Weather and Mobile Promotion

Abstract

Despite the ubiquitous impact of weather, little evidence exists, especially with field data, on how consumers respond to weather and how this affects their responses to promotions. On the basis of multiple field experiment datasets with over 10 million smartphone users, we investigate how sunny and rainy weather affects consumers’ incremental purchase responses to mobile promotions. Our field data can identify the causal impact because smartphone users across a wide range of geographical locations and climates are randomly assigned to receive mobile promotions with a prevention ad copy frame (treatment) and neutral ad copy frame (control). The data can also identify the incremental purchase responses because there is a baseline (holdout) group of smartphone users who are comparable to the treatment and control groups but receive no promotion. Our data analyses account for customer self-selection bias in multiple ways: (a) geographical locations in terms of different areas, (b) time variations in terms of different days and hours of the day, and (c) individual usage behavior heterogeneity in terms of activity bias in different weather condition. To further address endogeneity and self-selection concerns, our identification strategies rely on the within-person changes in weather, via both backward-looking historical weather and forward-looking forecasts, as well as deviations from the normal expected weather of geographical regions. The main result is that consumers are more responsive to SMS and APP promotions on sunshine days, but a prevention frame of ad copy increases the effectiveness of promotions on rainy and inclement days. These results are consistent with the affect-as-information theory (the sunny weather-induced positive mood boosts consumer response likelihood and hazard) and mood congruency hypothesis (the rainy weather-induced negative mood matches with the prevention frame of ad copy). In terms of the odds ratio of purchase likelihood, sunny weather leads to about 1.21 times more purchases as a result of the mobile promotions compared with cloudy weather, and rainy days leads to about 0.9 times less purchases than cloudy days. Hour-by-hour analyses with survival models suggest the hazard rate of responses would be 73% faster in sunny weather but 59% slower in rainy weather relative to cloudy sky. With over 150 million users of weather apps, there are a total of 2 billion checks of weather each day. For marketers, these staggering numbers may implicate some new business opportunities with weather-targeted SMS and APP promotions for smartphone users.

Keywords: Mobile, Targeting, Field Experiment, E-commerce, Advertising, Weather