Does In-Store Marketing Work? Effects of the Number and Position of Shelf Facings on Brand Attention and Evaluation at the Point of Purchase

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Web Appendix

METHOD OF CONSTRUCTING THE FRACTIONAL FACTORIAL DESIGN

To test the effects of the number and location of shelf facings and of price discounts independently of any brand-specific effects, we created a fractional factorial design as follows:

Shelf layout and Number of Facings

Drawing on the experience of Perception Research Services with planogram design, we used a simple display of four shelves (see Figure 2 in the article). Because bar soap and pain reliever packages are small, there were 12 columns of facings and two rows per shelf (for a total of 192 visible facings).

To ensure minimum visibility for the brands, the minimum unit was a block of 4 facings (two rows and two columns). As shown in Figure W1, there are therefore 24 possible planogram block locations (six blocks per shelf). We used three levels for the number of facings manipulation: four facings (one block), eight facings (two blocks), or 12 facings (three blocks). We assigned a third of the brands in each planogram to each level.

Shelf Position

The number of possible assignments of 12 brands (four with one block, four with two blocks, and four with three blocks) to 24 block locations is 24!/(4*1!*4*2!*4*3!) = 807 million trillion. We therefore added the following additional constraints: a) the blocks of facings belonging to the same brand must be adjacent on a single shelf (i.e., no brand can be on multiple shelves) and b) no brand has facings on both sides of the vertical axis of symmetry. These constraints reduce the number of block locations to 12.

To respect these constraints and to create a balanced fractional factorial design with respect to left *vs*. right and top *vs*. bottom, the planogram was divided into four quadrants (top left, top right, bottom left, and bottom right) and each quadrant contained exactly three brands and three facing levels (one block, two blocks, or three blocks). There were four possible patterns within a quadrant because the three-block brand occupies one entire row and the other row can either have the one-block brand on the left and the two-block brand on the right or *vice versa*. Each pattern was allocated to each quadrant following a latin-square design. We then allocated the 12 brands to these 12 cells following a second latin-square design. Finally, we randomly assigned each brand to either the regular or discount price condition with the constraint that exactly half of the brands were discounted in each planogram. The resulting 12 planograms and their mean-centered contrast codes are shown in Figure W2.

Relationships among Main Effects and Interactions

Table W1 shows the correlations of the facing number and location variables (i.e., FACING, FACINGSQ, LEFT, VCENTER, TOP, and HCENTER) and SALE with the brand variables and with all two-way interactions. We cannot show the entire set of correlations of the fractional factorial with all interactions because it is a 1056 x 1056 matrix (the full factorial of our six non-brand variables plus facings-squared yields 95 variables, crossed with brand, and there are 1056 variables). Note that the brand variables were mean-centered (i.e., 11/12 *vs*. -1/12) and multiplied by the facing variables to form the interaction variables. HCENTER was defined as the middle two rows. VCENTER was defined as +.5 if the brand facing touched the vertical center, -.5 if the brand facing touched the vertical center and 0 if the brand had 12 facings (i.e., spanned from vertical center to the extreme left or right end). Also, the HCENTER x FACINGSQ interaction was omitted because it was a linear function of HCENTER and the HCENTER x FACING interaction.

The main goal of the fractional factorial design was to allow the estimation of the main effects to be unconfounded with other main effects and to maximize the statistical efficiency of these estimates by minimizing the correlations among variables. As Table R1 shows, the current design achieves these goals because the correlations among the main effects are either exactly zero or close to zero (note that the intercorrelations among brand variables are identical, i.e., -.09). The condition number of the main effects (df = 19) is 3.9, which is well below the rule-of-thumb of 30 as an indicator of collinearity problems (Belsley 1984; Cohen et al. 2003, p. 424).

Even the correlations among the main effects and two-way interactions (which were not estimated in the regressions) are small. Only one such correlation is above .2 (i.e., -.71 for the correlation between HCENTER and the HCENTER x FACING interaction, and this is because, by design, brands with 12 facings span the entire length of one side of the shelf and hence cannot be assigned to either the center or extremity of the shelf, which is why HCENTER = 0 when facing = .5). The condition number for the entire set of variables (df = 115) is only 17.9, which indicates that the main effects are free of any serious confounding with two-way correlations.

Of course, being a fractional design, each main effect must be confounded with some linear combination of higher order interactions. These linear dependencies, presented in Table W2, show that the design is irregular (i.e., each main effect is not confounded with a specific higher order interaction, but with a fairly large number of such interactions, see Louviere, Hensher, and Swait 2000, pp. 89-96).

SPECIFICATION OF THE ATTENTION AND EVALUATION MODELS

For noting, reexamination, recall, and consideration, we estimated logistic regressions with normal random-effect intercepts. These models allow us account for the correlated errors within each group (one respondent for a product category), thus providing the correct estimates for the fixed-effect factors. They also provide the estimate (ρ) of the proportion of the variance in the error term that is due to within-subject errors, which captures unobserved heterogeneity. We estimated the following models using PROC XTLOGIT in STATA 9.0:

(1) $P(Y_{ij} = 1) = \frac{\exp(n_{ij})}{1 + \exp(n_{ij})}$, where Y_{ij} = $NOTING_{ij}$, $REEXAM_{ij}$, $RECALL_{ij}$, or $CONSID_{ij}$

and $n_{ij} = \beta_0 + \beta_1 \times FACING_{ij} + \beta_2 \times FACINGSQ_{ij} + \beta_3 \times LEFT_{ij} + \beta_4 \times HCENTER_{ij} + \beta_5 \times TOP_{ij}$

$+ \beta_6 \times VCENTER_{ij} + \beta_7 \times PRICE_{ij} + \beta_8 \times MEDUSE_{ij} + \beta_9 \times HIGHUSE_{ij} + \beta_{10} \times MEDUSE_{ij} \times FACING_{ij}$

$+ \beta_{11} \times HIGHUSE_{ij} \times FACING_{ij} + \beta_{12} \times HIGHMS_j + \beta_{13} \times HIGHMS_j \times FACING_{ij} + \beta_{14} \times CSDGOAL_i$

$+ \beta_{15} \times CSDGOAL_i \times FACING_{ij} + \beta_{16} \times PRICESHOP_i + \beta_{17} \times PRICESHOP_i \times FACING_{ij}$

$+ \beta_{18} \times VALUSHOP_i + \beta_{19} \times VALUSHOP_i \times FACING_{ij} + \beta_{20} \times EDUC_i + \beta_{21} \times EDUC_i \times FACING_{ij}$

$+ \beta_{22} \times AGE_i + \beta_{23} \times AGE_i \times FACING_{ij} + \beta_{24} \times CATORDER_i + \sum_{k=1}^{18} \alpha_k \times BRAND_{kj} + \beta_i + \varepsilon_{ij}$

where i indexes study participants in each category, j indexes brands, $BRAND_{kj}$ are the k brand-specific intercepts, β_i is the random individual intercepts and is iid ~ $N(0, \tau^2)$, and ε_{ij} is the residual error term and is iid ~ $N(0, \sigma^2)$. To allow identification and to reduce multicollinearity with the brand-specific factors, we removed the intercepts of three brands in each category: the new brand, the highest market share brand, and the lowest market share brand (i.e., Simple, Dove, and Ivory for soap and Nurofen, Tylenol, and St Joseph for pain relievers). The condition number was 9, the mean VIF 1.5, and the highest VIF 5.5, which are all well below the acceptable thresholds (Cohen et al. 2003). We also estimated a model replacing HIGHMS and its interaction with FACING with 18 interactions terms between FACING and the brand intercepts. This model had the same condition number, produced similar coefficients for the variables of interest, and showed larger interaction coefficients for high market-share brands, confirming the results of the reported model. For choice, we estimated this model with PROC CLOGIT in STATA 9.0:

(2) $$P(CHOICE_{ij} = 1) = \frac{\exp(n_{ij})}{\sum_{j=1}^{12} \exp(n_{ij})},$$

where $\beta_0 + \beta_1 \times \text{FACING}_{ij} + \beta_2 \times \text{FACINGSQ}_{ij} + \beta_3 \times \text{LEFT}_{ij} + \beta_4 \times \text{HCENTER}_{ij} + \beta_5 \times \text{TOP}_{ij}$

$+ \beta_6 \times \text{VCENTER}_{ij} + \beta_7 \times \text{PRICE}_{ij} + \beta_8 \times \text{MEDUSE}_{ij} + \beta_9 \times \text{HIGHUSE}_{ij} + \beta_{10} \times \text{MEDUSE}_{ij} \times \text{FACING}_{ij}$

$+ \beta_{11} \times \text{HIGHUSE}_{ij} \times \text{FACING}_{ij} + \beta_{12} \times \text{HIGHMS}_j + \beta_{13} \times \text{HIGHMS}_j \times \text{FACING}_{ij}$

$+ \beta_{14} \times \text{CSDGOAL}_i \times \text{FACING}_{ij} + \beta_{15} \times \text{PRICESHOP}_i \times \text{FACING}_{ij} + \beta_{16} \times \text{VALUSHOP}_i \times \text{FACING}_{ij}$

$+ \beta_{17} \times \text{EDUC}_i \times \text{FACING}_{ij} + \beta_{18} \times \text{AGE}_i \times \text{FACING}_{ij} + \sum_{k=1}^{9} \alpha_k \times BRAND_{kj} + \beta_i + \varepsilon_{ij}$

UNOBSERVED HETEROGENEITY AND CONTROL FACTORS IN THE ATTENTION AND EVALUATION MODELS

For attention, there are almost no differences across brands after controlling for all the other factors in the regression, but still large differences across individuals. It is the opposite pattern for the three evaluation measures, which have large amounts of unobserved heterogeneity for brands and smaller unobserved heterogeneity for individuals (note that the brand test for choice is not comparable with the other dependent variables because of the different model specifications). The CATORDER variable shows that recall was higher for the second than for the first category. This is simply a recency effect (i.e., the recall question was first asked for the second category, the one that participants had just finished), which is well-established in the memory literature.

References

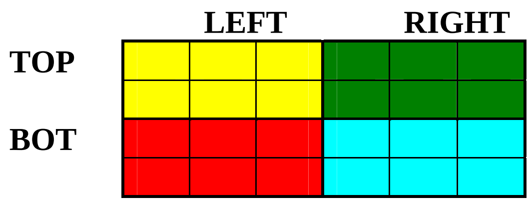
Belsley, David A. (1984), "Demeaning Conditioning Diagnostics Through Centering," *American Statistician*, 38 (2), 73.

Cohen, Jacob, Patricia Cohen, Stephen G. West, and Leona S. Aiken (2003), *Applied multiple regression/correlation analysis for the behavioral sciences*, 3rd ed. Mahwah, N.J.: L. Erlbaum Associates.

Louviere, Jordan J., David A. Hensher, and Joffre Dan Swait (2000), *Stated Choice Methods: Analysis and Applications*. Cambridge, UK ; New York, NY, USA: Cambridge University Press.

FIGURE W1

Quadrants (top) and Four Possible Patterns for each Quadrant (bottom)



1

4	8	8
12	12	12

3

8	8	4
12	12	12

2

12	12	12
8	8	4

4

12	12	12
4	8	8

FIGURE W2

Planograms 1 to 12: Design and Variable Coding

10*	11*	11*	6	6	6
12	12	12	4	5*	5*
9*	9*	9*	2	2	1*
8	8	7	3*	3*	3*

PLANO	BRAND	PATTERN	FACING	FACINGSQ	LEFT	TOP	VCENTER	HCENTER	SALE
1	1	3	-0.5	-0.33	-0.5	-0.5	0.5	-0.5	0.5
1	2	3	0	0.67	-0.5	-0.5	0.5	0.5	-0.5
1	3	3	0.5	-0.33	-0.5	-0.5	-0.5	0	0.5
1	4	4	-0.5	-0.33	-0.5	0.5	0.5	0.5	-0.5
1	5	4	0	0.67	-0.5	0.5	0.5	-0.5	0.5
1	6	4	0.5	-0.33	-0.5	0.5	-0.5	0	-0.5
1	7	2	-0.5	-0.33	0.5	-0.5	-0.5	0.5	-0.5
1	8	2	0	0.67	0.5	-0.5	-0.5	-0.5	-0.5
1	9	2	0.5	-0.33	0.5	-0.5	0.5	0	0.5
1	10	1	-0.5	-0.33	0.5	0.5	-0.5	-0.5	0.5
1	11	1	0	0.67	0.5	0.5	-0.5	-0.5	0.5
1	12	1	0.5	-0.33	0.5	0.5	0.5	0	-0.5

11*	11*	11*	3*	4	4
9*	10	10	5	5	5
7*	7*	6	2	2	2
8*	8*	8*	1*	1*	12

PLANO	BRAND	PATTERN	FACING	FACINGSQ	LEFT	TOP	VCENTER	HCENTER	SALE
2	12	2	-0.5	-0.33	-0.5	-0.5	-0.5	-0.5	-0.5
2	1	2	0	0.67	-0.5	-0.5	-0.5	-0.5	0.5
2	2	2	0.5	-0.33	-0.5	-0.5	0.5	0	-0.5
2	3	1	-0.5	-0.33	-0.5	0.5	-0.5	-0.5	0.5
2	4	1	0	0.67	-0.5	0.5	-0.5	-0.5	-0.5
2	5	1	0.5	-0.33	-0.5	0.5	0.5	0	-0.5
2	6	3	-0.5	-0.33	0.5	-0.5	0.5	0.5	-0.5
2	7	3	0	0.67	0.5	-0.5	0.5	-0.5	0.5
2	8	3	0.5	-0.33	0.5	-0.5	-0.5	0	0.5
2	9	4	-0.5	-0.33	0.5	0.5	0.5	-0.5	0.5
2	10	4	0	0.67	0.5	0.5	0.5	0.5	-0.5
2	11	4	0.5	-0.33	0.5	0.5	-0.5	0	0.5

9	9	8*	4*	4*	4*
10*	10*	10*	3	3	2*
5	6*	6*	1	1	1
7	7	7	11	12*	12*

PLANO	BRAND	PATTERN	FACING	FACINGSQ	LEFT	TOP	VCENTER	HCENTER	SALE
3	11	4	-0.5	-0.33	-0.5	-0.5	-0.5	0.5	-0.5
3	12	4	0	0.67	-0.5	-0.5	-0.5	-0.5	0.5
3	1	4	0.5	-0.33	-0.5	-0.5	0.5	0	-0.5
3	2	2	-0.5	-0.33	-0.5	0.5	0.5	-0.5	0.5
3	3	2	0	0.67	-0.5	0.5	0.5	0.5	-0.5
3	4	2	0.5	-0.33	-0.5	0.5	-0.5	0	0.5
3	5	1	-0.5	-0.33	0.5	-0.5	0.5	-0.5	-0.5
3	6	1	0	0.67	0.5	-0.5	0.5	-0.5	0.5
3	7	1	0.5	-0.33	0.5	-0.5	-0.5	0	-0.5
3	8	3	-0.5	-0.33	0.5	0.5	-0.5	-0.5	0.5
3	9	3	0	0.67	0.5	0.5	-0.5	-0.5	-0.5
3	10	3	0.5	-0.33	0.5	0.5	0.5	0	0.5

9	9	9	2	2	1*
8*	8*	7	3*	3*	3*
6*	6*	6*	10	11*	11*
4*	5	5	12	12	12

PLANO	BRAND	PATTERN	FACING	FACINGSQ	LEFT	TOP	VCENTER	HCENTER	SALE
4	10	1	-0.5	-0.33	-0.5	-0.5	0.5	0.5	-0.5
4	11	1	0	0.67	-0.5	-0.5	0.5	-0.5	0.5
4	12	1	0.5	-0.33	-0.5	-0.5	-0.5	0	-0.5
4	1	3	-0.5	-0.33	-0.5	0.5	-0.5	-0.5	0.5
4	2	3	0	0.67	-0.5	0.5	-0.5	0.5	-0.5
4	3	3	0.5	-0.33	-0.5	0.5	0.5	0	0.5
4	4	4	-0.5	-0.33	0.5	-0.5	-0.5	-0.5	0.5
4	5	4	0	0.67	0.5	-0.5	-0.5	0.5	-0.5
4	6	4	0.5	-0.33	0.5	-0.5	0.5	0	0.5
4	7	2	-0.5	-0.33	0.5	0.5	0.5	0.5	-0.5
4	8	2	0	0.67	0.5	0.5	0.5	-0.5	0.5
4	9	2	0.5	-0.33	0.5	0.5	-0.5	0	-0.5

7	7	6*	2	2	2
8*	8*	8*	1*	1*	12
5	5	5	9	10*	10*
3*	4	4	11*	11*	11*

PLANO	BRAND	PATTERN	FACING	FACINGSQ	LEFT	TOP	VCENTER	HCENTER	SALE
5	9	1	-0.5	-0.33	-0.5	-0.5	0.5	0.5	-0.5
5	10	1	0	0.67	-0.5	-0.5	0.5	-0.5	0.5
5	11	1	0.5	-0.33	-0.5	-0.5	-0.5	0	0.5
5	12	2	-0.5	-0.33	-0.5	0.5	0.5	-0.5	-0.5
5	1	2	0	0.67	-0.5	0.5	0.5	-0.5	0.5
5	2	2	0.5	-0.33	-0.5	0.5	-0.5	0	-0.5
5	3	4	-0.5	-0.33	0.5	-0.5	-0.5	-0.5	0.5
5	4	4	0	0.67	0.5	-0.5	-0.5	0.5	-0.5
5	5	4	0.5	-0.33	0.5	-0.5	0.5	0	-0.5
5	6	3	-0.5	-0.33	0.5	0.5	-0.5	-0.5	0.5
5	7	3	0	0.67	0.5	0.5	-0.5	-0.5	-0.5
5	8	3	0.5	-0.33	0.5	0.5	0.5	0	0.5

7*	7*	7*	12	12	11
6	6	5*	1*	1*	1*
2*	3*	3*	10	10	10
4	4	4	8	9	9*

PLANO	BRAND	PATTERN	FACING	FACINGSQ	LEFT	TOP	VCENTER	HCENTER	SALE
6	8	4	-0.5	-0.33	-0.5	-0.5	-0.5	0.5	-0.5
6	9	4	0	0.67	-0.5	-0.5	-0.5	-0.5	0.5
6	10	4	0.5	-0.33	-0.5	-0.5	0.5	0	-0.5
6	11	3	-0.5	-0.33	-0.5	0.5	-0.5	-0.5	-0.5
6	12	3	0	0.67	-0.5	0.5	-0.5	0.5	-0.5
6	1	3	0.5	-0.33	-0.5	0.5	0.5	0	0.5
6	2	1	-0.5	-0.33	0.5	-0.5	0.5	-0.5	0.5
6	3	1	0	0.67	0.5	-0.5	0.5	-0.5	0.5
6	4	1	0.5	-0.33	0.5	-0.5	-0.5	0	-0.5
6	5	2	-0.5	-0.33	0.5	0.5	0.5	-0.5	0.5
6	6	2	0	0.67	0.5	0.5	0.5	-0.5	-0.5
6	7	2	0.5	-0.33	0.5	0.5	-0.5	0	0.5

FIGURE W2 (CONTINUED)

Planograms 1 to 12: Design and Variable Coding

4	5*	5*	12*	12*	12*
6	6	6	10*	11	11
2*	2*	1	9*	9*	9*
3	3	3	8	8	7*

PLANO	BRAND	PATTERN	FACING	FACINGSQ	LEFT	TOP	VCENTER	HCENTER	SALE
7	7	2	-0.5	-0.33	-0.5	-0.5	-0.5	-0.5	0.5
7	8	2	0	0.67	-0.5	-0.5	-0.5	0.5	-0.5
7	9	2	0.5	-0.33	-0.5	-0.5	0.5	0	0.5
7	10	4	-0.5	-0.33	-0.5	0.5	0.5	-0.5	0.5
7	11	4	0	0.67	-0.5	0.5	0.5	-0.5	-0.5
7	12	4	0.5	-0.33	-0.5	0.5	-0.5	0	0.5
7	1	3	-0.5	-0.33	0.5	-0.5	0.5	0.5	-0.5
7	2	3	0	0.67	0.5	-0.5	0.5	-0.5	0.5
7	3	3	0.5	-0.33	0.5	-0.5	-0.5	0	-0.5
7	4	1	-0.5	-0.33	0.5	0.5	-0.5	-0.5	-0.5
7	5	1	0	0.67	0.5	0.5	-0.5	-0.5	0.5
7	6	1	0.5	-0.33	0.5	0.5	0.5	0	-0.5

3	4*	4*	11	11	11
5	5	5	9	10*	10*
1	1	12*	8*	8*	8*
2*	2*	2*	7	7	6*

PLANO	BRAND	PATTERN	FACING	FACINGSQ	LEFT	TOP	VCENTER	HCENTER	SALE
8	6	2	-0.5	-0.33	-0.5	-0.5	-0.5	-0.5	0.5
8	7	2	0	0.67	-0.5	-0.5	-0.5	0.5	-0.5
8	8	2	0.5	-0.33	-0.5	-0.5	0.5	0	0.5
8	9	4	-0.5	-0.33	-0.5	0.5	0.5	0.5	-0.5
8	10	4	0	0.67	-0.5	0.5	0.5	-0.5	0.5
8	11	4	0.5	-0.33	-0.5	0.5	-0.5	0	-0.5
8	12	3	-0.5	-0.33	0.5	-0.5	0.5	-0.5	0.5
8	1	3	0	0.67	0.5	-0.5	0.5	-0.5	-0.5
8	2	3	0.5	-0.33	0.5	-0.5	-0.5	0	0.5
8	3	1	-0.5	-0.33	0.5	0.5	-0.5	-0.5	-0.5
8	4	1	0	0.67	0.5	0.5	-0.5	-0.5	0.5
8	5	1	0.5	-0.33	0.5	0.5	0.5	0	-0.5

4*	4*	4*	8*	9	9
3	3	2*	10	10	10
12*	12*	11	7	7	7
1*	1*	1*	5	6*	6*

PLANO	BRAND	PATTERN	FACING	FACINGSQ	LEFT	TOP	VCENTER	HCENTER	SALE
9	5	4	-0.5	-0.33	-0.5	-0.5	-0.5	0.5	-0.5
9	6	4	0	0.67	-0.5	-0.5	-0.5	-0.5	0.5
9	7	4	0.5	-0.33	-0.5	-0.5	0.5	0	-0.5
9	8	1	-0.5	-0.33	-0.5	0.5	-0.5	-0.5	0.5
9	9	1	0	0.67	-0.5	0.5	-0.5	-0.5	-0.5
9	10	1	0.5	-0.33	-0.5	0.5	0.5	0	-0.5
9	11	3	-0.5	-0.33	0.5	-0.5	0.5	0.5	-0.5
9	12	3	0	0.67	0.5	-0.5	0.5	-0.5	0.5
9	1	3	0.5	-0.33	0.5	-0.5	-0.5	0	0.5
9	2	2	-0.5	-0.33	0.5	0.5	0.5	-0.5	0.5
9	3	2	0	0.67	0.5	0.5	0.5	-0.5	-0.5
9	4	2	0.5	-0.33	0.5	0.5	-0.5	0	0.5

3	3	3	8	8	7*
1	2*	2*	9*	9*	9*
12	12	12	4	5*	5*
11	11	10*	6*	6*	6*

PLANO	BRAND	PATTERN	FACING	FACINGSQ	LEFT	TOP	VCENTER	HCENTER	SALE
10	4	1	-0.5	-0.33	-0.5	-0.5	0.5	0.5	-0.5
10	5	1	0	0.67	-0.5	-0.5	0.5	-0.5	0.5
10	6	1	0.5	-0.33	-0.5	-0.5	-0.5	0	0.5
10	7	3	-0.5	-0.33	-0.5	0.5	-0.5	-0.5	0.5
10	8	3	0	0.67	-0.5	0.5	-0.5	0.5	-0.5
10	9	3	0.5	-0.33	-0.5	0.5	0.5	0	0.5
10	10	2	-0.5	-0.33	0.5	-0.5	-0.5	-0.5	0.5
10	11	2	0	0.67	0.5	-0.5	-0.5	-0.5	-0.5
10	12	2	0.5	-0.33	0.5	-0.5	0.5	0	-0.5
10	1	4	-0.5	-0.33	0.5	0.5	0.5	-0.5	-0.5
10	2	4	0	0.67	0.5	0.5	0.5	-0.5	0.5
10	3	4	0.5	-0.33	0.5	0.5	-0.5	0	-0.5

12*	1*	1*	8*	8*	8*
2	2	2	7	7	6*
11	11	11	4*	4*	3
9	10	10	5*	5*	5*

PLANO	BRAND	PATTERN	FACING	FACINGSQ	LEFT	TOP	VCENTER	HCENTER	SALE
11	3	3	-0.5	-0.33	-0.5	-0.5	0.5	-0.5	-0.5
11	4	3	0	0.67	-0.5	-0.5	0.5	-0.5	0.5
11	5	3	0.5	-0.33	-0.5	-0.5	-0.5	0	0.5
11	6	2	-0.5	-0.33	-0.5	0.5	0.5	-0.5	0.5
11	7	2	0	0.67	-0.5	0.5	0.5	0.5	-0.5
11	8	2	0.5	-0.33	-0.5	0.5	-0.5	0	0.5
11	9	4	-0.5	-0.33	0.5	-0.5	-0.5	-0.5	-0.5
11	10	4	0	0.67	0.5	-0.5	-0.5	0.5	-0.5
11	11	4	0.5	-0.33	0.5	-0.5	0.5	0	-0.5
11	12	1	-0.5	-0.33	0.5	0.5	-0.5	-0.5	0.5
11	1	1	0	0.67	0.5	0.5	-0.5	-0.5	0.5
11	2	1	0.5	-0.33	0.5	0.5	0.5	0	-0.5

12*	12*	11*	7*	7*	7*
1	1	1	5	6	6
8	9	9	4	4	4
10*	10*	10*	3*	3*	2*

PLANO	BRAND	PATTERN	FACING	FACINGSQ	LEFT	TOP	VCENTER	HCENTER	SALE
12	2	2	-0.5	-0.33	-0.5	-0.5	-0.5	-0.5	0.5
12	3	2	0	0.67	-0.5	-0.5	-0.5	-0.5	0.5
12	4	2	0.5	-0.33	-0.5	-0.5	0.5	0	-0.5
12	5	4	-0.5	-0.33	-0.5	0.5	0.5	0.5	-0.5
12	6	4	0	0.67	-0.5	0.5	0.5	-0.5	-0.5
12	7	4	0.5	-0.33	-0.5	0.5	-0.5	0	0.5
12	8	1	-0.5	-0.33	0.5	-0.5	0.5	-0.5	-0.5
12	9	1	0	0.67	0.5	-0.5	0.5	0.5	-0.5
12	10	1	0.5	-0.33	0.5	-0.5	-0.5	0	0.5
12	11	3	-0.5	-0.33	0.5	0.5	-0.5	-0.5	0.5
12	12	3	0	0.67	0.5	0.5	-0.5	-0.5	0.5
12	1	3	0.5	-0.33	0.5	0.5	0.5	0	-0.5

TABLE W1

Correlation Matrix of Manipulated Independent Variables

	FACING	FACINGSQ	LEFT	HCENTER	TOP	VCENTER	SALE
FACING (F)	1.00	.00	.00	.00	.00	.00	.00
FACINGSQ (F2)	.00	1.00	.00	.00	.00	.00	.00
LEFT (L)	.00	.00	1.00	.00	.00	.00	.00
HCENTER (H)	.00	.00	.00	1.00	.00	.00	-.10
TOP (T)	.00	.00	.00	.00	1.00	.00	.03
VCENTER (V)	.00	.00	.00	.00	.00	1.00	-.11
SALE (S)	.00	.00	.00	-.10	.03	-.11	1.00
b1	.00	.00	.00	.00	.00	.10	.05
b2	.00	.00	.00	.00	.00	.10	.05
b3	.00	.00	.00	.00	.00	-.05	.00
b4	.00	.00	.00	.06	.00	-.10	-.05
b5	.00	.00	.00	.06	.00	.10	-.05
b6	.00	.00	.00	-.06	.00	.05	.05
b7	.00	.00	.00	.00	.00	-.10	-.05
b8	.00	.00	.00	.06	.00	-.10	.05
b9	.00	.00	.00	-.06	.00	.05	-.05
b10	.00	.00	.00	.06	.00	.10	.05
b11	.00	.00	.00	.00	.00	-.10	-.05
b12	.00	.00	.00	-.12	.00	-.05	.00
LF	.00	.00	.00	.00	.00	.00	-.07
LF2	.00	.00	.00	.00	.00	.00	.00
LT	.00	.00	.00	.00	.00	-.06	.08
LS	-.07	.00	.00	.20	.08	.00	.00
LV	.00	.00	.00	.00	-.06	.00	.00
LH	.00	.00	.00	.00	.00	.00	.20
TF	.00	.00	.00	.00	.00	.00	-.10
TF2	.00	.00	.00	.00	.00	.00	.14
TS	-.10	.14	.08	.20	.00	-.03	.00
TV	.00	.00	-.06	.00	.00	.00	-.03
TH	.00	.00	.00	.00	.00	.00	.20
SF	.00	.00	-.07	.08	-.10	.00	.00
SF2	.00	.00	.00	.00	.14	-.20	.00
SV	.00	-.20	.00	-.07	-.03	.00	.00
SH	.08	.00	.21	.00	.21	-.07	.00
VF	.00	.00	.00	-.08	.00	.00	.00
VF2	.00	.00	.00	.14	.00	.00	-.20
VH	-.08	.14	.00	.00	.00	.00	-.07
HF	.00	.00	.00	-.71	.00	-.10	.10

TABLE W1 (CONTINUED)

Correlation Matrix of Manipulated Independent Variables

	FACING	FACINGSQ	LEFT	HCENTER	TOP	VCENTER	SALE
b1F	.00	.00	.00	.08	.00	.00	.00
b1F2	.00	.00	.00	-.13	.00	.07	-.07
b1L	.00	.00	.00	.00	.00	.00	-.15
b1H	.08	-.13	.00	.00	.00	-.06	.09
b1T	.00	.00	.00	.00	.00	.00	.04
b1V	.00	.07	.00	-.06	.00	.00	-.12
b1S	.00	-.07	-.15	.09	.04	-.12	.00
b2F	.00	.00	.00	.08	.00	-.06	-.18
b2F2	.00	.00	.00	-.13	.00	-.04	.04
b2L	.00	.00	.00	.00	.00	.10	.15
b2H	.08	-.13	.00	.00	.12	.00	-.09
b2T	.00	.00	.00	.12	.00	.00	-.06
b2V	-.06	-.04	.10	.00	.00	.00	.08
b2S	-.18	.04	.15	-.09	-.06	.08	.00
b3F	.00	.00	.00	.08	.00	.00	.00
b3F2	.00	.00	.00	-.13	.00	-.14	.00
b3L	.00	.00	.00	-.12	.00	-.05	-.10
b3H	.08	-.13	-.12	.00	.00	.00	.15
b3T	.00	.00	.00	.00	.00	.05	-.11
b3V	.00	-.14	-.05	.00	.05	.00	-.02
b3S	.00	.00	-.10	.15	-.11	-.02	.00
b4F	.00	.00	.00	.00	.00	-.06	.06
b4F2	.00	.00	.00	-.09	.00	.04	-.04
b4L	.00	.00	.00	-.06	.00	-.20	.05
b4H	.00	-.09	-.06	.00	-.06	.12	.03
b4T	.00	.00	.00	-.06	.00	-.10	.04
b4V	-.06	.04	-.20	.12	-.10	.00	-.02
b4S	.06	-.04	.05	.03	.04	-.02	.00
b5F	.00	.00	.00	-.08	.00	.00	.00
b5F2	.00	.00	.00	.04	.00	.07	-.14
b5L	.00	.00	.00	.06	.00	.00	-.05
b5H	-.08	.04	.06	.00	.06	-.12	-.03
b5T	.00	.00	.00	.06	.00	.10	.04
b5V	.00	.07	.00	-.12	.10	.00	-.02
b5S	.00	-.14	-.05	-.03	.04	-.02	.00
b6F	.00	.00	.00	.00	.00	.00	-.06
b6F2	.00	.00	.00	.09	.00	-.07	.04
b6L	.00	.00	.00	.18	.00	.15	-.05
b6H	.00	.09	.18	.00	-.06	.00	.03
b6T	.00	.00	.00	-.06	.00	.05	-.16
b6V	.00	-.07	.15	.00	.05	.00	-.07
b6S	-.06	.04	-.05	.03	-.16	-.07	.00

TABLE W1 (CONTINUED)

Correlation Matrix of Manipulated Independent Variables

	FACING	FACINGSQ	LEFT	HCENTER	TOP	VCENTER	SALE
b7F	.00	.00	.00	.00	.00	.00	.00
b7F2	.00	.00	.00	.00	.00	-.07	.07
b7L	.00	.00	.00	.00	.00	.00	-.05
b7H	.00	.00	.00	.00	.00	.06	-.15
b7T	.00	.00	.00	.00	.00	.00	.04
b7V	.00	-.07	.00	.06	.00	.00	-.02
b7S	.00	.07	-.05	-.15	.04	-.02	.00
b8F	.00	.00	.00	-.08	.00	.06	.12
b8F2	.00	.00	.00	.04	.00	.04	.14
b8L	.00	.00	.00	-.18	.00	.10	.05
b8H	-.08	.04	-.18	.00	.06	-.18	.03
b8T	.00	.00	.00	.06	.00	.00	.14
b8V	.06	.04	.10	-.19	.00	.00	.08
b8S	.12	.14	.05	.03	.14	.08	.00
b9F	.00	.00	.00	.00	.00	.00	.12
b9F2	.00	.00	.00	.09	.00	.14	.07
b9L	.00	.00	.00	-.06	.00	-.05	-.05
b9H	.00	.09	-.06	.00	-.06	.18	-.03
b9T	.00	.00	.00	-.06	.00	-.05	-.06
b9V	.00	.14	-.05	.18	-.05	.00	.13
b9S	.12	.07	-.05	-.03	-.06	.13	.00
b10F	.00	.00	.00	-.08	.00	.06	-.06
b10F2	.00	.00	.00	.04	.00	-.04	.04
b10L	.00	.00	.00	.06	.00	-.20	.05
b10H	-.08	.04	.06	.00	-.06	.00	-.09
b10T	.00	.00	.00	-.06	.00	.10	.04
b10V	.06	-.04	-.20	.00	.10	.00	-.02
b10S	-.06	.04	.05	-.09	.04	-.02	.00
b11F	.00	.00	.00	-.08	.00	.00	.06
b11F2	.00	.00	.00	.13	.00	-.07	-.04
b11L	.00	.00	.00	.12	.00	.00	.05
b11H	-.08	.13	.12	.00	.00	-.06	.09
b11T	.00	.00	.00	.00	.00	-.10	.04
b11V	.00	-.07	.00	-.06	-.10	.00	-.02
b11S	.06	-.04	.05	.09	.04	-.02	.00
b12F	.00	.00	.00	.08	.00	.00	-.06
b12F2	.00	.00	.00	.04	.00	.07	-.11
b12L	.00	.00	.00	.00	.00	.15	.10
b12H	.08	.04	.00	.00	.00	.06	-.03
b12T	.00	.00	.00	.00	.00	-.05	-.01
b12V	.00	.07	.15	.06	-.05	.00	-.02
b12S	-.06	-.11	.10	-.03	-.01	-.02	.00

TABLE W2

Aliases

LEFT = LF2 + LV + TS + 3 * SH - 3 * LTH - TSV + 3 * FSH - 3 * SVH - LF2V - TF2S - 3 * LFTH - 3 * FSVH + 3 * LTVH + F2STV + 3 * LFTVH

TOP = LS + TF2 + TV + 3 * SH - 3 * LTH - LSV + 3 * FSH - 3 * SVH - LF2S - TF2V - 3 * LFTH - 3 * FSVH + 3 * LTVH + LF2SV + 3 * LFTVH

FACING = intercept + LF - LF2 - LV + LH - 1.33333 * TS - TV + 0.33333 * SV - 3 * SH - 1.5 * HF + 0.5 * HF2 + 3 * LFH + 3 * LTH + 0.33333 * LTS + LTV - 0.33333 * LSV + TFV + TFS - TSH + TSV + TVH - 3 * FSH - FSV + 4 * SVH + LF2V + 0.33333 * TF2S + 0.66667 * F2SV - LFST + LFSV - LFTV + 3 * LFTH + LSTH + FSTH - LSVH + 2 * FSVH - 4 * LTVH + 3 * FTVH + 0.66667 * LF2ST - 0.66667 * LF2SV - F2STV - LFSTH + LFSVH - 6 * LFTVH

FACINGSQ = intercept + 4 * LT - 4 * LS - LV + 3 * LH + 3 * TF - 3 * TF2 - TV + 6 * TH - 3 * SF + 3 * SF2 - SV - 9 * SH + 1.5 * HF + 1.5 * HF2 + 3 * LFH + 3 * LFS - 3 * LFT + 9 * LTH - LTS - 3 * LTV - 6 * LSH + 5 * LSV + 12 * TFH - 3 * TFV - 3 * TSH + TSV - 3 * TVH - 15 * FSH + 3 * FSV + 12 * SVH + LF2V + LF2S - LF2T + 4 * TF2V - 2 * F2SV - 3 * LFSV + 3 * LFTV + 3 * LFTH + 3 * LSTH - 3 * FSTH + 3 * LSVH + 18 * FSVH - 12 * LTVH - 9 * FTVH + LF2ST - 2 * LF2SV - F2STV + 3 * LFSTH - 3 * LFSVH - 6 * LFTVH

PRICE = - 3 * LT + 4 * LS - 3 * TF + 3 * TF2 - 3 * TH + 3 * SF - 2 * SF2 + SV + 6 * SH - 3 * LFS + 3 * LFT - 6 * LTH + 3 * LTV + 3 * LSH - 4 * LSV - 9 * TFH + 3 * TFV + 3 * TVH + 12 * FSH - 3 * FSV - 6 * SVH - LF2S - 3 * TF2V + 2 * F2SV + 3 * LFSV - 3 * LFTV - 3 * LFSH - 3 * LSVH - 12 * FSVH + 6 * LTVH + 9 * FTVH + LF2SV + 3 * LFSVH

VCENTER = - 1.5 * LF + 1.5 * LF2 + 5 * LT - 5 * LS + LV + 3 * LH + 3 * TF - 3 * TF2 + TS + TV + 3 * TH - 3 * SF + 3 * SF2 - SV - 3 * SH + 1.5 * VF - 0.5 * VF2 + 4.5 * LFS - 4.5 * LFT + 3 * LTH - LTS - 6 * LTV - 3 * LSH + 6 * LSV - 3 * LVH + 9 * TFH - 4.5 * TFV - 3 * TSH - 3 * TVH - 9 * FSH + 4.5 * FSV + 3 * FVH + 3 * SVH - LF2V + 0.5 * LF2S - 0.5 * LF2T + 3.5 * TF2V - TF2S - 3.5 * F2SV + 1.5 * LFST - 6 * LFSV + 6 * LFTV - 1.5 * FSTV + 6 * LFSH - 6 * LFTH - 3 * FSTH - 3 * LFVH + 3 * LSVH + 12 * FSVH - 3 * LTVH - 12 * FTVH + 3 * STVH - 0.5 * LF2ST + 1.5 * F2STV + 3 * LFSTH - 9 * LFSVH + 9 * LFTVH

HCENTER = 0.16667 * LF - 0.16667 * LF2 + 0.33333 * LT - 0.33333 * LS + 0.66667 * LH + 0.33333 * TF - 0.33333 * TF2 - 0.11111 * TS - 0.33333 * SF + 0.33333 * SF2 - 0.22222 * SV - 2 * SH + 0.16667 * VF - 0.16667 * VF2 + 0.66667 * VH - HF + LFH - 0.33333 * LFV + 0.16667 * LFS - 0.16667 * LFT + 2 * LTH + 0.11111 * LTS - 0.33333 * LTV + 0.55556 * LSV - 0.33333 * LVH + 0.66667 * TFH - 0.5 * TFV - 0.66667 * TSH + 0.33333 * TSV + 0.33333 * TVH - 2.66667 * FSH + 0.5 * FSV + FVH + 2.33333 * SVH + 0.33333 * LF2V + 0.16667 * LF2S - 0.16667 * LF2T + 0.5 * TF2V + 0.11111 * TF2S - 0.27778 * F2SV - 0.16667 * LFST - 0.33333 * LFSV + 0.33333 * LFTV - 0.33333 * LSTV - 0.16667 * FSTV + 0.33333 * LFSH + 1.66667 * LFTH + LSTH - 0.66667 * FSTH - LFVH - 0.33333 * LSVH + 3.33333 * FSVH - 2.33333 * LTVH - 0.66667 * FTVH + 0.33333 * STVH + 0.05556 * LF2ST - 0.22222 * LF2SV - 0.16667 * F2STV + 0.33333 * LFSTV + 0.66667 * LFSTH - LFSVH - 1.66667 * LFTVH - 0.66667 * LSTVH

NOTE: Interactions are denoted using abbreviations, such as LF for LEFT x FACING, LF2 for LEFT x FACINGSQ, etc.