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ORIGINAL RESEARCH

The value of geolocation information across the promotion funnel

Marcel Goic[1] · **Jose A. Guajardo**[2] · **Liye Ma**[3]

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Abstract

This research uses a large sample of users from a mobile platform that enables firms to send *geolocated* promotions to examine how the value of geolocation information varies at different stages of the promotion funnel. This analysis reveals that although later stages of the promotion funnel account for a large fraction of the improvements obtained with geolocation, early stages of the purchase process also explain a significant part of the effect. Thus, our results show that geolocation adds value, not only because the promotional content becomes more relevant for consumers when they are closer to stores, but also because it allows it to reach consumers who are more willing to receive promotions in the first place. We analyze the role of location types and response times, contributing to a better understanding of the drivers of the value of geolocation information in mobile advertising, compared to traditional *push* and *pull* promotions.

Keywords Mobile technology · Geolocation · Conversion funnel · Retailing

✉ Marcel Goic
mgoic@uchile.cl

Jose A. Guajardo
jguajardo@berkeley.edu

Liye Ma
liyema@umd.edu

[1] Department of Industrial Engineering, University of Chile, and Instituto Sistemas Complejos de Ingeniería, Santiago, Chile

[2] Haas School of Business, University of California Berkeley, Berkeley, CA, USA

[3] Robert H. Smith School of Business, University of Maryland, College Park, MD, USA

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1 Introduction

The penetration of mobile technology has been rapid and global, with more than two-thirds of the world's population having a mobile subscription (GSMA, 2024). One distinguishing feature of mobile technology is that it enables the tracking of geolocation information of users. Surveys indicate that 8 in 10 marketers use location data in their ad campaigns,[1] with an expected market size of USD 232.7 billion by 2033.[2] Although there is general support for the notion that geolocation information is of value, there are important open questions about the mechanisms by which location-based marketing can influence customers. In this research, we investigate the role of geolocation depending on the customer's progress through the promotion funnel.

Extant literature has indicated that customers make purchase decisions depending on multiple environmental factors (Balasubramanian et al., 2005) and that firms' communications play different roles depending on the customers' relative progressions in their paths to purchase (Goic et al., 2022). Consequently, we expect that the effect of geolocation depends on that progression. In this paper, we study *how the value of geolocation varies throughout the promotion funnel.* We explore how geolocation contributes to informing customers in the early stages of the purchase process, and we compare it against the contribution of geolocation in converting customers later in the process. Furthermore, we compare geolocation messages against *push* promotions by firms and *pull* promotions (customers-initiated interactions), contributing to a better understanding of whether and how firms can benefit from the use of alternative types of messages in different stages of the promotion funnel.

In this study, we collaborated with a mobile platform that sends promotions from different retailers to consumers. The platform acts as an aggregator of multiple firms and sends geolocated messages to customers entering a predefined virtual perimeter called a *geofence*. In addition to the location-based messages, the mobile app may send push notifications to customers. These massive messages intend to generate more activity in the app and complement the more limited frequency of geolocated messages. Finally, some campaigns are also posted on the Facebook fan page of the platform. Once a customer "likes" a promotional campaign, she receives the message from that campaign in the app with the same information she would receive for a regular campaign.

One distinctive feature of the platform is the multi-stage nature of the interaction between the users and a given promotion. When customers initially receive a short message on their mobile devices, we observe whether they open it to see the full details of a promotion and whether they subsequently accept and redeem it in the stores. The information collected by the platform across stages is indicative of customers' progressions in the conversion funnel, separating users who purchased from those who were informed about the promotions or showed some interest but did not

[1] https://www.geoplugin.com/resources/location-based-marketing-statistics-top-insights-revealed/
[2] https://www.businessresearchinsights.com/market-reports/location-based-market-102271

purchase. This feature allows us to track effectiveness metrics in different stages and decompose the value of geolocation information throughout the promotion funnel.

Our analysis reveals that pull and geolocated messages are more likely to be redeemed than push messages. When decomposing the effect of geolocation through the promotional funnel, we find that geolocation adds value not only for reaching consumers more willing to redeem a promotion, but also for reaching consumers who are more willing to receive them. When assessing geolocation's relative impact on sales generation, we find that the upper funnel accounts for 27.4%−30.7% of the total effect, depending on the geolocation technology used. Pull messages show a smaller upper funnel effect, though it still comprises 22.1% of the conversion total probability. These are novel findings in the literature, which mostly argue that geolocation contributes to later stages of the process.

There are several reasons why location-based promotions can be more effective, including reduced transportation costs (Lian et al., 2019), better fit with the context in which messages are delivered (Tong et al., 2020), and better targeting capabilities (Ghose et al., 2019; Luo et al., 2014). All these factors provide an aggregated prediction that, after receiving and evaluating the content of a promotional campaign, geotargeted consumers should be more likely to convert, as we find in our analysis. However, we also find that they are more likely to download and open messages. Considering that in our application, these steps are taken without knowing what the actual product is being promoted, the observed pattern reveals an additional and complementary mechanism that contributes to location-based marketing effectiveness. We propose that geolocation allows firms not only to find customers who are more likely to convert once the promotional information is delivered but also to find customers who are in a *shopping-oriented* mindset, which makes them more willing to receive promotional information in the first place. To analyze the plausibility of this complementary mechanism, we conducted additional analyses and found largely consistent evidence with the proposed mechanism. Indeed, we verified that the marginal lift of geolocated messages mainly manifests when they are delivered at shopping-oriented locations and that geolocated messages are opened and accepted faster, indicating that customers are more ready to explore shopping-related information.

Overall, our results revealed that geolocation helps at later stages of the promotion funnel as well as early in the process, suggesting that location information allows firms to find those customers who are more receptive to receiving promotional information in a more favorable *shopping* mode. In this paper, we offer a detailed decomposition of the value of using geolocation information throughout the promotion funnel and establish a direct comparison between *geolocated*, *push* and *pull* messages in mobile environments.

2 Theoretical foundation

Research on location-based marketing has shown that using customer location can lead to more effective marketing campaigns (Luo et al., 2014). Moreover, existing research has examined how factors such as time of delivery (Fang et al., 2015),

weather (Li et al., 2017), coupon value (Danaher et al., 2015), competition (Fong et al., 2015), and product type (Bart et al., 2014) can influence consumer response to mobile coupons. Although existing studies have disentangled important aspects of mobile advertising, they do not describe how the value of geolocation varies at different stages of the conversion funnel.

Literature from different disciplines has proposed frameworks to understand how information affects different stages of the decision processes. In advertising, most agree witha hierarchy of effects where customers' responses to advertising occur in an ordered sequence, starting from cognitive recognition to finishing in conative action (Barry & Howards, 1990). The well-known AIDA framework (Lavidge & Steiner, 1961; Reed & Ewing, 2004) provides a relevant conceptual framework and indicates that promotional activities can have different effects depending on the progression in the promotion funnel. Our empirical setting—in which we observe a series of sequential actions from the consumers—enables us to extend this framework to the case of mobile advertising. After downloading a message to the mobile device, the customer is *aware* of the existence of a promotion. When she opens the message, she shows *interest* in the value offering, and when she accepts, she indicates a *desire* for the products on promotion. Finally, redemption is the specific *action* the customer can take to make the promotion effective. Although the literature indicates that the effect of advertising does not necessarily follow a linear progression (Vakratsas & Ambler, 1999), our observation of consumer sequential actions indicates different levels of purchase interest. In this research, we study how geolocation plays a distinctive role depending on the level of progress of the customer in her path to purchase.

The impact of advertising along the conversion funnel has been empirically investigated in other contexts, such as online retailing (Todri et al., 2020) and brick-and-mortar stores (Seiler & Yao, 2017). However, previous analyses of the role of geolocation throughout the conversion funnel in the context of mobile are mostly descriptive. For example, survey-based research has suggested that consumers may use mobile phones to search for information in the early stages of the process (Holmes et al., 2013). The empirical literature exploring the effectiveness of location-based marketing suggests that mobile targeting has a "lower funnel" effect. For instance, Luo et al. (2014) suggest that when consumers are close to the stores, and after having the campaign information, they can better imagine the benefits of the products, inducing higher purchase intentions.

In this research, we decompose the value of geolocation in different purchase stages and propose mechanisms consistent with the findings of this decomposition. If geolocation boosts conversions only because of giving customers promotions that they can imagine as more attractive, conversions should be more likely only after customers see the information of a campaign. Complementary, a positive effect of geolocation in the early stages of the promotion funnel would indicate that geolocation is effective not only because it delivers information that is more relevant to the current location of the customer but also because it reaches prospects who are more predisposed to receive that content.

Our comparison of different mobile communications is also related to the distinction between *pull* and *push* promotions. In a push strategy, the channels stimulate

sales, while in a pull strategy, the primary goal is to attract consumers directly (Martín-Herrán et al., 2010). This distinction has been studied in the context of traditional brick-and-mortar retailing (Neslin et al., 1995), but less so in the analysis of mobile. A distinctive characteristic of our setting is that we observe *pull* messages—sent to subscribers upon request—and *push* communications—sent without the need for customer action, thus allowing us to compare these different mechanisms in the context of mobile marketing for the same universe of campaigns and users. Indeed, for some campaigns, the platform sends push messages to customers regardless of their location; we refer to these messages indistinctively as non-geolocated or push messages. On the other hand, the company implemented a protocol to connect the platform to Facebook and a fraction of the messages in our sample originates when users "like" a specific promotion through the company´s Facebook fan page. We refer to these cases as *pull* messages because they are directly triggered by a concrete action by the user. This is in contrast with geolocated messages that are automatically triggered by a customer's location and do not require any action from the user, a feature aligned with push messages. However, a feature aligned with pull communications is the customer's ability to activate (or deactivate) location-based services on their mobile devices, which can be interpreted as an information signal of their willingness to receive promotions. Thus, we posit that geolocated messages triggered through geofences can be seen as an intermediate category in the pull versus push spectrum.

In summary, this paper contributes by analyzing how the value of using geolocation information differs *throughout the conversion funnel* in comparison to other promotional vehicles. Our investigation is based on the analysis of a rich dataset that allows a detailed characterization of the mechanism by which geolocation information provides value.

3 Research setting and data

3.1 Research setting

We collaborated with a mobile platform that enables firms to implement geolocated marketing programs. The mobile platform started operations in 2013 and has since collaborated with hundreds of brands. The company tracks the position of registered users through their mobile phones, sending them geolocated promotions when they enter predetermined locations. In the platform, promotional information is gradually revealed to consumers in several steps. When a message is sent, it is first downloaded to the user's mobile device and displayed in the list of available promotions. Like the inbox of an email account, users at this stage only see a broad description, typically with no explicit description of the specific products available or the exact discount offered. Given the succinct nature of the message, the company names them "whispers" (see Web Appendix 1 for an example). By clicking on a "whisper," the user sees detailed information about the campaign, including product, price, and locations where the promotion can be redeemed. With that information at hand, the user can accept the campaign to

receive a promotional code; accepting has no immediate cost or benefit for the users but denotes their potential interest in the promotion. Using this code, users can then redeem the promotion in the associated retail stores. Each coupon can be redeemed only once.

The platform uses different technologies to implement geolocation that differ in cost and precision. Indeed, in addition to regular geofencing, the company uses Bluetooth *beacons*, which are typically installed in-store or within a few meters, allowing to reach customers who are very close to the store. These require dedicated devices, though, which could increase the cost of the campaign and, therefore, only represent a very small percentage of the geolocated messages in our data. We, therefore, distinguish regular geofencing—which we label as *geolocated (no beacon)* messages—from geofencing implemented using beacons—which we label as *geolocated (beacon)* messages.

3.2 Data

We focus on campaigns with complete data for all stages of the promotion funnel, including redemption behavior reflecting final sales. In our application, redemption data are available only for a major multinational fast-food chain, which integrated its point of sales systems with the mobile app for operationalizing customers' redemptions of promotions. For other retailers, we observe downloads and acceptances, but we do not observe final sales. In addition, we concentrate on campaigns with at least one message sent through each promotion type, i.e., campaigns with at least one geolocated, push, and pull message. This alleviates a potential endogeneity concern that might appear if some campaigns use a given promotion vehicle but not others.

To further alleviate endogeneity concerns, we focus on customers who have received all types of messages (geolocated, push, and pull) during their history using the app. Indeed, it is natural to argue that customers who never received a geolocated message can be systematically different from customers who did. In addition, the analysis will focus on customers who received only one message for a given campaign, i.e., we exclude customer-campaign cases where the customer received multiple messages for a given campaign. This restriction is imposed to avoid contamination across channels and to isolate the effects of interest, i.e., this choice allows us to identify the differential impact of receiving a promotion through different channels without cross-channel contamination.

Our resulting sample thus covers 51,700 consumers and their responses to 24 promotional campaigns that took place in Santiago, Chile. Campaigns are for fast food, with an average list price for the product of around USD$10. Often, campaigns were of the "buy one, get one free" type, with an average discount of 44% off the list price. Table 1 reports descriptive statistics for our sample of analysis, broken down by message type. In general, the platform converts 1.85% of the messages but pull and geolocated messages have better conversion rates than push ones, which aligns with previous literature.

Table 1 Number of messages by message type/funnel stage

Message Type	Sent (S)	Download (D)	Open (O)	Accept (A)	Redeem (R)	Conversion (R/S)
Geolocated (beacon)	651	593	471	248	54	8.29%
Geolocated (no beacon)	61,994	46,555	28,701	13,304	2,822	4.55%
Push	301,924	163,479	105,511	42,497	3,683	1.22%
Pull	3,856	3,490	3,058	2,143	272	7.05%
Total	368,425	214,117	137,741	58,192	6,831	1.85%

4 Main analysis: decomposing the value of geolocation information

Our main goal is to estimate the value of geolocation in each stage of the promotional funnel, and then to evaluate the contribution that geolocation information has in helping conversions. A key component to estimate the impact of geolocation across the different stages of the funnel is the modeling of the relationship between the different decisions in the process. Although in our empirical setting, the characteristics of the campaign are progressively revealed to the user, there are common factors affecting the decision at all stages, and therefore, we adopt a modelling framework where the underlying utility functions of each stage are correlated.[3] Thus, our analysis is based on a multivariate probit model, which has been frequently used before to jointly model sequential decisions (Agarwal et al., 2015; Rutz et al., 2012). We control for differences between campaigns through fixed effects. In this model, the promotional channel has a distinctive coefficient per equation, providing us with a quantification of how these new information pieces locally help customers progress to the next stage. Formally speaking, the indirect utility u^h_{ijk} derived by customer i for a message of type k from campaign j in stage of the promotional funnel h (h in $\{D, O, A, R\}$) is given by

$$u^h_{ijk} = \beta^h_j + \gamma^h_k + \theta\prime \mathbf{x}_{ij} + \varepsilon^h_{ijk} \tag{1}$$

where $\varepsilon_{ijk} = (\varepsilon^D_{ijk}, \varepsilon^O_{ijk}, \varepsilon^A_{ijk}, \varepsilon^R_{ijk})$ follows a multivariate normal distribution with cero mean and variance covariance matrix V_ε. In this definition of the utility functions, β^h_j represents campaign-level fixed-effects, and γ^h_k captures the effect of message type k in that stage.[4] The set of covariates $\mathbf{x}_{ij}$ captures additional information about the context in which the promotion reached consumers. Here, we create dummy variables characterizing the time at which customers receive a message: *Weekend* (Saturday or Sunday), *Lunchtime* (between 11 am and 3 pm), and *Dinnertime* (between 5 and 9 pm), to capture daily and weekly seasonal effects that correlate with

[3] In Appendix 2, we discuss an alternative model where funnel decisions are independent, conditional on the positive outcome of the previous stage.

[4] In Appendix 2, we discuss an alternative model where we also control for campaign covariates.

fast-food consumption. In all these regressions, non-geolocated messages are used as the baseline category, i.e., the coefficients for geolocated (beacon and no beacon) and pull messages represent the differential effect with respect to push messages.

The estimation of the covariance matrix V_ϵ show that the off-diagonal elements are significantly different from zero. Furthermore, using the likelihood ratio test, we reject that all correlations between stages are null (p-val < 0.001), providing support to our choice of using a multivariate probit as our modeling framework. Table 2 reports parameter estimates for all channel coefficients in all stages.

Estimates in Table 2 provide insights about the conditions under which these campaigns can be more effective. The coefficients of *Lunchtime*, *Dinnertime,* and *Weekend* are positive across all stages, indicating that the timing is relevant to increase download, open, acceptance, and redemption rates. Regarding the effect of promotional types in different stages of the decision process, most coefficients in the path to purchase are positive and significant, confirming that pull and geolocated messages are indeed more effective than push messages. Moreover, since the effects are positive at all stages, this suggests that channel choice influences customer conversion throughout the entire promotional funnel, not just in later stages. For example, if we focus on geolocated messages, our results indicate that sending promotional information based on customer location not only makes them more likely to accept and redeem, but also to download and open the messages in the first place.

To gain intuition on the magnitude of the channel effects, we report the *average* marginal effects, which measure how different covariates (e.g., channels) affect the probability of progressing in each stage (Bland & Cook, 2019). To compute marginal effects, we calculate the probability of having a positive outcome in each stage for each channel, and then we subtract it from the counterfactual probability of the event, assuming that the message was sent using the baseline channel (push). Marginal effects have been used in many other applications in marketing and related areas (e.g., Goic et al., 2021;

Table 2 Model estimates. All models include campaign fixed-effects (not reported). Standard errors in parentheses

Regression Coefficients	Download	Open	Accept	Redeem
Pull	1.192***	1.262***	1.163***	0.759***
	(0.028)	(0.025)	(0.023)	(0.034)
Geolocated (beacon)	1.225***	1.191***	0.860***	0.975***
	(0.067)	(0.052)	(0.051)	(0.072)
Geolocated (no beacon)	0.580***	0.457***	0.296***	0.529***
	(0.009)	(0.009)	(0.010)	(0.015)
Weekend	0.070***	0.150***	0.062***	0.120***
	(0.010)	(0.010)	(0.011)	(0.020)
Lunchtime	0.084***	0.147***	0.122***	0.127***
	(0.005)	(0.005)	(0.006)	(0.012)
Dinnertime	0.319***	0.253***	0.228***	0.243***
	(0.006)	(0.006)	(0.007)	(0.013)

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Kanat et al., 2018), and they will be instrumental in quantifying the relative impact of each channel across the promotional funnel. Results are displayed in Table 3.

One of the main objectives of this research is to evaluate if different communication channels generate differential impacts in the upper or lower parts of the promotional funnel. The analysis of marginal effects shows that geolocated messages have meaningful effects in increasing download and open rates, demonstrating important upper funnel effects. For instance, compared to a push message, those sent based on the location of the user are 0.164 percentage points more likely to be downloaded. If the precision of the location is further improved with beacons, the likelihood of downloading increases by 0.273 percentage points with respect to the baseline. From Table 3, we observed similar lifts in the likelihood of opening a message. Considering that in the early stages of the process the user has a very incomplete description of the value offering of the promotion, these positive effects are explained by a favorable predisposition to receive and evaluate promotional information when users are located close to shopping stores. Although the marginal effects for pull messages are similar in magnitude to those exhibits by geolocation, the mechanism is rather explained by selection, where users self-declare they are interested in the campaign.

The descriptive statistics previously shown in Table 1 indicate that, from those who accept the promotion, only 11.7% (6,831/58,192) redeem them. From a business perspective, we are interested in knowing if the positive upper funnel we have found has any material impact on final conversions or if it vanishes in the lower funnel stages. To gain intuition about the relative importance of each type of promotion in motivating users to complete their purchases, we evaluate the relative impact of each stage on the final redemption probability. In this analysis, we first compute the probability that customers will move forward through different stages for each channel. Then, we compare those probabilities against a counterfactual scenario where the effect of a specific stage is removed. Formally, if p_k^h is the probability of having a positive outcome in stage h when receiving a promotion through message type k, then the change in total conversion probability for the corresponding stage is given by:

$$\Delta p_k^h = \left(p_k^h - p_0^h\right) \prod_{g \neq h} p_k^g \tag{2}$$

In this expression, $\left(p_k^h - p_0^h\right)$ is the average marginal effect of each channel on each stage, representing how the probability of progressing to the next stage is

Table 3 Average marginal effects for channel effects. In parentheses, we report standard deviations across message instances

MARGINAL EFFECTS	Download	Open	Accept	Redeem
Pull	0,263***	0,245***	0,286***	0,204***
	(0,060)	(0,061)	(0,067)	(0,050)
Geolocated (beacon)	0,273***	0,268***	0,252***	0,263***
	(0,068)	(0,056)	(0,039)	(0,047)
Geolocated (no beacon)	0,164***	0,130***	0,100***	0,160***
	(0,033)	(0,026)	(0,015)	(0,033)

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

influenced by the corresponding channel. Intuitively, Δp_k^h measures the change in the probability of conversion if the effect of type k were not present only in stage h. Using the estimates from Table 1 and Table 3, we compute those values for each type and then evaluate the relative importance of each stage, as reported in Fig. 1. For a detailed description of the computation of Δp_k^h, see Appendix 3.

The small acceptance/redemption rates effectively imply that even minimal effects at that stage have large impacts on the overall sales generation. Nevertheless, the influence that location information has on the upper funnel still accounts for 30.7% the total conversion probability (27.4% when using beacons). For pull messages, the effect on the upper funnel is smaller but still explains 22.1% of the conversion probability.

Taken together, these results indicate that the value of geolocation cannot be exclusively explained by an increased likelihood of redemption, as suggested by previous literature. Further, a significant part of the improvement is attributed to reaching consumers who are more receptive to receiving promotions, given their proximity to stores. In other words, the effectiveness of location-based marketing is due to not only an increased willingness to buy but also the reach of consumers who are more willing to receive promotions and read shopping-related information.

Previous empirical research has proposed that when individuals are close to the stores, they form a more concrete mental construal of the context, facilitating the evaluation of the value proposition (Luo et al., 2014). This theory can explain large differences in redemptions at the end of the purchase process, as we observe in our setting. Nevertheless, it does not provide a satisfactory explanation for the positive differences we found in the early stages of the process. Recall that customers have only partial information about the value proposition of the campaign when deciding to open, and therefore, it is unlikely that they can make concrete evaluations of the attractiveness of the promotion. By opening a message after only observing the brand and a succinct description of the value offering, users are signaling a broad interest in receiving promotional information. We label this state as consumers being in a *shopping mode*.

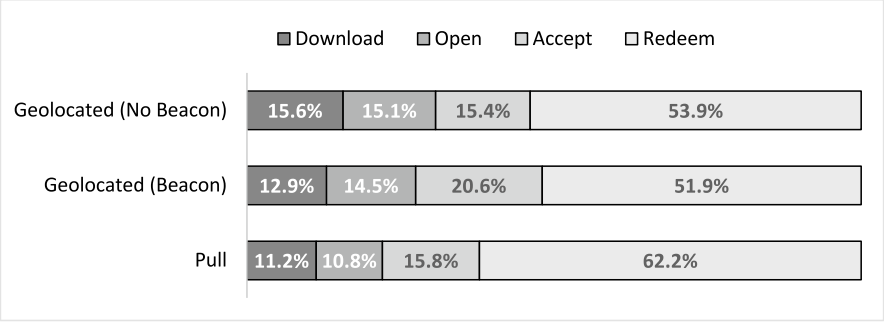

Fig. 1 Contribution of each stage to final conversion, by message type (relative to push messages)

5 Beyond the main effects: location types and response times

5.1 Location types

The majority of (no beacon) geolocated messages are delivered around individual *stores* (44%) and shopping *malls* (40%). Nevertheless, we also observe messages sent through non-shopping-oriented fences in high-traffic locations such as education campuses, parks, and subway stations, which altogether account for 16% of geolocated messages. As we have interpreted the relevant effect of geolocation in the upper funnel to be explained by a greater willingness to receive promotional information, we expect geolocated messages to be more effective in purchase-oriented locations. To evaluate if this is indeed the case, we run an alternative version of regression (1), but further distinguishing geolocated messages as {store, mall, other}. For a detailed analysis, see Web Appendix 4.

The results show that messages delivered in shopping-oriented locations (*malls*, *stores*) are more effective than otherwise (*other*). This analysis indicates that the proximity to stores significantly improves the odds of a positive outcome in all stages of the funnel, including those in the upper funnel. The identification of this favorable predisposition to purchase in shopping-oriented locations is consistent with our proposed mechanism of reaching customers who are more likely to be in a *shopping mode.*

5.2 Response times

In the dataset, we observe the time elapsed between when a message was sent and opened (for messages that were indeed opened), and the time elapsed between opening and accepting a promotion (for messages that were indeed accepted), recorded in minutes. The dataset does not include records of the times at which messages were redeemed.

If customers receiving geolocated messages are indeed in what we call a *shopping mode*, they should be more prepared to check and respond to promotions. Therefore, we expect shorter response times for geolocated messages. Results of a fixed-effects regression of response times on message type and control variables confirm faster opening and acceptance times for geolocated messages (see Web Appendix 5). In addition, we observe faster sent-to-open times for pull messages than for push messages. Overall, these results are consistent with our description that upper funnel effects are associated with a higher predisposition to receive promotional information through the geolocated and pull channels. These results regarding response times are relevant as they provide complementary support to the idea that part of the effectiveness of geolocation is explained by a shopping-oriented mindset that manifests in the upper promotional funnel, thus providing additional evidence in favor of our proposed mechanism.

A related question is whether response times in the sent-to-open and open-to-accept stages are predictive of subsequent redemption behavior. We examine this

question by incorporating response time covariates into our model specification (see details in Web Appendix 6). The results show negative coefficients for the time elapsed in the sent-to-open period: the faster the user opens the message, the larger the probability of a positive outcome. Furthermore, the included interactions with channels reveal that sent-to-open response times are stronger for geolocated messages. We posit that shorter opening times in those cases reflect that customers are receiving the message in a relevant context and, hence, are more likely to respond more quickly. For instance, customers might check their mobile devices more frequently or be more attentive to the app, which is once again consistent with our proposed explanation of customers being in shopping mode.

6 Discussion and conclusion

The analysis shows that geolocated messages and pull messages exhibit higher conversion rates than push messages. When decomposing the effects by stages, our estimates show that an important fraction of the value added by geolocation could be attributed to later stages of the purchase (lower funnel), as described in previous research. However, a meaningful 22.1% to 30.7% of the geolocation effect is explained by better performance in the early decisions of downloading and opening messages (upper funnel). This novel finding cannot be derived from aggregated conversion metrics and sheds further light on why geolocation information can be valuable.

Although we found that both pull and geolocated messages are more effective than the baseline, the reasons explaining the higher conversions are different depending on the channel. In conversions derived from pull messages, it is the user who selects herself to receive the promotion, and therefore, no contextual information is used for targeting. Notice however, that geolocation could be used to further improve the effectiveness of pull messages. Indeed, while in our empirical application, pull messages are sent a few minutes after liking the campaign on the Facebook page, our results suggest that geolocation could be used to optimize the timing of the delivery, or to retarget messages, so they are not only sent to users who are interested in the campaign, but also they are sent at the right time when they are close to the stores.

A focal theme of this research is the analysis of the underlying mechanisms driving mobile conversions. In this regard, we attribute the gains from geolocation to a dual mechanism: geolocation not only exhibits larger conversion rates once the customers receive full information about promotions, but also because customers are more willing to receive them. Our complementary analyses of shopping locations and response times provided further evidence that customers who receive the messages through geolocation are indeed in a more deliberative state, which facilitates their processing of promotional information. Altogether, we pose that geolocation information helps to identify and reach customers who are predisposed to receive promotional information in what we call s*hopping mode*. This is a novel finding that complements our understanding of the reasons why location-based marketing can be effective.

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Declarations

Ethical approval The data used in this project was collected under the consent of the users and anonymized for the purpose of the analysis.

Conflict of interest The authors declare no conflict of interest related to this project.

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