The Effect of In-Store Travel Distance on Unplanned Purchase With Applications to Store Layout and Mobile Shopping Apps

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We investigate the relationship between in-store trip length and unplanned spending in a field study by using an instrumental variable approach. We find that the effectiveness of location-based mobile apps in increasing travel distance and unplanned spending is more substantial than that of product category relocation.

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the vice shopping basket condition chose a brand of potato chips and a brand of cookies to purchase while those in the virtuous shopping basket condition chose a brand of pretzels and a type of grapes. In all conditions, the price of the initial choices summed to $4.00, however some items were portrayed to be on sale using the following manipulation. In addition to showing participants the current price of each item, we reported the last week’s price in a separate column next to the current price column. One item in the second category was noted to be on sale (with a label emphasis – ON SALE!) with the original price being $3.50 marked down to the sale price of $2.50 The other option within this category was sold at its regular price of $2.50. Accordingly, a participant who chose the sale item would perceive that they had saved $1.00, but total spending of all participants was actually equal to $4.00 prior to the impulsive spending task. After making their initial choices, participants were then asked to indicate their willingness to pay for Snickers bars. Consistent with the licensing effect, we find that, in the no savings condition, the virtuous shopping basket composition licenses increased impulsive spending on Snickers bars. In contrast, when participants saved money on their prior choices, the licensing effect of the virtuous basket disappears as there is no significant difference in impulsive spending between vice and virtue conditions.

The second study builds on the first study in several ways. First, we demonstrate that the licensing effect of virtuous basket composition extends to impulsive spending on a relatively virtuous item (Soyjoy Nutrition Bar) and that, as in Study 1, this effect does not manifest in the savings condition. Second, to better reflect the real shopping experience, we increased the number of product categories in the initial choice phase and altered the composition of the shopping baskets (e.g., 3 virtue items plus 1 vice item rather than 2 virtue items). Third, we find that virtuous basket composition leads to higher health self-concept than a vice basket composition but that savings attenuate this difference. Finally and most importantly, we show that health self-concept mediates the moderating role of savings on the effect of virtuous shopping basket composition on subsequent impulsive spending.

Furthermore, to test our thesis in a real shopping setting, we leveraged data from the field study conducted by Stilley, Inman and Wakefield (2010). In this study, 400 customers were intercepted as they entered two different grocery stores located in a southwestern city. Before they entered the store, respondents were asked to estimate how much they intended to spend in total. Since respondents kept track of their purchases in order using a hand-held scanner, we were able to measure the composition of their shopping basket and the amount of accumulated savings before they make impulsive purchases (i.e., items bought after respondents exceeded their mental budgets). We again find that lower hedonicity rating of the shopping basket is associated with higher subsequent impulsive spending only when accumulated savings are low, providing external validity for our results.

Using both simulated and real shopping data, this paper documents the moderated licensing effect of virtuous prior shopping on subsequent impulsive spending. In particular, participants who earlier purchased more utilitarian (vs. hedonic) products are later willing to spend more on impulsive purchases but only when they did not realize any savings on their prior purchases.

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**EXTEnded Abstract**

Retailers have traditionally located frequently purchased products (e.g., milk) in strategic locations that encourage shoppers to cover a longer distance in the store. In this case, consumers will be exposed to more products and in-store stimuli along the way, thus become more likely to make unplanned purchases. In addition, recent advances in location-based mobile marketing have made it possible to integrate shoppers’ location with their loyalty card information and offer targeted promotions to increase distance traveled.

The effectiveness of in-store shopper marketing strategies aimed at increasing in-store travel distance is contingent on whether there is a direct effect of longer in-store trip distance on unplanned purchasing, and if so, the magnitude of this effect. Rather surprisingly, the academic research literature has largely been silent on this important practical issue. While Granbois (1968) and Inman, Winer and Ferraro (2009) include a metric related to trip length (e.g., number of aisles shopped) and show that it is positively correlated with the likelihood of unplanned purchases, to the best of our knowledge there has been no study that explicitly estimates the direct relationship between in-store trip length and unplanned spending. Part of the reason for this gap in research is that before the recent development of radio frequency identification (RFID) tracking, in-store trip length was difficult and costly to obtain. Further, even if in-store trip length can be measured reliably and cost-effectively, a direct interpretation of the regression coefficient of in-store path length on the amount of unplanned purchases is still misleading because in-store path length is endogenous.

The endogeneity of in-store path length is caused by omitted in-store and out-of-store variables, simultaneity/reversed causality, and measurement error. First, some omitted in-store and out-of-store variables can cause changes in both unplanned purchases and in-store path lengths. Suppose that a shopper is attracted by the display of an unplanned item and purchases that product. Then both in-store path length and the amount of unplanned purchases increase, but there is no direct causal relationship between the two, resulting in a spurious correlation. Second, since both in-store path length and the amount of unplanned purchases are generated during the same shopping trip, it is difficult to empirically tease apart the direction of causality between them. For instance, it is possible that a shopper decides to buy an unplanned product first, then incurs the additional distance to purchase that product. Third, the difficulty of accurately measuring in-store trip length may lead to a noisy measure.

To combat the aforementioned endogeneity issues, we construct an instrumental variable based on the length of a “reference path,” which is determined by the store layout, a shopper’s planned purchases, and an assumption about her search strategy. Specifically, we consider two possible strategies, an infinitely forward-looking traveling-salesman strategy (TSP) or a one-step-look-ahead strategy (a “greedy” algorithm). We show that the length of this reference path is strongly correlated with the length of the actual in-store path. Importantly, since the reference path is determined before the shopper starts her grocery trip, this instrumental variable temporally precedes the dependent variable (amount spent on unplanned purchases).

Our field study was conducted in a medium-sized grocery store located in a northwestern U.S. city. We collected data from 300 shoppers by offering each of them a $5 store gift card as participation compensation. Each participant first completed an entrance survey. The questions therein included: (1) whether they had a shopping list...
today; (2) their total shopping budget; (3) whether they were shopping alone; and (4) their familiarity with the store in terms of the product locations. Finally, on a list of all product categories in the store, they checked all the products they planned to purchase during the current shopping trip. This forms the “planned” set of products for each respondent. After finishing the entrance survey, the experimenter helped participants to put on a PathTracker® belt. The RFID (Radio Frequency Identification) tag on the PathTracker® belt emits a radio frequency signal every five seconds, which is then picked up by the antennas at the perimeter of the store, allowing us to track the (x,y) coordinate of the shopper in the store at any time. We compute the total in-store path length for each shopper using their shopping path obtained from the RFID tracking. After completing their shopping trip and checking out, participants completed an exit survey in which they answered several demographic questions, including their gender, age, household size, household income, and whether they have children. The store provided the transaction history for this specific shopping trip for all of the participants. By comparing each shopper’s total purchases to the planned categories stated in the entrance survey, we compute the amount of money that each shopper spent on unplanned purchases.

With our empirical data collected through the field study and having constructed a valid instrument, we estimate the causal effect of in-store path length on unplanned spending using two-stage least squares. We estimate that the elasticity of unplanned spending on in-store travel distance is around 1.44, which is 53% higher than the corresponding OLS estimate that does not account for endogeneity. To put this into perspective, for our dataset, increasing path length by 10% for each shopper (an average of around 140 feet) will increase unplanned spending by about 14.4%, or $2.27 per shopper, which is 53% higher than the (uncorrected) OLS estimate.

Having estimated the effect of in-store travel distance on unplanned purchases, we then use our econometric framework to conduct two sets of policy experiments to explore the potential effectiveness of (a) location-based mobile apps to deliver in-store targeted promotions and (b) product placement strategies in increasing unplanned purchases via increasing shoppers’ path length. We find that by strategically promoting an additional product category (hence adding an additional “planned” category into a consumer’s shopping list), the overall amount of unplanned purchase can be increased by as much as 28%. In contrast, we find that relocating product categories only has a limited effect (around 5%) on increasing unplanned purchases.

REFERENCES


