Promotions

Impact of
Mailer and Display Location on
Kroger Purchases

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Agenda

- **Business Objective**
- **Data**
- **Analysis**
  - **Promotions with most sales**
  - **Product pairings**
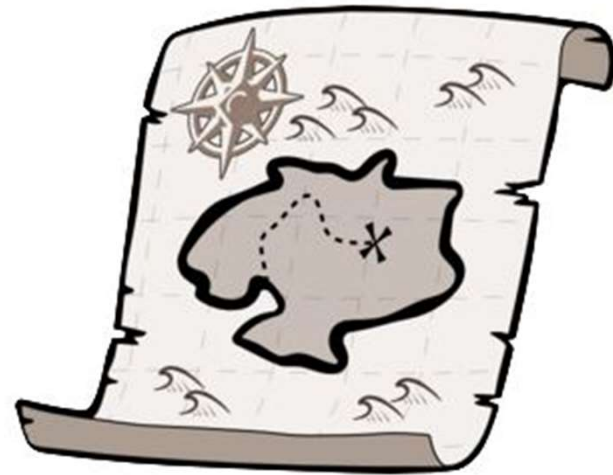 - **Product segments**
- **Recommendations**

image: clipart-library.com

Business Objective

Which promotions are most effective for pastas, sauces, pancake mixes, and syrups in Kroger stores?

Promotion Types

Weekly Mailer:
- Wrap Front
- Wrap Back
- Wrap Interior
- Front Page
- Back Page
- Interior Page
- Interior Page Line Item
- Not Included in Mailer

In-Store Display:
- Store Front
- Front End Cap
- Side Aisle End Cap
- Promo Seasonal Aisle
- Secondary Location
- Rear End Cap
- Store Rear
- Mid Aisle End Cap
- In Aisle
- In Shelf
- Not Promoted in Store Display

General Recommendations

1. Overall, the most effective promotions are:
    - In-store: rear end cap, other end caps, and in-aisle
    - Mailer: front or interior page

2. Some products can benefit by pairing with other products.

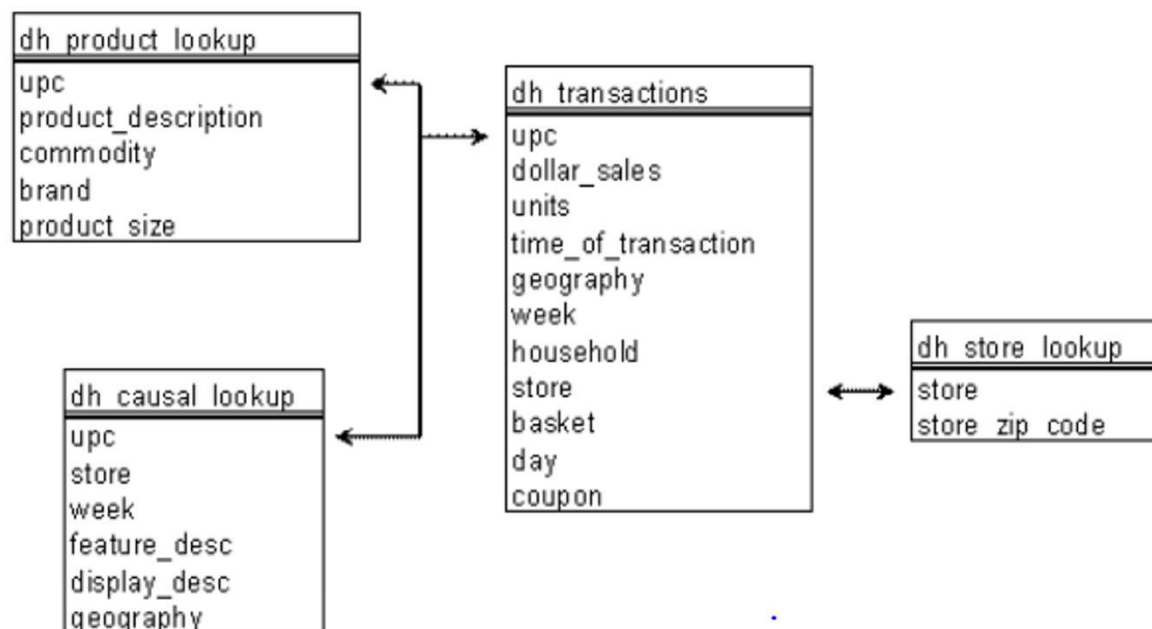3. Sauces are more influenced by promotions.

Data

Kroger Data

Tables:

Products

Transactions

Promotions

Stores

Products:

pasta/sauce

pancake mix/syrup

dh_product_lookup
- upc
- product_description
- commodity
- brand
- product_size

dh_transactions
- upc
- dollar_sales
- units
- time_of_transaction
- geography
- week
- household
- store
- basket
- day
- coupon

dh_store_lookup
- store
- store_zip_code

dh_causal_lookup
- upc
- store
- week
- feature_desc
- display_desc
- geography

Data: https://8451.com/area51

Data Overview

- **Unique transactions: 5,197,681**

- **Unique households: 510,027 (30% with only one basket)**

- **Unique baskets: 3,316,349 (avg 6.5 baskets/house)**

image: clipart-library.com

Data Wrangling

Clean the data

- **Attributes (ex: mushroom, alfredo, macaroni, maple): 44 unique**
- **Sizes (ounces, labels, missing values)**
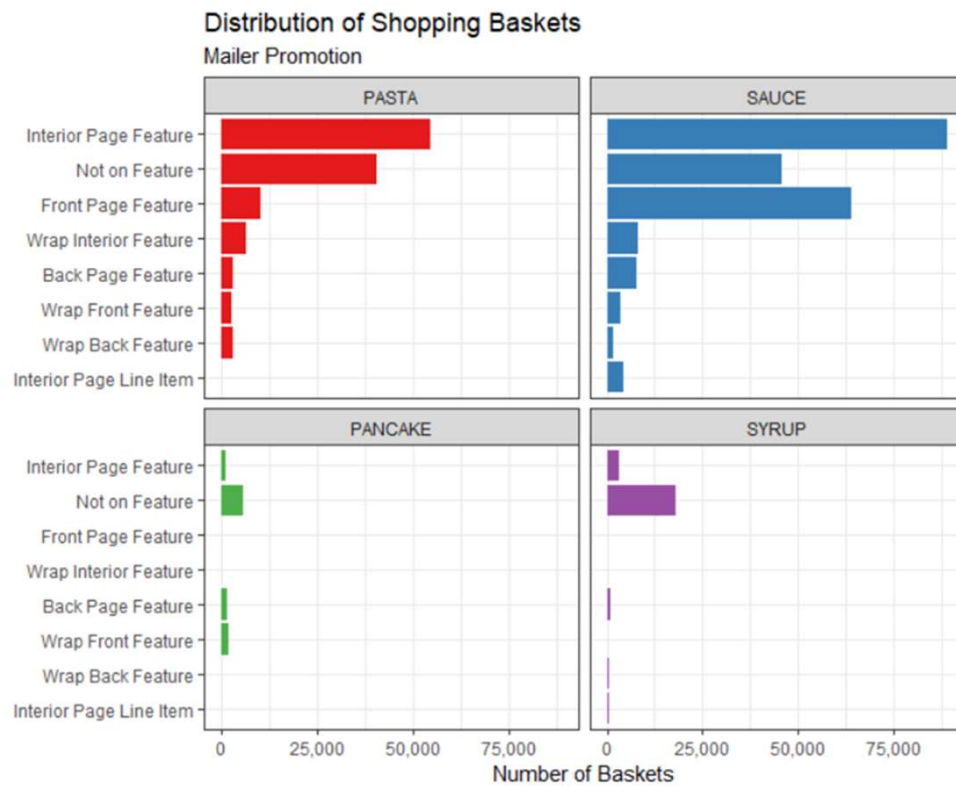
Combine the 4 data tables

- **Promotions recorded: 104 weeks ➜ 61 weeks**
- **Unique transactions: 5,197,681 ➜ 379,011**
- **Unique products: 927 ➜ 411**

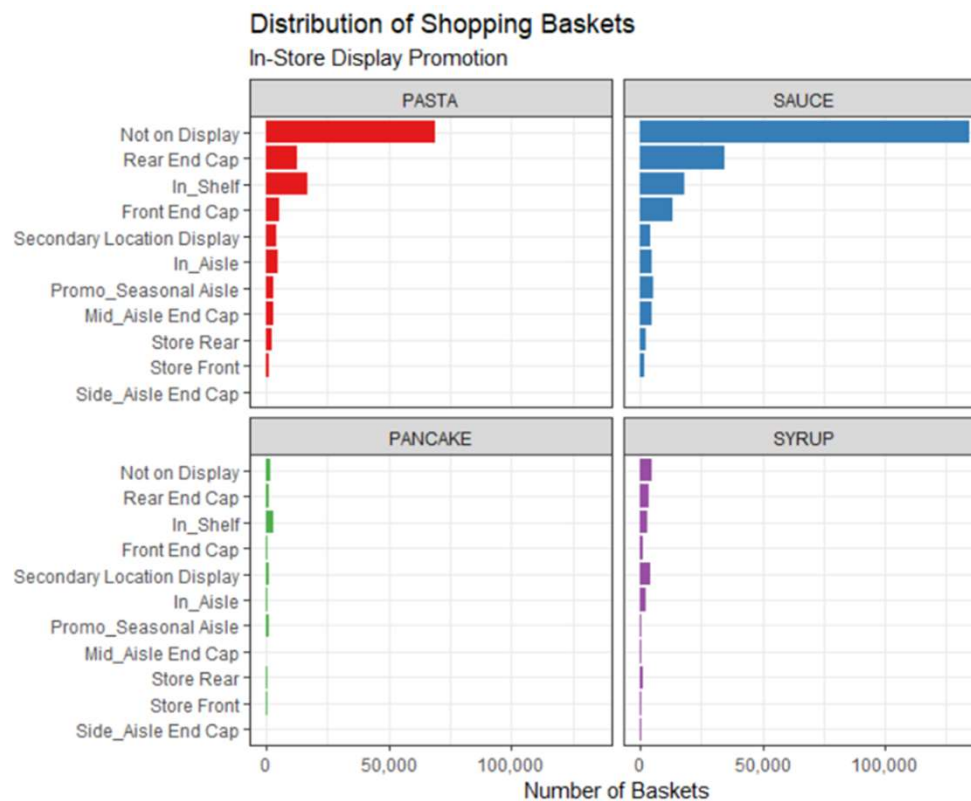**Combined all transactions for each Product**

image: clipart-library.com

Mailer Promo Resulting in Sales

Distribution of Shopping Baskets
Mailer Promotion

In-Store Promo Resulting in Sales

Distribution of Shopping Baskets
In-Store Display Promotion

Most Frequent Attributes

Most Frequently Sold Product Attributes

Most Frequent Brands
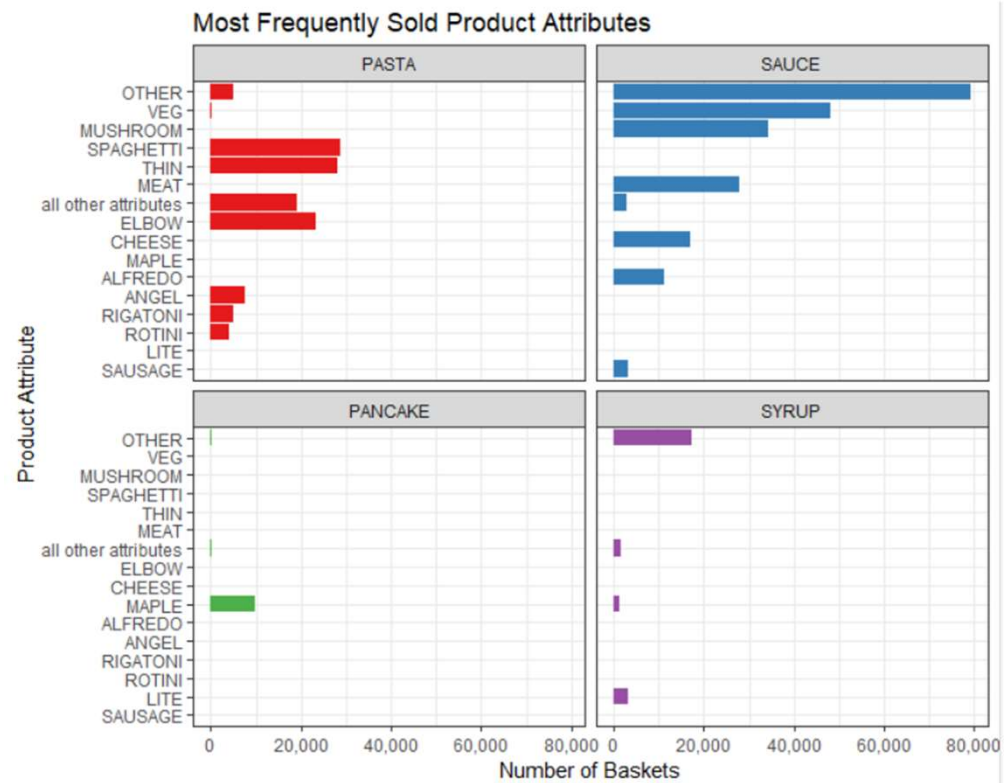
Most Frequently Sold Brands
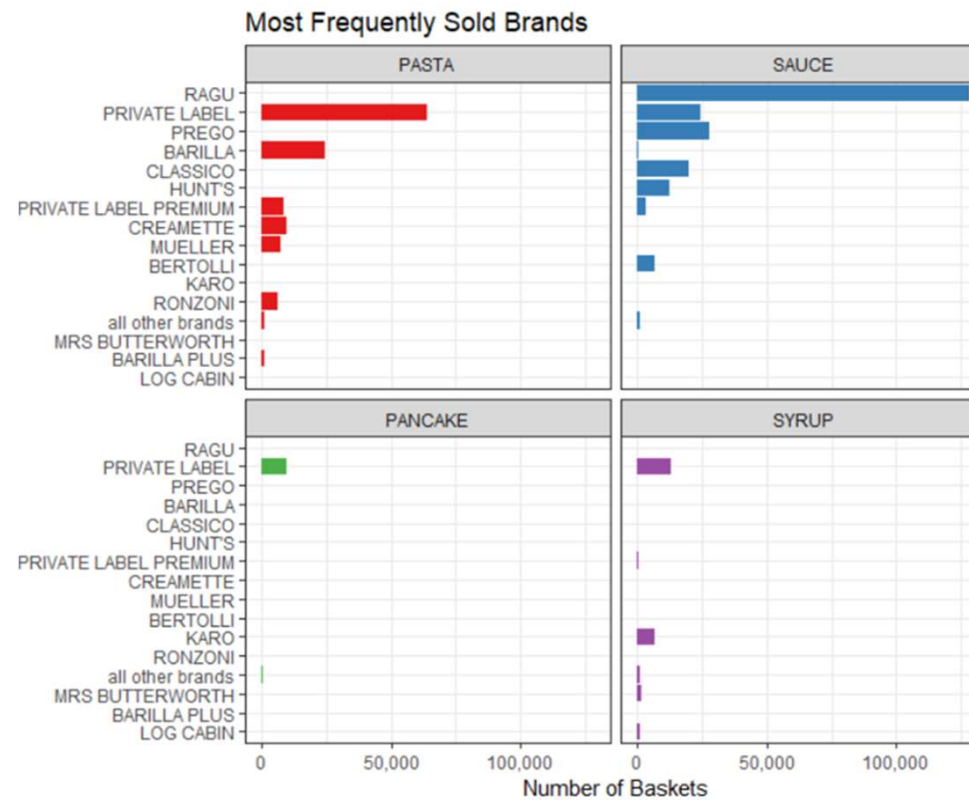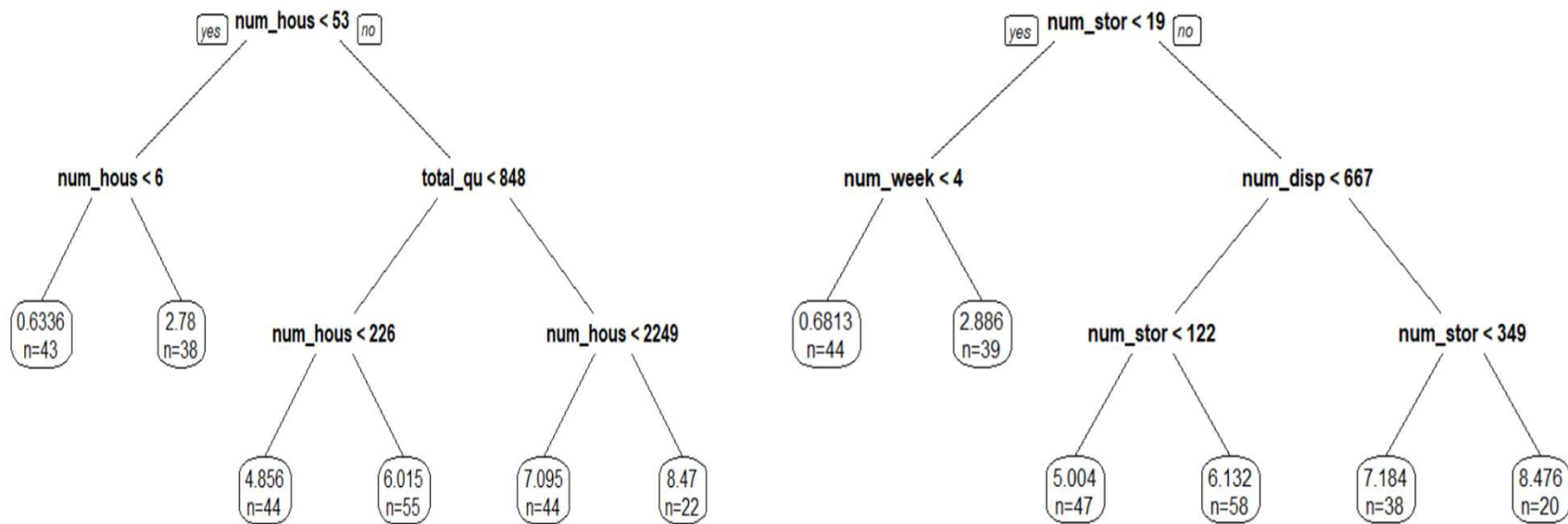
Analysis

Goal: best results for promotion (Display and Mailer)

KPI: number products sold

Random Forest

Random Forest Ensemble

Why Random Forest?

- Decision Tree Model. Aggregates to improve predictions
  - Random variables (reduce variance)
  - Random rows (reduce bias)

- Advantage: measurable goal ➔ number baskets

- Advantage: variable importance

- Advantage: accuracy

Random Forest Modeling

- **Organized by product (one row per product)**

- **Key variables used:**

  - **In-store display location**

  - **Weekly mailer placement**

  - **Number baskets (log)**

- **Split data into train, validation, and test data sets**

Random Forest Parameter Tuning

mtry = 5
- # randomly selected variables at each split
- rule = p/3
- need less when many relevant predictors

ntrees = 1000
- high to stabilize error
- rule = p*10
- need more to converge if mtry low
- need more to converge is sample size small

Optimum Mtry

Optimum Ntree
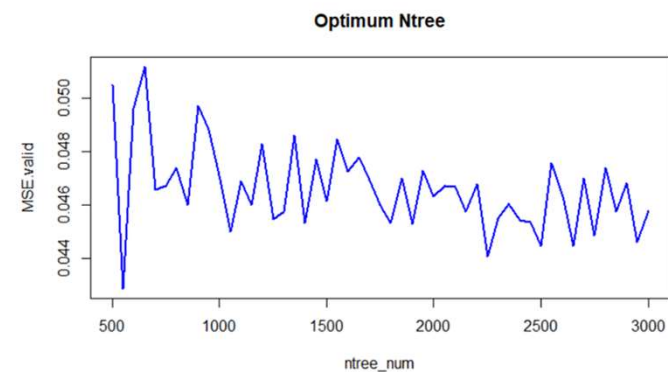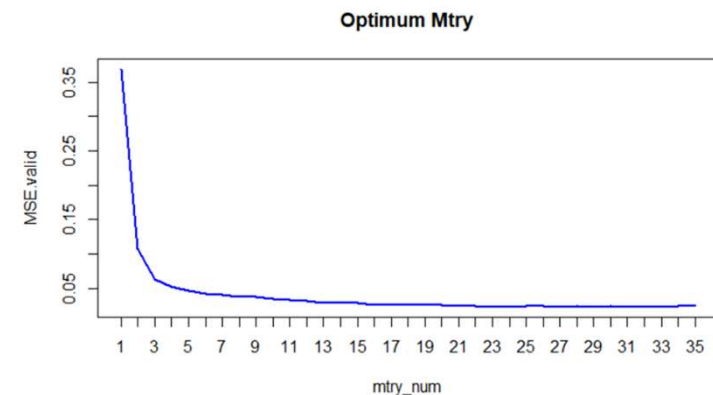
Model Robustness

- **Similar MSE with different samples**
- **Similar Variable Importance results with different samples**

Sample	MSE training	MSE testing
1	6.5916	0.0215
2	6.3910	0.0264
3	7.1961	0.0162

Random Forest Results

- **Target: predict number sales**

- **Overall, not by commodity**

- **Higher percent is better predictor**

	%IncMSE
Mailer: interior page	.3024
Store: rear end cap	.1176
Store: front end cap	.0655
Store: in shelf	.0573
Store: mid aisle end cap	.0528
Store: in aisle	.0313
Mailer: front page	.0191
Store: secondary location	.0184
Store: store rear	.0135
Store: promo seasonal	.0116
Store: store front	.0115
Percent coupons	.0102
Mailer: wrap interior	.0076
Store: side aisle end cap	.0012
Mailer: line item	.0007
Mailer: back page	< .0001
Mailer: wrap front	< .0001
Mailer: wrap back	< .0001

Actionable Recommendations

image: clipart-library.com

In-store Display Promotions
- **Rear end caps are prime**
- **Also consider other end caps and in-aisle**

Weekly Mailer Promotions
- **Mailer interior or front page are prime**
- **Mailer wrap less effective**

Goal: evaluate purchase pairings

KPI: 'lift' compared with guessing

Association

Association

image: clipart-library.com

Variables Used in Analysis

basket & products (n=411)

Basket	Ragu Meat Sauce	Kroger Thin Spaghetti	Bertolli Garlic Alfredo Sauce	Ragu Chunky Tomato Sauce	Creamette Macaroni
3207644	1	0	0	0	0
7462988	0	1	1	0	0
8212345	0	0	0	1	0
4231123	1	0	0	0	0

Most Frequent Purchases

411 products

Most frequently purchased products:
- **Ragu Traditional Plain (20,111)**
- **Private Label Spaghetti Regular (19,011)**
- **Ragu Spaghetti Sauce Meat (14,918)**
- **Private Label Thin Spaghetti (11,242)**
- **Private Label Complete Pancake Mix (9,460)**

How Good is the Rule?

● Support: percent transactions that contain both items

● Confidence: percent time second item is included when first item is sold

● Lift: improvement over random guessing

I used support > 0.0001 and confidence > 0.05

Results

When someone has Private Label Spaghetti in basket, what else are they buying?

Basket Including This	Also Include This	Support	Conf	Lift
PRIVATE LABEL SPAGHETTI REGULAR, RAGU TRADITIONAL PLAIN	=> RAGU OWS SPAG SAUCE MEAT	0.0002	0.105	2.1
PRIVATE LABEL SPAGHETTI REGULAR, RAGU TRADITIONAL PLAIN	=> RAGU\TOMATO GRLC/ONION SC	0.00011	0.056	2.0
PRIVATE LABEL SPAGHETTI REGULAR, RAGU\TOMATO GRLC/ONION SC	=> RAGU TRADITIONAL PLAIN	0.00011	0.126	1.8
PRIVATE LABEL SPAGHETTI REGULAR, RAGU OWS SPAG SAUCE MEAT	=> RAGU TRADITIONAL PLAIN	0.0002	0.112	1.6

Observation: purchasing Private Label pasta, but not Private Label sauce!

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Mailer Promotions for Sauce By Brand

Promotion for Sauce by Brand

Mailer Promotion

Brands (top to bottom): RAGU, PREGO, PRIVATE LABEL, CLASSICO, HUNT'S, BERTOLLI, PRIVATE LABEL PREMIUM, NEWMAN'S, BARILLA

Mailer Promotion legend:
- Wrap Front Feature
- Wrap Back Feature
- Wrap Interior Feature
- Front Page Feature
- Back Page Feature
- Interior Page Feature
- Interior Page Line Item
- Not on Feature
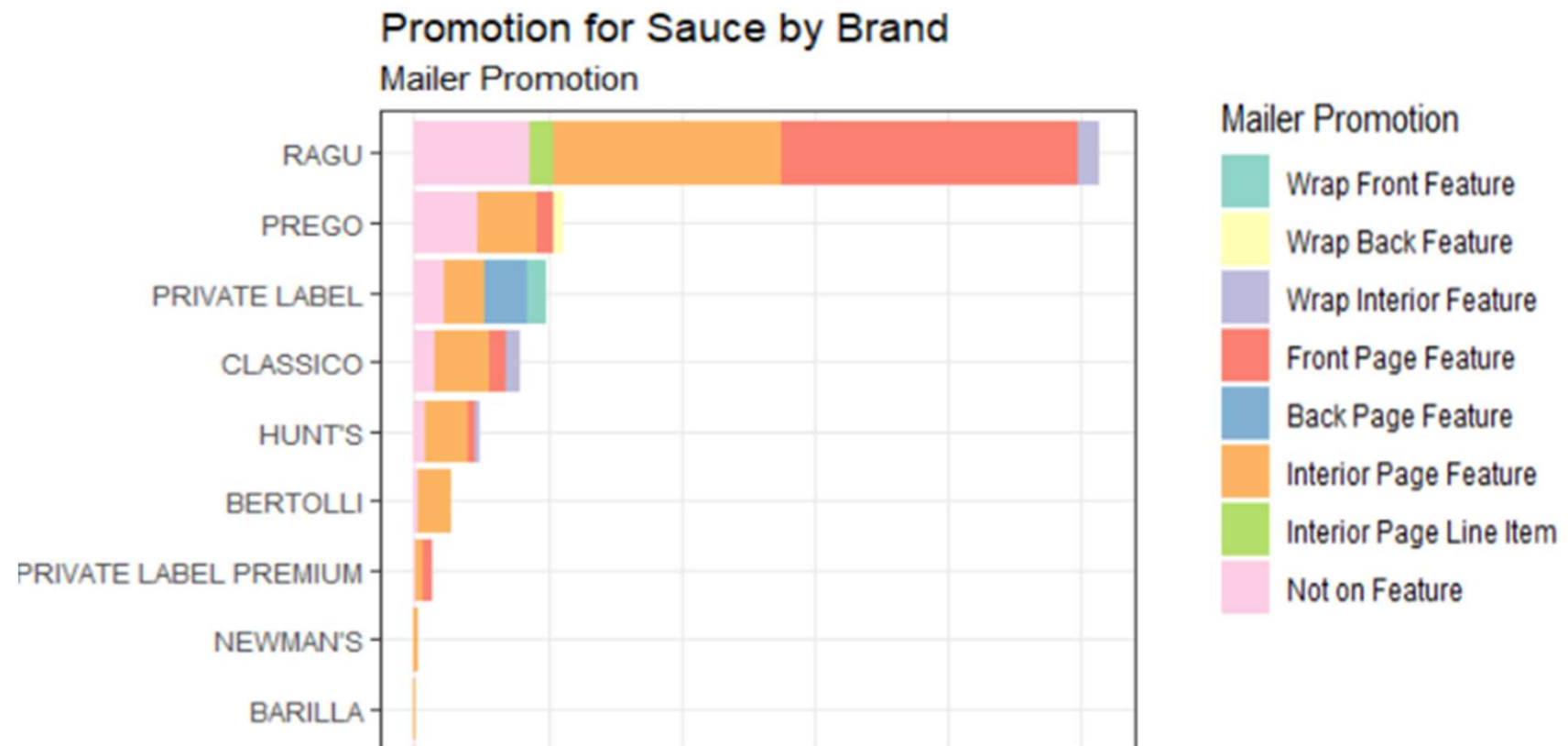
Actionable Recommendation

Increase marketing of Private Label Spaghetti Sauce to pair with Private Label pasta.

One possible target area is promotion on back page of mailer.

Goal: identify similar products to inform marketing strategy

KPI: analyze what is similar and different between groups

Clustering

Clustering

image: clipart-library.com

Variable Selection

Variables in model determine how clusters are formed.

Used LASSO regression modeling to identify key variables which predict number sales.

	1
(Intercept)	12.719
upc	.
commodity	.
brand	.
product_attribute	.
product_size_factor	.
product_desc	.
num_households	0.569
percent_coupons	.
total_quantity	0.298
avg_quantity	.
max_quantity	.
num_weeks	.
first_week	.
last_week	.
avg_dollars	.
total_dollars	0.047
num_stores	.
num_regions	.
num_feature_Wrap_Front	.
num_feature_Wrap_Back	.
num_feature_Wrap_Interior	.
num_feature_Front_Page	.
num_feature_Back_Page	.
num_feature_Interior_Page	.
num_feature_Interior_Page_Line_Item	.
num_feature_Not_on	.
num_display_Store_Front	.
num_display_Front_End_Cap	.
num_display_Side_Aisle_End_Cap	.
num_display_Promo_Seasonal_Aisle	.
num_display_Secondary_Location	.
num_display_Rear_End_Cap	0.061
num_display_Store_Rear	.
num_display_Mid_Aisle_End_Cap	0.195
num_display_In_Aisle	.
num_display_In_Shelf	.
num_display_Not_on	.

Key Variables Used in Analysis

Variables used to cluster:

- **number households**
- **total quantity**
- **total dollars**
- **display: rear end cap**
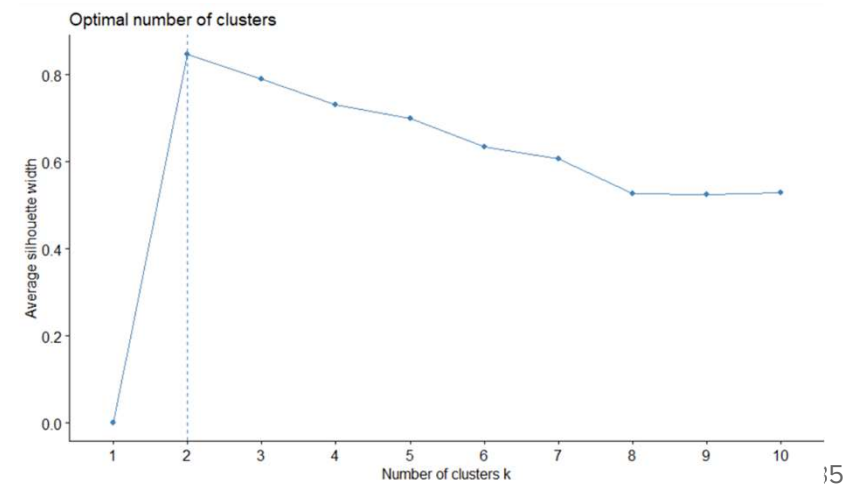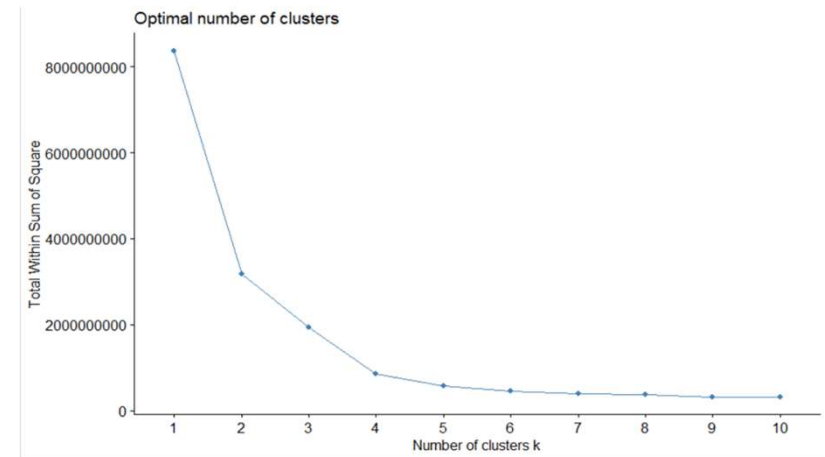- **display: mid aisle end cap**

Variables used to understand clusters:

- **commodity**
- **product description**
- **attribute**

Number Clusters

Three methods to select optimal number:

- **Dendrogram: height**
- **Elbow: Compactness of cluster**
- **Silhouette: Quality of cluster**
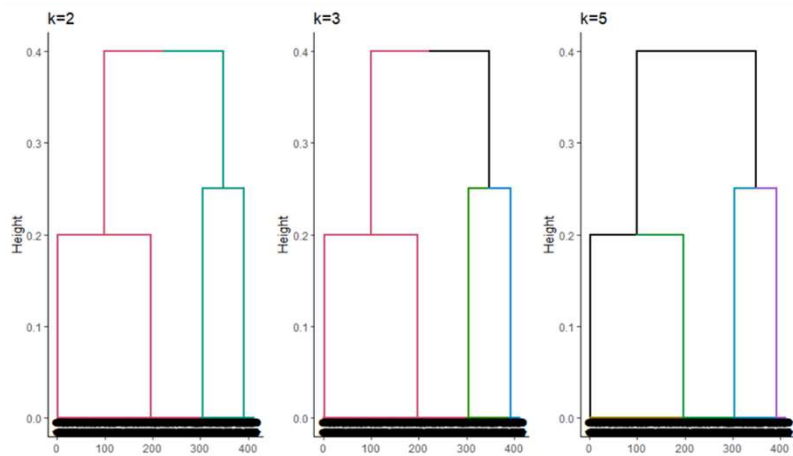
Promos More Important for Cluster 2

Cluster 1 (n=109 products): less influenced by promotion

Cluster 2 (n=302 products): more influenced by promotion

Cluster	avg # house	avg qty	avg rear endcap sales	avg mid aisle endcap sales
1	81	102	0	0.58
2	1095	1612	169.26	28.05

Sauces More Frequent in Cluster 2

Category	Ratio cluster1 to cluster2
Pasta	1:2
Sauce	1:4
Pancake	1:1
Syrup	1:2

Can also dig deeper into specific products within cluster

Actionable Recommendation

Sauces should be promoted, potentially the best location being in rear and mid-aisle end caps.

Implementation

Actionable Recommendations

- **Overall, the most effective promotions are:**
  - **Display: rear end cap, other end caps, in-aisle**
  - **Mailer: interior or front page (random forest)**

- **Increase marketing of Private Label Spaghetti Sauce to pair with Private Label pasta. One possible target area is back page mailer promo. (association)**

- **Sauces should be promoted, particularly in rear and mid-aisle end caps. (clustering)**

Links

Github: https://github.com/BethHilbert/r-KrogerCustomerEngagement

RPubs: http://rpubs.com/Beth_Hilbert/446290

Dashboard: https://public.tableau.com/profile/beth.hilbert#!/vizhome/KrogerCarboPromotions/StoryNewProduct

Data: https://8451.com/area51

Thank you

Supplemental Slides

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Random Forest MSE

```
randomForest(formula = log_num_baskets ~ ., data = carbo_product_train
,       mtry = 5, ntree = 1000, importance = TRUE)
              Type of random forest: regression
                    Number of trees: 1000
No. of variables tried at each split: 5

        Mean of squared residuals: 0.02925261
                  % Var explained: 99.54
```

Comparison: MSE for different seeds

Seed	MSE in-sample	MSE out-of-sample
513398	6.5916	0.0215
123456	6.3910	0.0264
765432	7.1961	0.0162

Random Forest Variable Importance

Comparison: Variable Importance for different seeds

	%IncMSE	IncNodePurity
num_households	1.389896	256.829
total_quantity	1.312795	245.813
log_total_dollars	0.867237	187.217
num_stores	0.712819	177.221
num_display_Not_on	0.474066	113.246
num_feature_Interior_Page	0.312262	86.450
max_quantity	0.181702	82.513
num_weeks	0.160652	58.481
num_feature_Not_on	0.155070	41.928
num_display_Rear_End_Cap	0.138708	47.058
avg_quantity	0.101703	37.013
num_display_Front_End_Cap	0.059833	27.098
num_display_Mid_Aisle_End_Cap	0.057790	30.495
num_display_In_Shelf	0.041143	10.806
num_feature_Front_Page	0.027192	6.943
num_display_In_Aisle	0.023380	7.142
percent_coupons	0.020904	9.279
num_regions	0.016480	10.748
num_display_Secondary_Location	0.013809	2.985
first_week	0.013751	7.869
last_week	0.013109	8.351
num_display_Store_Rear	0.012909	4.437
num_display_Promo_Seasonal_Aisle	0.011883	3.730
num_display_Store_Front	0.011540	5.312
num_feature_Wrap_Interior	0.008806	2.289
avg_dollars	0.008091	2.657
num_display_Side_Aisle_End_Cap	0.002235	0.605
product_attribute	0.000832	10.026
num_feature_Wrap_Back	0.000817	0.168
commodity	0.000660	0.850
product_size_factor	0.000578	0.519
num_feature_Interior_Page_Line_Item	0.000392	0.210
num_feature_Wrap_Front	0.000079	0.075
num_feature_Back_Page	-0.000025	0.050

	%IncMSE	IncNodePurity
num_households	1.492812	272.930
total_quantity	1.321068	236.843
log_total_dollars	0.867256	191.637
num_stores	0.748286	166.821
num_display_Not_on	0.589969	143.023
num_feature_Interior_Page	0.302420	88.780
num_weeks	0.186619	64.081
num_feature_Not_on	0.179941	47.155
max_quantity	0.162338	84.402
num_display_Rear_End_Cap	0.117588	38.372
avg_quantity	0.116743	52.573
num_display_Front_End_Cap	0.065456	31.226
num_display_In_Shelf	0.057334	21.071
num_display_Mid_Aisle_End_Cap	0.052866	24.765
num_display_In_Aisle	0.031263	7.244
num_regions	0.019456	15.345
num_feature_Front_Page	0.019123	4.317
num_display_Secondary_Location	0.018363	6.293
num_display_Store_Rear	0.013534	3.860
num_display_Promo_Seasonal_Aisle	0.011595	5.256
num_display_Store_Front	0.011476	6.449
last_week	0.011227	6.350
percent_coupons	0.010213	5.051
first_week	0.007670	5.329
num_feature_Wrap_Interior	0.007570	1.647
avg_dollars	0.007515	2.870
product_attribute	0.002562	10.364
commodity	0.001622	0.719
num_display_Side_Aisle_End_Cap	0.001207	0.592
product_size_factor	0.000878	0.536
num_feature_Interior_Page_Line_Item	0.000711	0.446
num_feature_Back_Page	0.000038	0.089
num_feature_Wrap_Front	0.000033	0.024
num_feature_Wrap_Back	0.000011	0.076

Association: Items

390 items, 293,320 shopping trips

```
transactions as itemMatrix in sparse format with
 293320 rows (elements/itemsets/transactions) and
 390 columns (items) and a density of 0.0033

most frequent items:
        RAGU TRADITIONAL PLAIN      PRIVATE LABEL SPAGHETTI REGULAR              RAGU OWS SPAG SAUCE MEAT
                          20111                                19011                                14918
        PRIVATE LABEL THIN SPAGHETTI PRIVATE LABEL COMPLETE PANCAKE MIX                        (Other)
                          11243                                9460                                303831

element (itemset/transaction) length distribution:
sizes
        1        2        3        4        5        6        7        8        9       10       11       12       13       14
 231823    46200    10081     3347     1131      410      158       95       41       20        4        6        2        2

   Min. 1st Qu.  Median   Mean 3rd Qu.   Max.
    1.0     1.0     1.0     1.3     1.0    14.0
```

Association: Rules

support = 0.0001, confidence = 0.05

```
set of 1518 rules

rule length distribution (lhs + rhs):sizes
  1   2    3    4
  3 706  805    4

  Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
   1.0     2.0     3.0     2.5     3.0     4.0

summary of quality measures:
     support            confidence        lift              count
 Min.   :0.000    Min.   :0.05    Min.   : 1    Min.   :    30
 1st Qu.:0.000    1st Qu.:0.07    1st Qu.: 6    1st Qu.:    35
 Median :0.000    Median :0.11    Median : 10   Median :    45
 Mean   :0.000    Mean   :0.12    Mean   : 16   Mean   :   124
 3rd Qu.:0.000    3rd Qu.:0.16    3rd Qu.: 19   3rd Qu.:    84
 Max.   :0.069    Max.   :0.51    Max.   :215   Max.   :20111

mining info:
      data ntransactions support confidence
 TransFood        293320  0.0001        0.05
```

Association: Rules for Specific Product

```
           data ntransactions support confidence
TransFood        293320  0.0001       0.05
> rules_lift <- sort(basket_rules, by = "lift", decreasing = TRUE)
> rules_subset <- subset(basket_rules, subset = lhs %in% "PRIVATE LABEL SPAGHETTI REGULAR")
> rules_lift <- sort(rules_subset, by = "lift", decreasing = TRUE)
> inspect(rules_lift)
```

	lhs		rhs	support	confidence	lift	count
[1]	{PRIVATE LABEL LASAGNA PASTA,						
	PRIVATE LABEL SPAGHETTI REGULAR}	=>	{PRIVATE LABEL ELBOW MACARONI}	0.00013	0.355	11.7	38
[2]	{PRIVATE LABEL SPAGHETTI REGULAR,						
	PRIVATE LABEL SPAGHETTI THIN}	=>	{PRIVATE LABEL ELBOW MACARONI}	0.00027	0.224	7.4	80
[3]	{PRIVATE LABEL COMPLETE PANCAKE MIX,						
	PRIVATE LABEL SPAGHETTI REGULAR}	=>	{PRIVATE LABEL ELBOW MACARONI}	0.00015	0.181	5.9	43
[4]	{PRIVATE LABEL ELBOW MACARONI,						
	PRIVATE LABEL SPAGHETTI REGULAR}	=>	{PRIVATE LABEL SPAGHETTI THIN}	0.00027	0.105	3.3	80
[5]	{PRIVATE LABEL SPAGHETTI REGULAR,						
	RAGU TRADITIONAL PLAIN}	=>	{RAGU OWS SPAG SAUCE MEAT}	0.00020	0.105	2.1	60
[6]	{PRIVATE LABEL SPAGHETTI REGULAR,						
	RAGU TRADITIONAL PLAIN}	=>	{RAGU\TOMATO GRLC/ONION SC}	0.00011	0.056	2.0	32
[7]	{PRIVATE LABEL SPAGHETTI REGULAR,						
	RAGU\TOMATO GRLC/ONION SC}	=>	{RAGU TRADITIONAL PLAIN}	0.00011	0.126	1.8	32
[8]	{PRIVATE LABEL ELBOW MACARONI,						
	PRIVATE LABEL SPAGHETTI REGULAR}	=>	{PRIVATE LABEL COMPLETE PANCAKE MIX}	0.00015	0.057	1.8	43
[9]	{PRIVATE LABEL SPAGHETTI REGULAR,						
	RAGU OWS SPAG SAUCE MEAT}	=>	{RAGU TRADITIONAL PLAIN}	0.00020	0.112	1.6	60

Clustering Product Details

	num_households	total_quantity	total_dollars	num_display_Rear_End_Cap	num_display_Mid_Aisle_End_Cap
1	81.4	101.61	149.54	0	0.58
2	1095.82	1611.95	1873.23	169.26	28.05

1	SAUCE	ALFREDO	FIVE BROS GARLIC ALFREDO
1	SAUCE	ALFREDO	CLSCO ALFREDO ROAST GARLC
1	SAUCE	CHEESE	NEWMANS SAY CHEESE PAS
1	SAUCE	CHEESE	RAGU ORGANIC CHEESE SAUCE
1	SAUCE	CHEESE	CHEF PIZZA SAUCE CHEESE
1	SAUCE	MARINARA	NEWMANS MARINARA SAUCE
1	SAUCE	MEAT	RAGU RICH&MEATY CLASSIC I
1	SAUCE	MEAT	RAGU R&M MAMAS MEAT SAUCE
1	SAUCE	MUSHROOM	PRIVATE LABEL ORIG SPAG SC MUSHROOM
1	SAUCE	MUSHROOM	PRIVATE LABEL HM STY SPAG SCE MUSH
1	SAUCE	MUSHROOM	PRIVATE LABEL 3 MUSHROOM PASTA SAUCE
1	SAUCE	OTHER	NEWMANS\SOCKAROONI SAUCE
1	SAUCE	OTHER	NWMN DIAVOLO SPCY SMR SCE
1	SAUCE	OTHER	NEWMN OWN BOMBOLINA PASTA SCE
1	SAUCE	OTHER	NEWMN OWN GARLIC&PPR SCE
1	SAUCE	OTHER	BERTOLLI BASIL DCD SPICE
1	SAUCE	OTHER	RAGU ORGANIC TRADITIONAL
1	SAUCE	OTHER	PREGO SPAG SAUCE PLAIN
1	SAUCE	OTHER	EMERIL SCE PEPR PSTA
1	SAUCE	OTHER	EMERILS ROSTED GARLIC SCE
1	SAUCE	PESTO	CLSCO BASIL PESTO SAUCE

2	SAUCE	MEAT	RAGU MAMAS MEAT SAUCE
2	SAUCE	MEAT	RAGU RICH&MEATY BF/ON/GRL
2	SAUCE	MEAT	RAGU MEAT SPAGHETTI SAUCE
2	SAUCE	MEAT	PREGO MEAT PASTA SAUCE
2	SAUCE	MEAT	PREGO SPAG SAUCE MEAT
2	SAUCE	MEAT	PREGO MINI MEATBALL PASTA
2	SAUCE	MEAT	PREGO SPAG SAUCE MEAT
2	SAUCE	MEAT	PREGO HEARTY MT MEATBALL
2	SAUCE	MEAT	PREGO HEARTY 3 MEAT SUPRM
2	SAUCE	MEAT	PRIVATE LABEL SPAGHTTI SAUCE MEAT
2	SAUCE	MEAT	PRIVATE LABEL SPAG SCE MEAT
2	SAUCE	MUSHROOM	HUNTS SPAG.SAUCE MUSHROOM
2	SAUCE	MUSHROOM	RAGU TRADITIONAL MUSHROOM
2	SAUCE	MUSHROOM	RAGU GS SUPER MUSHROOM
2	SAUCE	MUSHROOM	BERTOLLI MUSHROOM&GRLC SC
2	SAUCE	MUSHROOM	RAGU HEARTY SAUT ON/MUSH
2	SAUCE	MUSHROOM	RAGU SUPER MUSHRM SPGH SC
2	SAUCE	MUSHROOM	CLASSICO MUSH&RIPE OLIVES
2	SAUCE	MUSHROOM	CLASSICO\TRIPLE MUSHROOM
2	SAUCE	MUSHROOM	PREGO MUSH & GRN PEPPER S
2	SAUCE	MUSHROOM	PREGO MUSHROOM & GARLIC
2	SAUCE	MUSHROOM	PREGO MUSHROOM SPAG SAUCE
2	SAUCE	MUSHROOM	PREGO MUSHROOM SPAG SAUCE
2	SAUCE	MUSHROOM	PREGO ZESTY MUSH/X SPICY

Cluster Distribution of Kroger Brands

commodity
- PASTA
- SAUCE
- PANCAKE
- SYRUP
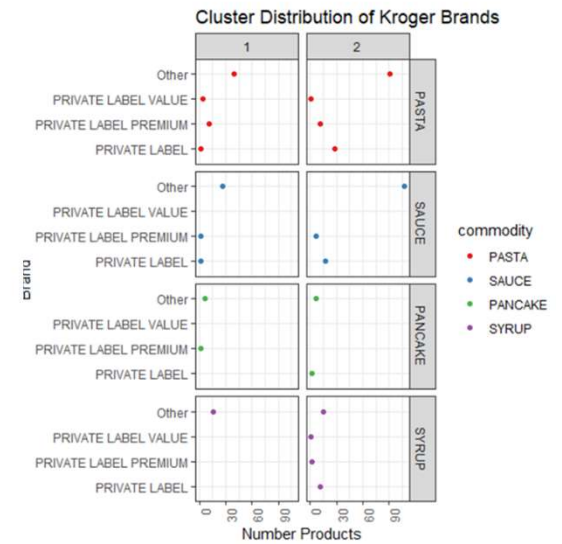
Summaries: # baskets for each # items

	n_items	nbaskets
	<int>	*<int>*
1	1	2029944
2	2	891441
3	3	265834
4	4	85373
5	5	27749
6	6	9853
7	7	3549
8	8	1451
9	9	607
10	10	282
11	11	115
12	12	68
13	13	37
14	14	20
15	15	16
16	16	1
17	17	5
18	18	2
19	21	1
20	24	1
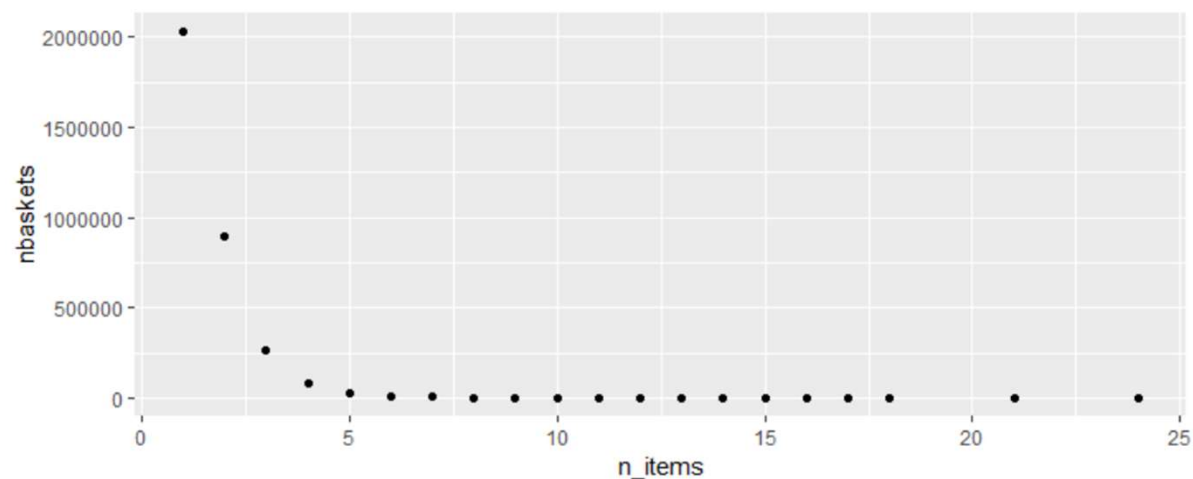
Unique baskets: 3,316,349

(avg 6.5 baskets/house, avg size 1.57 items)

50

Summaries: # houses for each # baskets

	n_baskets	n_households
	<int>	<int>
1	1	153390
2	2	73590
3	3	47968
4	4	35256
5	5	27189
6	6	21962
7	7	18129
8	8	14940
9	9	12737
10	10	10926

... with 124 more rows
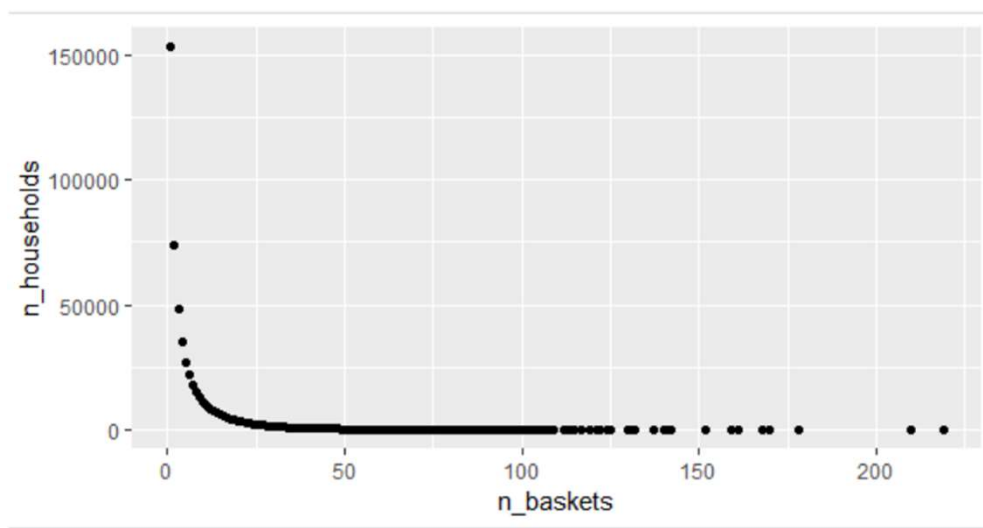
Unique households: 510,027

Join Sources

- Remove the following:
  - Transactions without products: 58,436
  - Products without transactions: 27
  - Transactions without promotions: 4,815,935
  - Promotions without transactions: 177,471
  - Products without stores: 0

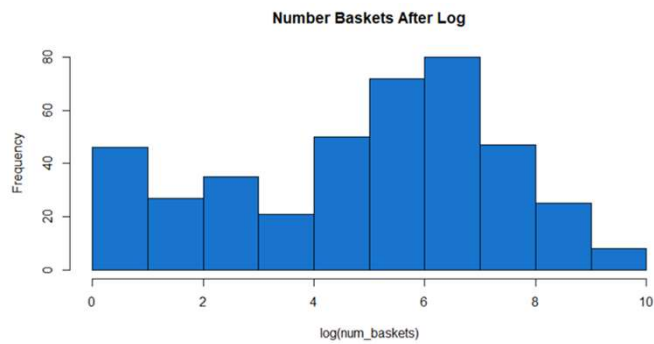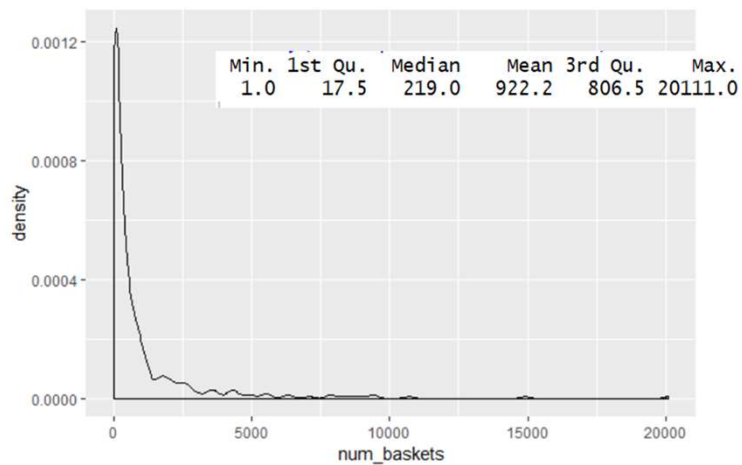Result is:

Transactions: 5,197,681 ➔ 379,011

Products: 927 ➔ 411

Align to Product-Grain

upc

commodity

brand,

product_attribute

product_size_factor

product_desc

counts (qty, weeks, dollars)

feature and display counts

```
carbo_product <- carbo %>%
  group_by(upc,
           commodity,
           brand,
           product_attribute,
           product_size_factor,
           product_desc) %>%
  summarize(num_households = n_distinct(household),
            percent_coupons = mean(coupon),
            total_quantity = sum(quantity),
            avg_quantity = mean(quantity),
            max_quantity = max(quantity),
            num_baskets = n_distinct(basket),
            num_weeks = n_distinct(week),
            first_week = min(week),
            last_week = max(week),
            avg_dollars = round(mean(dollar_sales),2),
            total_dollars = round(sum(dollar_sales),2),
            num_stores = n_distinct(store),
            num_regions = n_distinct(geography)
  )
```

Log num_baskets and total_dollars

	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
	1.0	17.5	219.0	922.2	806.5	20111.0

	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
	0.50	34.45	327.19	1416.10	1413.36	35788.62

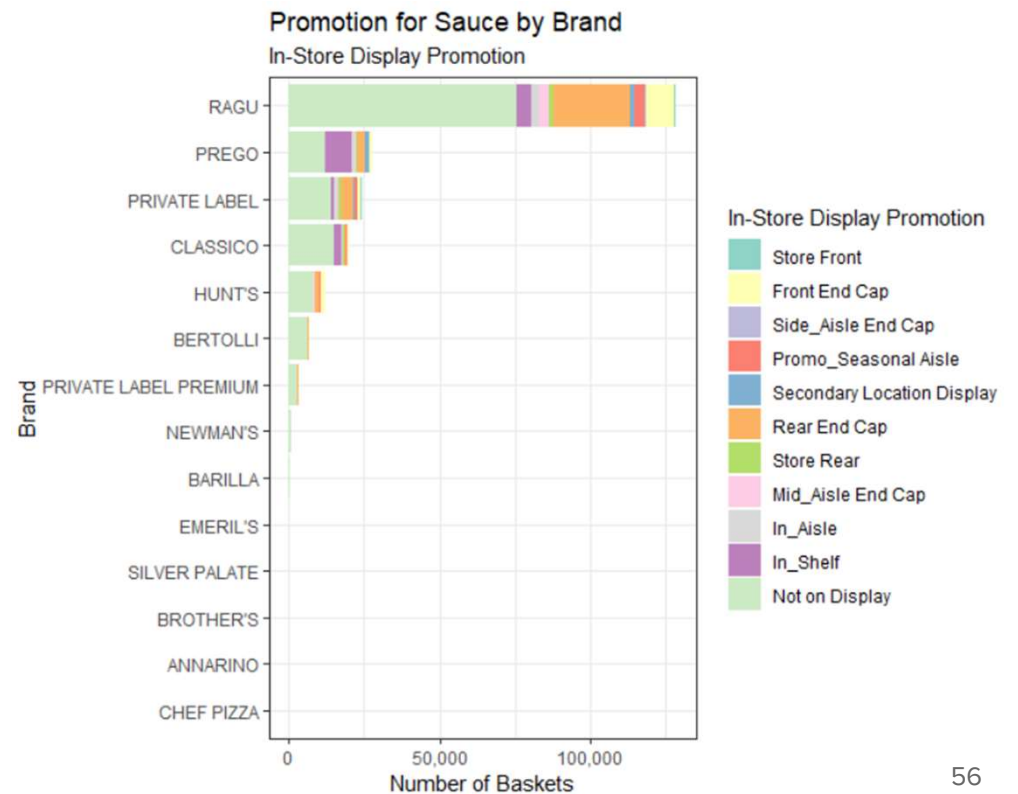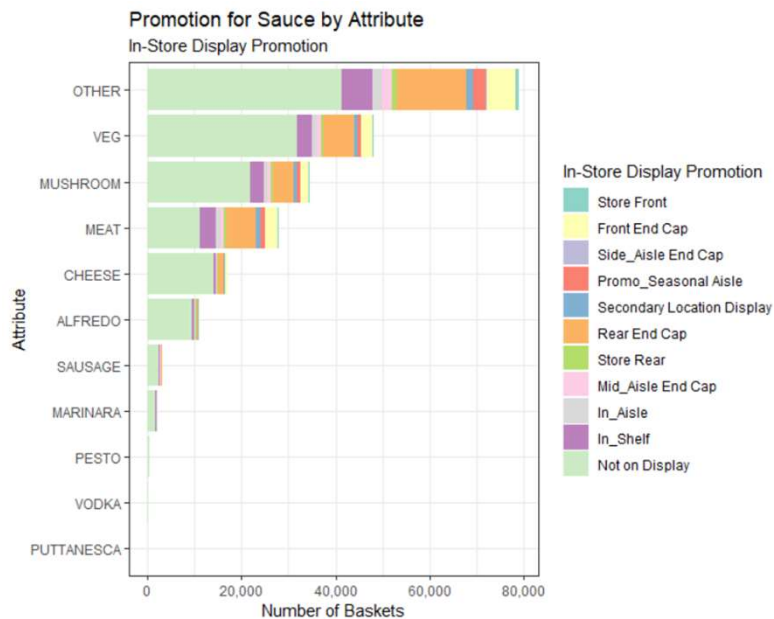Number Baskets After Log

Total Dollars After Log
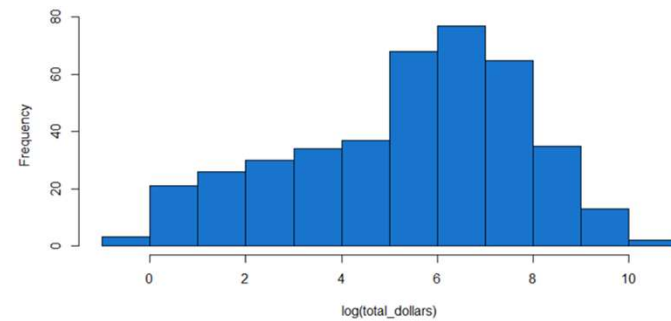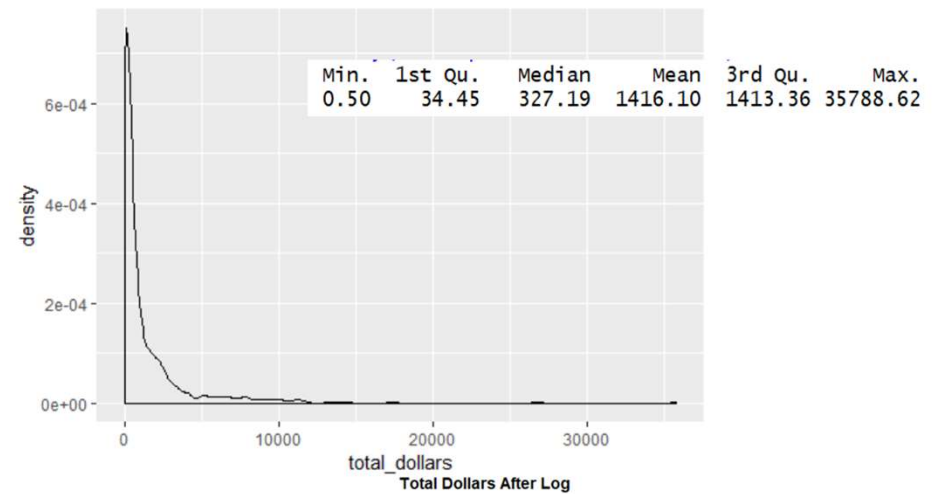
Promotion Type Pairings

- Blank cell, never promoted in that combo
- Observations:
  - pasta/sauces promoted across all categories
  - sauces not front or side end caps
  - pastas never line item
  - pancakes/syrups back or interior but otherwise absent

Pasta and Sauces Dominate Promotion Types
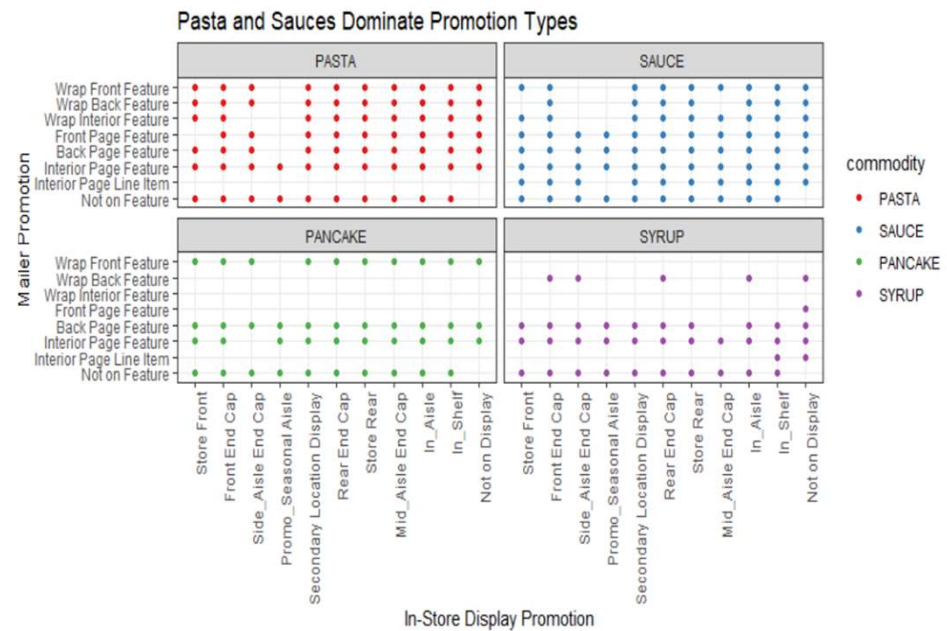
Focus on Sauce ~ Display

- Attribute: Vegetable and Mushroom most
- Brand: Ragu dominates
- Location: Rear End Cap, then In-Shelf
- Not front store

Promotion for Sauce by Attribute
In-Store Display Promotion

Promotion for Sauce by Brand
In-Store Display Promotion

Focus on Sauce ~ Mailer

- Location: Interior and Front Page
- Not on feature is much smaller than with