

When Do Discounts Matter?

An Investigation of Potential Drivers of Discounts Elasticities
Across Brands, Categories and Store Formats

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Executive Summary

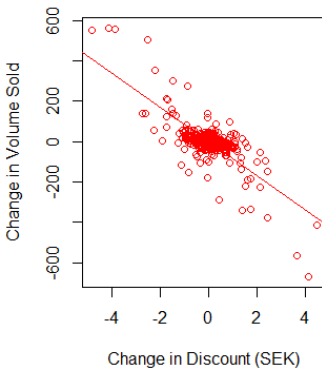
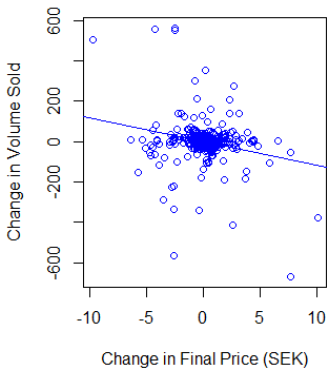
- Most quantitative research papers model the effect of price promotions as the effect of changes in the final retail price while consumer behavior research suggests customers can evaluate (listed) retail price and discounts differently
- We estimate the discounts' elasticities apart from price elasticities and investigate its systematic drivers from brand factors, category factors and store formats
- Discounts are most effective in a hypermarket format followed by a supermarket and a convenience store
 - Discounts are more effective for categories with higher dependency on discounts and fewer unique items promoted
 - Discounts are more effective for brand's with higher discount depth
 - Discounts are less effective for the brand that offers discounts too often

Different Effects Between Final Price VS. Listed Price and Discounts

- Research in the area of consumer behavior suggests the potential promotion framing phenomena in which customers evaluate regular price and discounts differently
 - This framing is influenced by several factors such as situational factors (e.g., Jeffrey Inman, Peter, & Raghurir, 1997), customer's characteristics (e.g., Wakefield & Inman, 1993, 2003), discounts characteristics (e.g., DelVecchio, Krishnan, & Smith, 2007), and store characteristics (Shankar & Krishnamurthi, 1996)
- Most quantitative research papers model the effect of price promotions as the effect of changes in the final retail price or the regular price
 - Maybe lack of discount offered
 - Maybe information regarding discount is not observable

(Model-free) Evidence

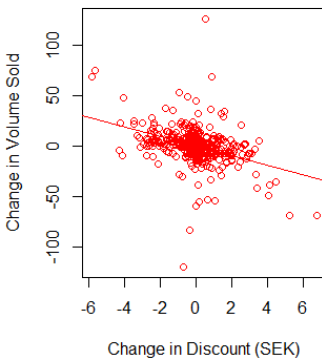
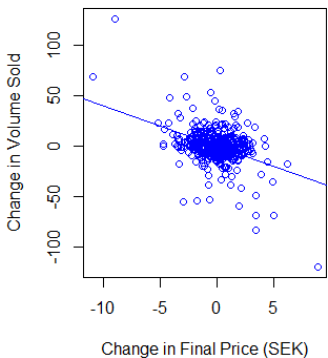
Brand A



- For soft drink, Brand A's change in discounts seems to be more effective than change in final price

(Model-free) Evidence

Brand B

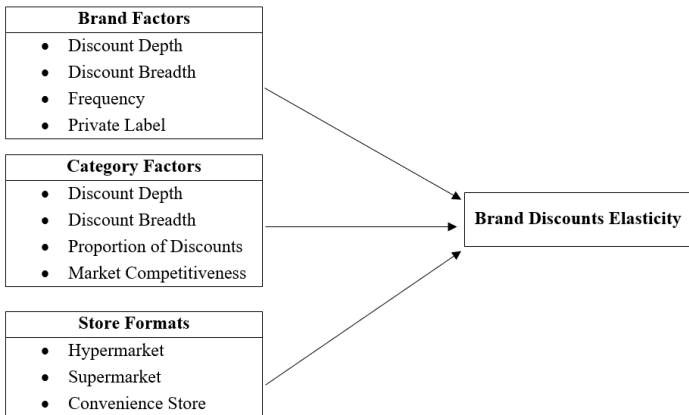


- For soft drink, Brand B's change in discounts seems to be (slightly) less effective than change in final price

Research Purpose

To distinguish and quantify the effect of promoted discounts from the final retail price on retail brand sales as well as investigate its potential determinants using three factors: brand factors, category factors and store formats

Conceptual Framework



Proposed research framework to investigate the potential drivers of discounts effectiveness using three factors: brand factors, category factors and store formats

Data & Setting

- Point of sales data from loyalty cards from 10,0000 customers at one specific grocery hypermarket in a mid-sized city from Oct 2014 to Nov 2016
- It includes store information including its locations and its formats consisting of hypermarket, supermarket and convenience store
- We select total 28 categories that have a variety of brands offered across these three formats in 153 weeks of interest
 - These 28 categories are different in terms of their number of major brands ranging from two brands to nine brands
 - Their average discounts' depths across formats ranging from 3.5% to 14.7%
 - Their average discounts' breadth ranging from 20.9% to 52.6%
 - Their average proportions of category purchase based on discounts ranging from 32.7% to 80.1%
 - Their variance of market share from 0.6 to 13.9

Variable Operationalization (I)

Variable	Operationalization
$Sales_{ijk,t}$	Unit sales for brand i in category j in store format k in week t .
$Price_{ijk,t}$	Price sold of brand i in category j in store format k in week t , computed as a sales-weighted average across its SKUs sold in period t , expressed in local currency.
$Regular\ Price_{ijk,t}$	Price before discounts of brand i in category j in store format k in week t , computed as a sales-weighted average across its SKUs sold in period t , expressed in local currency.
$Discounts_{ijk,t}$	Discounts offered of brand i in category j in store format k in week t , computed as a sales-weighted average across its SKUs sold in period t , expressed in local currency.
$LineLength_{ijk,t}$	Number of unique SKUs sold by brand i in category j in store format k in week t
$CompPrice_{ijk,t}$	Sales-weighted average of brands i 's competing brands' ($\neq i$) average price sold in in category j in store format k in week t
$CompLineLength_{ijk,t}$	Sales-weighted average of brands i 's competing brands' ($\neq i$) number of unique SKUs sold in in category j in store format k in week t
$Holiday_t$	An indication variable equal to 1 if it is a national holiday in week t

Variable Operationalization (II)

Variable	Operationalization
$BrandDiscountDepth_{ijk}$	Average weekly ratio of discounts to regular prices of brand i in category j in store format k
$BrandDiscountBreadth_{ijk}$	Average weekly ratio of number of SKUs getting promoted to total number of SKUs of brand i in category j in store format k
$Frequency_{ijk}$	Ratio of number of weeks in which negative price-promotion shocks are at least 5% of the brand i 's regular price to total number of weeks in the study in category j in store format k
$PrivateLabel_{ij}$	An indication variable equal to 1 if brand i in category j is owned by the retailer
$CatDiscountDepth_{jk}$	Average weekly ratio of discounts to regular prices of category j in store format k
$CatDiscountBreadth_{jk}$	Average weekly ratio of number of SKUs getting promoted to total number of SKUs of category j in store format k
$CatMarketComp_{jk}$	Variance in shares across brand of category j in store format k
$CatDiscProportion_{jk}$	Average weekly ratio of number of products purchased based on discounts to total number of products purchased of category j in store format k
$Format_k$	Dummy variables including <i>Hypermarket</i> indicating hypermarket store format and <i>Supermarket</i> indicating supermarket store format

Methodology: First-Stage Regression

First, to estimate discount elasticity across brands, categories and formats, we adopt an error-correction specification (Datta, van Heerde, Dekimpe, & Steenkamp, 2019) as our sales-response model;

$$\begin{aligned} \Delta sales_{i,j,k,t} = & \beta_{0i,j,k} + \beta_{1i,j,k} \Delta RegPrice_{i,j,k,t} - \beta_{1'i,j,k} \Delta Discounts_{i,j,k,t} \\ & + \beta_{2i,j,k} \Delta LineLength_{i,j,k,t} + \beta_{3i,j,k} \Delta CompPrice_{i,j,k,t} \\ & + \beta_{4i,j,k} \Delta CompLineLength_{i,j,k,t} \\ & + \gamma_{i,j,k} [Sales_{i,j,k,t-1} \\ & \quad - \beta_{5i,j,k} (\Delta RegPrice_{i,j,k,t-1} - \Delta Discounts_{i,j,k,t-1})] \\ & - \beta_{6i,j,k} \Delta LineLength_{i,j,k,t} + \beta_{7i,j,k} Holiday_t + \varepsilon_{i,j,k} \end{aligned}$$

where $\Delta X_t = X_t - X_{t-1}$

- The immediate effect of discounts is captured by $\beta_{1'i,j,k}$

Methodology: First-Stage Regression

- We want to compare the discount effectiveness ($\beta_{1'i,j,k}$) across brands, categories and formats, we need to control for scale differences
- We convert this unit effectiveness of discounts into percentage elasticities at mean ($\eta_{i,j,k}$) by multiplying it with the ratio of the average weekly brand sales i in category j in store format k to its average weekly discounts offered (Srinivasan et al., 2004)

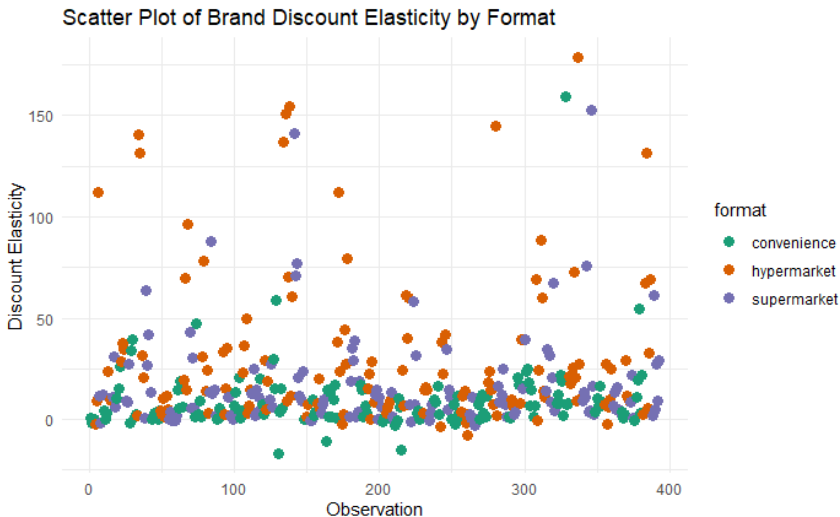
$$\eta_{i,j,k} = \frac{\beta_{1'i,j,k} \times \text{Discounts}_{i,j,k}}{\text{Sales}_{i,j,k}} \times 100$$

Methodology: Second-Stage Regression

- Second, to see how brand factors, category factors and store formats influence discount effectiveness, we estimate discounts elasticities at mean $\eta_{i,j,k}$ with respect to brand factors, category factors and store formats. The model for discount elasticity of brand i in category j in store format k is:

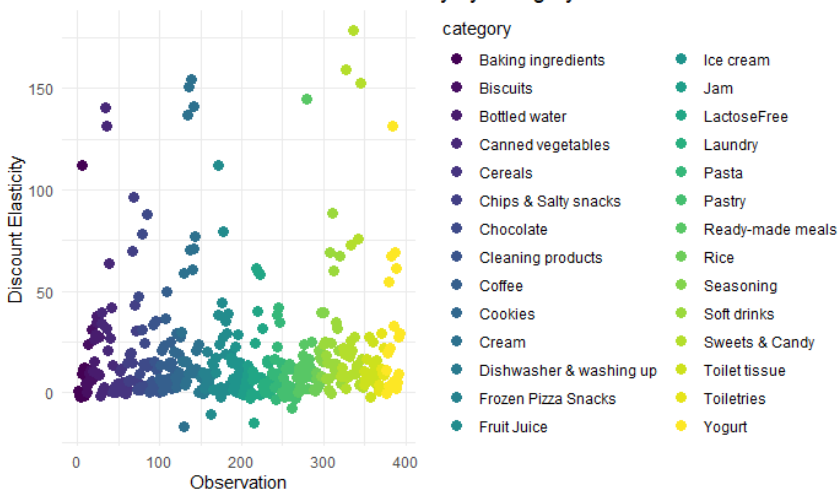
$$\begin{aligned} \eta_{i,j,k} = & \delta_0 + \delta_1 \text{BrandDiscountDepth}_{i,j,k} + \delta_2 \text{BrandDiscountBreadth}_{i,j,k} \\ & + \delta_3 \text{Frequency}_{i,j,k} + \delta_4 \text{PrivateLabel}_{i,j} \\ & + \delta_5 \text{CatDiscountDepth}_{j,k} + \delta_6 \text{CatDiscountBreadth}_{j,k} \\ & + \delta_7 \text{CatDiscProportion}_{j,k} + \delta_8 \text{CatMarketComp}_{j,k} \\ & + \delta_9 \text{Format}_k \end{aligned}$$

Results from First-Stage Regression ($\eta_{i,j,k}$)



Results from First-Stage Regression ($\eta_{i,j,k}$)

Scatter Plot of Brand Discount Elasticity by Category



Results from First-Stage Regression ($\eta_{i,j,k}$)

- From 393 brands in 28 categories across three store formats, the discount elasticity ($\eta_{i,j,k}$) of each brand ranges from -12 to 133 with its standard error ranges from 0.4 to 12 suggesting non-significant estimates of discounts effectiveness for some brands in some categories in a specific format
- These differences of estimates and significance indicate an evident heterogeneity across categories and store formats. Hence, it is reasonable to investigate the potential drivers of discounts elasticity from brand factors, category factors and store formats

Regression Result of Discounts Elasticity on Brand Factors, Category Factors and Store Format

		Estimate	Standard Error	
	Constant	-2.00	2.29	
Brand	BrandDiscountDepth	4.88	0.30	***
	BrandDiscountBreadth	-0.01	0.05	
	Frequency	-0.06	0.02	***
	PrivateLabel	0.58	1.00	
Category	CatDiscountDepth	0.18	0.15	
	CatDiscountBreadth	-0.39	0.11	***
	CatDiscProportion	0.25	0.06	***
	CatMarketComp	-0.13	0.13	
Format	Hypermarket	4.23	1.22	***
	Supermarket	2.45	1.13	*
Observation		393		
Adjusted R-Squared		0.62		

Significance levels: * $p < .10$, ** $p < .05$, *** $p < .01$ (two-sided)

Results

- Store formats are highly statically significant implying the considerable differences of discount elasticity across formats
 - Customers are more sensitive to the discount offered when they shop in the hypermarket
- For category factors, only category discounts' breadth and their proportion of purchase on discounts affect discount elasticity
 - customers are less sensitive to the category that usually have products on discounts but more sensitive to the category that they usually purchase on deal
- For brand factors, brand discounts' depth and discounts' frequency ratio are found to be influential factors for their discount elasticities
 - Offering higher discounts can increase their elasticities
 - Offering discounts too many times can decrease their discounts' elasticities

Recommendation

- The store managers, category managers and brand managers can design their discounts offered that would benefit them based on where their products are placed and which category their products belong to
- Hypermarket store manager can focus on non-price marketing strategies as price-promotion strategy is already effective
- Category manager may consider offering wide range of discounts to attract customers (and increase total category sales)
- Brand manager should consider "timing" for discounts offering by offer one-time big discounts and avoid offering discounts too many times
- However, achieving higher discount effectiveness does not necessarily mean achieving higher profit