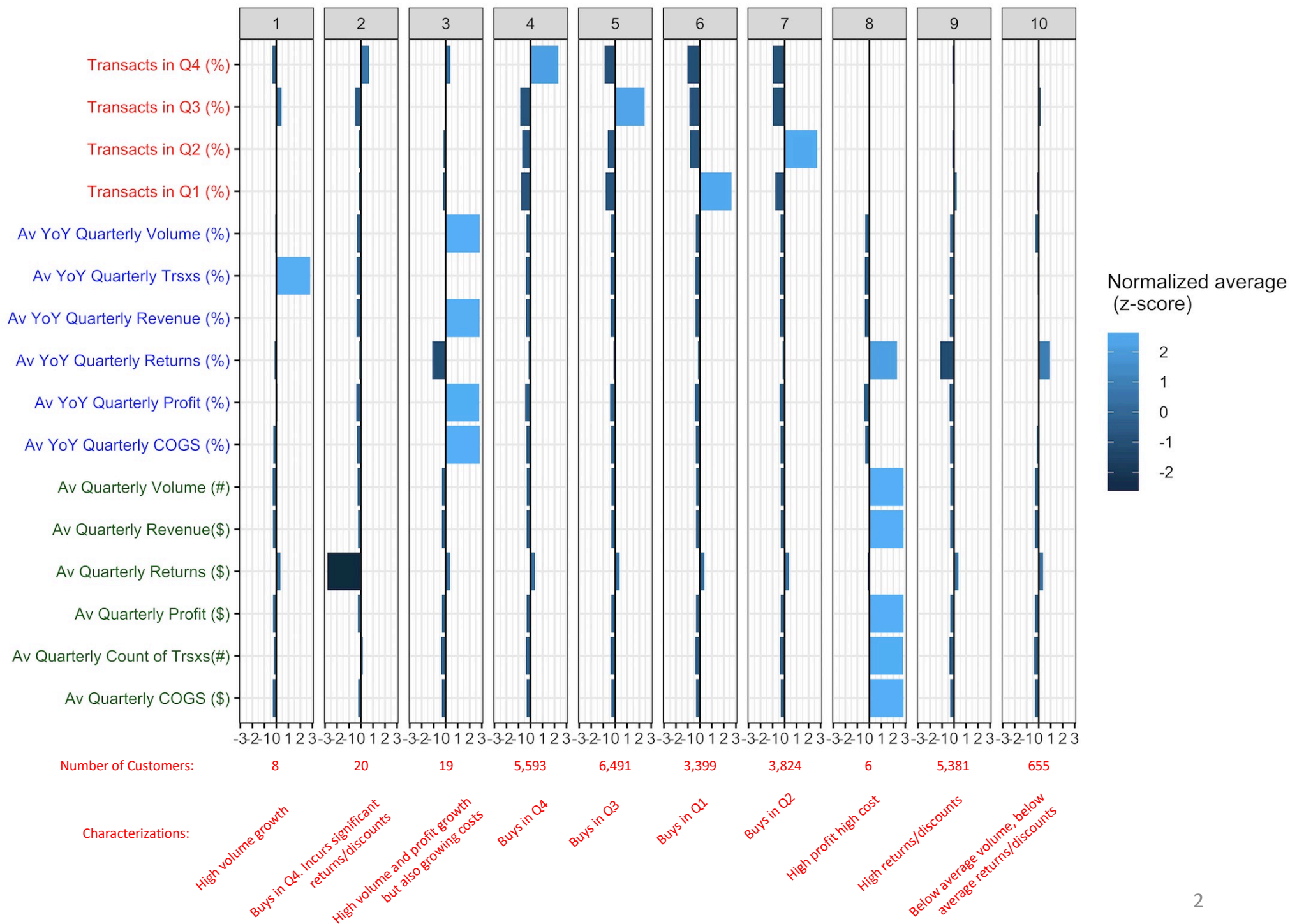


Summary

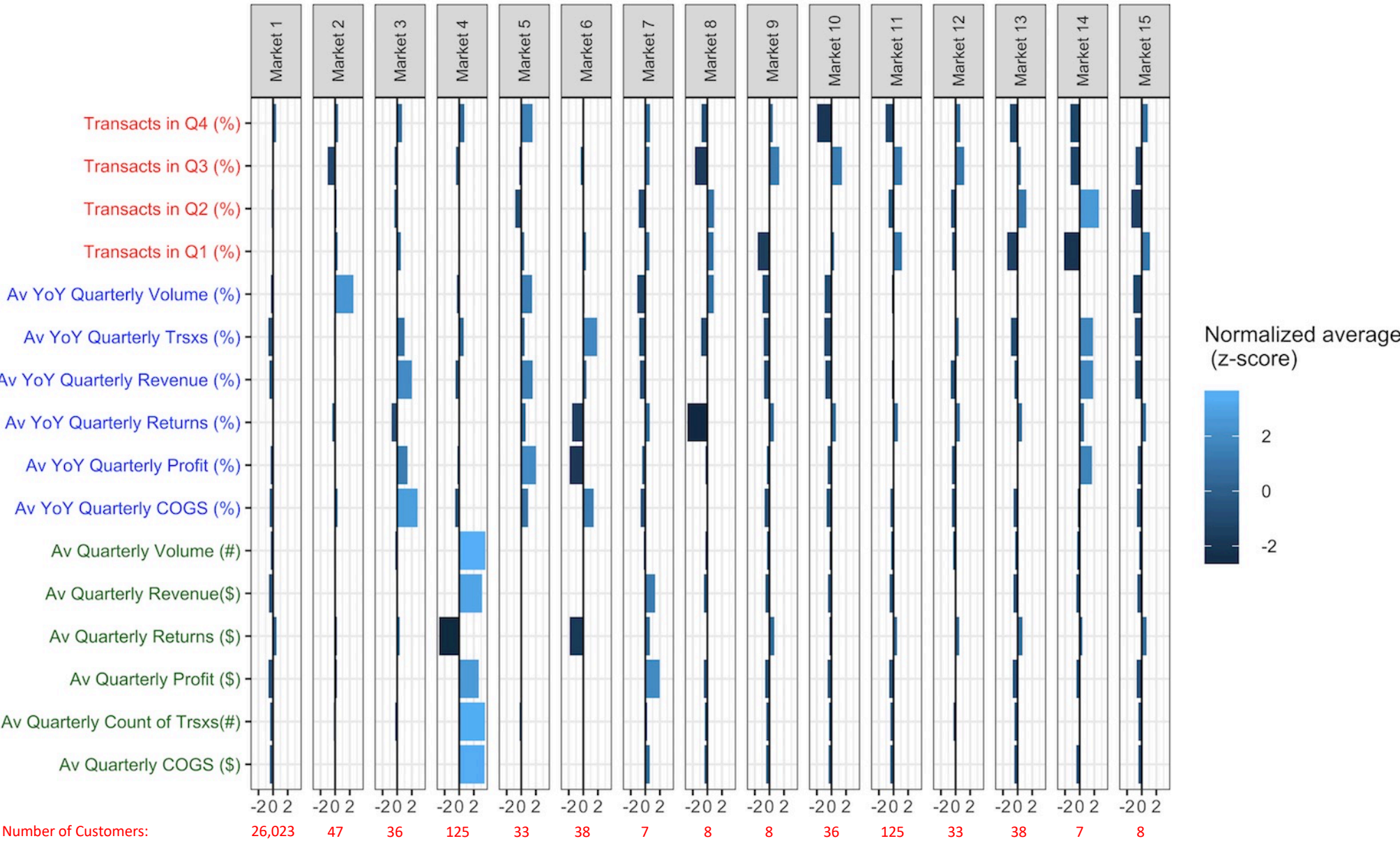
1. The current practice of “End Market” classification fails because “Market 1” makes up >98% of all customers
2. By segmenting customers based on purchasing behavior (e.g., how much, how often, when, where) we can identify like-groupings of customers
3. Targeting underperforming customers may result in incremental revenue and cost improvement
4. Back-of-the-envelope analysis suggests ~700K in potential annual savings:
 - \$333K in potential annual revenue headroom at 25% under-performer lift rate
 - \$361K in potential annual cost reduction at 25% under-performer lift rate
5. Additional areas for exploration:
 - Implement a targeted sales function (BAU: engineers solely responsible for sales)
 - Plant optimization / reduce redundancy
 - Seasonality of purchasing (consolidation, targeting)
 - How sensitive are customers to price increases?
 - Which customers/markets are most influenced by regulations?
 - Target customers based on likelihood of gains (predictive modeling)

Characteristics of Cluster Groups



“End Market” Segmentation Fails because 98% of customers are labeled “Market 1”

Characteristics of End Market Groups



Characterizations:

Entire Portfolio,
mostly unremarkable

...?

...?

...?

Targeting Customers for Interventions

Process:

- Assign a cluster to each customer along with information about common cluster behavior (e.g., average profit, average cost, etc.)
- Identify customers that are under-performing relative to their cluster
- Target customers in order of potential upside (delta from group mean)
- For future exploration: Target customers based on *likelihood of incremental gain (predictive modeling)*

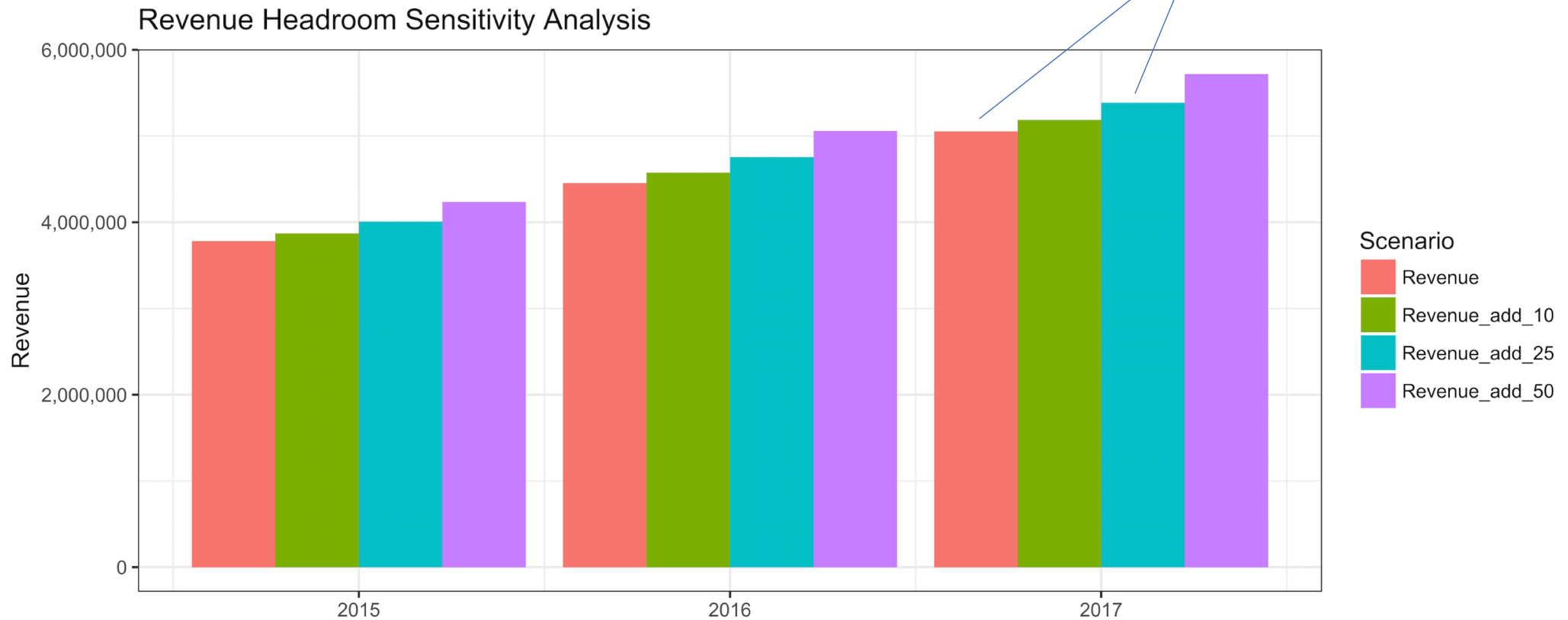
Example: Top 10 Underperforming Customers by profit:

Customer	Cust. Av Quarterly Profit	Cluster Av Quarterly Profit	Delta
Customer 243	\$13,192	\$20,595	\$(7,402)
Customer 126	\$13,422	\$20,595	\$(7,173)
Customer 21670	\$18,175	\$20,595	\$(2,420)
Customer 10569	\$20	\$433	\$(413)
Customer 76	\$20,256	\$20,595	\$(339)
Customer 11669	\$40	\$361	\$(321)
Customer 6118	\$51	\$361	\$(310)
Customer 12692	\$70	\$361	\$(292)
Customer 6108	\$100	\$361	\$(262)
Customer 8197	\$169	\$361	\$(193)

Potential Upside: Increasing Revenues

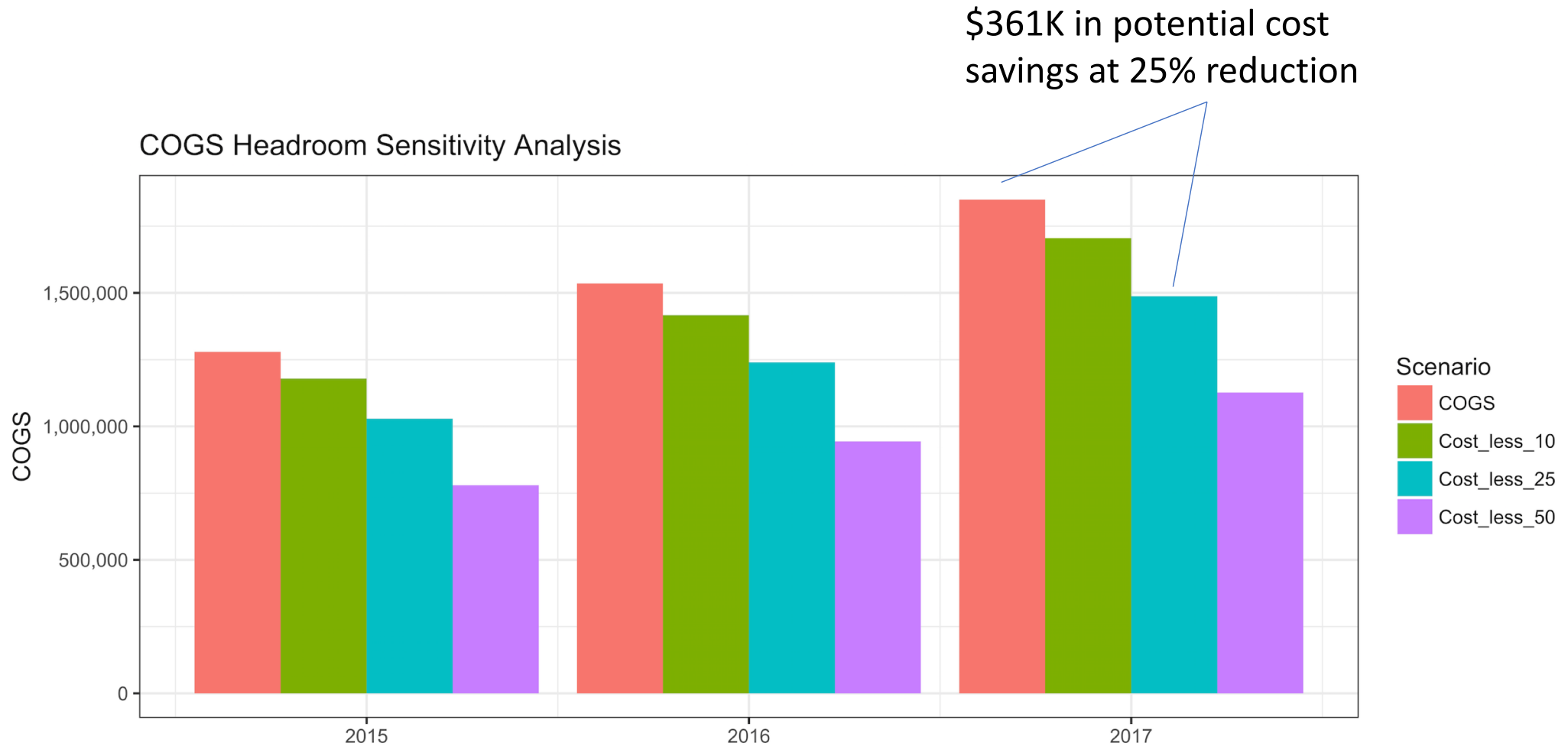
If we increased underperformer revenues by 10%-50%, how much would that be worth?

\$333K in potential cost savings at 25% increase



Potential Upside: Decreasing COGS

If we decreased underperformer costs by 10%-50%, how much would that be worth?



Appendix

Future Topics:

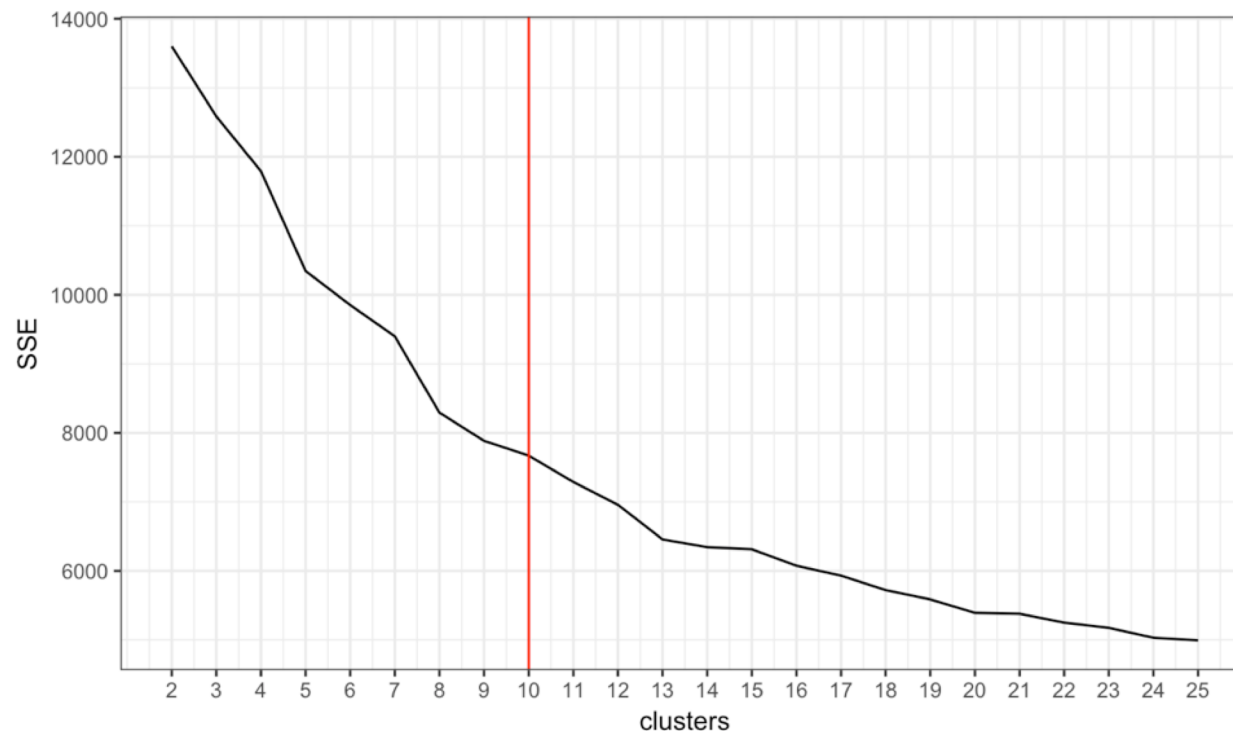
- Employ predictive modeling to target customers based on things like:
 - Predicted sensitivity to increased prices
 - Likelihood of attrition
 - Likelihood to consolidate plants/products
 - Additional data to enhance models:
 - Price of eventual goods sold by customers using our parts
 - Part classifications (materials, intended use, etc.)
 - Factory locations and customer locations
- Network Analysis
 - Which products are antecedents of other products?
 - Opportunities for cross selling?
- Optimization of product mix / manufacturing output
 - What is the exact right mix of products to produce so as to:
 - Maximize revenue
 - Minimize cost
 - Maximize LTV of customer
- Plant optimization
 - Redundancy in plants
 - Consolidation
 - Logistics optimization
 - “Data Envelopment Analysis” to determine relative efficiency of plants

Appendix

Why choose 10 clusters?

- “Elbow” method reveals 10 clusters is optimal
- Few enough to be understandable, and increasing group size incrementally decreases the Sum of Squared Errors within clusters

Within-Cluster Sum of Squared Errors for kmeans across different k



Appendix

Cluster Averages:

Characteristics	Clusters:									
	1	2	3	4	5	6	7	8	9	10
count	8	20	19	5,593	6,491	3,399	3,824	6	5,381	655
Av Quarterly Volume (#)	6,674	11,208	2,970	322	328	415	378	1,156,063	2,375	1,408
Av Quarterly Revenue(\$)	\$619	\$1,009	\$104	\$44	\$41	\$47	\$43	\$41,876	\$156	\$136
Av Quarterly Profit (\$)	\$361	\$433	\$77	\$33	\$31	\$36	\$33	\$20,595	\$107	\$102
Av Quarterly COGS (\$)	\$258	\$576	\$27	\$11	\$10	\$11	\$11	\$21,281	\$48	\$34
Av Quarterly Count of Trxs (#)	111	318	4	3	3	3	3	1,829	6	8
Av Quarterly Returns (\$)	-416%	-44022%	-246%	-65%	-50%	-68%	-54%	-7095%	-136%	-214%
Av YoY Quarterly Volume (%)	4387%	22%	57103%	18%	6%	-40%	-70%	6%	119%	967%
Av YoY Quarterly Revenue (%)	590%	27%	5918%	1%	0%	0%	-5%	11%	45%	551%
Av YoY Quarterly Profit (%)	649%	26%	4027%	-35%	-7%	0%	-3%	8%	41%	536%
Av YoY Quarterly COGS (%)	1355%	47%	44506%	21%	17%	8%	13%	16%	238%	2543%
Av YoY Quarterly Trxs (%)	2843%	32%	310%	0%	-2%	0%	0%	14%	26%	268%
Av YoY Quarterly Returns (%)	0%	0%	-5%	0%	0%	0%	0%	13%	-5%	6%
Transacts in Q1 (%)	22%	18%	16%	1%	1%	94%	2%	24%	29%	20%
Transacts in Q2 (%)	22%	18%	17%	4%	6%	1%	95%	24%	19%	21%
Transacts in Q3 (%)	35%	12%	26%	3%	84%	2%	0%	24%	25%	28%
Transacts in Q4 (%)	21%	48%	40%	91%	6%	2%	4%	28%	26%	31%