



Washington University in St. Louis

OLIN BUSINESS SCHOOL

Estimating the Retail Profit Effects of Retailer Targeted Coupons

Any mention of specific brands are for educational purposes only

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co-authored with

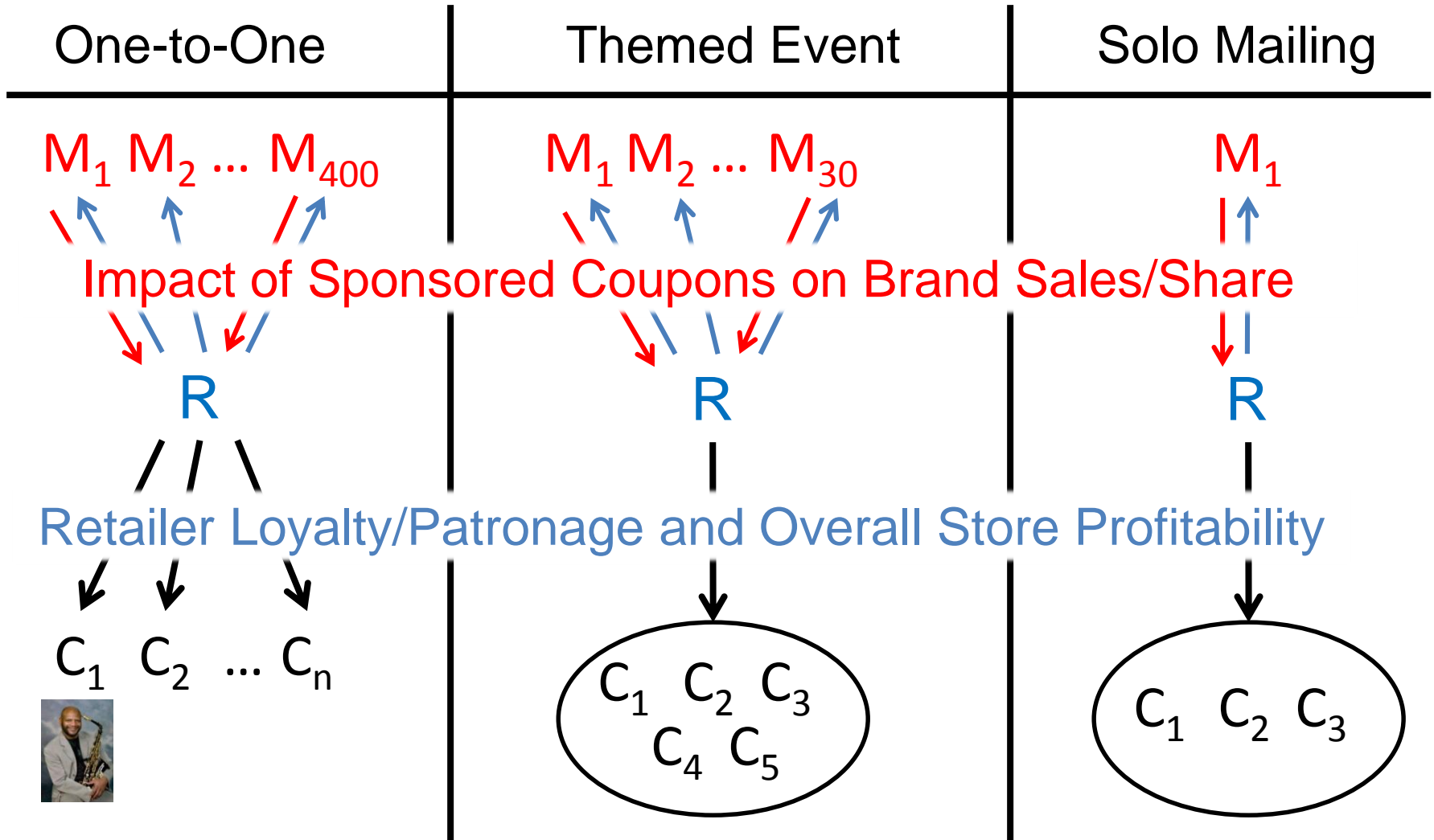
- 1. Alex Chaudhry, Assistant Professor of Marketing, Texas Tech, and**
- 2. Carrie Heilman, Associate Professor of Marketing, Virginia**

“We are teetering on the brink of an era of mass personalisation.”

- Phillip Clarke, Tesco CEO (“The Emporium Strikes Back”, The Economist, 13 July 2013)



Institutional Background



Relevant Coupons Save Time, Effort and Money

One-to-One Coupon

- 14-16 coupon bundle
- Customer's shopping history
- 2179 campaigns



MANUFACTURER COUPON EXPIRES 12/11/05

Save \$1.00

when you buy any TWO (2) Kroger potato chips

Valid only with coupon. Limit One per Customer with Coupon. Void if Reproduced, transferred or where taxed, Prohibited or Restricted by Law. DO NOT DOUBLE. Subject to applicable state and local laws. Must use Shopper's Card for Discount. Purchase excludes alcohol, tobacco products, fuel, gift cards, taxes, prescriptions and customer care centre services. Store Do not discard - please submit to clearing house as standard manufacturer's coupon. US: Please bill redemption costs to: The Kroger Company, 1014 Vine Street Cincinnati, OH 45202. Accounting Dept. Forward to: Division 040, 1014 Vine St., Cincinnati, OH 45202. Subject to state and local laws. Void where prohibited by law.

5 17854 40009 7 (8100)7 08040

MANUFACTURER COUPON EXPIRES 12/11/05

Save \$1.25

with the purchase of any Two (2) Jars of Smucker's Jams, Jellies, Preserves, or Fruit Spreads

CONSUMER: Limit one coupon per purchase. Good only in the U.S.A. use wherever restricted, or prohibited, or if altered, reproduced, or transferred. Any other use constitutes fraud. Consumer must pay any sales tax. RETAILER: You will be reimbursed for the face value of this coupon plus 8¢ if submitted in accordance with The J.M. Smucker Company Coupon Redemption Policy, coupon available upon request. Cash value 1/100 of 1¢. Redeem by mailing to: The J.M. Smucker Company, P.O. Box 870766, St. Paul, Texas 75807-0716. Good only in the U.S.A. ©2005 The J.M. Smucker Company.

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MANUFACTURER COUPON EXPIRES 12/11/05

Save \$2.00

off any TWO (2) packages of Hillshire Farm® Cocktail Links

CONSUMER: Limit one coupon per purchase. Void if copied, sold, exchanged or transferred. Consumer is responsible for any sales tax. Misuse constitutes fraud. RETAILER: Sara Lee Foods will reimburse you the face value of the coupon plus 8 cents handling if submitted in compliance with our Coupon Redemption Policy (available at www.sarleefoods.com). Cash value 1/20 cents. Send Coupon to Sara Lee Foods, P.O. Box 880952, El Paso, TX 78808-0952. Void where prohibited, licensed, taxed, or restricted by law ©2005 Sara Lee Foods

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MANUFACTURER COUPON EXPIRES 12/11/05

Save 25¢

when you buy any ONE (1) Kroger Chunky Soup

Valid only with coupon. Limit One per Customer with Coupon. Void if Reproduced, transferred or where taxed, Prohibited or Restricted by Law. DO NOT DOUBLE. Subject to applicable state and local laws. Must use Shopper's Card for Discount. Purchase excludes alcohol, tobacco products, fuel, gift cards, taxes, prescriptions and customer care centre services. Store Do not discard - please submit to clearing house as standard manufacturer's coupon. US: Please bill redemption costs to: The Kroger Company, 1014 Vine Street Cincinnati, OH 45202. Accounting Dept. Forward to: Division 040, 1014 Vine St., Cincinnati, OH 45202. Subject to state and local laws. Void where prohibited by law.

5 17854 40009 7 (8100)7 08040

MANUFACTURER COUPON EXPIRES 12/11/05

SAVE \$3.00

On Any (4) Hungry-Man Dinners

CONSUMER: One coupon per purchase. Good only on product indicated. Consumer pays any sales tax. Void if copied, sold, exchanged or transferred. RETAILER: Redeem on terms stated for consumer upon purchase of product indicated. ANY OTHER USE CONSTITUTES FRAUD. If submitted in compliance with Piracle Foods Corp.'s Coupon Redemption Policy (coupon available upon request), you will be reimbursed face value plus 8¢. Mail to: PIRACLE FOODS CORP., CMO DEPT. #4100, ONE FAWCETT DRIVE, DAL RIO, TX 78840. Failure to produce or present a receipt proving purchase of stack covering coupons may void all coupons submitted. Void if taxed, restricted, licensed, or presented in other than retail use of our products. Cash value 1/100¢.

5 17854 40009 7 (8100)7 08040

MANUFACTURER COUPON EXPIRES 12/11/05

SAVE \$1.00

On Any RED BARON® Pizza Product.

CONSUMER: Coupon valid for \$1.00 off any RED BARON® Pizza Product. Consumer pays any sales tax. Retailer: Schwab's Consumer Brands North America, Inc. will reimburse you for the face value of this coupon plus 8¢ if submitted in full compliance with Schwab's Consumer Brands North America, Inc. redemption policy invoice providing purchase of sufficient stock to cover coupons presented for redemption must be shown upon request. Cash value: 1/20 of 1¢. Void if copied, taxed, restricted or prohibited. Mail Coupons to: Schwab's Consumer Brands North America, Inc. CMO Dept. 72100, One Fawcett Drive, Dal Rio, TX 78840. Limit one coupon per purchase. ©2005 Schwab's Consumer Brands North America Inc.

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MANUFACTURER COUPON EXPIRES 12/11/05

Save 50¢

when you buy any TWO (2) 8 oz. packages of COOL WHIP® Whipped Topping

RETAILER: Kraft Foods Global, Inc. or a subsidiary, will reimburse the face value of this coupon plus handling if submitted in compliance with its Coupon Redemption Policy, previously provided you and available upon request. Cash value 1/100¢. Coupon can only be distributed by Kraft Foods Global, Inc. or its agent. Mail to: Kraft Foods Global, Inc., P.O. Box 880956, El Paso, TX 78808-0956. Offer expires: 12/11/2005. CONSUMER: One coupon valid for item (s) indicated. Any other use constitutes fraud. VOID IF COPIED, TRANSFERRED, PURCHASED OR SOLD. Valid only in the USA, FPO's and APO's. © 2005 KF Holdings

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MANUFACTURER COUPON EXPIRES 12/11/05

SAVE \$1.00

on any Mamma Bella Brand Products

CONSUMER: This coupon can be redeemed only for the brand specified. Coupon cannot be transferred, reproduced, sold or exchanged. Any other use constitutes fraud. RETAILER: Marzetti will pay you the normal value of this coupon, plus 8¢ handling, provided you and the consumer have complied with the terms of the offer. Void if copied, transferred, prohibited, taxed or restricted. Customer must pay any sales tax. Any other use constitutes fraud. Cash value 1/100¢. For redemption, mail to: T. Marzetti Company, CMS Dept. 78000.1 Fawcett Drive, Dal Rio, Texas 78840. LIMIT ONE COUPON PER PURCHASE

5 17854 40009 7 (8100)7 08040

Dear Melvin Banks,

Thanks for being such a great customer!

We appreciate how much you shop with us, so we've teamed up with some of your favorite brands to bring you special coupons for products you can use.

Please enjoy the savings, reserved only for premier customers like you. And check the back of this letter for some useful information about tried and true recipes.

Sincerely,

Russ Dispense

Russ Dispense
President, King Soopers

Themed Event Coupon

- Back to school, Healthy living, Baby
- 10 coupons
- Customer's lifestyle
 - Finer foods, healthy, convenience
- 1672 campaigns



Schooltime
made simple

Helpful Ideas for home and school



Make
back-to-school
special

Minute Maid® offers a variety of 100% juice products to meet your family's needs for great taste, convenience, nutrition and refreshment. Minute Maid juices and boxed juice drinks are a good source of calcium, which is essential for strong teeth and bones and they provide a full day's supply of vitamin C. They're ideal for school lunches, after school snack time or single serve for on-the-go.
Nutrition never tasted so good!



Schooltime
made simple

MANUFACTURER COUPON EXPIRES 8/13/06

Save \$1.00

on any Colgate Total®, Colgate Max Fresh® or Colgate® Luminous™ Toothpaste (4.0 oz. or larger)



MANUFACTURER COUPON EXPIRES 8/13/06

Save \$1.00

on any TWO Minute Maid® 100% Juice or Juice Drink or Minute Maid® 10 oz. 6-pack Juices-To-Go® 100% Juice (any flavor)



MANUFACTURER COUPON EXPIRES 8/13/06

Save 40¢

on any Suave® Kids® Hair Care product



uggest a little **Joy**?

has been America's most trusted cookbook since 1931. Joy of Cooking® line of frozen products. Now serving a full Joy of Cooking® line up lets you mix-and-match main dishes, ed in our Freezer Section. Plus, every package includes an en more variety. Dinner has never been easier!





next, pick a side dish, like bite size carrots ...




then, choose a bread, like mini french baguettes, and dinner is served!

Solo Mailing Coupon

- 1-6 coupons
- Customer's lifestyle & purchase history
- 362 campaigns

MANUFACTURER COUPON EXPIRES 12/7/08

SAVE \$2.00

on any THREE (3)
Joy of Cooking® frozen products



RETAILER: We will reimburse you for the face value of this coupon, plus \$0.08 handling, provided you have complied with terms on this coupon. **Terms:** Coupon may not be doubled, cannot be used with other coupons for the same item and must be redeemed prior to expiration date. Limit one coupon per purchase. Cash value 1/100th of one cent. Consumer pays any applicable sales tax. Invoices proving purchase to cover coupons must be available. Void if reproduced, prohibited, taxed or restricted by law. **To Redeem:** Mail coupon to Bellini Foods, Inc., CMS Dept. 17854, One Foxworth Drive, Del Rio, TX 78840. Joy of Cooking is a registered trademark of the Joy of Cooking Trust.



Research Questions

1. Assess Coupon Personalization Profitability

- Analyze the impact of varying levels of personalized coupons on expected store profitability.

2. Capture Cross-Category Demand Spillovers

- Estimate the + and - demand spillover effects within a large market basket (28 categories), i.e., “Big Data” context.

3. Prescribe Optimal Coupon Bundles

- Across all possible combinations of all types of coupons, identify profit maximizing bundles.

Data

- National Supermarket Retail Chain
 - Retailer's Loyalty Card Database
 - Purchase Incidences from 800 Households in 28 Categories over 102 Weeks.
 - Marketing Mix Variables (Displays, Features).
 - Coupon Types.
 - Demographics (Household Income, Age, Family Size).
 - Gross Margins (Retailer Profits).
 - Store Visits.
- Big Data Solution
 - 800 Households, 42 Covariates, 102 Weeks (Sample)
 - ~1 million observations
 - 55 Million Customers in Database (Population)
 - ~ 70 billion observations

Proposed Model

- **Basket-level Purchase Incidence Model**
 - Multivariate Logit (MVL)
 - Allows for cross-category dependencies across 28 categories.
 - Targeted retail coupons impact consumers' basket choices.
 - Allows for differences across households ([750 unique segments](#))
- **Store Choice Model**
 - Nested Logit
 - Allows store choice to depend on basket attractiveness.
 - Targeted retail coupons impact consumers' store choices.

Basket-Level Purchase Incidence Model

$$\begin{aligned} U_{hct} &= \alpha_{hc} + X_{ct}\beta_{1hc} + X_{hct}\beta_{2hc} + Inv_{hct}\beta_{3hc} \\ &+ W_h\beta_{4hc} + Z_{hct}\beta_{5hc} + \varepsilon_{hct} \end{aligned}$$

α_{hc} - Household h 's intrinsic preference

β_{1hc} - Sensitivities to retailer marketing variables

β_{2hc} - Sensitivities to retailer targeted coupons

β_{3hc} - Household inventory sensitivity

β_{4hc} - Demographic effects

β_{5hc} - Cross-category purchase spillovers

Store Choice Model

$$u_{ht} = \delta_h + StoreAttrac_{ht}\gamma_h + \eta_{ht}$$

δ_h - Household h 's intrinsic preference for the store

γ_h - Sensitivities to store attractiveness

$$StoreAttrac_{ht} = \ln \left(\sum_{c=1}^C e^{\hat{V}_{ht}} \right), \text{ where}$$

$$\begin{aligned} \hat{V}_{ht} &= \hat{\alpha}_{hc} + X_{ct}\hat{\beta}_{1hc} + X_{hct}\hat{\beta}_{2hc} + Inv_{hct}\hat{\beta}_{3hc} + W_h\hat{\beta}_{4hc} \\ &+ Z_{hct}\hat{\beta}_{5hc} \end{aligned}$$

Consumer Segments



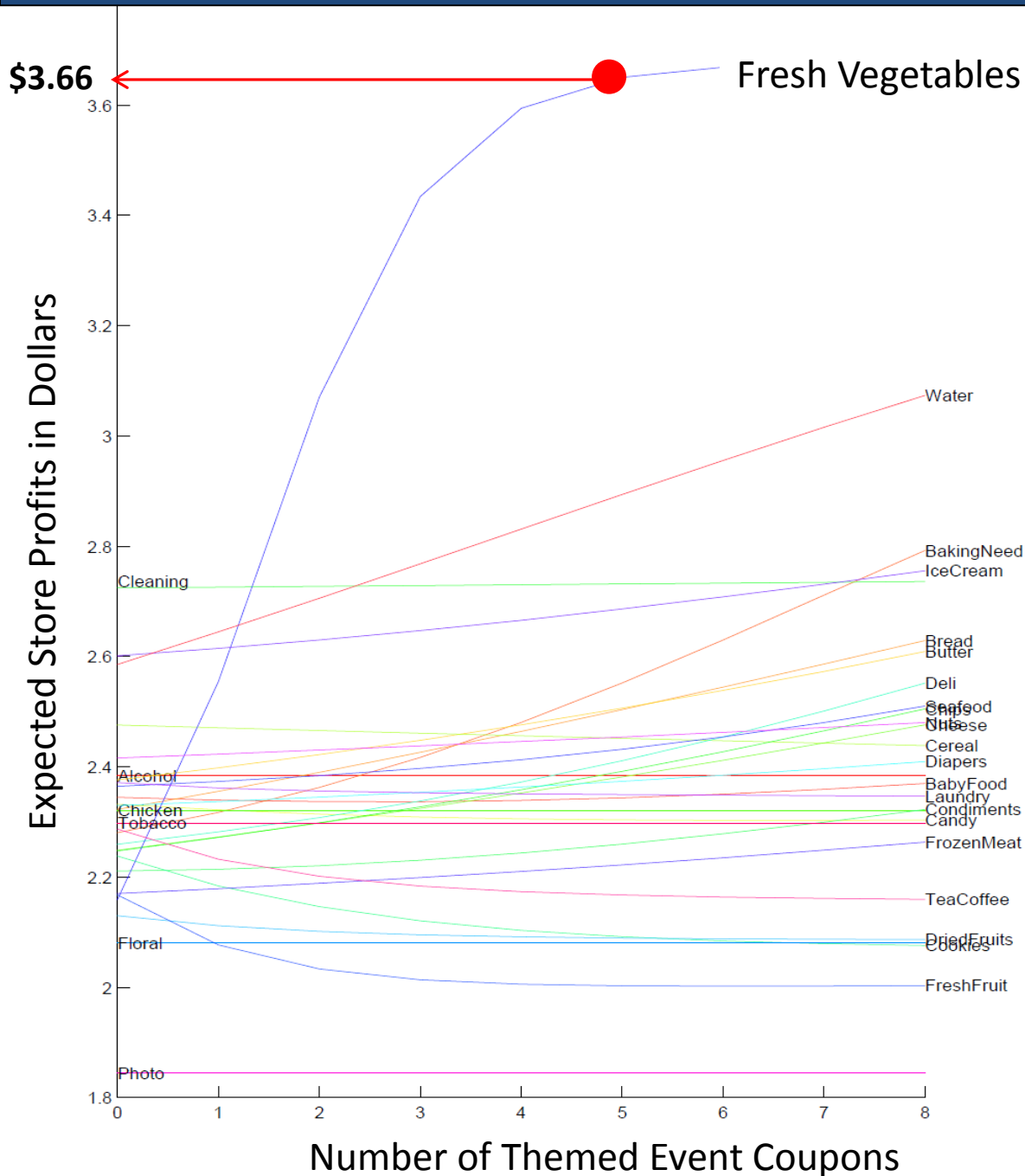
	Support 1	Support 2
Alcohol	0.190	0.810
Babyfood	0.579	0.421
Bread	0.440	0.560
Candy	0.731	0.269
Chicken	0.214	0.786
Chips	0.376	0.624
Cleaning	0.467	0.533
Condiments	0.498	0.502
Diapers	0.147	0.853
Fresh Fruit	0.247	0.753
Fresh Seafood	0.266	0.734
Frozen Meat	0.293	0.707
Ice Cream	0.439	0.561
Laundry	0.273	0.727
Tea Coffee	0.299	0.701
Tobacco	0.297	0.703
Water	0.749	0.251

2¹⁷ Possible Segments

750 Unique Segments

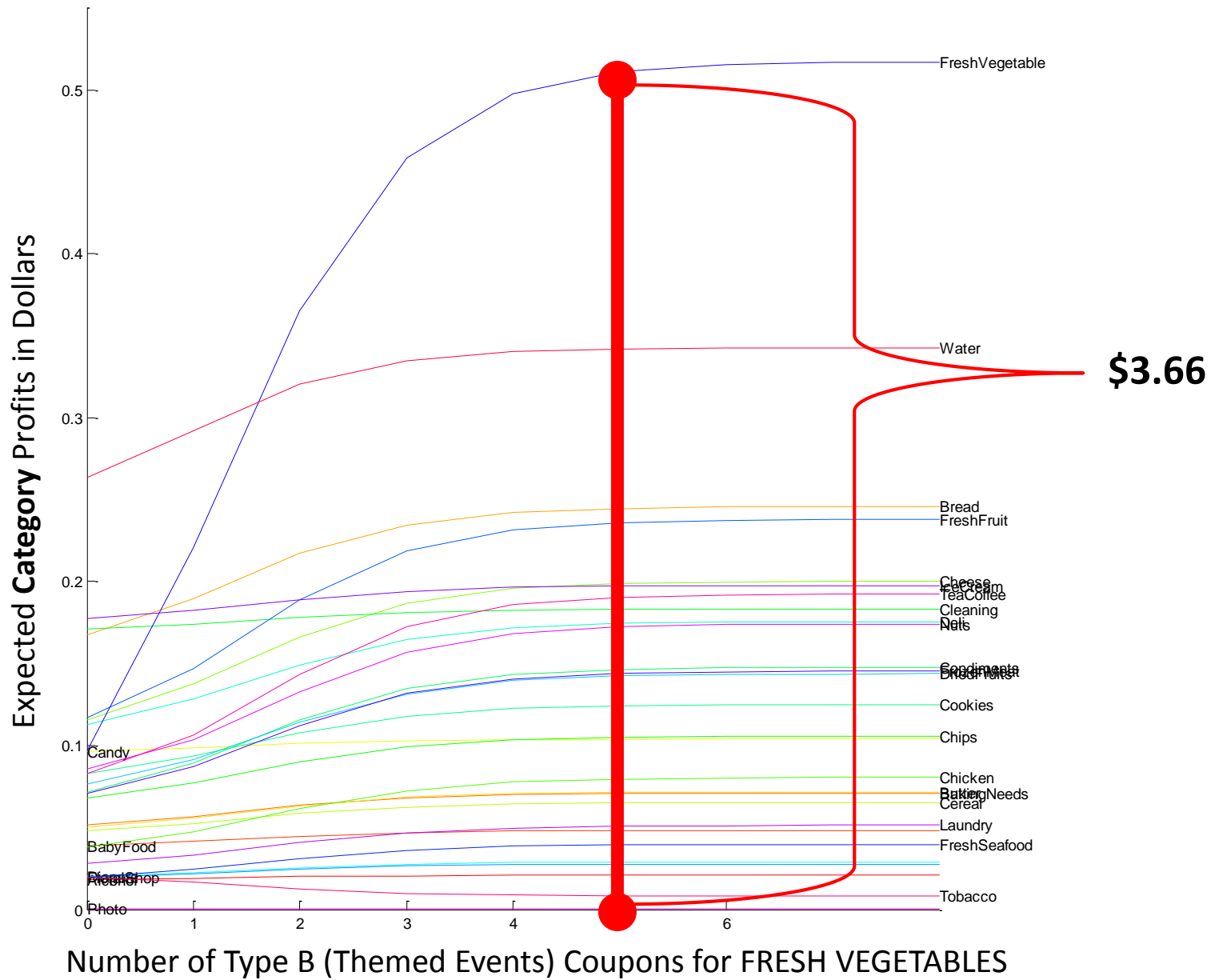
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	Alcohol	Baby Food	Banking Needs	Bread	...	Water
Houston	Seg 2	Seg 2	Seg 1	Seg 1	...	Seg 2
Chicago	Seg 1	Seg 1	Seg 1	Seg 2	...	Seg 1

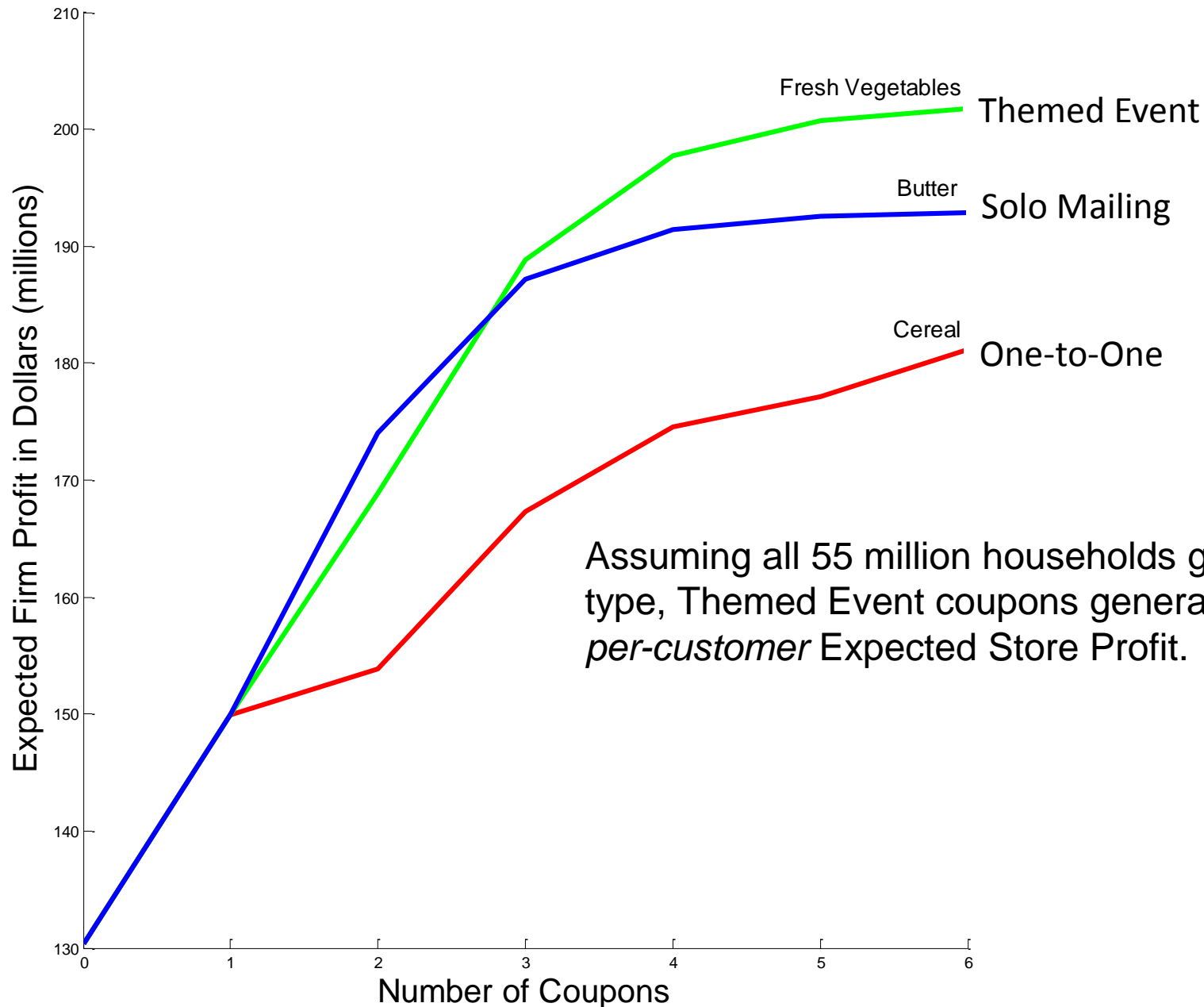


Each curve represents how the expected store profit changes as the retailer increases the number of retailer targeted coupons within a single category.

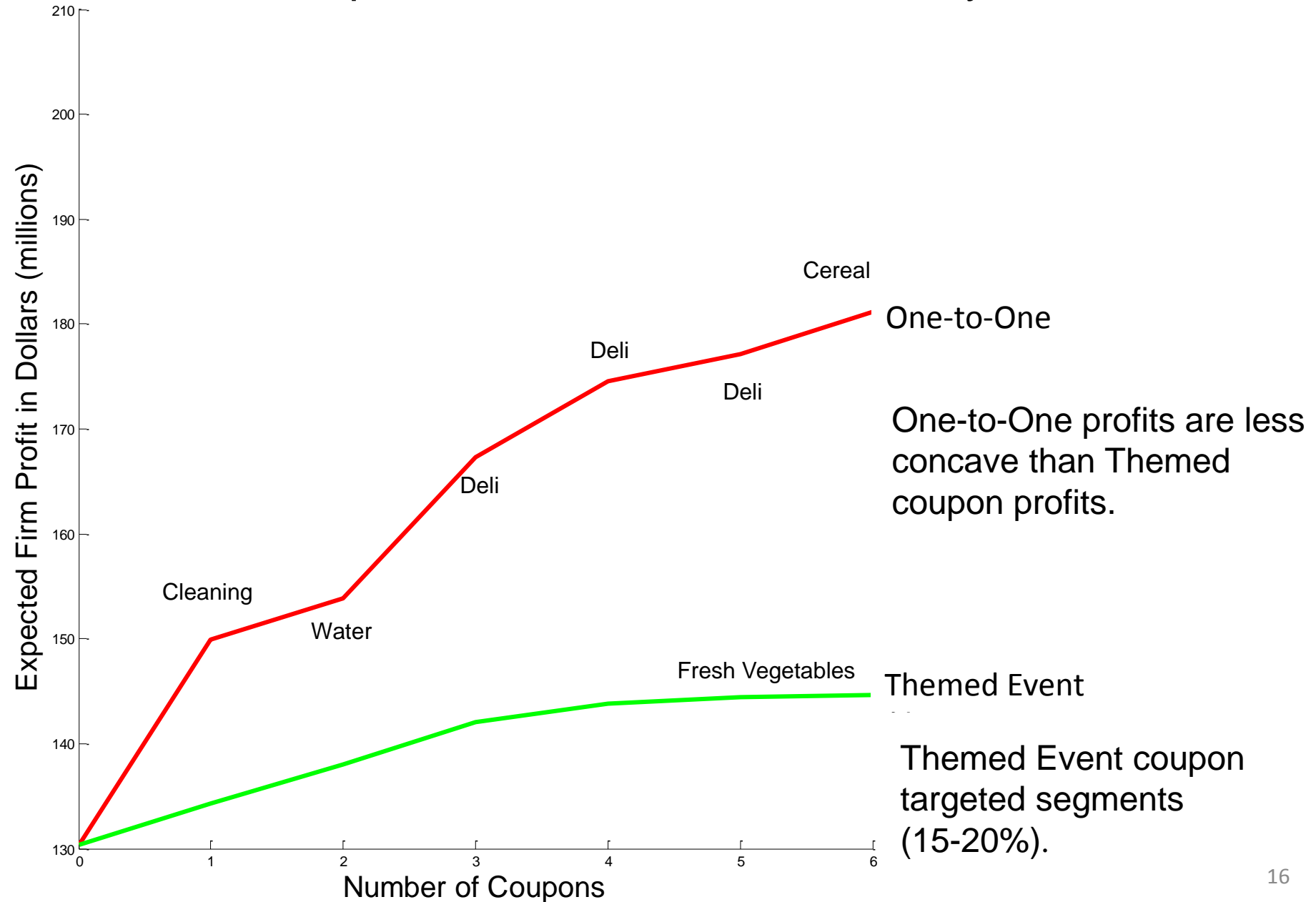
For example:
The Expected Store Profit yielded by a Customer who receives **5 Themed coupons** on Fresh Vegetables is **\$3.66**.



Assess Coupon Personalization Profitability



Assess Coupon Personalization Profitability



Prescribe Optimal Coupon Bundles

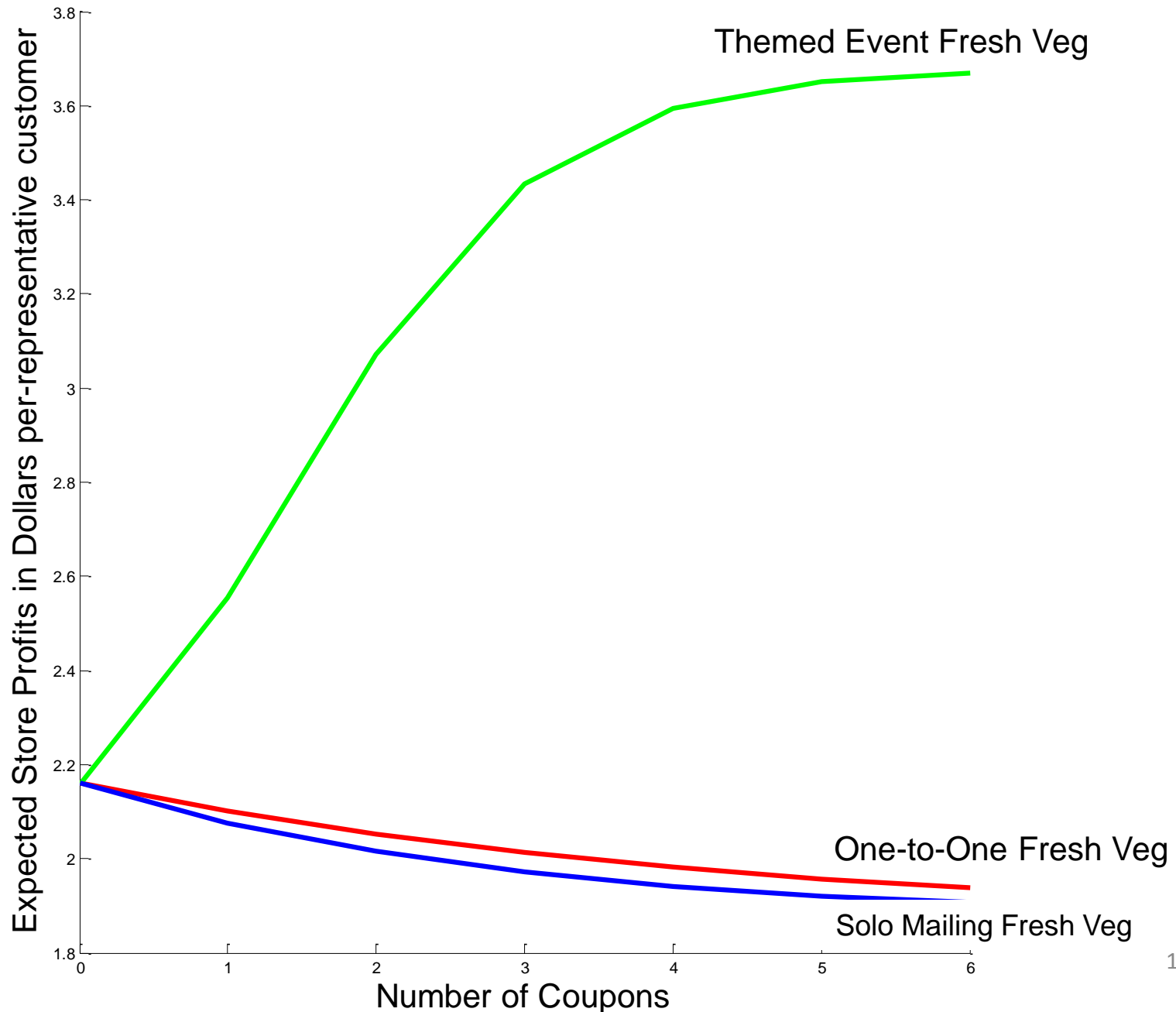
- Each Coupon Type
- 20 Category Coupon Bundle Simulation
- One coupon per category
- Big Data Solution (Optimization Burden)
 - 3,108,105 possible combinations

	Baseline	One-to-One	Themed	Solo
Expected Store Profit	\$2.37	\$3.00	\$2.74	\$2.69
Increase in Profit	N/A	26.6%	15.6%	13.5%
Alcohol	0	1	1	0
Babyfood	0	1	0	0
BakingNeeds	0	0	1	0
Bread	0	1	1	0
Butter	0	1	1	1
Candy	0	1	0	0
Cereal	0	1	0	0
Cheese	0	1	1	1
Chicken	0	0	1	1
Chips	0	1	1	1
Cleaning	0	1	1	1
Condiments	0	0	1	1
Cookies	0	0	0	1
Deli	0	1	1	1
Diapers	0	0	1	0
DriedFruits	0	1	0	1
FloralShop	0	1	1	1
Fresh Fruit	0	0	0	1
Fresh Seafood	0	1	1	1
Fresh Vegetables	0	0	1	0
Frozen Meat	0	1	1	1
Ice Cream	0	1	1	1
Laundry	0	0	0	1
Nuts	0	1	1	1
Photo	0	1	1	1
TeaCoffee	0	1	0	1
Tobacco	0	1	1	1
Water	0	1	1	1

20 Category Coupon Bundle Simulation:
one coupon per category

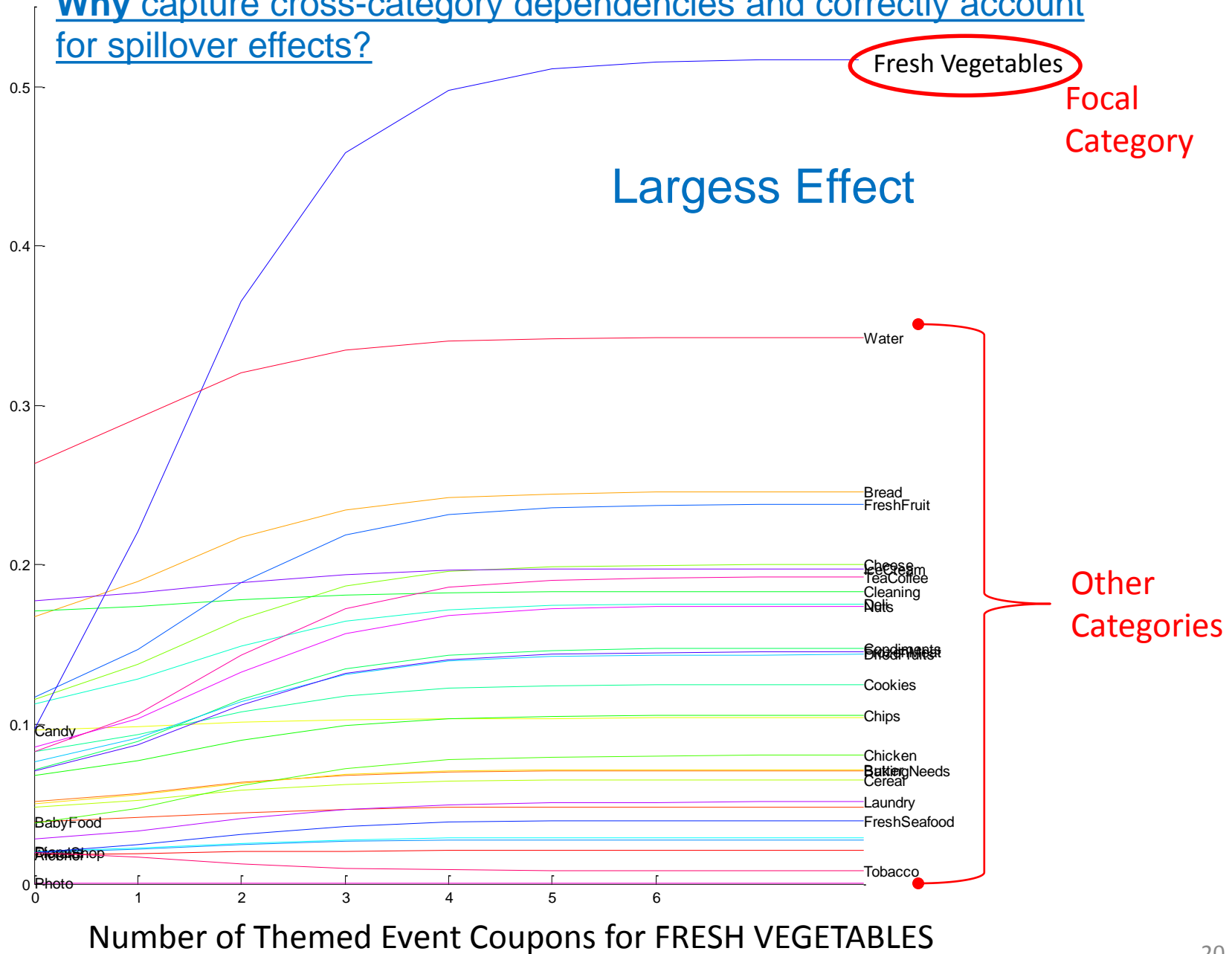
More degrees of freedom,
One-to-One Coupon can generate higher *per-customer* Expected Store Profits.

Why measure the separate impact of each retailer targeted coupon type ?

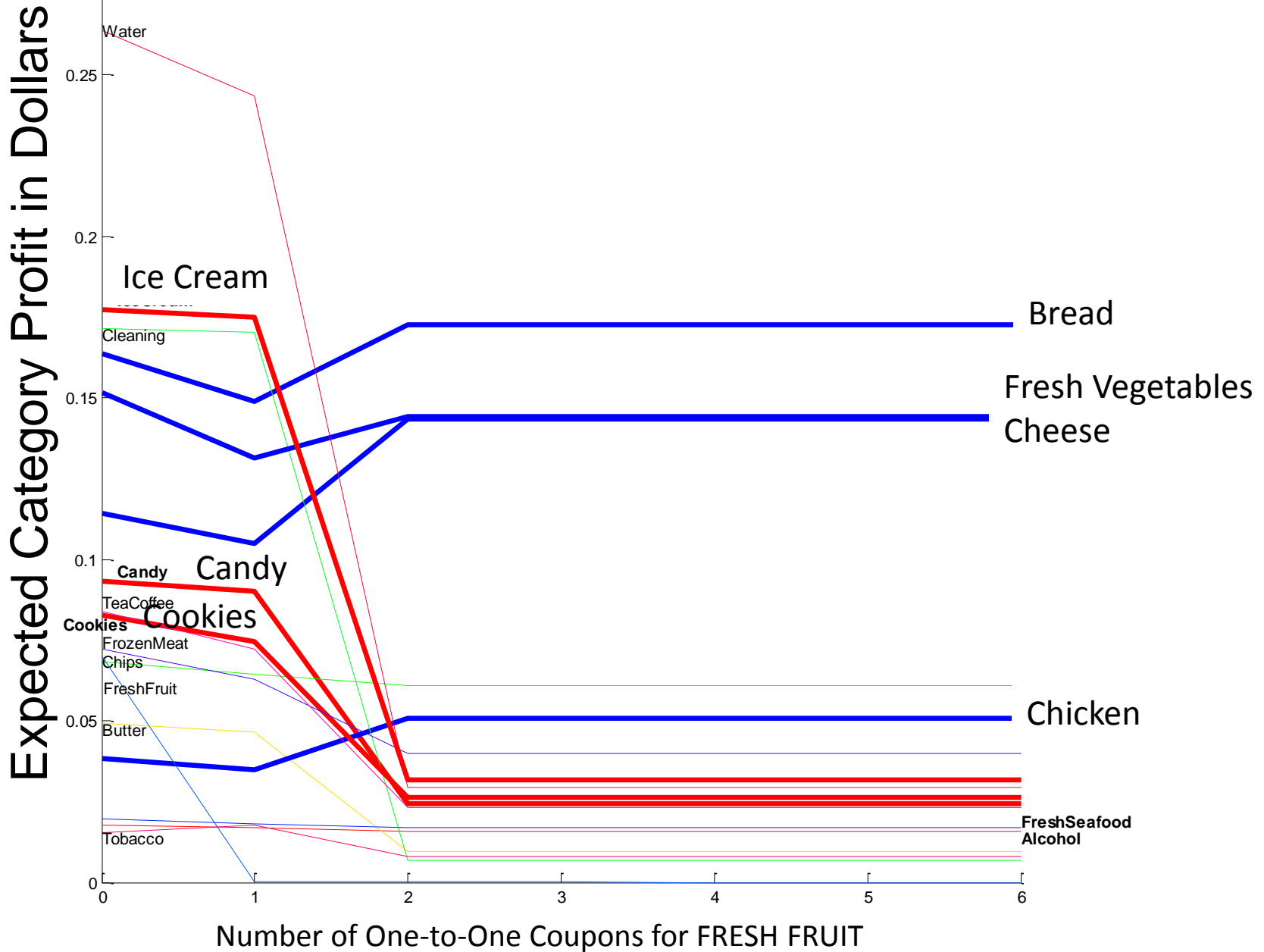


Why capture cross-category dependencies and correctly account for spillover effects?

Expected Category Profits in Dollars



Nuanced Cross-Category Impacts



Collaborative Opportunities

You have a number of ways to collaborate with the Center for Customer Analytics and Big Data (CCABD). Our annual activities are listed below, and we are open to discuss customizations with advisory board members.



Board Meetings

Board Meetings center on discussing how the CCABD should focus its efforts—What problems should Master of Science in Customer Analytics (MSCA) students be prepared to solve as they enter the workforce? How do you cultivate your analytics mastery? What topics need to be covered in the upcoming Immersion Training courses? There are two Board Meetings per year and each is a half-day session in the afternoon.

Consulting Project

Participating companies may engage the CCABD as a consultant for one semester-long company project annually. Supervised by an Olin faculty member or other experienced professional, a team of MSCA students will provide insights into a real-world problem facing your organization.

Research Roundtables

Research Roundtables begin with a presentation on cutting-edge research presented by a professor who is a customer analytics expert. Afterward, a board member discusses and contributes real-world insights, which leads toward the roundtable discussion about the learnings that emerge from this research. As a CCABD Advisory Board member company, you may send up to three people, in addition to the board member, to each of the two Research Roundtable discussions per year.

Immersion Training

Immersion Training allows participating companies to send up to three employees to two intensive workshops, each lasting two days, with Olin Business School professors. The course topics will be determined at the board meetings.



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