

The Effectiveness of Customized Promotions in Online and Offline Stores

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Web Appendix

Price Cut Elasticities in Our Joint Model of Incidence, Choice, and Quantity

Let:

PC_k = price cut of brand/alternative k ;

$\beta_{PC,g}$ = coefficient of price cut in brand utility functions (Equation 1) for segment g ;

$\phi_{PC,g}$ = coefficient of price cut in the purchase quantity function (Equation 3) for segment g ;

$e_{I,g}$ = price cut elasticity of purchase incidence probability for segment g ;

$e_{BI,g}$ = price cut elasticity of conditional choice probability for segment g ;

$e_{E(QI,B),g}$ = price cut elasticity of conditional expected purchase quantity for segment g ;

$e_{Q,g}$ = price cut elasticity of (unconditional) expected purchase quantity for segment g ;

$e_{Q,i}$ = household i 's price cut elasticity of (unconditional) expected purchase quantity.

Then, for each brand/alternative k :

$$e_{I,g} = (1 - \lambda_g) \cdot \beta_{PC,g} \cdot PC_k \cdot \Pr_g(B_k = 1 | I = 1) \cdot [1 - \Pr_g(I = 1)],$$

$$e_{BI,g} = \beta_{PC,g} \cdot PC_k \cdot [1 - \Pr(B_k = 1 | I = 1)],$$

$$e_{E(QI,B),g} = \frac{1}{\delta_g E_g(Q_k | I = 1, B_k = 1)} \cdot \frac{e^{\delta_g Z \phi_g}}{1 + e^{\delta_g Z \phi_g}} \left\{ \phi_{PC,g} \cdot PC_k - \omega_g \left[\frac{\phi_{PC,g} \cdot PC_k \cdot (1 - A_g)}{1 + e^{\delta_g Z \phi_g}} - A_g \cdot (e_{I,g} + e_{BI,g}) \right] \right\},$$

$$e_{Q,g} = e_{I,g} + e_{BI,g} + e_{E(QI,B),g},$$

$$e_{Q,i} = \sum_{g=1}^G \left[\frac{q_{i,g} \cdot A_g \cdot E_g(Q_k | I = 1, B_k = 1)}{\sum_g q_{i,g} \cdot A_g \cdot E_g(Q_k | I = 1, B_k = 1)} \cdot e_{Q,g} \right],$$

where $q_{i,g}$ = household i 's posterior probability of belonging to segment g ,

$A_g = \Pr_g(I = 1) \cdot \Pr_g(B_k = 1 | I = 1)$, and other notations are same as defined in the main text.