

The Effect of Wal-Mart Coming to Town

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Introduction

Trend in Retailing – US

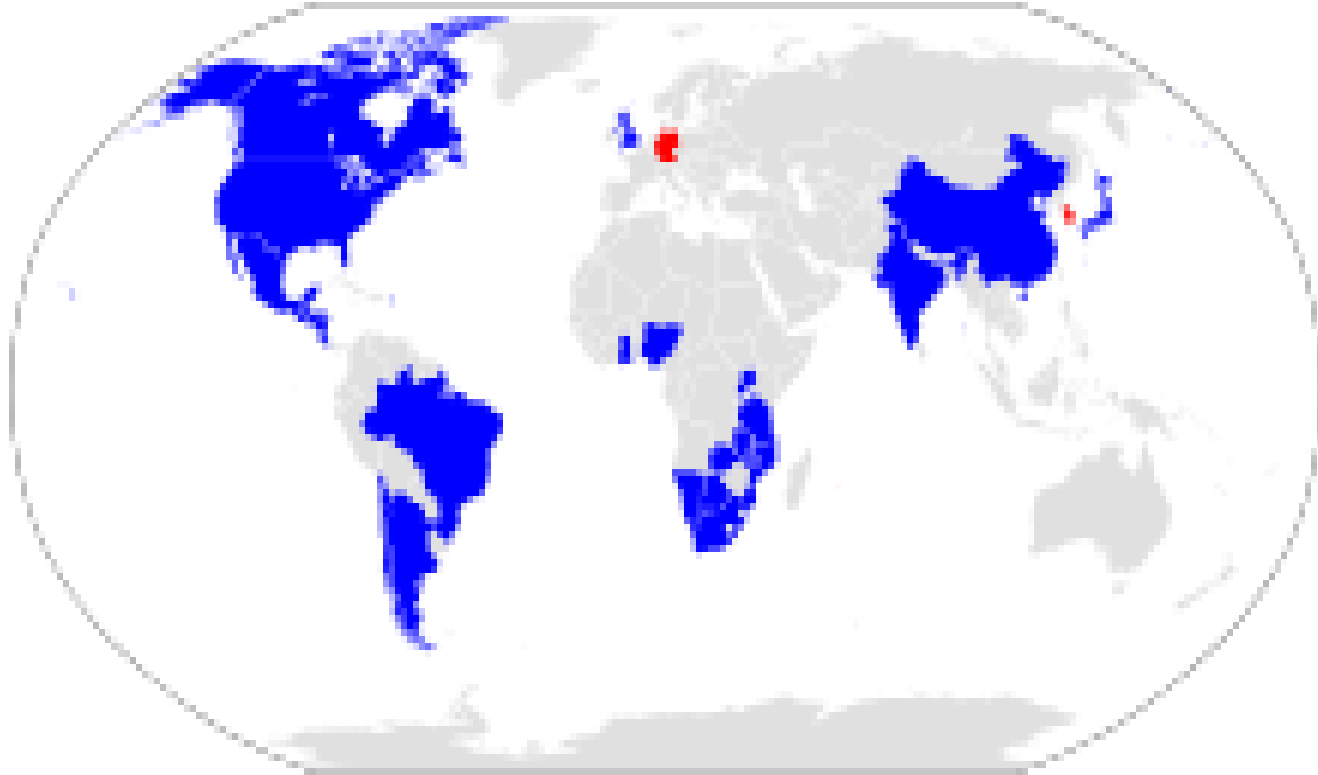
WAL*MART®

- Largest Retailer in World
- \$469B annual sales in 2013
(largest company in world)
- Over 8,500 stores in US
- In over 15 countries

Category	Disposable Dipers	Hair Care	Home Textiles	Tooth-paste
Wal-Mart's Share	32%	30%	13%	26%

Source: *Business Week Europe*, October 6, 2003

Walmart international locations



Wal-Mart in Chile

- Acquired D&S in 2009
- Walmart is the largest player with 33.4% market share

Introduction

Trend in Retailing

- Discount retailers
 - Low Retail Costs
- Dominate Retail Industry (Asymmetry)
 - Low Price
 - High Volume
- Possible Explanations
 - Logistic Improvements
 - Cost cutting

Research Questions

- Study 1:
 - What is the impact on local retailers?
 - Prices
 - Sales
- Study 2:
 - What is the impact on manufacturers?
 - Brand shares (premium vs value brands vs. store brands)

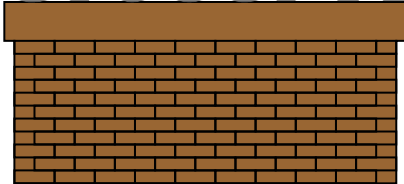
Study 1

2. Dry Goods

3. Clothing



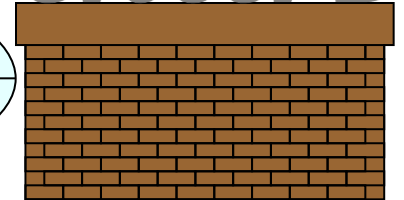
Grocer A



1. Produce
2. Dry Goods



Grocer B



1. Produce
2. Dry Goods

Research Question

What effect does the discounter's entry have on...

1. Consumer shopping patterns?
2. Retail prices?
3. Relative profits?
(traditional retailers')

Research Method

1. Data

- Chicago Area Grocery Store Chain
- Weekly Aggregate Sales
- Collected over period including entry by WM
- **No Consumer Data**
- **No Profit Data**

2. Theory

- Analytical/Equilibrium Model
- Gives insights when Data is Unavailable
- Use available data to test theory

Existing Literature

Impact of Discount Retailers

- Consumers & Prices

- Basker (*ReStat*, 2004)
- Singh, Hansen, & Blattberg (MKS '06)

- Manufacturers

- Dukes, Gal-Or, Srinivasan
(*J of Marketing Research*, '06)
- Inderst & Wey (WP '03)

- Competition

- Today's paper

Theory

Before Entry Model

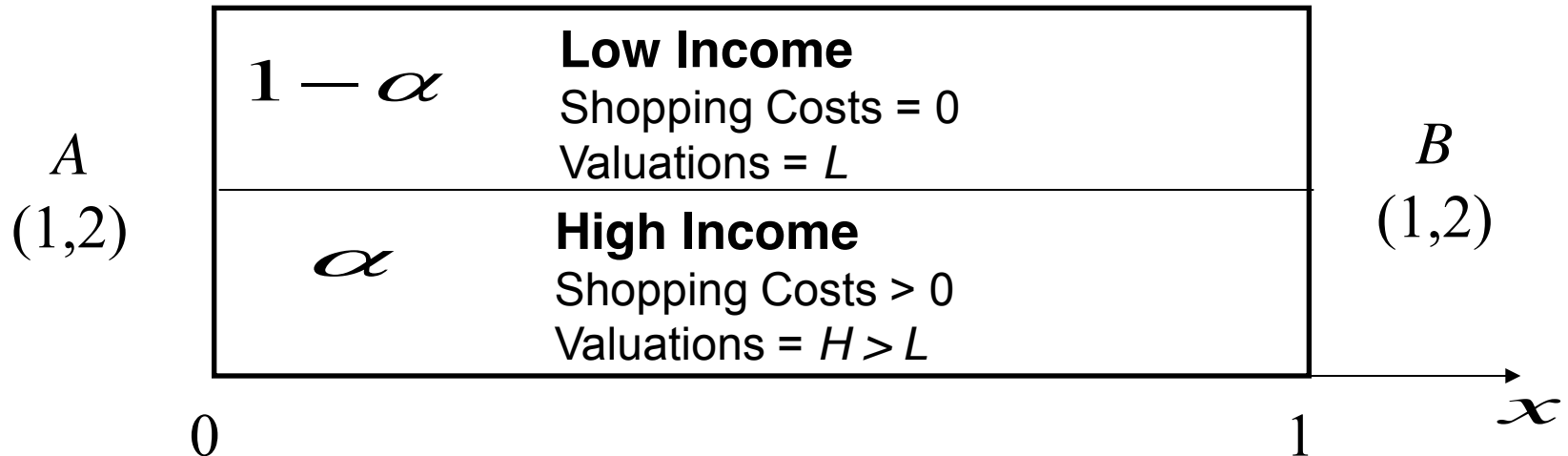
- Two "traditional" **Retailers**
 - A & B
 - Spatially differentiated
 - Carry two distinct products: 1 & 2
 - Incur marginal costs: $K > 0$
- **Products** (examples)
 1. Produce
 2. Packaged Dry Goods

Theory

Before Entry Model

- **Consumers**

- Buy both goods
- Fixed number
(On Hotelling interval $[0, 1]$)
- Two segments: $\alpha \in (0, 1)$



Theory

Before Entry Model

Retailers play a **pricing game**:

1. Set retail prices: $\left\{ \begin{array}{l} \text{Retailer } A: p_{1A} , p_{2A} \\ \text{Retailer } B: p_{1B} , p_{2B} \end{array} \right.$

2. Consumers

1. Observe all prices
2. Formulate their shopping plan
3. Execute plan

Theory

Before Entry Model

Assume: $L - K < t / 2$

No equilibria exists in which

1. one retailer serves *all* poor consumers
(Lemma 1)
2. a retailer does not serve poor consumers
(in at least one product) (Lemma 2)

Theory

Before Entry Model

If rich segment sufficiently large, $\alpha > \alpha_{BE}$
then there exists
reversed pricing equilibria:

Retailer i :	$\hat{p}_{1i} = L$
	$\hat{p}_{2i} = 2K + t - L$
Retailer j :	$\hat{p}_{1j} = 2K + t - L$
	$\hat{p}_{2j} = L$

with

symmetric market shares & profits

Theory

After Entry Model

Discounter

- Locates on Retailer A: $x = 0$
- Offers two products 2 & 3:
 - 2 – Overlapping product
 - 3 – Unique product
- Non-strategic (exogenous):
 - Offers lowest price on Product 2

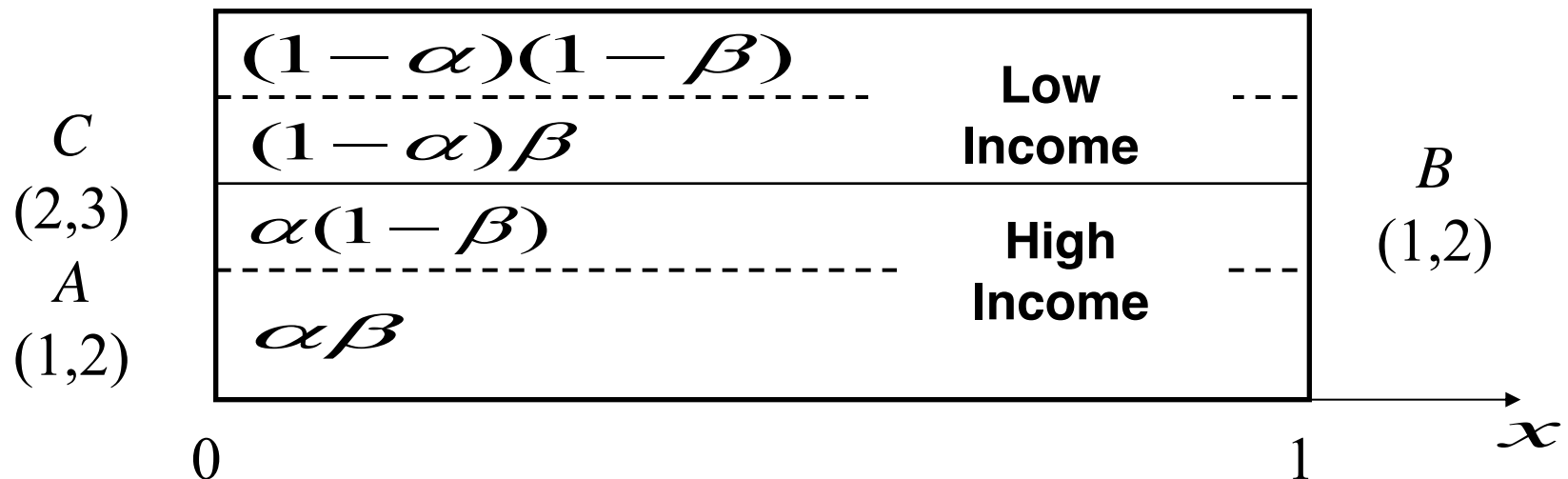
$$p_{2C} = K$$

Theory

After Entry Model

Consumers

- Type 1: Desire product 3: $\beta \in (0,1)$
- Type 2: No desire for product 3
- Rich consumers visit (Lemma 3)
 - No more than 2 stores for 3 products
 - No more than 1 store for 2 product



Theory

After Entry Model

Retailers play same **pricing game**:

1. Set retail prices: $\begin{cases} \text{Retailer } A: p_{1A} , p_{2A} \\ \text{Retailer } B: p_{1B} , p_{2B} \end{cases}$

2. Consumers

1. Observe all prices
2. Formulate their shopping plan
3. Execute plan

Theory

After Entry Model

No equilibria exists in which $P_{1A} \leq P_{1B}$

1. Suppose otherwise
2. All type 1's and poor buy Product 1 from Retailer A.
3. Only rich type 2's shop at Retailer B. They buy the bundle: Products 1 & 2
4. Profitable deviation: B steals poor consumers on product 1 by setting

$$\tilde{P}_{1B} = P_{1A} - \varepsilon$$

such that

$$\tilde{P}_{1B} + \tilde{P}_{2B} \text{ is constant}$$

Theory

After Entry Model

If rich segment sufficiently large,

$$\alpha > \alpha_{AE}(\beta)$$

then there exists an ***after entry equilibrium***

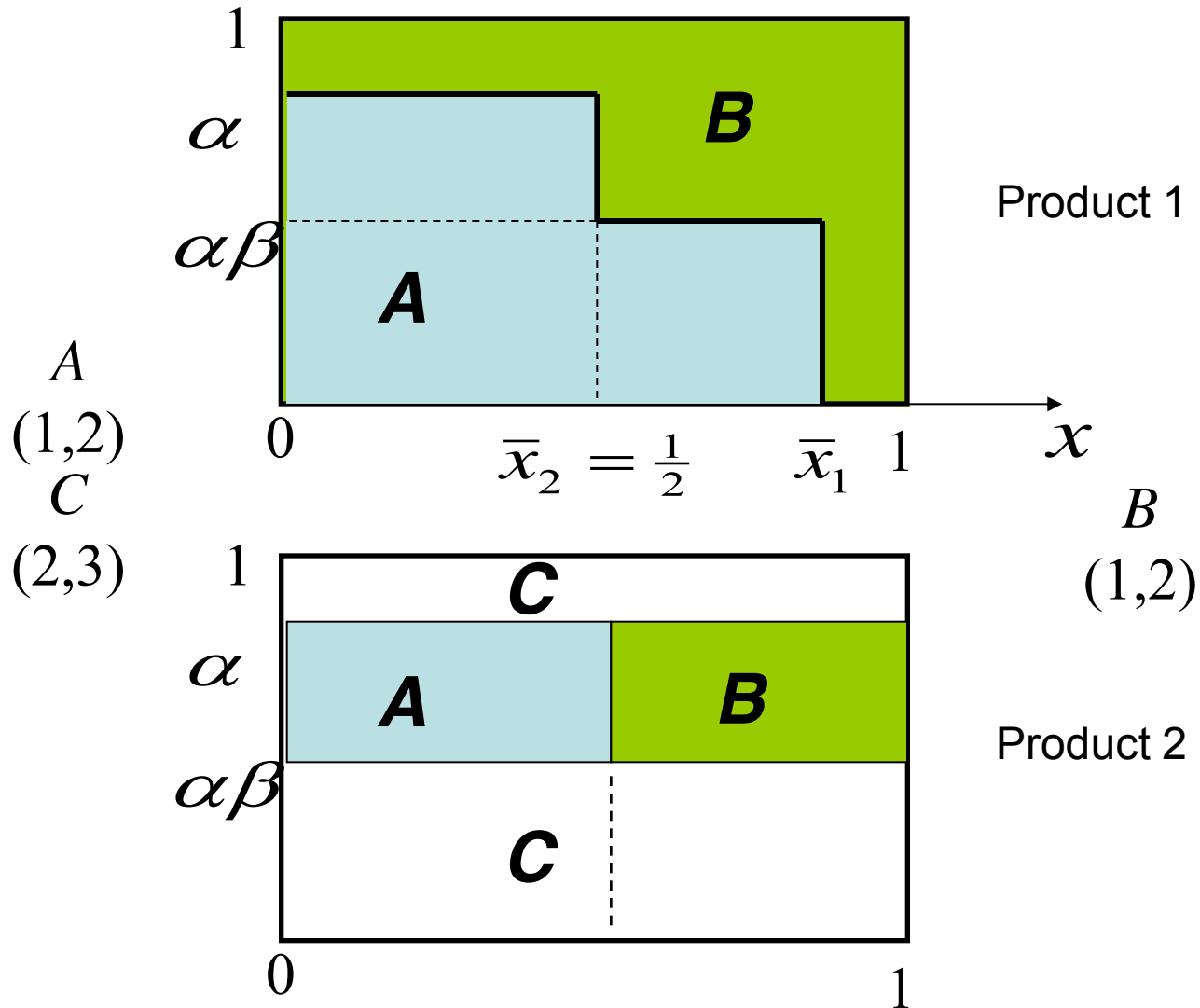
$$p_{1A}^* > p_{1B}^* \quad \text{and} \quad p_{2A}^* < p_{2B}^*$$

in which nearby retailer (A) earns more than distant retailer (B)

$$\pi_A^* > \pi_B^*$$

Theory

After Entry Model: Market Share Distribution

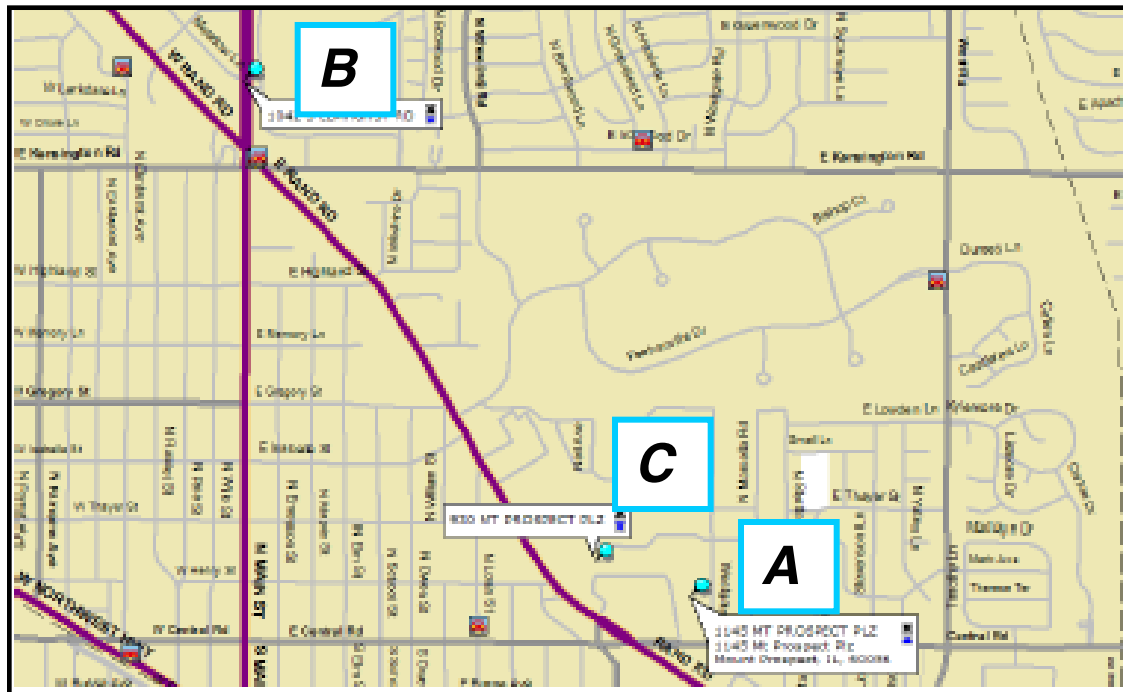


Empirical Verification

Data

Data from Chicago grocery chain

- Price, Promotion, Daily Sales
- 30 grocery categories
- Sampled from two stores, **A** & **B** Before & after entry by Wal-Mart



Empirical Verification

Tests

Two classes of predictions

1. Change in sales:
In which direction do category sales change after entry?
2. Change in shopping patterns:
How does entry affect who shops at traditional retailers?

Empirical Verification

Change in Sales

Nearby
Store

Distant
Store

	Department	Store A (28)	Store B (81)
Common Product	GM	-31% ↓	-30% ↓
	Grocery	-9% ↓	-12% ↓
Unique Product	Bakery	5%	-7%
	Dairy	-4%	-11%
	Deli	2%	-2%
	Fish	20%	4%
	Meat	-6% ↑	-14% ↓
	Produce	0%	-5% ↓
	Cheese	29%	-13%
	Frozen	0%	-11%
	Conv. Food	8%	-6%
	Bulk	14%	-9%
	Ccount	0%	-10%

Change in Sales After Wal-Mart's Entry

↓ ↑ Correspond to Theoretical Predictions

Empirical Verification

Change Shopping Patters

Assume:

*Income negatively correlated with price elasticity
(Hoch et al 2000)*

	Nearby Store	Distant Store
	Store A (28)	Store B (81)
Bath Tissue		
% change in price Index	-7.4%	-6.6%
% change in demand	-25% ↓	-24% ↓
Category Price Elasticity Before	-2.15	-2.06
Category Price Elasticity After	-1.39	-1.51
Dish Detergent		
% change in price Index	-6.8%	-7.20%
% change in demand	23% ↓	23% ↓
Category Price Elasticity Before	-2.21	-2.89
Category Price Elasticity After	-1.70	-2.33

**Change in Price Elasticity
After Wal-Mart's Entry**

Summary

- **Customer Base**

- Nearby retailer:

- Less price sensitive customers*

- Distant retailer

- More price sensitive customers for unique product*

- **Prices**

- Nearby retailer:

- Raise price on unique product*

- Distant retailer

- Lower prices on unique product*

Summary

For the traditional retailer...

- It might be *better* to be nearby the entering discounter

Conditions:

- Partial overlap of products.
- Consumers are properly segmented

Study 2

- Effect of Wal-Mart on Brand Performance

Introduction

- Wal-Mart sells about 15% - 20% of all grocery and other products sold
- Brand performance at Wal-Mart significantly affects manufacturer's market share
- Important to understand drivers of Brand performance at Wal-Mart

Research Objective

- Do brands perform differently at Wal-Mart Supercenters from other store formats?
- Are certain type of brands more likely to perform better/worse at WM
- What drives brand shares?
 - Prices, deals, assortment, competition
 - Sample selection, consumer preferences

Contributions

- Study different brands performance at Wal-Mart
- Provide a frame work to study and compare brand-retail format performances

Brand Shares and Prices

Orange Juice

Brand Name	WMSC Price	Other Formats Price	WMSC Share	Other Formats Share
SIMPLY ORANGE	1.61	1.67	8.35	5.46
TROPICANA	1.37	1.44	24.27	28.05
DOLE	1.39	1.31	0.82	1.14
FLORIDAS NATURAL	1.30	1.39	8.29	7.51
MINUTE MAID	1.26	1.33	23.02	15.84
ALL OTHER BRANDS	1.13	1.05	2.35	10.14
HOME MAKER	1.02	1.23	7.91	0.95

Brand Shares and Prices

Eggs

Brand Name	WMSC Price	Other Formats Price	WMSC Share	Other Formats Share
EGGLAND'S BEST	2.10	2.14	2.36	3.58
ALL OTHER BRANDS	1.62	1.20	2.65	14.73
PRIVATE LABEL	1.35	1.12	0.25	73.35
CAL-MAINE	1.28	1.08	0.08	3.97
COUNTRY CREEK	1.09	1.08	48.25	2.39
SUNNY MEADOW	1.05	1.03	46.43	2.14

Brand Shares and Prices

Paper Towels

Brand Name	WMSC Price	Other Formats Price	WMSC Share	Other Formats Share
BOUNTY	7.83	6.33	26.00	35.72
KLEENEX	5.59	5.30	12.08	8.81
BRAWNY	5.46	5.45	5.87	8.17
SCOTT	5.28	5.60	6.39	6.13
SPARKLE	4.78	4.52	18.96	9.09
ALL OTHER BRANDS	3.47	4.20	9.64	5.79
PRIVATE LABEL	3.41	4.67	21.05	26.31

Brand Shares and Prices

Toilet Paper

Brand Name	WMSC Price	Other Formats Price	WMSC Share	Other Formats Share
SCOTT	7.69	7.57	6.10	5.63
CHARMIN	6.72	5.71	24.55	27.32
KLEENEX	6.18	5.61	8.61	12.08
QUILTED NORTHERN	5.57	5.58	12.98	16.00
ALL OTHER BRANDS	4.26	3.84	14.75	5.73
ANGEL SOFT	3.42	3.91	30.33	15.70
PRIVATE LABEL	2.26	3.95	2.68	17.54

Brand Shares and Prices

Yogurt

Brand Name	WMSC Price	Other Formats Price	WMSC Share	Other Formats Share
DANNON	0.57	0.58	18.40	19.92
YOPLAIT	0.53	0.57	41.24	31.64
ALL OTHER BRANDS	0.52	0.58	7.31	11.37
BREYERS	0.42	0.44	8.70	6.72
PRIVATE LABEL	0.35	0.37	24.35	30.35

Data

- Nielsen panel data
 - UPC purchased, price paid
 - Store info, UPC info
- Markets selected based on number of HHs, purchase behavior and WM entry
 - Between 7 and 29 markets across categories
 - 3k – 5k HHs per category
- Construct price indices, assortment and competition from panel data

Data

	Orange Juice	Eggs	Paper Towels	Toilet Paper	Yogurt
	WMSC Others	WMSC Others	WMSC Others	WMSC Others	WMSC Others
Number of HHs	2836	2094	4504	4227	4093
Number of Markets	19	7	22	18	22
Percent of loyal HHs*	85%	74%	83%	82%	83%
Percent HHs spending at both formats	38%	64%	42%	47%	42%

Methodology

- Aggregate panel data to monthly sales
- Infer assortment and pricing in each market every month
- Classify each brand as premium, value or store brand
- Regress brand performance on prices, assortment, competition, market and time FE

Table 3: Summary of shares and performance measures by brand types across formats

Category	Store Brand		Value Brands		Premium Brands		Performance Measures		
	WM SC	Others	WM SC	Others	WM SC	Others	Value to Pre- mium	Value to Store	Store to Pre- mium
Orange Juice	27.54	32.26	39.59	35.59	32.87	32.15	1.09	1.30	0.83
Eggs	0.25	73.35	97.38	23.07	2.36	3.58	6.40	1222.43	0.01
Paper Towels	21.05	26.31	52.95	37.98	26.00	35.72	1.92	1.74	1.10
Toilet Paper	2.68	17.54	58.06	37.43	39.26	45.03	1.78	10.15	0.18
Yogurt	24.35	30.35	16.00	18.09	59.64	51.56	0.76	1.10	0.69

Measures of performance

- Interested in share at WMSC vs. other formats
- Ratio of shares at different formats
 - Intuitive dependent measure
 - Consistency requires information for all products attributes
- DID of shares between brand types and formats

$$DV_{pre/val} = \log \left(\frac{s_{pre,t}^{WM} / s_{pre,t}^{Oth}}{s_{val,t}^{WM} / s_{val,t}^{Oth}} \right) = \log \left(\frac{s_{pre,t}^{WM} / s_{val,t}^{WM}}{s_{pre,t}^{Oth} / s_{val,t}^{Oth}} \right)$$

- Less intuitive measure – needs a benchmark
- DID approach clean
- Consistent with logit specification

Measures of Marketing Mix

- Assortment

- Number of SKUs

- Percentage of National/Store brands

- SKUs for each size

- Assortment Entropy

- Variations in the number of sizes of different brands

- $$E_{fmt} = - \sum_{k \in J} \frac{\sum_{s \in S} I(s f k m t)}{\sum_{k \in J} \sum_{s \in S} I(s f k m t)} \ln \left(\frac{\sum_{s \in S} I(s f k m t)}{\sum_{k \in J} \sum_{s \in S} I(s f k m t)} \right)$$

Measures of Marketing Mix

- Prices
 - Price index: weighted average of purchase prices
- Promotions
 - Store coupon, store feature, manufacturer coupon, others

Measures of Competition

- Number of different stores by channel type
- Entropy
 - concentrations in the types of stores
- Wal-Mart's entry and expansion

Empirical Model

- DV: relative brand share ratio in each store format
- IV: marketing mix, competition

$$\ln \left(\frac{s_{jmt}^f}{s_{j'mt}^f} \right) = \underbrace{\sum_{m \in M} \sum_{f \in F} \alpha_{jj'}^{fm}}_{\text{market FE}} + \underbrace{\sum_{t \in T} \sum_{f \in F} \alpha_{jj'}^{ft}}_{\text{time FE}} + \underbrace{\sum_{f \in F} \sum_{k \in \{j, j'\}} \beta_{fk} \ln(p_{kfmt})}_{\text{price}} + \underbrace{\sum_{f \in F} \sum_{k \in \{j, j'\}} \gamma_{fk} \text{deal}_{kfmt}}_{\text{promotions}} \\
 + \underbrace{\sum_{f \in F} \sum_{k \in \{j, j'\}} \delta_{fk}^0 \ln(\text{nosku}_{kfmt}) + \sum_{f \in F} \delta_f^1 \text{pctnat}_{fmt} + \sum_{f \in F} \delta_f^2 \text{pctpvt}_{fmt}}_{\text{assortment}}$$

$$\begin{aligned}
& + \underbrace{\sum_{s \in S} \sum_{f \in F} \sum_{k \in \{j, j'\}} \delta_{sfk}^3 \text{size}_{skf_{mt}} + \sum_{f \in F} \delta_f^4 E_{f_{mt}}^a}_{\text{assortment}} \\
& + \underbrace{\sum_{l \in L} \sum_{f \in F} \rho_{lf}^0 n_{l_{mt}} + \sum_{f \in F} \rho_f^1 E_{mt}^c}_{\text{competition}} \\
& + \underbrace{\sum_{f \in F} \rho_f^2 \text{wmopen}_m + \sum_{f \in F} \rho_f^3 (\text{wmopen}_m \times \mathbb{I}(t > \text{wmentry}_m)) + \epsilon_{jj' f_{mt}}}_{\text{competition}}
\end{aligned}$$

For now...

Focus on

- Orange Juice
 - results qualitatively similar for other categories
- All consumers in the market

Assortment as important as price in explaining share differences

Results from ANOVA

	Premium / Value		Value / Store		Premium / Store	
	WMSC	Others	WMSC	Others	WMSC	Others
Orange Juice						
R-Square	73%	78%	54%	89%	61%	86%
WM entry	1%	1%	4%	1%	2%	0%
Price	7%	12%	11%	12%	9%	13%
Deals	9%	12%	4%	15%	8%	9%
Assortment	60%	57%	50%	52%	47%	51%
Competition	5%	2%	2%	6%	3%	5%
Market FE	15%	13%	22%	14%	25%	20%
Time FE	3%	4%	6%	1%	5%	2%

Table 5: Analysis of Variance for shares based on Non-loyal Consumers

	Premium / Value		Value / Store		Premium / Store	
	WMSC	Others	WMSC	Others	WMSC	Others
Orange Juice						
R-Square	49%	40%	37%	50%	48%	46%
WM entry	1%	3%	2%	2%	4%	6%
Price	2%	2%	6%	7%	12%	5%
Deals	23%	17%	11%	11%	5%	5%
Assortment	39%	27%	41%	43%	27%	40%
Competition	2%	3%	3%	9%	3%	4%
Market FE	27%	33%	27%	23%	38%	34%
Time FE	5%	16%	11%	5%	10%	7%

Parameters of Interest

- Price
 - Own and cross prices
 - Deal frequency
- Assortment
 - # SKUs available
 - Percent of national and store brand SKUs
 - Availability of different sizes
 - Entropy based on number of sizes
- Competition
 - # stores by format
 - Entropy based on number of stores
- Market level differences

Table 6: Regression Results based on All Consumers - Orange Juice

Category	Variable	Premium / Value					
		Walmart			Other Formats		
		est.	t-stat	Mean	est.	t-stat	Mean
Summary	R-square			75%			
	No. of Obs			1824			
WM activity	after_open	-0.15	-3.84		-0.1	-2.6	
	after_exp	0.07	1.91		-0.07	-1.96	
	store_open	-1.38	-3.16		0	.	
Own Price (log)	ln_price_num	-0.71	-4.04	0.27	-0.47	-2.93	0.32
	ln_price_den	0.63	2.43	0.09	0.81	4.96	0.13
Deals (abs)	deal_1_num	0.18	1.01	0.04	0.22	1.86	0.32
	deal_1_den	-0.07	-0.36	0.03	-0.67	-5.15	0.32
	deal_2_num	-1.54	-1.41	0.001	-0.19	-0.39	0.02
	deal_2_den	1.27	1.22	0.001	-0.21	-0.46	0.02
	deal_3_num	0.29	1.28	0.03	0.22	0.72	0.03
	deal_3_den	-0.35	-1.29	0.03	-0.18	-0.62	0.04
	deal_4_num	0.89	2.52	0.01	0.42	0.46	0.01
	deal_4_den	0.1	0.24	0.01	0.49	0.53	0.01

		WMSC			Others		
	__	est	t	mean	est	t	mean
	ln_no_sku_num	0.94	19.1	2.39	0.85	12.25	3.13
	ln_no_sku_den	-0.75	-15.17	2.51	-0.82	-10.55	3.29
	brand_nat	-0.84	-2.85	0.83	-0.6	-1.49	0.58
	brand_pl	-0.51	-1.18	0.13	-0.63	-1.42	0.31
	size8_num	0.02	0.99	0.3	0.04	1.38	0.74
	size8_den	-0.03	-1.54	0.5	-0.03	-1.15	0.34
	size59_num	0.17	2.06	0.98	-0.31	-1.99	1
Assortment (abs)	size59_den	0.1	1.61	0.18	0.04	0.79	0.21
	size64_num	-0.16	-1.72	0.99	0.7	0.87	1
	size64_den	0	0.03	1	0	.	1
	size128_num	0.19	5.33	0.87	0.06	1.6	0.87
	size128_den	-0.12	-4.08	0.85	-0.05	-0.49	0.99
	size9999_num	0.02	0.79	0.81	-0.05	-0.48	0.99
	size9999_den	-0.01	-0.29	0.83	-0.07	-1.02	0.98
	entropy_brand	1.28	4.45	1.04	0.62	1.05	1.07

Table 7: Regression Results based on Non-loyal Consumers only - Orange Juice

Category	Variable	Premium / Value					
		Walmart			Other Formats		
		est.	t-stat	Mean	est.	t-stat	Mean
Summary	R-square			0.39			
	No. of Obs			1767			
WM activity	after_open	0.21	2.22		0.18	1.89	
	after_exp	-0.15	-1.63		-0.2	-2.21	
	store_open	1.28	1.05		0	.	
Own Price (log)	ln_price_num	-1.5	-3.28	0.27	-0.42	-1.07	0.32
	ln_price_den	0.41	0.66	0.09	1.49	3.78	0.13
Deals (abs)	deal_1_num	0.62	1.45	0.04	0.74	2.52	0.32
	deal_1_den	-0.92	-1.86	0.03	-1.28	-4.04	0.32
	deal_2_num	1.53	0.57	0.001	0.56	0.48	0.02
	deal_2_den	-1.38	-0.56	0.001	-1.58	-1.42	0.02
	deal_3_num	0.12	0.21	0.03	0.67	0.9	0.03
	deal_3_den	-0.9	-1.37	0.03	-0.19	-0.26	0.04
	deal_4_num	3.77	3.89	0.01	-2.32	-1.09	0.01
	deal_4_den	0.34	0.36	0.01	1.26	0.57	0.01

	ln_no_sku_num	0.8	6.46	2.39	0.55	3.25	3.13
	ln_no_sku_den	-0.86	-7.1	2.51	-0.72	-3.77	3.29
	brand_nat	-1.13	-1.58	0.83	0.15	0.15	0.58
	brand_pl	-0.78	-0.73	0.13	-1.19	-1.11	0.31
	size8_num	0.14	2.46	0.3	0.02	0.37	0.74
	size8_den	-0.14	-2.72	0.5	-0.08	-1.48	0.34
	size59_num	0	-0.01	0.98	-0.25	-0.55	1
Assortment (abs)	size59_den	0.21	1.44	0.18	0.06	0.46	0.21
	size64_num	-0.19	-0.8	0.99	-1.17	-0.59	1
	size64_den	0.94	1.39	1	0	.	1
	size128_num	-0.03	-0.29	0.87	-0.21	-2.43	0.87
	size128_den	-0.15	-2.05	0.85	-0.36	-1.38	0.99
	size9999_num	-0.03	-0.49	0.81	-0.17	-0.57	0.99
	size9999_den	-0.01	-0.19	0.83	0.34	2.15	0.98
	entropy_brand	-0.4	-0.51	1.04	2.14	1.5	1.07

In Summary...

- Value brands perform better at WMSC as compared to Premium brands
- Store brands perform worse at WMSC as compared to Premium brands
- Assortment and prices are important in explaining variation in brand shares across formats
- Brands and sizes purchased dependent on format choice

Implication

- **Manufacturers**
 - Channel choice
 - Premium vs. value brands
- **Retailers**
 - Assortment decisions
 - Private labels
 - Carry different sizes and differentiated products

Possible concerns

- Measures of assortment
 - Constructed from panel data
 - Non-availability confounded with low preference
 - Verification from store level data for some chains
- Sample selection
 - Walmart reaches different distribution of preferences
- Why?

Thank You!!