

# Store Environment and Advertising: Investigating Two Manipulative Forces from the Supermarket<sup>1</sup>

Joeri Clochet,<sup>2</sup> Sam Cosaert,<sup>3</sup> Laurens Cherchye<sup>4</sup> & Bram De Rock<sup>5</sup>

## ABSTRACT

We compare two manipulative forces from our daily shopping environment: store environment and advertising. Deviating from existing studies in the literature, we isolate store environment and advertising by using a simple experimental design, and we use a revealed preference methodology for analyzing (rational) consumer behavior. In a first step, we confirm that both forces positively impact on the expenditures for the promoted good. In a second step, we use a revealed preference methodology to investigate whether these manipulating forces have an distortive effect on consumer behavior. Our experiment suggests that respondents effectively tend to behave more irrational when subject to these forces, i.e. they spend more money for less utility. More generally, our paper motivates the use of revealed preference methodology in combination with specifically targeted experiments to address questions related to marketing influences on (rational) consumer behavior.

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store environment, advertising, rational consumer behavior, revealed preferences, GARP

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## 1. Introduction

On 10 February 2009, yearly price negotiations between supermarket chain Delhaize and manufacturer Unilever failed, because of a price raise announced by Unilever. As a reaction to this, Delhaize banned 250 Unilever products from its shelves. This

created an awkward situation, especially when bearing in mind both players' considerable turnovers and market shares.<sup>6</sup> As a consequence, both parties started fighting each other by setting up marketing campaigns. Unilever sent out brochures about the banned products with the following message: "Unfortunately temporary unavailable at Delhaize. Luckily still available at other supermarkets." Delhaize, on the other hand, made special displays and printed special posters presenting alternatives to the banned products.

This is a typical example of the competing forces associated with store loyalty and brand loyalty. In this respect, an important stream within the marketing literature has focused on the effects of store environment and advertising. Store environment is then defined as the physical organization of stores in order to influence the customers' in-store spending; and advertising is interpreted as a form of communication that attempts to create brand loyalty. To quote Kotler (1973), who emphasized the importance of store atmosphere: "One of the most significant characteristics of a product is the place where it is purchased and consumed. In many cases, the atmosphere of the place has a larger impact than the product itself." Several follow-up studies have refined this observation; see, for example, Milliman (1982) on the influence of music, Bellizzi, Crowley and Hasty (1983) and Bellizzi and Hite (1992) on the effects of colors, and Hirsch (1995) on the manipulation of aromas.

As such, we may safely conclude that many parameters of the environment can influence the consumer. However, a lot of stimuli in the broad shopping environment also stem from advertising, such as attractive packing, TV commercials, .... These advertisement stimuli differ from the above mentioned atmospheric conditions because they are specifically related to the product and not to the store. But unlike store environment, advertising has often been subject to criticism. Holzhauer (1994) evaluates the pros and cons of advertising, and he argues that advertising is crucial in a differentiated market, as a source of information. Van Kralingen (1999) describes the emerging significance of brands. According to this author, we live in an appearance-oriented society, where the decision-making process is primarily based on image and stylishness, rather than functionality of the products. This implies that most consumers seldom choose or compare rationally. A general conclusion of these studies is that the major threat of advertising lies in the fact that it could influence the rationality of customers.

The marketing literature mostly treats advertising and store environment as being complementary. It is generally acknowledged that the presence of brand products positively impacts on the image of a supermarket. Leung and Oppewal (1999) consider store choice as a process determined by store names and brand names of the products that are sold within a store. Furthermore, Grewal et al. (1998) confirm that store names determine store image and in-store purchases. Brand and store names thus influence consumption together. However, we find little evidence on the separate effect of advertisement and store environment. Indeed, it is well possible that existing empirical results are partly obscured by interaction effect between these two manipulative forces.

In this study, we conduct a simple experiment that allows us to isolate the effects of advertising and store environment. Specifically, our experiment considers 3 groups of respondents. All respondents compose bundles of salt chips and paprika chips for a number of choice sets characterized by (varying) budget constraints. The first group is our control group; respondents in this group only get information on the choice set without further manipulation. For the second (treatment) group, we slightly manipulate the information by specifically advertising in favor of paprika chips. In the third (treatment) group, the salt chips are presented more attractively. In particular, paprika chips in group 2 are portrayed as an exclusive brand product, whereas salt chips in group 3 are portrayed as a store brand product associated with a pleasant and stimulating supermarket. Thus, group 2 is influenced by using advertising in favor of paprika chips, whereas group 3 is influenced by manipulating the environmental conditions.

In a first step, we compare the average spending on different types of chips for the several groups. This allows us to verify whether advertising and store environment effectively do have a positive effect on expenditures for the promoted goods. In a second step, we analyze the influence of these marketing effects on the rationality of the respondents. To do so, we make use of so-called revealed preference methods (see Varian, 2006, and Cherchye, Crawford, De Rock and Vermeulen, 2009, for recent surveys). More precisely, as we will argue, the generalized axiom of revealed preferences (GARP) allows us to test for each respondent whether he/she does make consumption choices that are ‘rational’, i.e. consistent with utility maximization for the given budget constraint. In fact, it has been argued that revealed preference methods are particularly well-suited for analyzing consumption data that are gathered by means of a choice experiment (see e.g. Sippel, 1991, and Harbaugh, Krause and Berry, 2001). In addition, our GARP-based method obtains for each respondent a so-called violation index, which measures the degree to which observed behavior deviates from rational behavior. This index allows us to quantify the amount of money that has been ‘wasted’ due to irrational behavior. Putting it differently, it captures the extent to which the respondent could have chosen a bundle that is ‘better and cheaper’.

The rest of this paper unfolds as follows. Section II presents the revealed preference methodology that we use in our analysis. Section III describes our experiment and discusses our empirical results. Section IV concludes.

## II. Revealed Preference Methodology

### A. Characterizing Rationality: GARP

Suppose that for a given consumer we observe  $T$  individual choices of  $N$ -valued bundles. For each observation  $t$ , the vector  $q_t \in \mathbb{R}_+^N$  (with non-negative components)

records the chosen quantities under the prices  $p_t \in \mathbb{R}_{++}^N$  (with strictly positive components). We let  $S = \{(p_t, q_t); t = 1, \dots, T\}$  be the corresponding set of  $T$  observations for the consumer under consideration. We will say that a given set of observations  $S$  corresponds to rational behavior if this set can be rationalized in the following sense:

**Definition 1.** (rationality) Let  $S = \{(p_t, q_t); t = 1, \dots, T\}$  be a set of observations. A utility function  $U$  provides a rationalization of  $S$  if for each observation  $t$  we have  $U(q_t) \geq U(q)$  for all  $q$  with  $p_t'q \leq p_t'q_t$ .

Essentially, this rationality condition requires that there exists a utility function  $U$  such that each observation in the set  $S$  effectively maximizes this function for the given budget constraint. Throughout, we will consider utility functions  $U$  that are monotonically increasing in their arguments.

Revealed preference methods basically verify whether it is possible to construct a utility function  $U$  that rationalizes behavior (captured by  $S$ ) in the sense of Definition 1. Varian (1982) established that such a data rationalizing utility function exists if and only if the set  $S$  satisfy the *Generalized Axiom of Revealed Preference* (GARP).<sup>7</sup>

**Definition 2.** (GARP) Let  $S = \{(p_t, q_t); t = 1, \dots, T\}$  be a set of observations. The set  $S$  satisfies the GARP if there exist relations  $R_0, R$  that meet:

- (i) if  $p_s'q_s \geq p_s'q_t$  then  $q_s R_0 q_t$ ;
- (ii) if  $q_s R_0 q_u, q_u R_0 q_v, \dots, q_z R_0 q_t$  for some (possibly empty) sequence  $(u, v, \dots, z)$  then  $q_s R q_t$ ;
- (iii) if  $q_s R q_t$  then  $p_t'q_t \leq p_t'q_s$ .

In words, condition (i) states that the quantities  $q_s$  are 'directly revealed preferred' over the quantities  $q_t$  (i.e.  $q_s R_0 q_t$ ) if  $q_s$  were chosen when  $q_t$  were equally attainable (i.e.  $p_s'q_s \geq p_s'q_t$ ). Next, condition (ii) defines the 'revealed preference' relation  $R$  by exploiting transitivity of preferences. Finally, condition (iii) imposes that the quantities  $q_t$  cannot be more expensive than revealed preferred quantities  $q_s$ . The next section will illustrate this GARP concept through some graphical examples.

In view of our further discussion, we end this section by introducing the violation index; see Afriat (1973) and Varian (1990). This index is especially relevant for a data set  $S$  (corresponding to some given consumer) that does not satisfy the GARP condition in Definition 2. Specifically, it captures the degree to which a given set  $S$  violates GARP. The computation of the violation proceeds in two steps. In a first step, for each bundle  $q_t$  the minimal expenditure defined over the revealed preferred bundles  $q_s$  ( $q_s R q_t$ ) is divided by the observed expenditure for the given bundle, i.e.

$$\theta^t = \frac{\min p_t'q_s}{p_t'q_t}$$

In a second step, the violation index  $\theta$  is computed as the average  $\theta^t$  defined over all  $T$  observations, i.e.

$$\theta = \sum_{t=1, \dots, T} \frac{\theta^t}{T}$$

If the set  $S$  satisfies GARP, which corresponds to rational behavior, then the value of  $\theta$  equals 1. Essentially, this means that each observation  $t$  is effectively cost minimizing when compared to revealed preferred bundles (i.e.  $\theta^t = 1$  for all  $t$ ). If the set  $S$  violates GARP, then we obtain a value of  $\theta$  between 0 and 1, which indicates that the consumer under consideration could have increased his/her utility by buying cheaper bundles. More precisely, he/she could have saved on average  $1-\theta$  of his/her budget to be (at least) equally well off. Or, conversely, it was possible to attain a higher utility level with the same budget.

## B. Graphical Illustrations

To enhance the intuition of the above concepts, we consider two example data sets, which are displayed in Figures 1 and 2. We will show that the data set in Figure 1 satisfies GARP, while the data set in Figure 2 violates GARP.

Figure 1 presents a situation in which a consumer chooses 3 ( $= T$ ) times between some combinations of 2 ( $= N$ ) goods. We consider three budget lines A, B and C. Each budget line corresponds to a different choice set, and the consumer has to select a bundle in each choice set. The choices  $q_a$ ,  $q_b$  and  $q_c$  represent the combinations (bundles) as they are ‘purchased’ by the consumer when confronted with the respective budget lines A, B and C. This defines a data set  $S$ , as in the general case above.

Let us illustrate GARP for this data set. First of all, bundle  $q_a$  appears to be better than bundle  $q_b$ : bundle  $q_b$  was affordable given the budget line A (which corresponds to  $q_a$ ), but the consumer has selected bundle  $q_a$ . Thus, the consumer reveals his/her preference of  $q_a$  over  $q_b$ , which is denoted by  $q_a R_0 q_b$ ; this complies with condition (i) in Definition 2. Next, bundle  $q_a$  is revealed better than bundle  $q_c$  as well (even though bundle  $q_c$  is not in the choice set characterized by the budget line A). Indeed, we already know that  $q_a R_0 q_b$ . Similarly, we obtain that bundle  $q_b R_0 q_c$ . Therefore, given condition (ii) in Definition 2, we conclude that  $q_a R q_c$ , i.e.  $q_a$  is indirectly revealed preferred over bundle  $q_c$ .

As a following step, we can verify that the data set  $S$  in Figure 1 is consistent with GARP (and, thus, the violation index  $\theta$  equals 1). Specifically, each quantity bundle is effectively expenditure minimizing over the corresponding set of revealed preferred bundles, which is required by condition (iii) in Definition 2. To see this, let us consider each of the three bundles separately. First, the revealed preferred set of bundle  $q_a$  contains only bundle  $q_a$  itself. Thus, bundle  $q_a$  satisfies the expenditure minimiza-

tion condition by construction. Next, the revealed preferred set of bundle  $q_b$  consists of bundles  $q_a$  and  $q_b$ . Then, it is easily seen that bundle  $q_b$  is expenditure minimizing over this set, as bundle  $q_a$  is not affordable given the budget line B associated with  $q_b$ . Finally, as indicated above, the revealed preferred set of bundle  $q_c$  consists of bundles  $q_a$ ,  $q_b$  and  $q_c$ . And we indeed find that  $q_c$  is expenditure minimizing because neither bundle  $q_a$  nor bundle  $q_b$  is affordable given the budget line C.

Figure 2 has a similar interpretation as Figure 1. It displays a set  $S$  with two bundles  $q_d$  and  $q_e$ , which are chosen under the budget lines D and E, respectively. We can show that this set  $S$  corresponds to a rejection of GARP. In a first step, we find that  $q_d R_0 q_e$  and  $q_e R_0 q_d$ ; the reasoning is directly analogous to before. Then, to show that GARP is violated, let us specifically consider the bundle  $q_d$ . The corresponding revealed preferred set consists of  $q_d$  and  $q_e$ . We see that  $q_e$  is situated under the budget line D, which means that this bundle is strictly cheaper than the bundle  $q_d$  (under the prices at which  $q_d$  was chosen). Thus, because  $q_e R_0 q_d$  we have a violation of condition (iii) in Definition 2; the consumer under consideration could have attained a better bundle with less money. This set  $S$  violates GARP and, thus, the violation index  $\theta$  is smaller than 1.

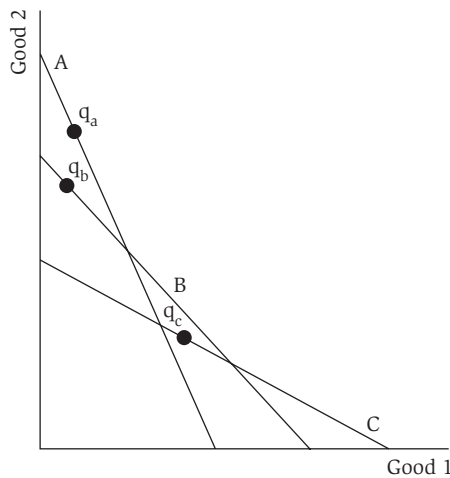


Figure 1. Directly and Indirectly Revealed Preference.

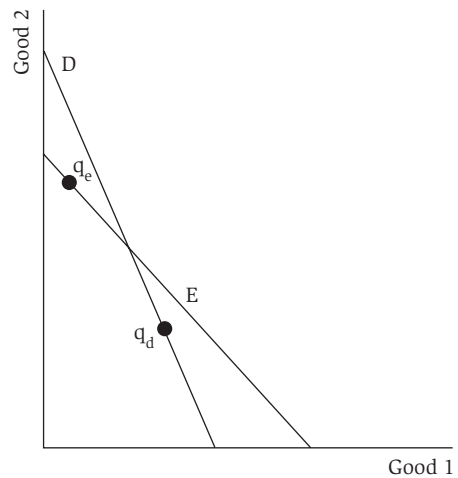
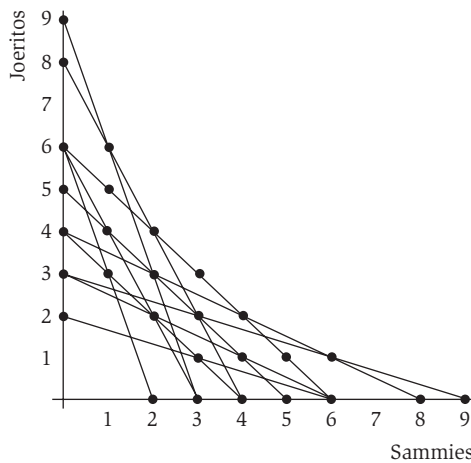


Figure 2. Violation of GARP.

### C. Experimental Choice Setting

To construct data sets  $S$  for our own empirical study, we use the same experimental choice set-up as Harbaugh, Krause and Berry (2001). Section III will discuss the specifics of our design. In this section, we briefly explain the construction of the sets  $S$ .

We operate with 11 choice sets, characterized by varying budget lines; the different budget lines are displayed in Figure 3. Each choice set consists of minimum 3 and maximum 7 possible discrete bundles. A bundle represents a combination of two goods: ‘Sammies’ and ‘Joeritos’, which correspond to two types of chips; see also Section III, which discusses our specific experimental design. Each point on the graph in Figure 3 corresponds with a bundle and is identified by specific coordinates (number of Sammies and number of Joeritos). For this study, the respondents dispose of a “10 euro” budget per choice set. Keeping this budget in mind, one can calculate the prices of the goods under consideration (Sammies and Joeritos). For each budget line, Figure 4 gives the prices and the coordinates of the different bundles that can be selected.



Source: Harbaugh, Krause and Berry, 2001.

**Figure 3.** 11 Choice Sets Containing Integer Product Bundles.

1)	$P_j = 10/9$	$P_s = 10/3$	(0,9)	(1,6)	(2,3)	(3,0)			
2)	$P_j = 5/4$	$P_s = 5/2$	(0,8)	(1,6)	(2,4)	(3,2)	(4,0)		
3)	$P_j = 5/3$	$P_s = 5/3$	(0,6)	(1,5)	(2,4)	(3,3)	(4,2)	(5,1)	(6,0)
4)	$P_j = 5/3$	$P_s = 10/3$	(0,6)	(1,4)	(2,2)	(3,0)			
5)	$P_j = 5/3$	$P_s = 5$	(0,6)	(1,3)	(2,0)				
6)	$P_j = 2$	$P_s = 2$	(0,5)	(1,4)	(2,3)	(3,2)	(4,1)	(5,0)	
7)	$P_j = 5/2$	$P_s = 5/4$	(0,4)	(2,3)	(4,2)	(6,1)	(8,0)		
8)	$P_j = 5/2$	$P_s = 5/2$	(0,4)	(1,3)	(2,2)	(3,1)	(4,0)		
9)	$P_j = 10/3$	$P_s = 10/9$	(0,3)	(3,2)	(6,1)	(9,0)			
10)	$P_j = 10/3$	$P_s = 5/3$	(0,3)	(2,2)	(4,1)	(6,0)			
11)	$P_j = 5$	$P_s = 5/3$	(0,2)	(3,1)	(6,0)				

**Figure 4.** 11 Choice Sets with Corresponding Prices and Possible Bundles.

One final remark is in order. It is clear from Figures 3 and 4 that each choice set (corresponding to a specific budget line) is a discrete set. Strictly speaking, this contrasts with our previous theoretical discussion, which implicitly assumed choice settings characterized by continuous quantity variables  $q_i$ . However, it can be verified that the GARP-based revealed preference methodology presented above applies with equal strength to the discrete choice setting in Figures 3 and 4. We can refer to Harbaugh, Krause and Berry (2001) for a detailed discussion.

### III. Experiment

#### A. Design

Our research basically aims at understanding customer behavior in a supermarket and, therefore, it is appropriate to use consumption goods that are widely appreciated. Given this, we decided to work with salt and paprika chips. In order to eliminate external influences as much as possible, we have chosen for two fictitious product names: Sammies for salt chips and Joeritos for paprika chips.

The respondents in our experiments are mainly students of the KULeuven Campus Kortrijk. Each student of this institution received a mail inviting him/her for participation. The chronological order of their positive reactions was used to divide the students into three groups (i.e. the first student was allocated to the first group, the second student to the second group, and so on). Using a similar procedure, we invited 10 extra persons from acquaintances. These extra respondents were again assigned randomly to the different groups. In the end, we obtained three groups with 30 respondents each.

In a second phase of the experiment, we sent the choice documents as attachments to all respondents. These choice documents mainly contained the choice sets discussed in Section II.C. In addition, these documents included additional information that differs over the three groups and pertains to the specific intention of this study, i.e. to compare possible guiding and irrationalizing effects of advertising and store environment. As indicated in the Introduction, group 1 is our control group; the 30 respondents in this group only receive the objective product information. Next, the 30 respondents in group 2 received a choice document with advertising elements in favor of paprika chips (Joeritos), while the 30 respondents in group 3 received a choice document with atmospheric stimuli in favor of salt chips (Sammies). The participants were told that they could win a cinema ticket if they properly cooperated. They knew that we had 20 tickets and, thus, the probability of winning a ticket was 22 percent.

Generally, a choice document has the following composition. The first page only provides information to the respondent; Pages 2 to 12 represent choice sets 1 up to 11. Each page contains the possible choices for exactly one choice set (see Figure 4 for



the possible choice sets). The respondent has to choose one bundle per page, and thus per choice set. Respondents are aware of the fact that this experiment measures preferences. However, to avoid unnatural behavior, we did not tell the respondents that rationality would be tested.

Respondents of different groups receive other documents. The differences specifically pertain to the lay-out of the first page of each document; the different lay-outs are displayed in the Appendices 1-3. The control group obtains only the objective information (see Appendix 1). The other two groups additionally get subjective information.

For group 2, the first page of the document advertises Joeritos as a brand product (see Appendix 2). In order to represent advertising as realistically as possible, we rely on the typology of Hayes (2000). This author states that the effectiveness of advertising depends on 4 factors: the messenger, the message itself, the receiver and the context. The messengers in this experiment are the rector of the KULeuven Campus Kortrijk, and a professor in economics. These two persons are well-known among the respondents. The actual message displayed in this group consists of a few slogans, again in favor of Joeritos. Next, the packing of the paprika chips is also made more attractive.

For group 3, the first page of the document simulates an attractive store environment (see Appendix 3). Store environment is of course more difficult to reproduce on a sheet of paper. Here, we draw on the typology of Baker (1986). According to Baker, store environment comprises ambient factors, design factors and social factors. Ambient factors are related to background characteristics of the shop. Therefore, we apply colors on the frame of the picture of salt chips, so that the attention of a respondent is immediately drawn to it. We also use a brighter picture. After all, Sammies represents a store brand product in our research, yet of a more expensive supermarket that brings about shopping pleasure. Design factors refer to the organization and presentation of the store and possible logos. Appendix 3 shows that salt chips are depicted more largely than paprika chips. Furthermore, we present a color picture instead of a black and white picture. This all contributes to a higher estimation of the design of the store. We also support Sammies by showing logos of supermarkets that are known for a more attractive design and thus suggest that Sammies can be found in this type of supermarket. Finally, social factors have a lot to do with the other people inside the shop. Such factors can of course not explicitly appear in the choice document of the store environment group, but one might derive implicit information from the typical clientele of the suggested supermarkets.

As an important concluding remark, let us stress that we do not just give an alternative advertising stimulus to group 3. As indicated above, we do make a distinction between the stimuli. The intention of this experiment is to be representative for choices in a real supermarket. In that case, store atmospherics definitely differ from typical product advertising, as manufacturers are not always able to govern the presentation of their product within a store. They can exercise little control over its

positioning in the store environment. For example, one can see in Appendix 3 that Sammies chips are presented much more attractively via a larger picture and via color. Indeed, it is the supermarket that stipulates the lighting and presentation. This is quite different from the situation for the advertising group 2. Appendix 2 shows that Joeritos chips are recommended via a superior packing, which effectively lies in the decision power of the manufacturer.

## B. Results

As discussed before, we focus on two main questions. First, does advertising and/or store environment impact on the budget share that is allocated to the promoted goods? Second, do these manipulative forces affect the rationality of consumption decisions? Our empirical results are summarized in Tables 1-3 (see Appendix 4).

We first consider the effect of advertising and store environment on the budget shares. Columns 2 and 3 from Table 1 show the average budget shares spent on Joeritos and Sammies per group. We emphasize once again that our experimental design allows us to isolate the effect of advertising (for group 2) and store environment (for group 3), so that possible interactions between both manipulative forces do not interfere with our results. To assess the effects in which we are interested, we can thus compare the expenditures on a particular product promoted by advertising (Joeritos, group 2) or atmospheric conditions (Sammies, group 3) with the expenditures on the same product in (control) group 1.

As suggested by the marketing literature, we find that more money is spent on Joeritos in group 2 (62.21% of the budget) than in the control group 1 (49.53%). This difference is significant, as the corresponding one-sided t-test generates a p-value of 0.018. Thus, we reject the null hypothesis that advertising has no influence on expenditures; our results suggest a significantly positive effect.

Let us then consider the effect of store environment on the budget share. When we omit atmospheric stimuli, test persons spend on average 50.47% of their budget on Sammies. This percentage rises up to 56.55% when introducing the ambient factors, design factors and social factors discussed before; see our results for group 3 in Table 1. This falls in line with the results of Kotler (1973), which we discussed in the introduction. However, the difference is not significant. Specifically, the associated one-sided t-test results in a p-value of 0.162. One possible explanation is the simplicity of our set-up. From that perspective, a more thorough experiment could produce more significant results. However, one may also interpret our results, which suggest a diverging effect of advertising and store environment, as supporting the argument of Dawar and Parker (1994) and Rao and Monroe (1998), who claim that brand names effectively do have a much larger impact on product appreciation than store names.

Let us then evaluate whether the manipulative forces under study have an irrationalizing impact on consumer behavior. To this end, Table 2 presents the average

violation indices per group. Recall from Section II that a violation index closer to 1 suggests more rational decision behavior.

A first finding is that, on average, respondents chose fairly rationally, i.e. values of the violation index are generally close to 1. However, we also observe that the (average) violation index differs between, on the one hand, the control group 1 and, on the other hand, the (advertising) group 2 and (atmosphere) group 3. This idea is in line with the argument of Holzhauer (1994), who claims that marketing stimuli actually interfere with rationality.

To see whether any of the observed differences of the (average) violation indices is significant, we have performed one-sided t-tests, to compare the control group 1 with, respectively, group 2 and group 3. We obtain a p-value of 0.051 for the test related to group 2, and a p-value of 0.038 for the test associated with group 3. These results suggest that the respondents in the treatment groups 2 and 3 effectively do behave more irrational than the respondents in the control group.

At this point, we have to make two remarks concerning our experimental design. Firstly, our experiment is rather rudimentary (e.g. simulating a particular store environment through the lay-out of a paper document). As such, one may expect the effects to be even stronger in real-life settings and/or more sophisticated experiments. Secondly, given our experimental design, we want to stress that our results only indicate a distortive effect of the stimuli conditional upon the basic model of rationality that we consider. This could point to irrationality, as we interpret it, but it could also mean that one should extend this basic model. In this respect, an alternative experimental design in which the same participant has to make the choices before and after being subjected to the stimuli, could shed extra light on the irrationalizing effect.<sup>8</sup> More generally, our results do indicate using revealed preference methodology to investigate more sophisticated settings as an interesting avenue for further research.

#### IV. Conclusion

We have investigated and compared two manipulative forces from our daily shopping environment: store environment and advertising. This led us to two types of results. Firstly, our experiment confirmed that these manipulative forces indeed increased the expenditures for the promoted good. In this respect, our results also suggest that the (brand) advertising effect is more effective than the (store) ambience effect. Secondly, by using revealed preference methods we have shown that the manipulative forces under study have an distortive effect on consumer behavior, i.e. respondents tend to spend more money for less utility. This suggests – at least to some extent – that customer protection is warranted in settings where the stimuli clearly have no informational effect. More generally, our paper motivates the use of revealed preference

methodology in combination with specifically targeted experiments to address questions related to marketing influences on (rational) consumer behavior.

## NOTES

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2. University of Leuven, Faculty of Business and Economics.
3. University of Leuven, Faculty of Business and Economics.
4. Corresponding author. University of Leuven, Campus Kortrijk and Tilburg University, Center. Address: E. Sabbelaan 53, B-8500 Kortrijk, Belgium. E-mail: laurens.cherchye@kuleuven-kortrijk.be. Tel: +32 56 246109. Fax: +32 56 246999.
5. Université Libre de Bruxelles, ECARES and ECORE.
6. For example, Delhaize Belgium realized a 4.4 billion euro turnover in 2008. In 2007, the supermarket attained a market share of about 25.7% (Source: AC Nielsen). Next, Unilever is the manufacturer of A-brands Axe, BeceL, Coral, Dove, Effi, Knorr, Lipton, Ola, Signal and Sun. It reached a turnover of about 500 million euro in 2008.
7. See also Samuelson (1938), Houthakker (1950) and Afriat (1967) for seminal contributions on revealed preference analysis of consumer behavior, which formed the inspiration for Varian's GARP axiom.
8. We thank the referee for pointing this out.

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## Appendix

### A. Appendix 1


This appendix contains the front page of the choice document that was sent to respondents from the control group (i.e. group 1).

Joeritos	Sammies
	
<p>Product data:</p> <ul style="list-style-type: none"> <li>• Paprika chips</li> <li>• 50 gram</li> </ul>	<p>Product data:</p> <ul style="list-style-type: none"> <li>• Salt chips</li> <li>• 50 gram</li> </ul>

B. Appendix 2

This appendix contains the front page of the choice document that was sent to respondents from the advertising group (i.e. group 2).

**Joeritos Joeritos Joeritos Joeritos**

Joeritos	Sammies
 <p data-bbox="319 996 489 1025">Product data:</p> <ul data-bbox="323 1054 619 1248" style="list-style-type: none"><li>• Paprika chips</li><li>• 50 gram</li><li>• Joeritos: "crispy and tasteful", "everyone's favorite"</li></ul>	 <p data-bbox="704 996 873 1025">Product data:</p> <ul data-bbox="708 1054 864 1132" style="list-style-type: none"><li>• Salt chips</li><li>• 50 gram</li></ul>



**Joeritos Joeritos Joeritos Joeritos**

### C. Appendix 3

This appendix contains the front page of the choice document that was sent to respondents from the environment group (i.e. group 3).

Joeritos	Sammies
	
<p>Product data:</p> <ul style="list-style-type: none"> <li>• Paprika chips</li> <li>• 50 gram</li> </ul>	<p>Product data:</p> <ul style="list-style-type: none"> <li>• Salt chips</li> <li>• 50 gram</li> </ul>
	

### D. Appendix 4: Tables 1-3

Columns 2 and 3 from Table 1 present the average budget shares spent on Joeritos and Sammies per group. Column 4 from Table 1 presents the variance of the Joeritos budget share per group. One can find the disaggregate information of the violation indices per group in Table 2. Table 3 shows the t-test results discussed in the main text.



**Table 1.** Average budget share and variance per group.

	<b>Budget share Joeritos</b>	<b>Budget share Sammies</b>	<b>Variance budget share Joeritos</b>
Control group	0.495	0.505	0.056
Advertising group	0.622	0.378	0.048
Store environment group	0.434	0.566	0.056

**Table 2.** Average violation indices per group.

	<b>Control group</b>	<b>Advertisement group</b>	<b>Store environment group</b>
Pass (on total of 30)	20	20	18
Mean	0.994	0.983	0.986
Standard deviation	0.009	0.037	0.025
Minimum	0.977	0.833	0.888
First quartile	0.990	0.980	0.980
Median	1.000	1.000	1.000
Third quartile	1.000	1.000	1.000
Maximum	1.000	1.000	1.000

**Table 3.** t-tests with respective p-values.

<b>t-test</b>	<b>One-sided p-values</b>
Aggregated violation index of the advertisement group is inferior to the aggregated violation index of the control group	0.051
Aggregated violation index of the store environment group is inferior to the aggregated violation index of the control group	0.038
Stimulative effect of advertising	0.018
Stimulative effect of store environments	0.162