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As consumers spend more time on their mobile devices, a focal retailer's natural approach is to target potential customers in close proximity to its own location. Yet focal (own) location targeting may cannibalize profits on inframarginal sales. This study demonstrates the effectiveness of *competitive* locational targeting, the practice of promoting to consumers near a competitor's location. The analysis is based on a randomized field experiment in which mobile promotions were sent to customers at three similar shopping areas (competitive, focal, and benchmark locations). The results show that competitive locational targeting can take advantage of heightened demand that a focal retailer would not otherwise capture. Competitive locational targeting produced increasing returns to promotional discount depth, whereas targeting the focal location produced decreasing returns to deep discounts, indicating saturation effects and profit cannibalization. These findings are important for marketers, who can use competitive locational targeting to generate incremental sales without cannibalizing profits. Although the experiment focuses on the effects of unilateral promotions, it represents an initial step in understanding the competitive implications of mobile marketing technologies.

Keywords: mobile commerce, mobile targeting, competitive targeting, locational targeting, randomized field experiment

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Geo-Conquesting: Competitive Locational Targeting of Mobile Promotions

As consumers spend an increasing amount of time on their mobile devices, marketers are increasingly able to target them on the basis of their locations in real time. Mobile promotions can now reach consumers when and where they are most receptive. While a retailer has clear reasons to consider promoting to consumers near its own location, because these consumers would incur low travel costs to take advantage of offers, mobile promotions also have enormous potential as competitive weapons. No longer limited by physical location, mobile technologies give an offline retailer the capability to maintain a presence anywhere— including on a competitor's doorstep.

Among practitioners, the locational targeting of customers within certain designated areas (typically near a firm's own location) is referred to as "geo-fencing." When applied to competitors' locations, the tactic is referred to as "geo-conquesting." Practitioners have claimed higher response rates through this competitive locational targeting approach compared with own-location targeting but have also stressed the desire to validate these approaches (Walsh 2013). Thus, we aim to provide a more nuanced understanding of how competitive locational targeting should be used.

Competitive locational targeting has intuitive appeal: a consumer's proximity to a competitor's location indicates potential interest in a product or service category. However, in the absence of strong marketing interventions, locational switching costs heavily favor the competitor. The ability to reach individual consumers located near a competitor suggests that marketers could use promotions to appeal to customers who would not otherwise purchase from the focal retailer. To our knowledge, prior research has not adequately quantified the effectiveness of competitive locational targeting.

With the cooperation of a mobile service provider, we conducted a randomized field experiment designed specifically to estimate the causal effects of locational targeting. We use a multipronged approach to identify locational targeting effects. First, we sampled customers from several locations: promotional offers were sent to mobile users located near a focal retailer's own location, a competitor's location, and a benchmark location. The three locations were similarly trafficked outdoor shopping areas. The focal retailer was a mainstream movie theater at the designated focal location, and a competing movie theater was located at the competitive location. The third location was a shopping area with no movie theater, located an equal distance from the other two locations; it serves as a quasiexperimental control (referred to as the "benchmark location"). This enabled us to evaluate the effectiveness of targeting a retailer's own location and a competitive location relative to the benchmark location. We randomly assigned discount depth for the promotional offer so that we could estimate customer sensitivity to promotional prices at each location. Finally, we randomly varied the timing of the promotions, sending half in real time and half exactly one week later. The timing manipulation provided a measure of baseline purchasing rates for each location.[1]

From the results, we first show that competitive locational targeting can take advantage of heightened demand that the focal retailer would not otherwise capture. When offering deep discounts, competitive locational targeting was more effective than targeting the benchmark location, even though the benchmark location is closer to the focal location, providing a conservative test of competitive locational targeting effects. Increasing returns to discount depth indicated the presence of threshold effects, consistent with locational switching costs. In comparison, targeting a retailer's own (focal) location showed decreasing returns to deep discounts, indicating saturation effects and profit cannibalization.

These findings contribute to the literature in three key ways. First, we extend the literature relating location to demand (e.g., Davis 2006; Huff 1964) by identifying the effects of competitive locational targeting. Recent mobile marketing research has approached this topic by evaluating the effectiveness of focal locational targeting. For example, customers are more likely to click through on search results for places near their current location (Ghose, Goldfarb, and Han 2013). Proximity to the focal retailer also affects response to promotional offers (Luo et al. 2014). Even

within the confines of a shopping mall, distance has been shown to influence response (Danaher et al. 2015). In these previous studies, customers' responsiveness was shown to decline with increasing distance from a focal retailer. However, it would be shortsighted to conclude that locational responsiveness to mobile promotions is merely a function of proximity to a retailer's own stores. Competitive locational targeting can generate additional incremental sales, a missed opportunity if using focal targeting alone.

Second, we contribute to the literature on competitive promotions. Empirical evidence on competitively targeted promotions is surprisingly limited. The cannibalization of profits on inframarginal sales has long been recognized as an implicit cost of promotional discounts (Bawa and Shoemaker 1989), and yet no studies have compared the cannibalization of margins that result from focal versus competitive targeting of discounts. We approach this problem through the interaction between locational targeting and discount depth. We found cannibalization to be more severe near a focal retailer's own location compared with the competitive location. This creates a short-term incentive for price discrimination: in the experiment, high discounts were optimal for the competitive location, whereas medium discounts were optimal for the focal location.

Finally, we demonstrate how mobile technologies empower researchers and managers to draw insights on marketing phenomena that were impractical to study in the past. Previous technologies such as point-of-sale scanners and e-commerce made it more feasible to observe the outcome of marketing interventions by allowing access to customer histories. In contrast, mobile technologies provide access to customers' real-time presence, a capability that affects both academic and applied marketing research.

BACKGROUND

Mobile Marketing

The use of mobile marketing has increased in recent years as consumer mobile usage and receptivity have grown. U.S. adults spend more than an hour a day on their mobile phones on nonvoice mobile activities (eMarketer 2013). Moreover, 47% of study respondents would provide their location to receive relevant offers or discounts, and 57% believe short message service (SMS) or push notifications convey the most persuasive offers (mBlox 2013). Locational targeting has been widely adopted by mobile marketers and is forecast to account for 40% of the $11.4 billion in U.S. mobile ad spending in 2014 (BIA/Kelsey 2014).

Commenters have long predicted that context—taking the right action at the right place and time—would be critical to the success of mobile marketing (Kenny and Marshall 2000). Academic research has only recently begun to show how consumers' real-time context affects mobile marketing effectiveness; for example, promotional response is higher in crowded transit environments (Andrews et al. 2015). Our study demonstrates how the proximity of competitive locations is an important aspect of mobile marketing context.

Several well-established channels for promotion might benefit from heightened demand near a competitive location; however, the unique features of mobile marketing distinguish it from extant channels. Compared with channels that can be used to target competitors' physical locations,

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[1]We also compare observable characteristics, including shopping area attributes, local demographics, and individual mobile usage behavior, to show that the locations are closely matched.

such as handbills and outdoor advertising, a mobile promotion is less obtrusive because mobile notifications are easy to check with a glance or ignore if so desired. In addition, mobile promotions are private, making monitoring and retaliation by competitors more difficult. The individual addressability of customers allows for promotions that cannot be shared as well as better experimentation and measurement as offline marketers adapt testing tactics from direct marketing.

Locational targeting using mobile technology combines the strengths of online and traditional direct marketing and differs from each in important respects. In particular, precise real-time locational targeting provides additional opportunities in many scenarios in which demand is sensitive to timing or historical data are unavailable (e.g., in new customer acquisition).[2] Marketers' ability to actually implement competitive locational targeting comes from the combination of features provided by ubiquitous, real-time mobile platforms.

Competitive Promotions

The literature on competitive promotions has a long and rich history and yet remains an active area of research. Researchers have extensively analyzed competitive targeting using theoretical models that focus on strategic consequences of price discrimination, enabled by the increased availability of individual or household data (for a review, see Arora et al. 2008). The focus has been on characterizing conditions when competing firms erode profits in a prisoner's dilemma scenario, in which competitors would be better off if they could avoid poaching one another's customers (Shaffer and Zhang 1995). Price competition in such scenarios intensifies when each firm's strong segment is another firm's weak segment (Corts 1998), conditions that arise naturally under spatial competition. Informational advantages, which could be interpreted as locational information, can also affect whether sellers should offer discounts to their own customers or their competitors' customers (Shin and Sudhir 2010).

The corresponding empirical literature provides limited evidence on the effectiveness of competitive promotions. Bawa and Shoemaker (1987) use a direct mail coupon field study to show that response is higher among recent buyers of a brand; reanalyzing the data using a quasiexperimental design, they infer that incremental sales are roughly equal for buyers and nonbuyers (Bawa and Shoemaker 1989). Zhang and Wedel (2009) find that competitive promotions are more effective in offline than online settings relative to loyalty promotions, whereas loyalty promotions are more profitable overall. Besanko, Dubé, and Gupta (2003) bridge the empirical and theoretical literature streams by showing that the prisoner's dilemma does not arise in an empirically calibrated model of competition.

Notably, previous empirical studies have not focused on the causal effects of competitive targeting; our study accounts for baseline differences in competitively targeted customers. Relatedly, previous studies have not examined how the response to competitive promotions varies with discount depth. By experimentally varying the discount depth, we evaluate how cannibalization creates an incentive to offer different prices to competitively targeted customers and customers near the focal location. In addition, the targeting procedures used in prior studies require individual customer histories (e.g., through loyalty card programs) and individual addressability (e.g., mailing addresses or point-of-sale coupon systems). Locational targeting does not require information on customers' past behavior, potentially rendering it more useful for customer acquisition.

Hypotheses

Reaching customers at the right place and at the right time should result in higher promotional response at a given discount depth. Promotions targeting locations with higher real-time demand should produce higher promotional response than other locations, although previous mobile marketing research has suggested that promotional response will decrease with distance from the focal firm. Moreover, properly timed promotions to customers in targeted locations should produce a positive incremental effect over nontargeted or asynchronous promotions.

The aforementioned factors lead to several predictions. First, when targeting a competitive location, we expect to demonstrate the effectiveness of locational targeting. Customers who receive the promotion when they are located near the competitor should have a higher response relative to a counterfactual scenario in which they receive the same discount at another time (a week later) or place (the benchmark location). This difference can be attributed to a locational targeting effect.

Separately, when targeting the firm's own location, we also expect to find locational targeting effects. This would reinforce findings from other mobile research (Danaher et al. 2015; Ghose, Goldfarb, and Han 2013; Luo et al. 2014) with additional measures to reduce selection bias. In contrast, when targeting the benchmark location, we do not expect the timing manipulation to affect response, because these customers have not chosen a location that indicates interest in the product or category.

We also make comparisons across locations. Promotional response should be highest in the focal location, followed by the competitive location, and should be lowest in the benchmark location (due to heightened interest in the other locations). Even though interest in the product could be as high in the competitive location as in the focal location, customers would incur a locational switching cost if they act on a real-time promotion. Switching costs can potentially be offset by increased discount depth.

FIELD EXPERIMENT

Empirical Setting

We conducted a large-scale randomized field experiment with a major wireless service provider (that wishes to remain anonymous). Random assignment of our independent variables enables us to estimate causal effects to test our hypotheses. In observational data, marketers' deliberate targeting could introduce selection biases, unobserved to us, that obscure other differences in promotional response. An experiment also provides the opportunity to introduce more

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[2]Whether locational targeting offers incremental benefits over behavioral targeting and whether there are positive interactions are important questions for further research in their own right.

variation than a marketer might generate naturally, such as the wide range of discount depths we use. A field setting is critical for external validity because the targeting relies on real-life context. A large-scale experiment is required given our expected effect sizes and the experiment's multivariate design.

The retailer featured in the test promotions is a movie theater, and the promotion is for a discounted general admission voucher valid only on the day of the offer. We chose the category for high anticipated response because the corporate partner has found customers in this market to be sensitive to mobile promotions. Because movie screenings are consumed on site, both the timing of the offer and the recipient's location should affect response. Both the focal and competitive locations housed mainstream theaters that differ mainly on location.

Experimental Design

Mobile customers were offered discounts for the immediate purchase of a special offer through SMS.[3] The promotion was for a movie ticket voucher good for general admission on the day of the offer only, emphasizing urgency, which has been shown to influence mobile promotion responsiveness (Danaher et al. 2015). Recipient selection occurred over the course of an hour, on a Saturday morning between 11:00 A.M. and 12:00 P.M. The experiment had a three-factor design (3 [location] × 3 [discount depth] × 2 [timing condition]).

At the time of the trial, the promotional SMS was pushed to customers within 200 meters of three locations: the focal theater, a competing theater, and a benchmark location. All three are located along the second ring road of a large city in Asia. The distance between the focal and competing theaters is 2.4 miles (4 kilometers), and the benchmark location is roughly halfway between them.

At each location, we offered promotions with discounts at multiple depths. Low, medium, and high discount conditions, corresponding to discounts of 20%, 40%, and 60%, respectively, were randomly assigned, with one-third of the sample receiving each promotion depth. We chose these discount depths through consultation with the corporate partner on the basis of its experience running similar promotions. The medium and high discount depths were deemed sufficient to generate substantial purchasing. A response to the 20% discount would indicate that some buyers may have purchased in the absence of a promotion. The SMS read, "To buy a voucher for general admission to any of today's 2D showings at [focal theater] at a [20%, 40%, 60%] discount, follow this link."

Ideally, we observe the effect of location for otherwise identical customers, but location cannot be experimentally controlled. Thus, it is important to establish that, aside from differences in movie theater presence, the targeted locations are similar. Each experimental location included a large, high-traffic outdoor shopping area, composed of a central building containing larger merchants and separate areas that house many small vendors. In the focal and competitive

locations, the movie theaters occupy their own distinct areas, whereas the benchmark location did not have a movie theater (for a detailed comparison of location characteristics and nearby demographics, see Web Appendix A, Table 1). We were also able to compare the mobile usage behavior for customers across locations and did not find significant differences (see Web Appendix A, Table 2). Finally, we compared the movie titles being played at each theater and found a high degree of overlap (see Web Appendix A, Table 3).

Customers from different locations may also have differing stable preferences for movies or movie theaters; although this would not make locational targeting less effective, customers with different stable preferences could presumably be targeted through alternative channels (depending on the availability of data). As an additional measure, to distinguish the real-time locational precision of the mobile channel, we introduced a timing manipulation to estimate nontargeted baseline purchase rates for customers at each location. We created the "nontargeted" groups by randomly selecting half of the sample at each location and withholding the initial promotion from these groups. Instead, we sent them the promotion at the same time of day one week after the initial sampling, regardless of their location at that time. The delay suppresses locational targeting effects for these customers, so their response serves as a baseline for estimating the locational targeting effects. Because movie titles change from week to week and demand for given movies diminishes over time, the timing manipulation could capture changing market conditions; Web Appendix A, Table 4, reports information on demand for the titles shown.

The targeted/nontargeted and low/medium/high manipulations resulted in 6 randomized experimental cells for each experimental location. With three locations, there were a total of 18 cells. The design is between subjects, with 1,000 recipients in each cell, for a total sample size of 18,000.

Data

In addition to identifiers for the experimental cell, the data include indicators for whether a consumer purchased a voucher (the overall average purchase rate was 2.6%) and indicators for the nontargeted group's location when the nontargeted promotions were sent out one week later. Although the customer's exact location was not available, 93% of the nontargeted group was outside all of the experimental locations, indicating high "compliance" with the manipulation (see Web Appendix A, Table 5).

Government regulations prohibit the wireless provider from revealing customers' demographic information. However, our data include customers' mobile usage behavior, which enables us to compare customers across experimental cells (for summary statistics and randomization checks, see Web Appendix A, Tables 6 and 7).

RESULTS

Real-Time Locational Targeting Effects

We first examine our hypotheses relating to the existence of real-time targeting effects. We do so by comparing the purchase rates for targeted and nontargeted groups at each location and discount depth. Figure 1 depicts the purchase rate for each experimental cell. The difference between the

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[3]In our setting, customers may receive promotional SMS messages three to four times per month. Movie promotions occur every few months, but our sample excluded customers who previously received similar movie offers.

Figure 1
TARGETING EFFECTS BY LOCATION AND DISCOUNT DEPTH
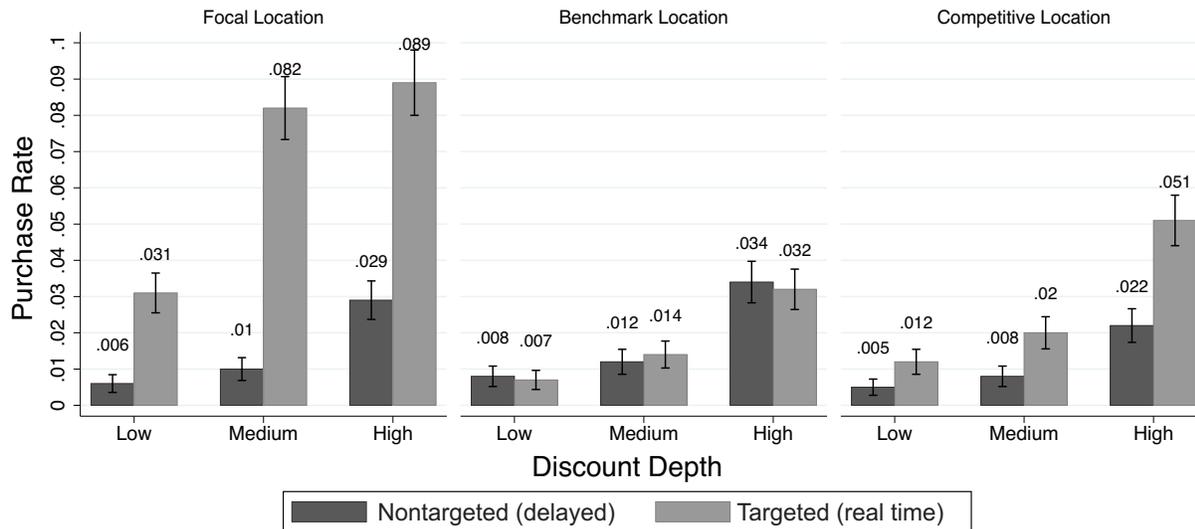
Notes: Error bars denote one standard error in each direction. The focal location targeted customers near the seller (a movie theater), whereas the competitive location targeted customers near a rival seller. The benchmark location was a similar shopping area with no movie theater. The targeted group was sent promotions in real time through geo-fencing at each of the three locations. The randomly selected nontargeted group was sampled at the same time but was sent the promotion one week later. The difference between the targeted and nontargeted groups is statistically significant at the focal location (all discount depths) and the competitive location (medium and high discount depths), but not at the benchmark location. Values and tests for differences appear in Web Appendix B, Table 1.

bars indicated as targeted and nontargeted represents the effect of targeting conditional on location and discount depth. We measure these differences using the timing manipulation, which should reach customers when they are not at the targeted locations; detailed tests of the differences, including robustness checks that account for compliance with the manipulation and changes in movie demand, appear in Web Appendix B, Table 1.

The competitive group showed a positive locational targeting effect at medium and high discount depths. These differences support the study's primary hypothesis: locational targeting of customers near a firm's competitor can result in elevated promotional response. Previous research on mobile marketing has emphasized proximity to retailers' own locations; we provide the first rigorously controlled evidence that other potential target locations represent real-time demand hot spots. The pattern of response also suggests that competitive locational targeting needs to be combined with deeper discounts, which we explore further in our comparisons across locations and discount depths.

Notably, the focal group showed a positive locational targeting effect at each discount depth. This finding is consistent with prior research and makes an additional contribution by attributing locational targeting effects to the mobile channel's real-time capabilities.

In contrast, we find no differences in purchase rates for people in the benchmark group, who were located an equal distance from each of the theater locations. This comparison provides a useful falsification check: we expected no difference or, at most, a small real-time effect for this group. The

null effect could be due to travel costs; however, note that the customers in the competitive location face slightly higher travel costs. We interpret the lack of a targeting effect for the benchmark location as showing that where a consumer chooses to go that day (i.e., a shopping center with one of the two rival movie theaters) is critical to locational targeting response.

Comparison Across Locations

Next, we compare the magnitudes of the effects across the various target locations. We expected that purchasing rates would be highest in the focal location, followed by the competitive location, and then the benchmark location. This prediction corresponds with the notion that the retailer faces heightened demand in both its own location and the competitive location, but locational switching costs suppress the response in the competitive location.

Table 1 presents differences in purchase rates by location. The single differences are the result of two-sample t-tests, whereas the interactions (the difference-in-differences comparisons) are tested using linear regression. Each t-test compares the mean response for two experimental cells (2,000 observations). Each regression estimates an interaction using four cells (4,000 observations).

We find that the focal location results in a higher purchasing rate than the other two locations, at all discount depths. Even though the benchmark location is closer, the competitive location produces a higher purchasing rate, but only at the high discount depth. This is consistent with the expectation that although customers in the focal and competitive

Table 1
DIFFERENCES IN PURCHASING BETWEEN LOCATIONS

Discount		Comparison		
		Focal−Competitive	*Focal−Benchmark*	*Competitive−Benchmark*
Low	Targeted (A)	.019*** (.006)	.024*** (.006)	.005 (.004)
	Nontargeted (B)	.001 (.003)	−.002 (.004)	−.003 (.004)
	Difference-in-differences (A – B)	.018** (.007)	.026*** (.007)	.008 (.006)
Medium	Targeted (A)	.062*** (.010)	.068*** (.009)	.006 (.006)
	Nontargeted (B)	.002 (.004)	−.002 (.005)	−.004 (.004)
	Difference-in-differences (A – B)	.060*** (.011)	.070*** (.011)	.010 (.007)
High	Targeted (A)	.038*** (.011)	.057*** (.011)	.019** (.009)
	Nontargeted (B)	.007 (.007)	−.005 (.008)	−.012 (.007)
	Difference-in-differences (A – B)	.031** (.013)	.062*** (.013)	.031*** (.012)

**$p < .05$.

***$p < .01$.

Notes: Standard errors are in parentheses. Test is for differences in purchase rates between customers sampled from each pair of locations. Difference-in-differences estimates are from a linear regression with factors coded to estimate the quantity indicated. N = 2,000 for targeted and control comparisons; N = 4,000 for difference-in-differences.

locations may have heightened demand for the retailer's product, there are substantial switching costs for customers in the competitive location.

The ordering of effect sizes holds for both the total purchasing rates in the targeted groups (the rows labeled "Targeted") as well as the portion of purchasing attributed to locational targeting through the timing manipulation (the difference-in-differences rows). Thus, we attribute the differences in response to locational targeting. This finding is consistent with the notion that real-time mobile targeting amplifies locational switching costs and provides further indication that competitive locational targeting should be paired with deeper discounts.

In contrast to these findings, there were no significant differences in purchasing rates for the nontargeted (delayed) groups across locations at any discount depth (there was an expected increase in purchasing at deeper discount depths). This provides additional assurance that, in this study, location-based targeting did not induce selection biases that would compromise comparisons across locations.

Discount Effects and the Discount Response Curve Across Locations

We next examine how targeting different locations results in different discount response curves, which affect optimal discount depths; differences in shape can create incentives to price discriminate. Figure 1 also provides some indication of customer sensitivity to discount depth. In particular, we observe strong visual evidence of diminishing returns to discount depth in the focal location. We test the inflection of each curve by comparing the difference in purchase rates between low and medium discounts with the difference in purchase rates between medium and high discounts, in each location. A positive estimate indicates increasing differences with discount depth (a convex response).

Table 2 shows regressions testing the effects of varying the discount depth. For customers in the focal location, the purchasing rate increases substantially between the low and medium discount depths (Model 1). The purchasing rate does not show a similar increase when going from the

medium to the high discount depth (Model 2), and the difference-in-differences comparison indicates a concave response to increasing discounts (Model 3).

For customers in the competitive location, the purchasing rate increases when going from the medium to the high discount depth (Model 5), in contrast to a muted responsiveness when going from the low to the medium discount (Model 4). The difference-in-differences comparison indicates a convex response to increasing discounts (Model 6). These increasing returns will typically lead to higher optimal discount depths because it is more likely that increasing the discount depth will increase the quantity sold fast enough to offset reduced margins. Although we observe a similar pattern in the benchmark location, the observed convexity is not statistically significant (see Web Appendix B, Table 2). Thus, in the benchmark location, there is relatively less promise of large returns to deeper discounts.

Three additional regressions compare the effects of varying discount depths between the focal and competitive locations. The competitive location shows a response with positive inflection relative to the focal location's diminishing returns (the triple-difference tested in Model 9 compares the inflection in the focal location with the competitive location). This is partially driven by a higher increase in response when going from the low to the medium discount depth in the focal location (Model 7); however, a higher increase in response when going from the medium to the high discount depth in the competitive location also contributes to differences in inflection (Model 8).

These comparisons are based on changes in response levels. Price elasticities are an alternative measure of discount sensitivity that accounts for proportional changes in demand. We computed arc elasticity with respect to price (1 – discount depth), and it does not change the pattern of results: in the focal location, arc elasticities were –3.2 over the segment from low to medium discount depths, and only –.2 over the segment from medium to high. In contrast, arc elasticities in the competitive location were –1.7 over the segment from low to medium and –2.2 over the segment from medium to high. A nonparametric bootstrap analysis of

Table 2
REGRESSIONS COMPARING EFFECTS OF VARYING DISCOUNT DEPTH

	1	2	3	4	5	6	7	8	9
	Focal Location			Competitive Location			Competitive–Focal		
	Mid – Low	High – Mid	Difference-in-differences (2 – 1)	Mid – Low	High – Mid	Difference-in-differences (5 – 4)	Difference-in-differences (4 – 1)	Difference-in-differences (5 – 2)	Triple-difference (6 – 3)
Targeted (A)	.051*** (.010)	.007 (.013)	–.044*** (F = 8.39)	.008 (.006)	.031*** (.008)	.023** (F = 4.62)	–.043*** (.009)	.024** (.012)	.067*** (F = 13.0)
Nontargeted (B)	.004 (.004)	.019*** (.006)	.015 (F = .98)	.003 (.004)	.014*** (.005)	.011 (F = 1.06)	–.001 (.009)	–.005 (.012)	–.004 (F = .05)
Difference-in-differences (A – B)	.047*** (.011)	–.012 (.014)	–.059*** (F = 7.55)	.005 (.007)	.017* (.010)	.012 (F = .63)	–.042*** (.013)	.029* (.017)	.071*** (F = 7.30)
N	4,000	4,000	6,000	4,000	4,000	6,000	8,000	8,000	12,000

*$p < .10$.
**$p < .05$.
***$p < .01$.

Notes: Standard errors are in parentheses. Mid – Low and High – Mid estimate parameters representing differences in purchase rates for the discount depths compared and only include observations for those discount depths. The difference-in-differences columns (Models 3 and 6) pool observations for all three discount depths and report Wald tests against the null hypothesis that the difference between purchase rates at high and medium discount depths is the same as the difference between purchase rates at medium and low purchase rates. These tests show the concavity/convexity of the discount depth response. Models 7 and 8 test for differences in discount depth response between locations, and the triple-difference (Model 9) tests for differences in inflection in the discount depth response curve between the two locations.

differences in arc elasticities generated the same result as Model 9: the interaction between low-mid arc elasticity and mid-high arc elasticity for focal versus competitive locations was significant at the 95% confidence level.

The discount response curves are consistent with high diminishing returns to deep discounts, or saturation effects, in the focal location. In contrast, the increasing returns to deep discounts at the competitive location are consistent with threshold effects, whereby the discount depth must be deep enough to compensate consumers for their locational switching costs. This difference in response can create an incentive for price discrimination; a rough analysis of revenues indicates that the short-term revenue-maximizing policy is to offer a high discount depth in the competitive location and a medium discount in the focal location (Web Appendix B, Figure 1).

DISCUSSION

Tactical Implications

This study demonstrates the effectiveness of competitive locational targeting using a randomized field experiment, in which SMS promotions were sent to mobile users in several locations. We found that competitive locational targeting can increase purchasing response. We attribute this increased purchasing to a locational targeting effect by varying both the location and the timing of the targeted promotion.

Marketers could use the methods in this study to optimize their mobile campaigns with locational targeting. Our study also demonstrates how mobile marketing provides offline brick-and-mortar retailers improved access to measurement and testing capabilities. Experimentation has grown among digital marketers: in an industry survey, 64% reported that they would be running experiments, an increase of 3% over the previous year (Econsultancy and Adobe 2014). An improved ability to run mobile experiments could bring a higher standard of evidence to marketing in offline settings.

Competitive locational targeting may be more valuable than focal locational targeting for several reasons. First, the convex response to discount depth implies that discounting to customers near a competitor is less likely to cannibalize short-term sales. Second, a retailer may have fewer ways of reaching customers located near its competitors. Near its own locations, a store can display signs, or an idle employee can distribute flyers nearby. These tactics would be costlier in competitive locations, may not allow for price discrimination, and would invite retaliation. For a retailer trying to extend its reach, competitive locations provide more potential targets than its own locations. Furthermore, nearby customers are more likely to be aware of the focal retailer, so targeting competitive locations provides the means to increase awareness. Because competitive targeting may require deep discounts, it could benefit the retailer more if used as an intermittent acquisition tool rather than a uniform policy.

Limitations and Generalizability

A limitation of the field experiment is that we do not observe outcomes for customers who do not receive any promotion. We instead evaluate targeting effects by separately varying the location and the timing of the promotion. In addition, note that the no-discount purchase rate would likely not exceed the purchase rate with a 20% discount,

putting a rough floor on the gains from targeting. If we assume that the no-discount purchase rate equals the 20% discount response, we would find targeting effects at the medium or high discount depth for the focal location and only at the high discount depth for the competitive location. Researchers face similar dilemmas when outcomes other than promotional response cannot be measured; we hope the design of our study provides ideas for working around this limitation.

The other main limitation of the study is that there are many dimensions on which our results may or may not generalize, including different geographic markets, different promotional channels, and different product markets. The main concern for different geographic markets is that there are differences in mobile usage patterns across markets. In particular, SMS promotions are more ubiquitous in countries other than the United States. Attitudes toward targeting practices also differ, but considerable heterogeneity exists within each market, and attitudes are correlated with age (PricewaterhouseCoopers 2014). In particular, younger consumers are more open to targeted mobile marketing; this accounted for some of the cross-country differences in surveys and also suggests increasing openness across most geographic markets in the coming years as younger consumers age into a larger proportion of the market.

We would expect to find similar effects to those in our study using closely related promotional channels. For example, locational targeting using mobile app advertising could be just as effective as SMS. However, users typically need to opt in to sharing their location data, so app-specific selection effects would be quite important (e.g., restaurant ads on a restaurant review app could be highly effective; movie tickets might not sell well on a travel app, but museums or tourist attractions might).

Perhaps of greatest concern is how these tactics would perform in different product markets. We expect the same general pattern to apply in settings in which demand is particularly sensitive to time and location. We would not call movie tickets unique, but the combination of features was amenable to the objectives of our field experiment. The first is the importance of context; specifically, the time and place of consumption are important for movies, for which consumption is tied to the retail location. A few product markets share this feature—most notably, restaurants. However, other product markets do not share this feature, and although the locational targeting effect may still be present, there are additional factors to consider; for example, brand preferences for apparel might increase switching costs. Location in retail markets where consumption is not immediate still has value as an indicator of demand, and marketers can take advantage of a shopper's inferred needs and category salience. Finally, variation in margins across markets will affect retailers' ability to profitably offer deep discounts in competitive locations; regardless, the tactic may still prove viable as a customer acquisition strategy.

Industry reports provide anecdotal support for our conjectures. Practitioners rank restaurants and retail as the top two categories for competitive locational targeting, whereas the top two overall mobile advertising categories were financial services and telecommunications (xAd 2013). This is consistent with the notion that the importance of prox-

imity and timing for a category determine the effectiveness of competitive locational targeting.

Our discussion of generalization is necessarily speculative. Given the resources to run experiments in many categories, we might detect patterns that more precisely identify moderators and boundary conditions. However, given the importance of specific contextual factors, we caution that it could be difficult to make generalizations even within product categories: a test in a casual restaurant would not necessarily extend to fine dining, and lunch and dinner markets could differ substantially. Just as field experiments have long been an important tool in online marketing, mobile marketers are currently developing the tools needed for rigorous testing. Therefore, our ultimate recommendation is that mobile technology should be used to bring "evidence-based marketing" to offline settings.

Long-Term Effects

It is important to consider the long-term effects of any change in tactics. A single experiment cannot directly test long-term effects of locational targeting policies, but it may provide the basis to consider several possibilities. In particular, consumers may adjust their behavior on the basis of how locational targeting affects their expectations, and rival firms may respond to competitive locational targeting.

Some studies have indicated that promotions increase price sensitivity (e.g., Mela et al. 1997), and discounts that are too deep or too frequent can affect customers' expectations through reference price effects. In our specific setting, movie theaters already offer many forms of discounts and promotions, so the introduction of a new type of promotion would change price sensitivity in degree rather than provoke a major shift. In a market in which promotions are more unexpected, there may be a more substantial shift.

In addition, competitive locational targeting is less likely to trigger strategic consumer behavior (whereby consumers behave with the goal of receiving discounts) than targeting a retailer's own location with promotions. With own-location targeting, customers can more easily infer what it was about their own behavior (location, time of day, etc.) that resulted in receiving the promotion; the reasons for receiving a competitive promotion may be more difficult to guess. The most discount-sensitive customers may eventually find out about the promotion (we note the great lengths to which some consumers will go when seeking discount codes online or maximizing coupon use offline); even then, the customer risks making an extra trip for an uncertain chance of obtaining a discount. Thus, we expect that competitive locational targeting will actually mitigate undesirable (to the focal retailer) shifts in consumer behavior.

Our findings could also affect long-term competitive outcomes. The effectiveness of competitive promotions provides a strong unilateral incentive for firms to exacerbate the situation by actively targeting each other's locations. In our study, the competitively targeted promotions needed to overcome locational switching costs through deeper discounts than would be optimal for customers in the focal location. This finding is consistent with the conditions for intensified price competition predicted by theory (Corts 1998) in that the focal firm's weak segment is presumably the competitive firm's strong segment. Thus, locational tar-

geting has the potential to be used in concert with price discrimination to intensify price competition. In many retail markets, investments in location are quite significant, and the dilution of locational differentiation could prove costly.

Despite factors indicating increased price competition, we would not predict a total collapse of differentiation or pure price competition. From the response to focal and competitive targeting, it is likely that defensive promotions can deter poaching without needing to match discount depth; informational advantages about one's own customers could favor defensive promotions even further (Shin and Sudhir 2010). Brand asymmetries could also deter competitive targeting tactics (Desai, Shin, and Staelin 2014). Competitive targeting has even been shown to create positive spillovers for the competitive retailer due to switching costs (Anderson and Simester 2013) or the substitution from paid to organic links in online search for trademarks (Chiou and Tucker 2012). Positive spillovers (e.g., customers who are now more inclined to see a movie but do not want to travel to take advantage of the promotion) would dampen the incentive to compete on price in response to competitive promotions.

As of yet there has been no empirical analysis of the ideal competitive response; further research should investigate the effects of brand asymmetries and defensive mobile tactics. Presently, the strongest clues for what will happen come from observing the effects of prior marketing innovations. Although targeting technologies have been adopted over the past few decades, in practice we have yet to see drastically intensified competition as a result of competitive targeting. For example, online retailing has not yet led to frictionless commerce with pure price competition, and price dispersion still persists (Baye, Morgan, and Scholten 2004). Competitively targeted promotions in consumer packaged goods have not led to all-out price wars either, and the competitive response to promotions observed in the literature is surprisingly limited (Steenkamp et al. 2005). This could be due to imperfect information (Chen, Narasimhan, and Zhang 2001); mobile promotions can be difficult for competitors to monitor, and targeted consumers may not be identifiable, creating barriers to competitive response. Thus, although defensive tactics may prove to be quite effective, we believe that a tactical advantage currently accrues to marketers who effectively deploy these mobile techniques.

Conclusions

Our randomized field experiment provides causal estimates of locational targeting effects from mobile promotions in a retailer's own location and competitors' locations. We attribute a large fraction of the promotional response to the real-time targeting feature of the promotion. The optimal discount depth varies in each location, creating an incentive for third-degree price discrimination. Although these results should generalize to restaurants and retail, we recommend that marketers use similarly careful designs to optimize their own mobile promotions. As the availability and precision of these tools increases in the long run, locational targeting has the potential to intensify competition; at present, we find that they provide a substantial tactical advantage to a savvy marketer.

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