T2-CG	T3-CG
Website revisit (%)	35.62	36.53	35.51	36.08	-0.92	0.10	-0.46	1.02	0.46	-0.56
					(1.04)	(1.16)	(1.12)	(1.17)	(1.13)	(1.24)
Product pages viewed	1.26	1.33	1.39	1.40	-0.07	-0.14	-0.15	-0.06	-0.07	-0.01
					(0.09)	(0.10)	(0.10)	(0.10)	(0.10)	(0.11)
Products added to cart	0.62	0.73	0.73	0.73	- 0.11 [*]	-0.12*	- 0.11 [*]	-0.01	-0.00	0.01
					(0.06)	(0.06)	(0.06)	(0.07)	(0.07)	(0.07)
Products removed from cart	0.30	0.38	0.33	0.37	-0.08	-0.04	-0.07	0.04	0.01	-0.03
					(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.04)
Cart-to-view ratio	0.47	0.45	0.49	0.48	0.02	-0.02	-0.02	-0.04	-0.04	0.01
					(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Observations	4,279	4,229	2,813	3,185						

Figure 1: Examples of Retargeting

Figure 1a: Retargeting Advertising



Figure 1b: Retargeting Promotion



Figure 2: Design of the Study





Figure 3a: Effects of Retargeting Advertising on Revisit (%) by Past Cart Activity

Notes: *** p < 0.001; ** p < 0.01; * p < 0.05.



Figure 3b: Effects of Retargeting Advertising on Purchase (%) by Past Cart Activity

Notes: *** p < 0.001; ** p < 0.01; * p < 0.05.





Notes: *** p < 0.001; ** p < 0.01; * p < 0.05.



Figure 4b: Effects of Retargeting Advertising on Purchase (%) by Past Purchase Behavior

Notes: *** p < 0.001; ** p < 0.01; * p < 0.05.



Figure 5a: Effects of Retargeting Promotions on Revisit (%) by Past Cart Activity

Notes: *** p < 0.001; ** p < 0.01; * p < 0.05.





Notes: *** p < 0.001; ** p < 0.01; * p < 0.05.



Figure 6a: Effects of Retargeting Promotions on Revisit (%) by Past Purchase Behavior

Notes: *** p < 0.001; ** p < 0.01; * p < 0.05.



Figure 6b: Effects of Retargeting Promotions on Purchase (%) by Past Purchase Behavior

Notes: *** p < 0.001; ** p < 0.01; * p < 0.05.



Figure 7: Longer-Term Effects of Retargeting on Purchase (%) by Past Cart Activity

Notes: *** p < 0.001; ** p < 0.01; * p < 0.05.

Online Companion Appendix to

Retargeting Using Advertising and Promotions

Web Appendix A: Effects of Retargeting Advertising

			Difference
	Т3	CG	T3-CG
Recency in cart			
≤ 1 week	28.38	31.12	-2.73
			(3.53)
1-2 weeks	19.88	20.77	-0.89
			(2.52)
> 2 weeks	14.30	11.71	2.59*
			(1.03)
Products in cart			
1-2 products	11.53	10.52	1.01
-			(1.32)
3-4 products	14.09	14.12	-0.03
-			(1.97)
\geq 5 products	22.88	20.99	1.89
-			(1.67)
Categories in cart			
1 category	11.11	11.50	-0.39
			(1.22)
2 categories	17.82	15.70	2.12
C C			(1.73)
\geq 3 categories	26.70	24.63	2.07
e			(2.41)
Observations	2.813	3,185	

Table WA-1a: Effects of Retargeting Advertising on Revisit (%) by Past Cart Activity

			Difference
	Т3	CG	T3-CG
Recency in cart			
≤ 1 week	3.30	5.59	-2.29
			(1.57)
1-2 weeks	1.59	1.54	0.05
			(0.77)
> 2 weeks	0.80	0.70	0.10
			(0.26)
Products in cart			
1-2 products	0.57	0.41	0.16
			(0.29)
3-4 products	0.70	1.75	-1.05
			(0.61)
\geq 5 products	2.03	2.20	-0.17
			(0.58)
Categories in cart			
1 category	0.49	0.55	-0.06
			(0.28)
2 categories	1.48	1.70	-0.22
			(0.58)
\geq 3 categories	2.32	2.82	-0.50
			(0.87)
Observations	2,813	3,185	

Table WA-1b: Effects of Retargeting Advertising on Purchase (%) by Past Cart Activity

			Difference
	Т3	CG	T3-CG
Recency			
\leq 3 weeks	20.63	19.28	1.35
			(2.63)
3-10 weeks	23.92	16.97	6.95*
			(2.89)
> 10 weeks	18.03	15.10	2.93
			(2.47)
Monetary value			
≤ \$25	25.59	16.89	8.70^{**}
			(2.85)
\$25-\$60	16.59	14.78	1.81
			(2.39)
> \$60	20.84	20.00	0.84
			(2.75)
Non-buyers	13.73	14.13	-0.41
2			(1.20)
Observations	2.813	3,185	

Table WA-1c: Effects of Retargeting Advertising on Revisit (%) by Past Purchase Behavior

			Difference
	Т3	CG	T3-CG
Recency			
\leq 3 weeks	2.43	3.21	-0.79
			(1.08)
3-10 weeks	3.05	2.35	0.70
			(1.16)
> 10 weeks	0.70	1.02	-0.32
			(0.61)
Monetary value			
\leq \$25	1.04	1.78	-0.73
			(0.81)
\$25-\$60	1.35	1.23	0.11
			(0.74)
> \$60	3.72	3.66	0.07
			(1.29)
Non-buyers	0.57	0.79	-0.22
			(0.28)
Observations	2,813	3,185	

Table WA-1d: Effects of Retargeting Advertising on Purchase (%) by Past Purchase Behavior

Web Appendix B: Effects of Retargeting Promotions

				Difference			
	T1	T2	Т3	T1-T2	T1-T3	T2- T3	
Recency in cart							
≤ 1 week	34.68	33.84	28.38	0.84	6.30	5.46	
				(3.12)	(3.40)	(3.41)	
1-2 weeks	24.83	22.60	19.88	2.23	4.95*	2.72	
				(2.20)	(2.40)	(2.33)	
> 2 weeks	16.21	14.16	14.30	2.05^{*}	1.91	-0.14	
				(0.92)	(1.03)	(1.01)	
Products in cart				. ,	. ,		
1-2 products	13.16	12.21	11.53	0.96	1.63	0.68	
-				(1.18)	(1.30)	(1.28)	
3-4 products	19.96	13.55	14.09	6.41***	5.87**	-0.54	
-				(1.73)	(1.96)	(1.84)	
\geq 5 products	25.56	25.16	22.88	0.40	2.68	2.28	
-				(1.47)	(1.61)	(1.61)	
Categories in cart							
1 category	15.48	13.29	11.11	2.19	4.37***	2.18	
				(1.15)	(1.23)	(1.19)	
2 categories	21.71	18.55	17.82	3.16*	3.89*	0.73	
C				(1.53)	(1.70)	(1.67)	
\geq 3 categories	26.10	26.32	26.70	-0.23	-0.60	-0.38	
č				(2.05)	(2.27)	(2.26)	
Observations	4 279	4 229	2 813	`` <i>`</i>	```	``` <i>`</i>	

Table WB-1a: Effects of Retargeting Promotions on Revisit (%) by Past Cart Activity

 Observations
 4,279 4,229 2,813

 Notes:
 *** p < 0.001; ** p < 0.01; * p < 0.05. Standard errors appear in parentheses.

		Difference				
	T1	T2	Т3	T1-T2	T1-T3	T2- T3
Recency in cart						
≤ 1 week	9.57	7.64	3.30	1.93	6.27***	4.34**
				(1.84)	(1.70)	(1.61)
1-2 weeks	3.45	2.60	1.59	0.85	1.86*	1.01
				(0.89)	(0.88)	(0.80)
> 2 weeks	2.01	0.83	0.80	1.18^{***}	1.21***	0.04
				(0.30)	(0.32)	(0.26)
Products in cart						
1-2 products	1.31	0.89	0.57	0.42	0.74^{*}	0.32
				(0.37)	(0.37)	(0.33)
3-4 products	3.24	0.98	0.70	2.25**	2.54***	0.29
				(0.67)	(0.68)	(0.48)
\geq 5 products	4.63	3.27	2.03	1.36^{*}	2.60^{***}	1.24^{*}
				(0.66)	(0.65)	(0.59)
Categories in cart						
1 category	1.98	1.23	0.49	0.75	1.49***	0.74^{*}
				(0.41)	(0.38)	(0.32)
2 categories	3.42	1.95	1.48	1.47^{*}	1.94**	0.47
				(0.62)	(0.63)	(0.55)
\geq 3 categories	4.93	3.24	2.32	1.70	2.62**	0.92
				(0.92)	(0.93)	(0.83)
Observations	4,279	4,229	2,813			

Table WB-1b: Effects of Retargeting Promotions on Purchase (%) by Past Cart Activity

						Difference			
	T1	T2	Т3	T1-T2	T1-T3	T2- T3			
Recency									
\leq 3 weeks	23.02	21.94	20.63	1.07	2.39	1.31			
				(2.33)	(2.60)	(2.58)			
3-10 weeks	24.77	21.34	23.92	3.43	0.86	-2.58			
				(2.50)	(2.83)	(2.75)			
> 10 weeks	21.77	19.59	18.03	2.17	3.73	1.56			
				(2.27)	(2.48)	(2.44)			
Monetary value									
\leq \$25	22.92	23.68	25.59	-0.75	-2.66	-1.91			
				(2.48)	(2.82)	(2.86)			
\$25 - \$60	18.87	16.20	16.59	2.68	2.28	-0.40			
				(2.15)	(2.36)	(2.29)			
> \$60	27.63	23.21	20.84	4.43	6.79*	2.36			
				(2.45)	(2.72)	(2.61)			
Non-buyers	17.15	15.39	13.73	1.76	3.42**	1.66			
				(1.06)	(1.15)	(1.14)			
Observations	4.279	4.229	2.813						

Table WB-1c: Effects of Retargeting Promotions on Revisit (%) by Past Purchase Behavior

					Difference	e
	T1	T2	T3	T1-T2	T1-T3	T2- T3
Recency						
\leq 3 weeks	4.20	2.19	2.43	2.01^{*}	1.77	-0.23
				(0.98)	(1.10)	(0.96)
3-10 weeks	4.70	2.41	3.05	2.29^{*}	1.65	-0.64
				(1.10)	(1.25)	(1.08)
> 10 weeks	4.89	3.76	0.70	1.13	4.19***	3.06***
				(1.14)	(0.95)	(0.86)
Monetary value						
≤\$25	2.82	2.65	1.04	0.17	1.78	1.61
				(0.96)	(0.85)	(0.85)
\$25-\$60	4.03	1.89	1.35	2.15^{*}	2.69**	0.54
				(0.96)	(0.96)	(0.76)
> \$60	6.91	3.82	3.72	3.09*	3.19*	0.10
				(1.27)	(1.40)	(1.21)
Non-buyers	1.96	1.18	0.57	0.78^{*}	1.39***	0.61*
-				(0.36)	(0.34)	(0.29)
Observations	4.279	4.229	2.813		•	

Table WB-1d: Effects of Retargeting Promotions on Purchase (%) by Past Purchase Behavior

Observations4,2/94,2292,813Notes: *** p < 0.001; ** p < 0.01; * p < 0.05. Standard errors appear in parentheses.

Web Appendix C: Longer-Term Effects of Retargeting

					Difference						
	TT1	тэ	T 2	CC	T1 T2	T1 T2				T2 CC	
- <u>_</u>	11	12	13	UG	11-12	11-13	11 - CG	12-13	12-CG	13-CG	
Recency in cart											
≤ 1 week	10.64	11.35	12.21	11.17	-0.72	-1.57	-0.53	-0.86	0.18	1.04	
					(2.06)	(2.36)	(2.16)	(2.40)	(2.20)	(2.49)	
1-2 weeks	6.76	7.53	9.94	9.23	-0.77	-3.18	-2.47	-2.41	-1.70	0.71	
					(1.33)	(1.63)	(1.58)	(1.64)	(1.59)	(1.84)	
>2 weeks	5.77	6.30	5.48	5.68	-0.53	0.29	0.09	0.82	0.62	-0.20	
					(0.61)	(0.66)	(0.64)	(0.68)	(0.66)	(0.70)	
Products in cart					()	()		()	()	()	
1-2 products	3.12	4.83	4.82	3.59	-1.71*	-1.70^{*}	-0.47	0.01	1.24	1.23	
1 2 pro duce io	0.112			5.69	(0.69)	(0.79)	(0.69)	(0.85)	(0.76)	(0.85)	
3-4 products	5 72	5 2 5	5.04	4 66	(0.07) 0.47	0.67	1.06	0.00	0.59	0.39	
5 T products	5.72	5.25	5.01	1.00	(1.06)	(1 19)	(1.00)	(1.17)	(1.09)	(1.22)	
> 5 products	0.05	10.05	0.02	11 22	0.10	(1.17)	(1.10)	(1.17)	(1.07)	(1.22)	
\geq 5 products	9.95	10.05	9.92	11.32	-0.10	(1, 1, 2)	-1.3/	(1.12)	-1.2/	-1.41	
Coto a si a in a st					(1.02)	(1.13)	(1.14)	(1.13)	(1.14)	(1.24)	
Categories in cart							0.60				
1 category	3.95	5.07	4.62	4.63	-1.12	-0.67	-0.68	0.45	0.44	-0.01	
					(0.68)	(0.75)	(0.71)	(0.78)	(0.75)	(0.81)	
2 categories	6.83	7.55	7.15	7.10	-0.72	-0.32	-0.27	0.40	0.45	0.05	
C					(0.99)	(1.10)	(1.06)	(1.13)	(1.09)	(1.19)	
> 3 categories	11.40	10.36	11.42	12.02	1.05	-0.02	-0.61	-1.06	-1.66	-0.60	
- 8			_		(1.45)	(1.64)	(1.64)	(1.60)	(1.60)	(1.77)	
Observations	4 279	4 229	2 813	3 185	()	(• • •)		()		())	

 Table WC-1: Longer-Term Effects of Retargeting on Purchase (%) by Past Cart Activity

 4,2/9 4,229 2,813 3,185

 Notes:
 *** p < 0.001;
 ** p < 0.01;
 * p < 0.05. Standard errors appear in parentheses.