

Advanced Analytics Internship Project

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AUGUST 2023

Private Promotion Activation Q2 | Summary Results

Promo-inactive Members were sent one of two promotions to try to reactive members into promotions

Segment	Tenure	P(REG)	P(15K Choice)	Optimal Offer	Registration Rate		(Mitigated) % Incremental RmNts	
					15K	5K	15K	5K
1	0-12M	High/Med	High	15K	1.3%	1.5%	1.10%	0.07%
2			Med	-		1.1%		1.56%
3			Low	5K	1.9%	2.9%	-3.79%	-0.11%
4		Low	High/Med/Low	5K	0.3%	0.4%	0.00%	0.35%
5	12M+	High	High	15K	2.9%	3.4%	0.00%	1.11%
6			Med/Low	-		3.5%		0.00%
7		Med/Low	High/Med/Low	-		0.6%		1.19%
Overall					1.07%	0.90%	\$ 23K	\$ 1.2M

While 15K offer has higher registration rate, each segment has 5K offer with higher registration rates

Negative Incrementality observed on several segments

- Results driven from small sample sizes, inequivalence, outlier high volumes
- Several mitigation methods resulted no substantial change
- Final incremental results based on mitigating algorithms

RECOMMENDATION & NEXT STEPS

- Since new members do not have substantial history, exclude new members from future promo-inactive campaigns
- No longer provide 15K promotional offer for promo-inactive members

Background: Prior Campaigns

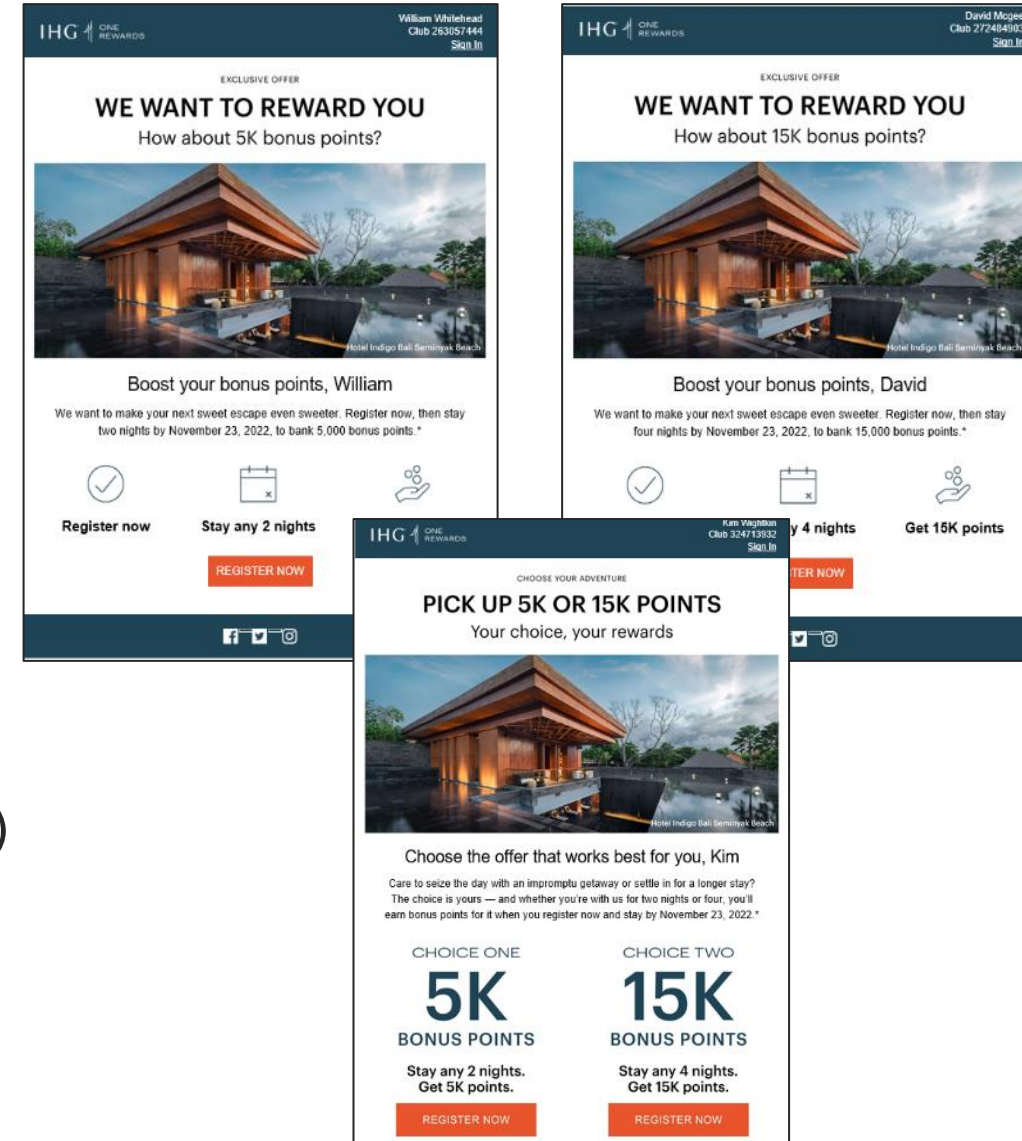
In Q3/4 2022, IHG ran two concurrent promotions

Pick Your Payout: all current IHGOR members provided offer to choose incentive

- Every 2 nights, receive 2k points (2K2N)
- Every 4 nights, receive 10k points (10K4N)

Private Promotion Activation: promo-inactive (no participation in Multi-Brand promo in 2022) IHGOR members with one of following incentives (random design)

- Stay 2 nights, receive 5k points (5K2N)
- Stay 4 nights, receive 15k points (15K4N)
- Choice of one of the above



Private Campaign Promotion with Optimization

IHG sent promotion to similar IHGOR members (5.6M inactive – not participated in any Multi-Brand promotion) with similar set of incentives

- Stay 2 nights, receive 5k points (5K2N)
- Stay 4 nights, receive 15k points (15K4N)
- *No Choice offer*

Stay Dates: May 12 – June 26

Offers determined by

- Member Tenure: (<12 months & 12+ months)
- P(Register): (Propensity to Register into Campaign)
- P(15K|Choice): (Selects 15K when offered choice)
- Optimal Offer: (Estimated incrementality based on previous private campaign)

Tenure	P(Register)	P(15K Choice)	Optimal Offer	Sizing / Distribution		
				5K	15K	Control
<12 months	High/Med	High	15K	20%	60%	20%
		Med	None	50%	0%	50%
		Low	5K	60%	20%	20%
	Low	High/Med/Low	5K	60%	20%	20%
12+ months	High	High	15K	20%	60%	20%
		Med/Low	None	50%	0%	50%
	Med/Low	High/Med/Low	None	50%	0%	50%

Probability Category	Deciles
High	1-3
Med	4-8
Low	9-10

Not every member segment has same sizing (controls and tests)

Campaign Registration Rate

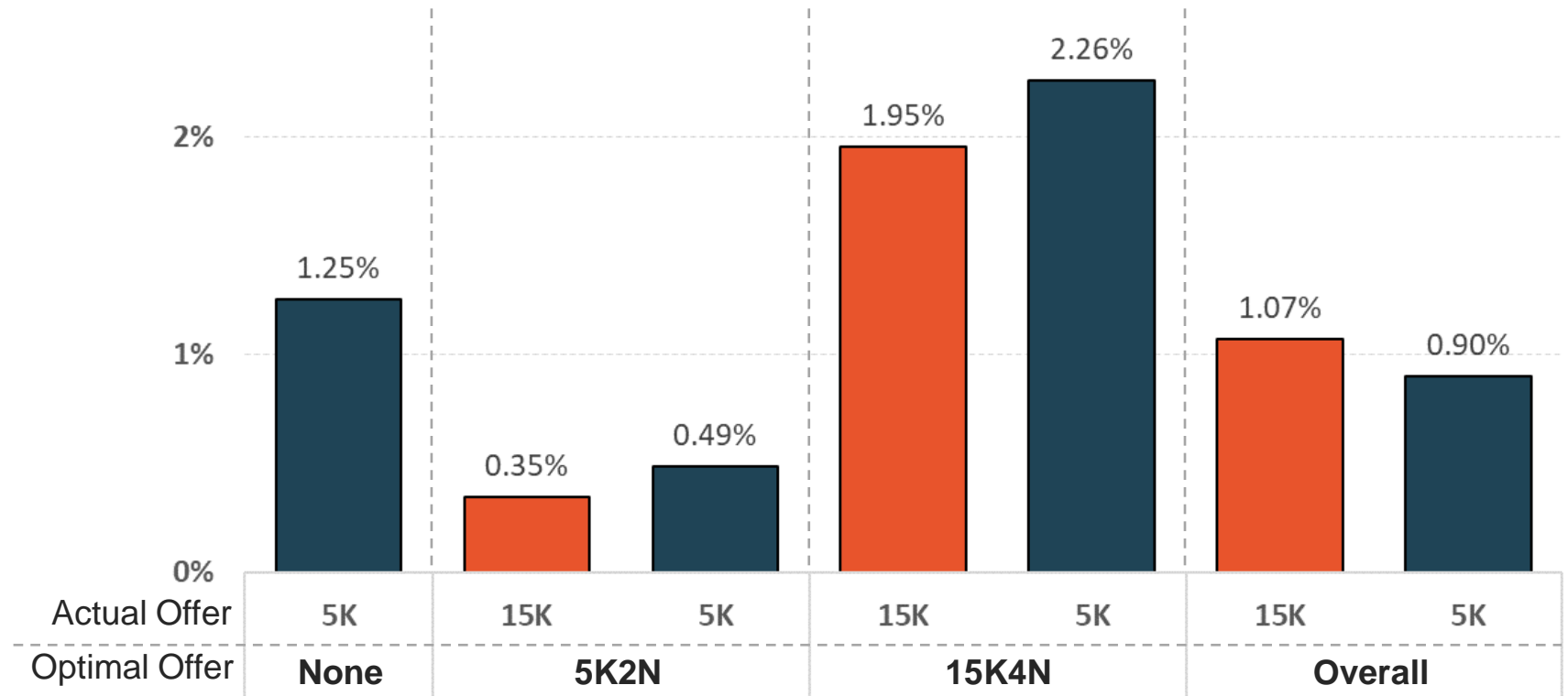
ADVANCED ANALYTICS
2023 INTERNSHIP
PROJECT

0.94% registered overall

15K4N offer appears to have a higher registration rate

Further analysis and segmentation by Optimal Offer (determined from previous campaign results) and Sent Offer shows 5K2N offer outperforms 15K4N offer

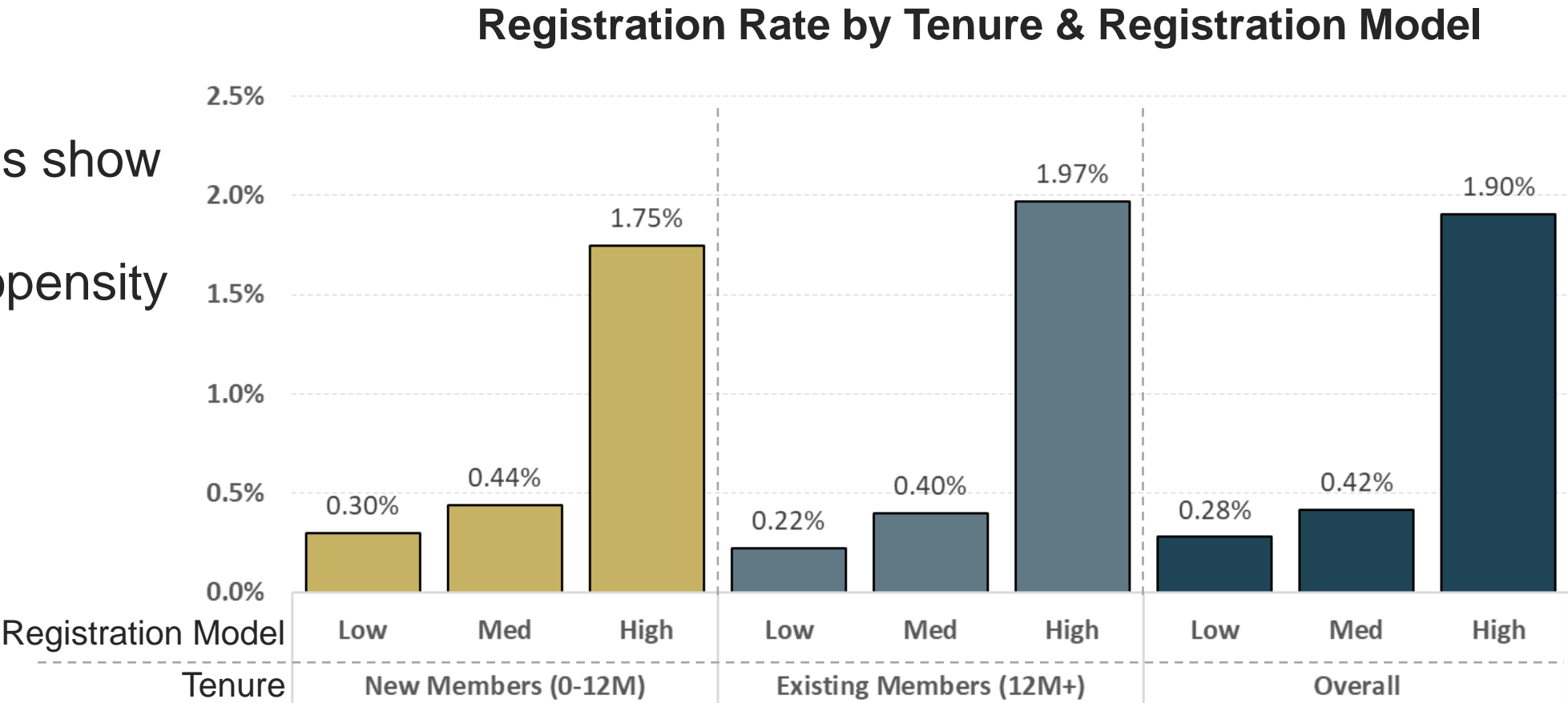
Registration Rate by Promo Offer and Optimal Offer



SIMPSON'S PARADOX!

Registration Model Efficacy

Registration rates show
model built for
registration propensity
worked!



Campaign Bias Mitigation

Negative incrementality driven from

- Small sample sizes
- Inequivalence between treatment groups

Difference of Differences

- Compares promo period (45 days) to pre-promo period (45 days)
- Measures incremental RmNts within each time period
- Next, measures difference of incremental RmNts against each time period
- 15K4N offer incremental revenue accurately changed (\$650K → \$23K)

Segment	Tenure	P(REG)	P(15K Choice)	Optimal Offer	Members			(Pre-Campaign) % Incremental RmNts		(Actual-Campaign) % Incremental RmNts		(Mitigated) % Incremental RmNts		
					15K	5K	Control	15K	5K	15K	5K	15K	5K	
1	0-12M	High/Med	High	15K	372,461	124,168	124,434	0.80%	-0.68%	1.91%	-0.61%	1.10%	0.07%	
2			Med	-		288,324	288,322		-0.98%		0.58%		1.56%	
3			Low	5K	25,807	77,435	25,756	2.58%	0.68%	-1.20%	0.57%	-3.79%	-0.11%	
4		Low	High/Med/Low	5K	721,843	2,165,718	721,322	-0.82%	-0.59%	-0.84%	-0.24%	0.00%	0.35%	
5	12M+	High	High	15K	246,376	82,128	82,431	0.14%	2.42%	0.11%	3.53%	0.00%	1.11%	
6			Med/Low	-		385,660	385,592		0.68%		0.68%		0.00%	
7			Med/Low	High/Med/Low	-		1,167,185	1,167,348		-0.41%		0.77%		1.19%
Overall											\$ 650K	\$ 1.2M	\$ 23K	\$ 1.2M

Campaign Performance

Relative to new members (0-12M), existing members show stronger engagement and performance

- Higher Incrementality
- Higher registration rates

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6			Med/Low	-		3.5%		0.00%
7		Med/Low	High/Med/Low	-		0.6%		1.19%
Overall					1.07%	0.90%	\$ 23K	\$ 1.2M

OBSERVATIONS

- Imbalance between treatment group
- Registration model was accurate and strong predictor of promotional registration
- New members (0-12M) do not have as much time to have engaged a promotion
- Higher registration rates and incrementality for 5K2N offer compared against 15K4N offer
- While total award costs not measured, 15K point award has higher cost than 5K point award

RECOMMENDATION & NEXT STEPS

- Thorough QA checks before campaign launch
- Continue collaboration with Advanced Analytics to leverage statistical modeling for targeting
- Exclude new members (0-12M) on future promo-inactive campaigns
- No longer provide 15K4N promotional offer for promo-inactive members

THANK YOU!

Questions?

Bias Mitigation

Mitigating Negative Incrementality

Negative Incrementality observed for several segments (control out-stayed tests)

- EX: Segment 8

Segment	Tenure	P(REG)	P(15K Choice)	Optimal Offer	Members			Registration Rate		RmNts / Member			% Incremental RmNts / Member	
					15K	5K	CONTROL	15K	5K	15K	5K	CONTROL	15K	5K
1	0-12M	High	High	15K	187,545	62,533	62,631	2.06%	2.23%	1.2761	1.2496	1.2413	2.80%	0.67%
2			Med	-		49,698	49,713		2.52%		0.4243	0.4300		-1.34%
3			Low	5K	19,734	59,196	19,639	2.23%	3.34%	0.4382	0.4434	0.4415	-0.73%	0.45%
4		Med	High	15K	184,916	61,635	61,803	0.54%	0.76%	0.1841	0.1742	0.1922	-4.20%	-9.34%
5			Med	-		238,626	238,609		0.77%		0.1047	0.1024		2.28%
6			Low	5K	6,073	18,239	6,117	0.92%	1.24%	0.1790	0.1911	0.1903	-5.94%	0.41%
7		Low	High	5K	186,143	558,581	186,287	0.29%	0.33%	0.0803	0.0823	0.0822	-2.24%	0.14%
8			Med	5K	378,113	1,134,316	377,959	0.24%	0.36%	0.0549	0.0540	0.0540	1.68%	-0.01%
9			Low	5K	157,587	472,821	157,076	0.40%	0.59%	0.0521	0.0537	0.0544	-4.22%	-1.39%
10	12M+	High	High	15K	246,376	82,128	82,431	2.93%	3.39%	1.9815	2.0492	1.9793	0.11%	3.53%
11			Med	-		186,702	186,694		2.83%		0.4924	0.4958		-0.70%
12			Low	-		198,958	198,898		4.02%		0.5320	0.5221		1.90%
13		Med	High	-		123,949	123,997		0.80%		0.6932	0.6826		1.56%
14			Med	-		221,611	221,620		0.76%		0.2275	0.2259		0.72%
15			Low	-		93,276	93,267		0.85%		0.2089	0.2033		2.76%
16		Low	High	-		158,331	158,430		0.47%		0.2773	0.2867		-3.27%
17			Med	-		475,396	475,363		0.39%		0.1384	0.1369		1.09%
18			Low	-		94,622	94,671		0.67%		0.1366	0.1288		6.07%
Overall Incremental Revenue													\$621,305	\$1,231,177

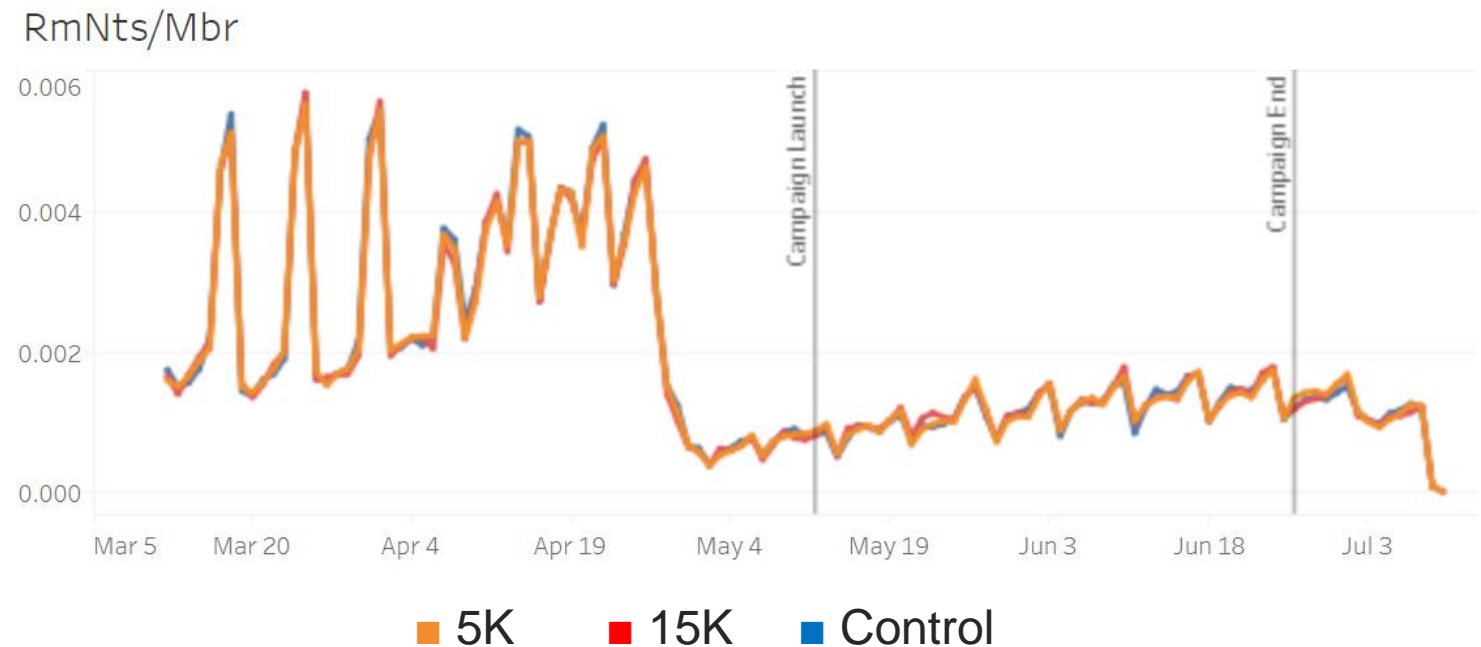
Inequivalence Example

Segment 8

- Tenure: 0-12M
- P(Register): Low
- P(15K | Choice): Med

Two months prior to campaign launch, Control has higher RmNts compared to promotional offers

- 5K offer has 1 % fewer RmNts compared to Control (RmNts/Mbr: 0.156 vs 0.158)
- 15K offer has 2 % fewer RmNts compared to Control (RmNts/Mbr: 0.155 vs 0.158)



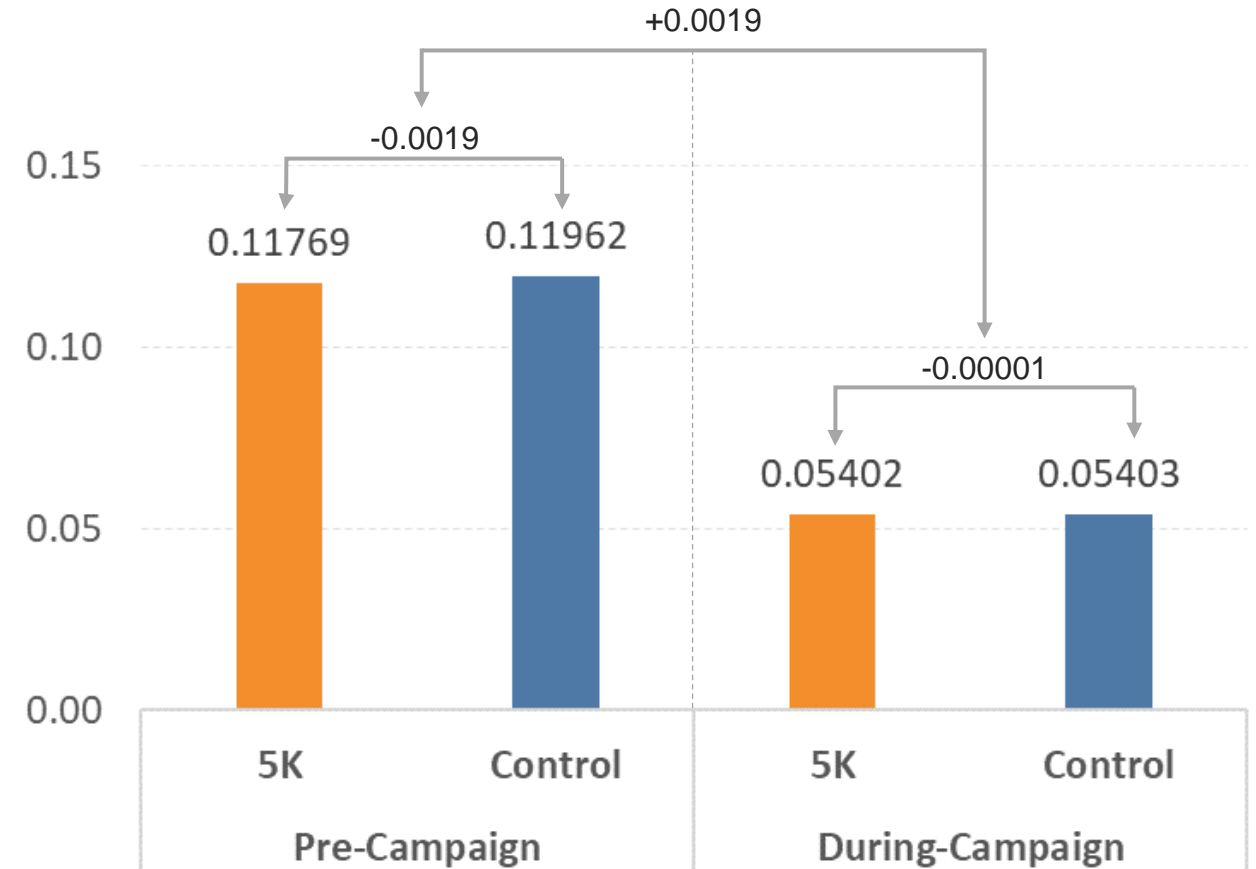
Methodology: Difference of Differences

Segment 8

- Tenure: 0-12M
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Difference of Differences

- Compares promo period (45 days) to pre-promo period (45 days)
- Measures incremental RmNts (5K test offer against control offer) within each time period
- Next, measures difference of incremental RmNts against each time period



Difference of Differences

Further examination of difference between campaign (45 days) and 45 days prior showed incremental revenue

- Substantial decrease for 15K offer (\$621K → \$26K)
- No substantial change for 5K offer (\$1.2M → \$1.2M)

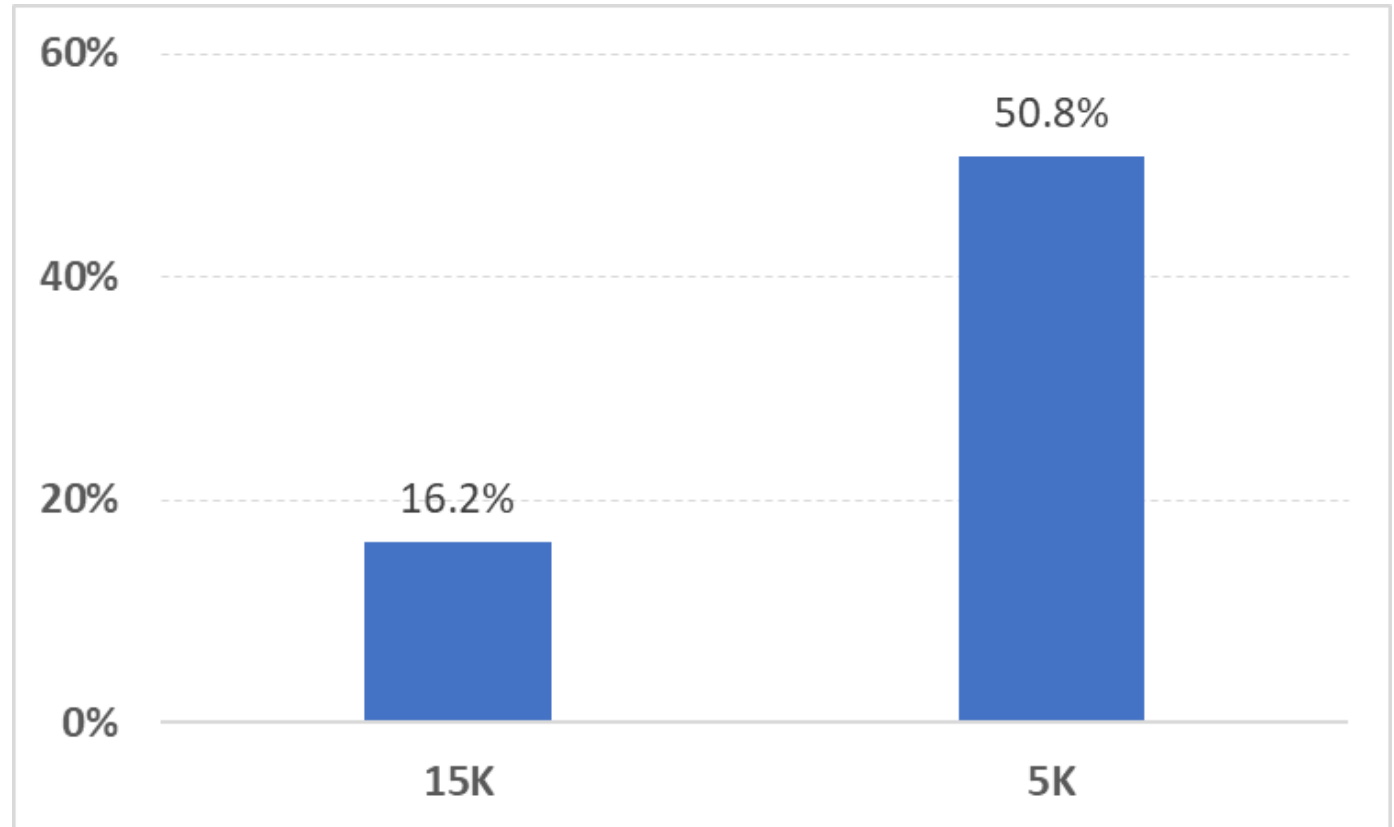
Segment	Tenure	P(REG)	P(15K Choice)	Optimal Offer	(Pre-Campaign) RmNts / Member			(In-Campaign) RmNts / Member			(Original) % Incremental RmNts / Member		(Diff) % Incremental RmNts / Member		
					15K	5K	CONTROL	15K	5K	CONTROL	15K	5K	15K	5K	
1	0-12M	High	High	15K	2.6405	2.5983	2.6169	1.2761	1.2496	1.2413	2.80%	0.67%	1.90%	1.38%	
2			Med	-			0.6956	0.6986		0.4243	0.4300		-1.34%		-0.91%
3			Low	5K	0.4542	0.4483	0.4429	0.4382	0.4434	0.4415	-0.73%	0.45%	-3.30%	-0.78%	
4		Med	High	15K	0.6185	0.6125	0.6170	0.1841	0.1742	0.1922	-4.20%	-9.34%	-4.45%	-8.60%	
5			Med	-			0.3594	0.3638		0.1047	0.1024		2.28%		3.48%
6			Low	5K	0.7588	0.7363	0.7366	0.1790	0.1911	0.1903	-5.94%	0.41%	-8.94%	0.46%	
7		Low	High	5K	0.2272	0.2278	0.2281	0.0803	0.0823	0.0822	-2.24%	0.14%	-1.83%	0.28%	
8			Med	5K	0.1166	0.1177	0.1196	0.0549	0.0540	0.0540	1.68%	-0.01%	4.20%	1.61%	
9			Low	5K	0.3418	0.3405	0.3412	0.0521	0.0537	0.0544	-4.22%	-1.39%	-4.40%	-1.19%	
10	12M+	High	High	15K	2.6603	2.7209	2.6565	1.9815	2.0492	1.9793	0.11%	3.53%	-0.03%	1.11%	
11			Med	-			0.5527	0.5533		0.4924	0.4958		-0.70%		-0.59%
12			Low	-			0.5321	0.5244		0.5320	0.5221		1.90%		0.43%
13		Med	High	-			0.9037	0.9055		0.6932	0.6826		1.56%		1.75%
14			Med	-			0.2918	0.2946		0.2275	0.2259		0.72%		1.67%
15			Low	-			0.2949	0.2956		0.2089	0.2033		2.76%		3.02%
16		Low	High	-			0.1898	0.1967		0.2773	0.2867		-3.27%		0.24%
17			Med	-			0.0983	0.0977		0.1384	0.1369		1.09%		0.48%
18			Low	-			0.2928	0.2878		0.1366	0.1288		6.07%		4.34%
Overall Incremental Revenue:											\$621,305	\$1,231,177	\$26,068	\$1,177,360	

Appendix

Member Distribution by Offer

Over half of the members that were sent an offer were sent the 5K offer

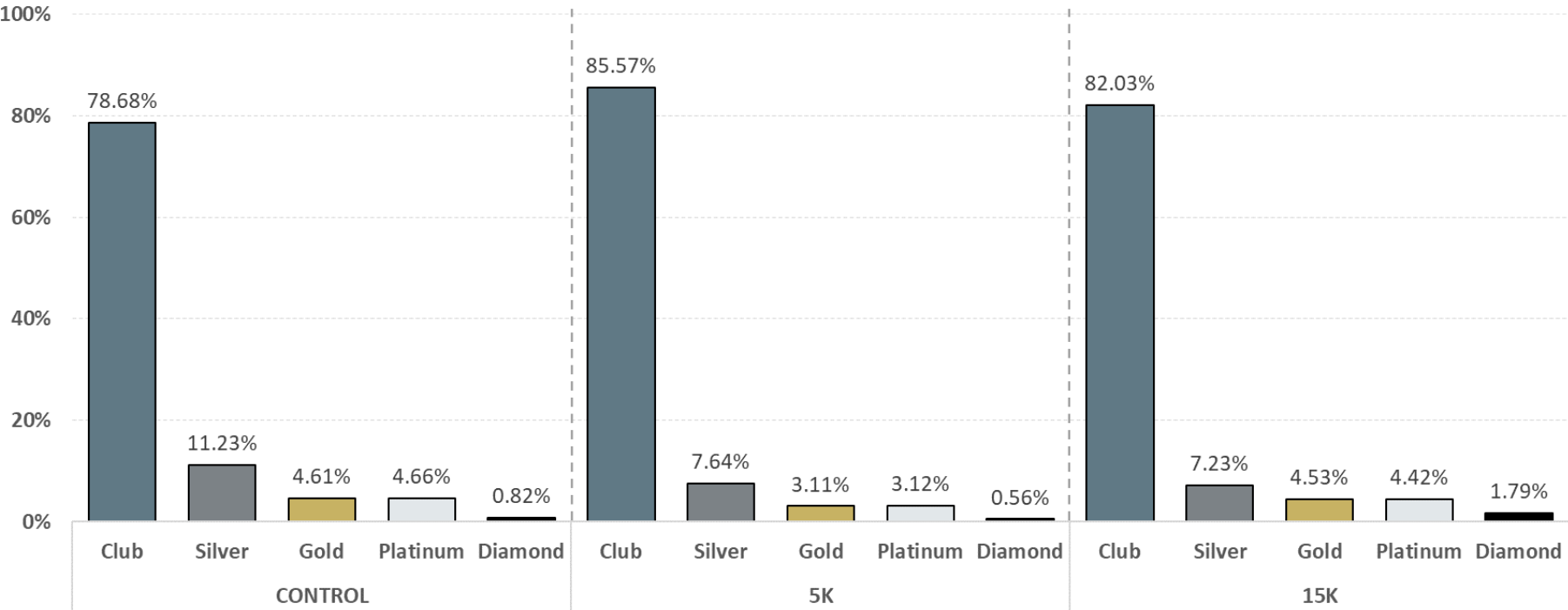
Percent of Members by Promo Offer



Member Distribution by Offer

More members that
were sent the 15K
offer were a higher
membership tier

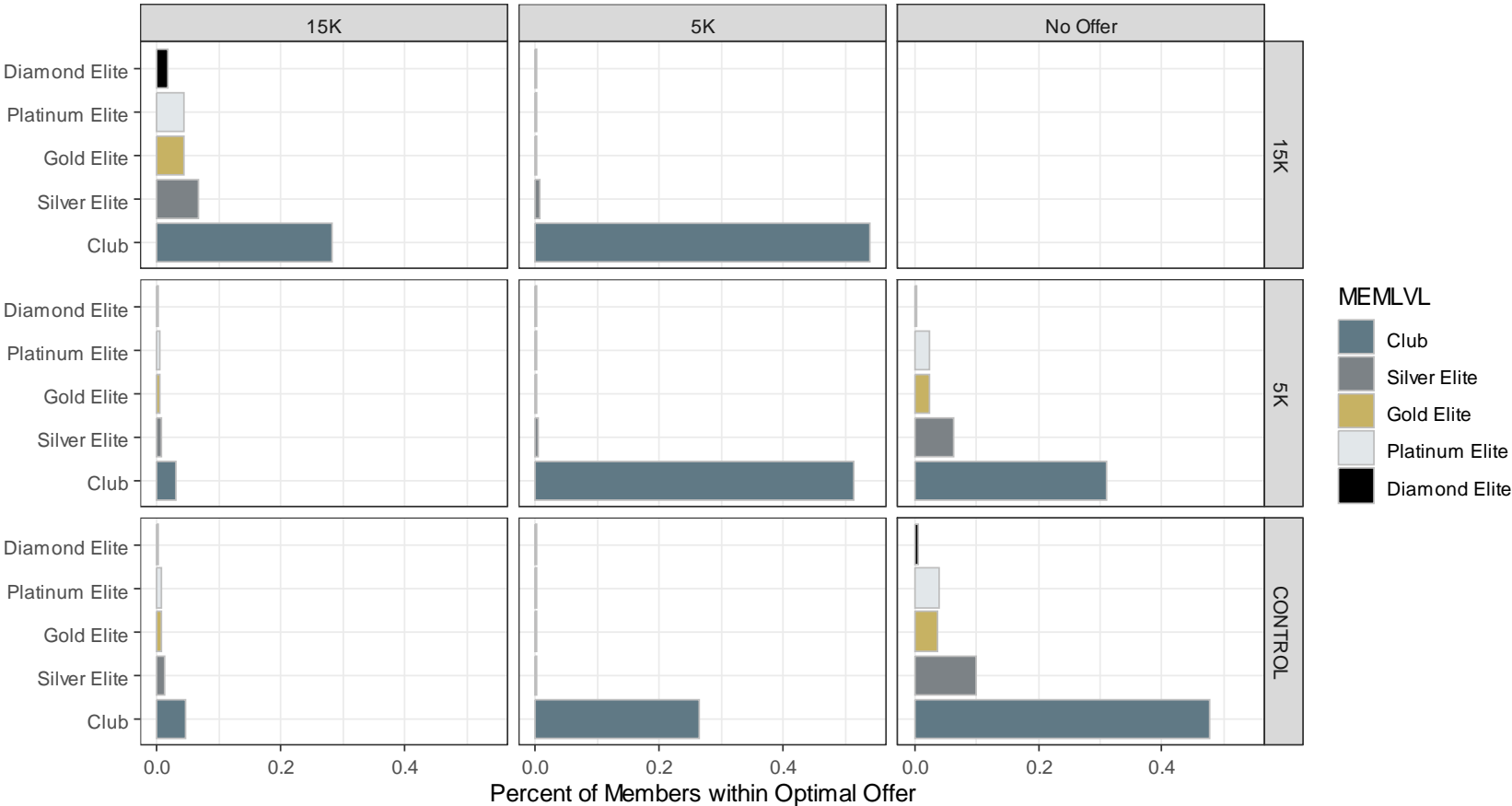
Percent of Members by Promo-Offer and
Membership Tier



Member Distribution by Offer

M

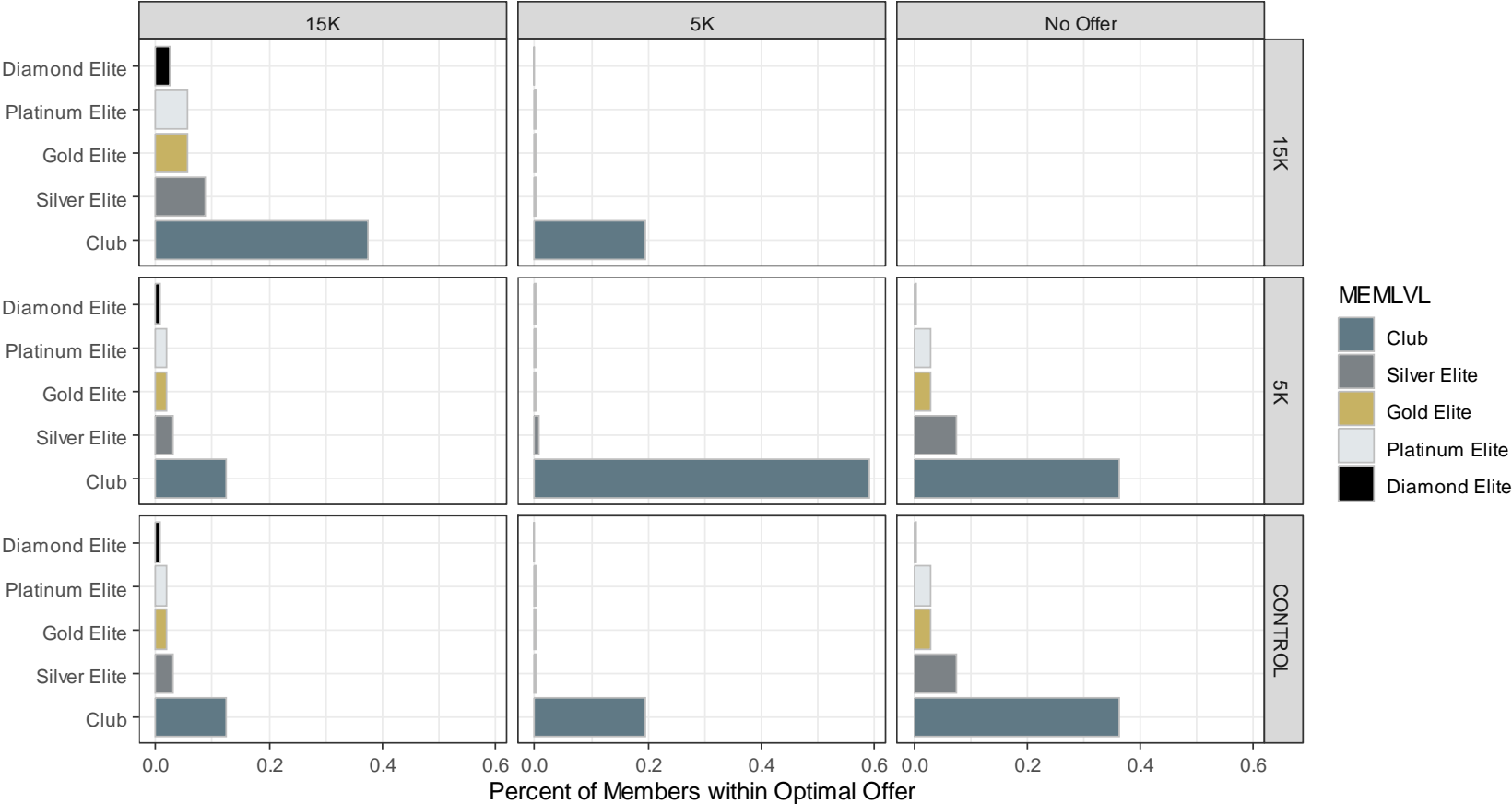
Percent of Members within PROMO_OFFERs



Member Distribution by Offer

M

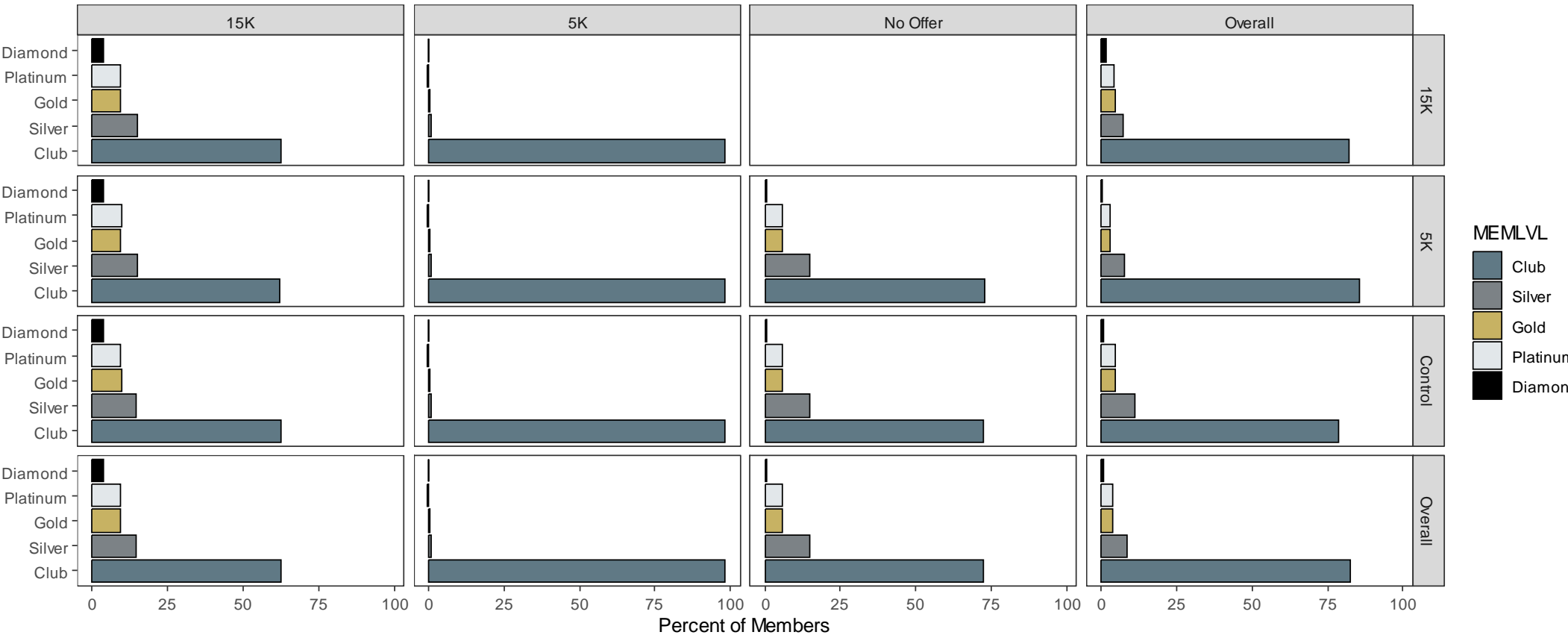
Percent of Members within OPTIMAL_OFFERs



Member Distribution by Offer

D

Percent of Members within Actual Offer
(PROMO_OFFERS) & Optimal Offer (OPTIMAL_OFFERS)



Inequivalence Example

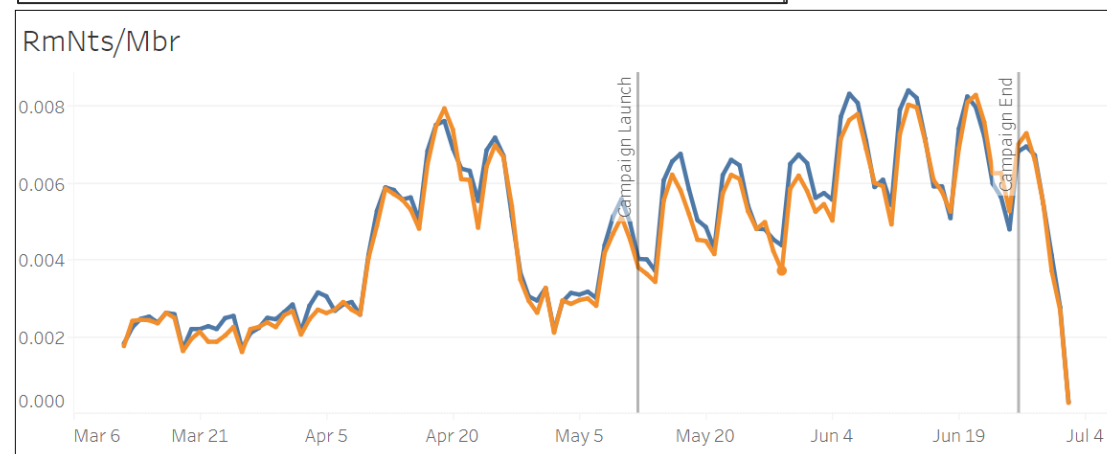
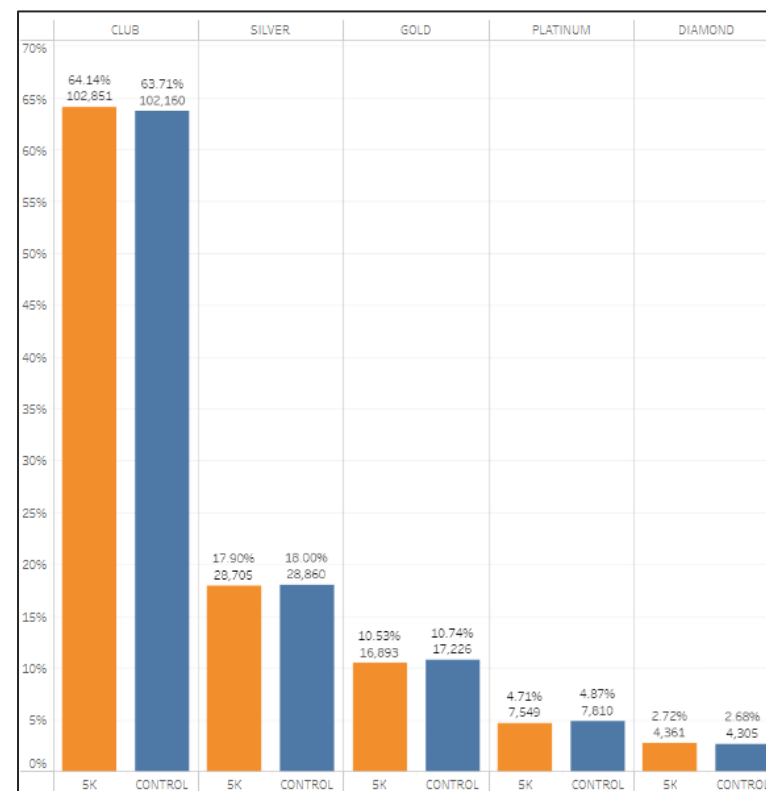
Segment

- Tenure: 12M+
- P(Register): Low
- P(15K | Choice): High

~160k members per treatment group

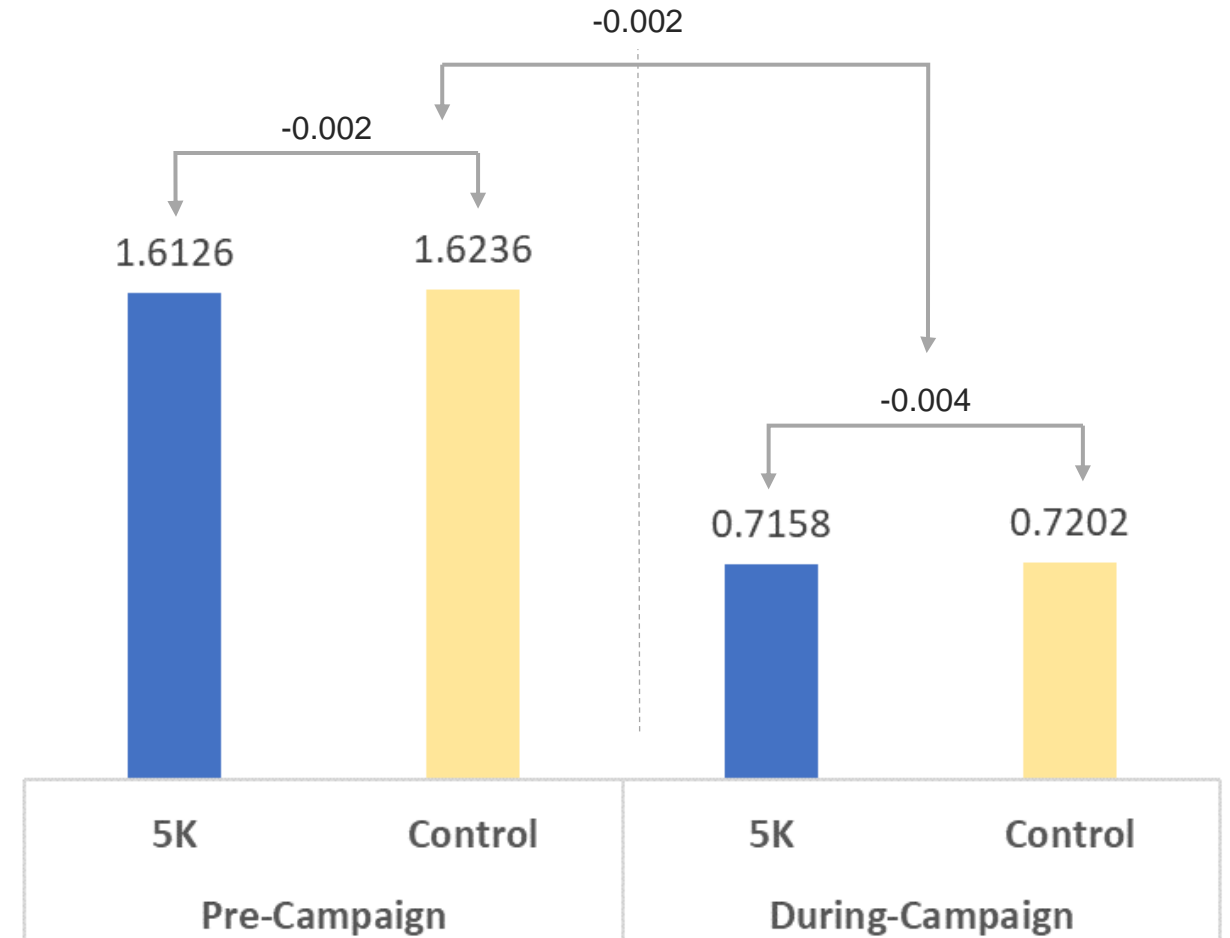
Elite tiers over index by 42 bps in control (relative to 5K offer), from original recommendation

Further analysis showed, 2 months prior to campaign launch, 5K offer has 4% fewer RmNts compared to Control (RmNts/Mbr: 0.22 vs 0.23)



Methodology: Difference of Differences

- *Segment*
 - Tenure: 0-12M+
 - P(Register): High/Med
 - P(15K | Choice): High
- *Difference of Differences*
 - Compares promo period (45 days) to pre-promo period (45 days)
 - Measures incremental RmNts (5K test offer against control offer) within each time period
 - Next, measures difference of incremental RmNts against each time period



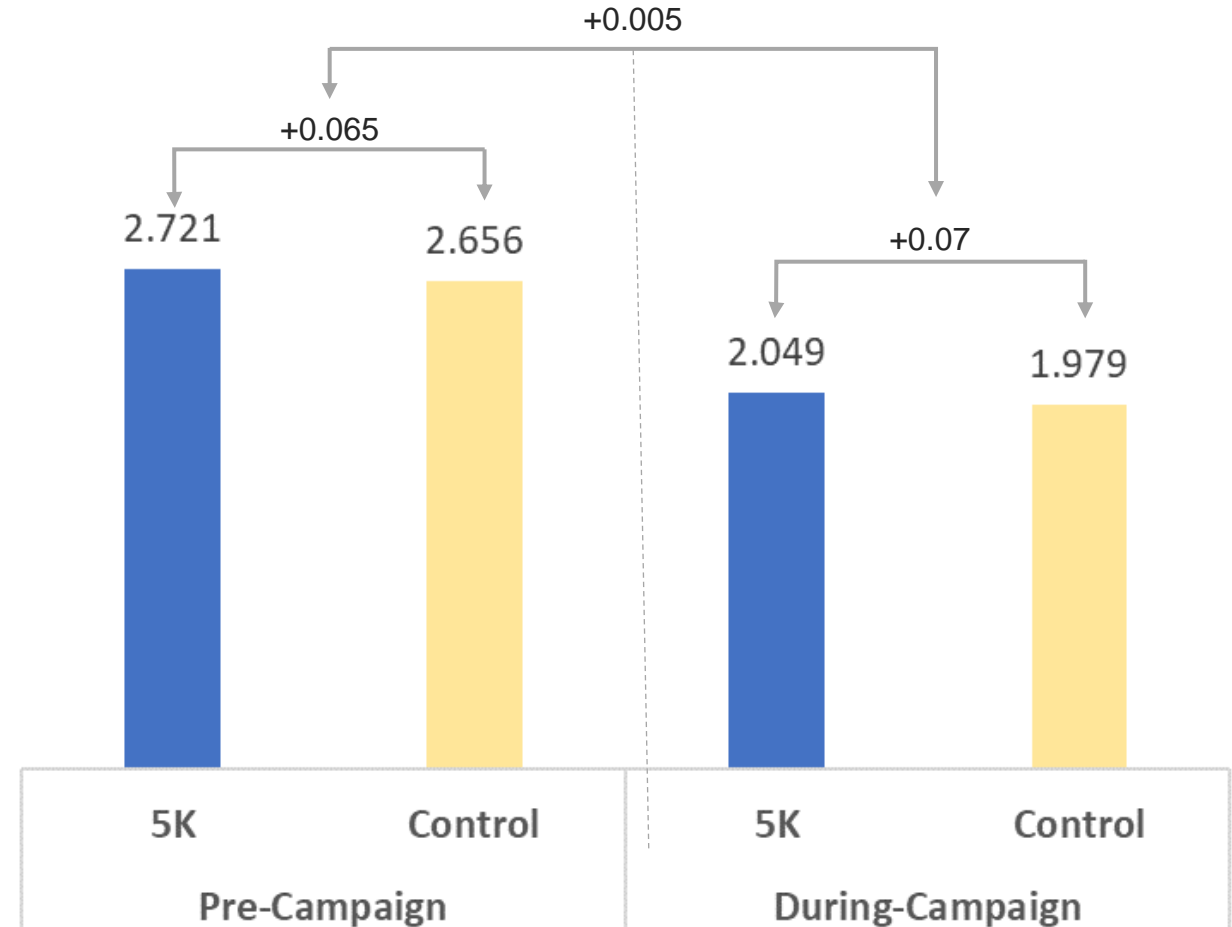
Methodology: Difference of Differences

- *Segment*

- Tenure: 12M+
- P(Register): High
- P (15K | Choice): High

- *Difference of Differences*

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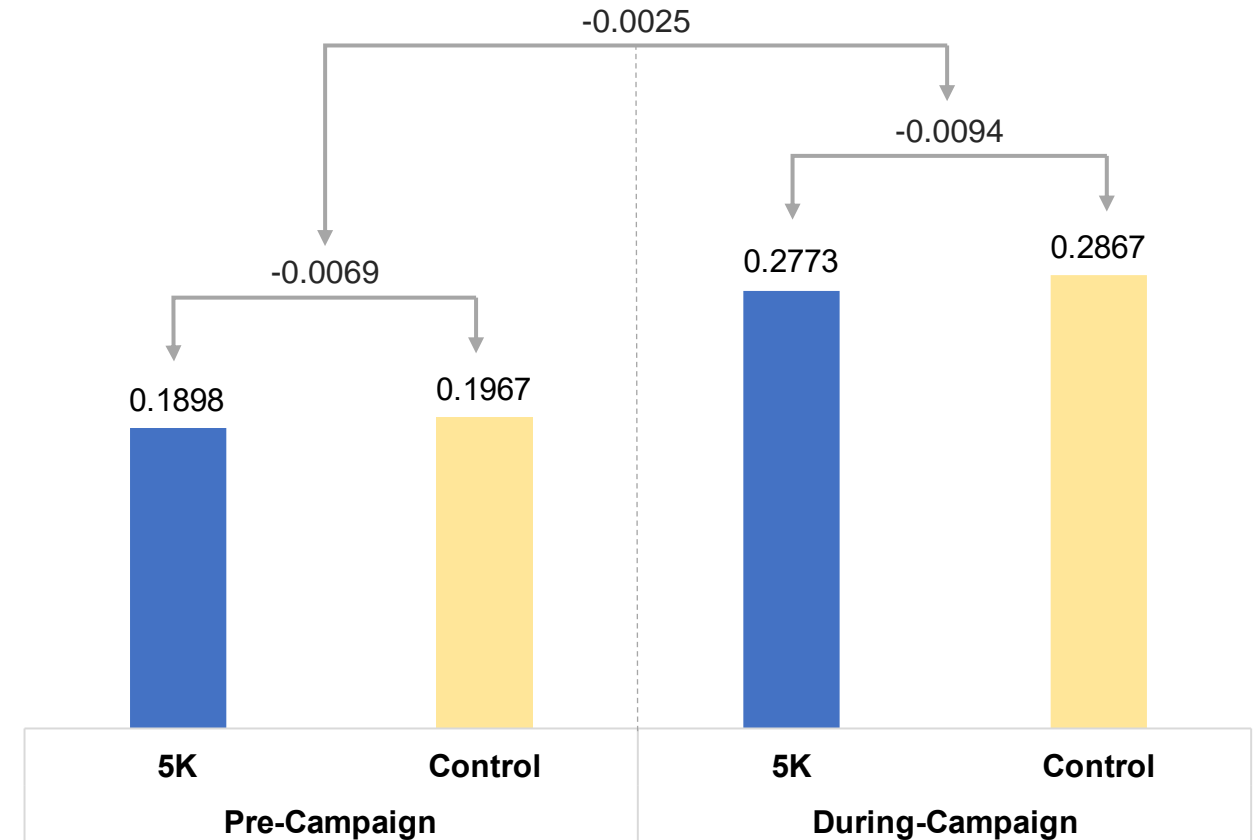
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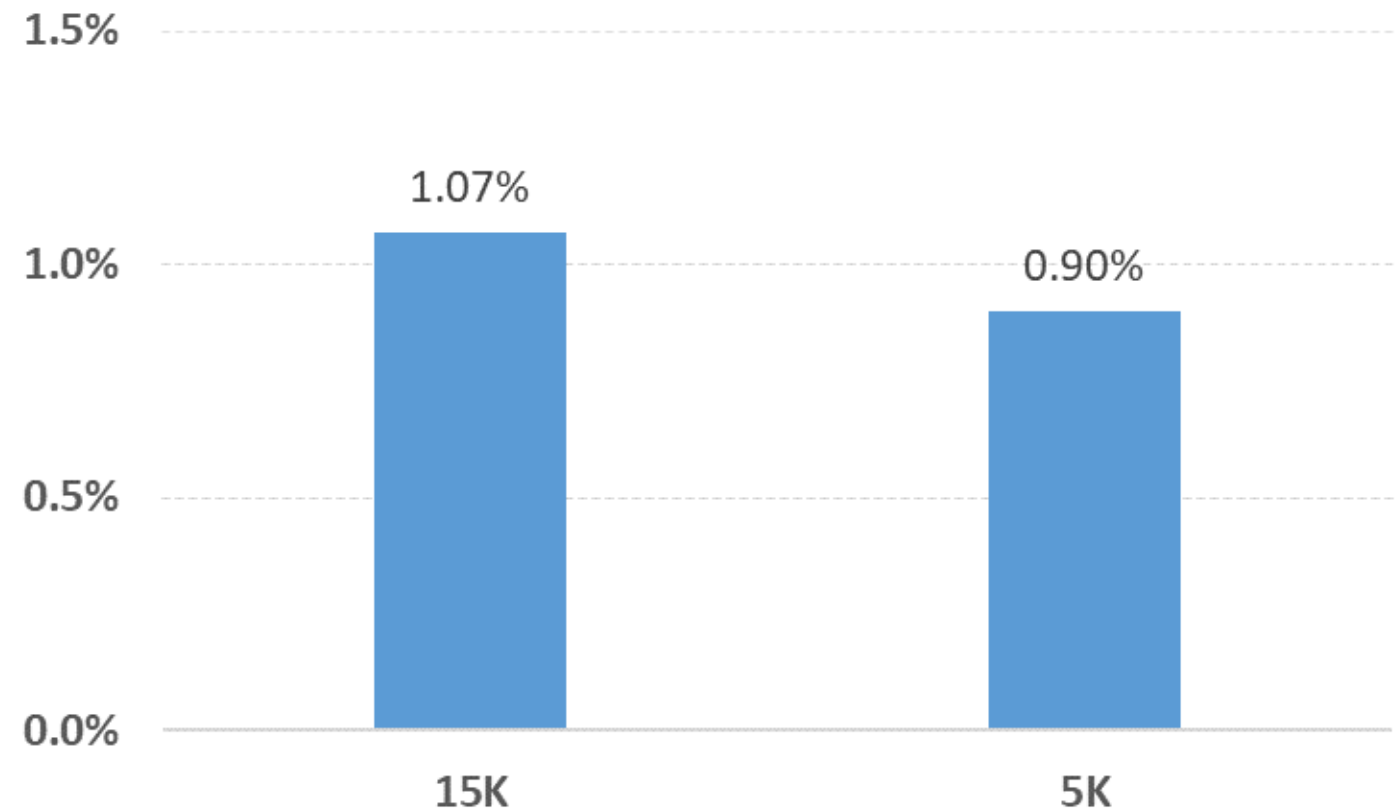
Campaign Registration Rate

5.6 million promo-inactive members received one of two offers

0.94 % registered overall

- 15K: 14,653
- 5K: 38,667

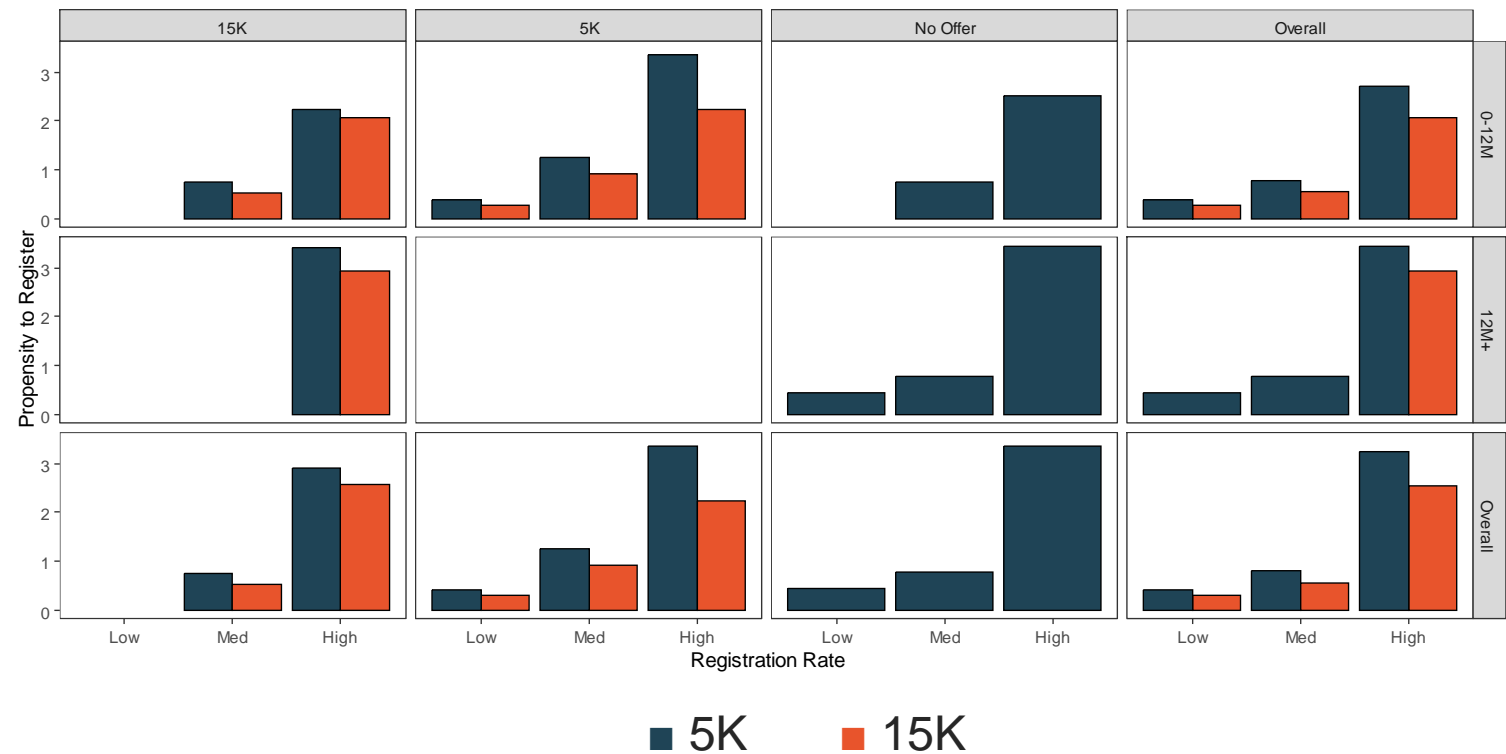
Registration Rate by Promo Offer



Registration Model Efficacy

Registration rates show
model built for registration
propensity worked!

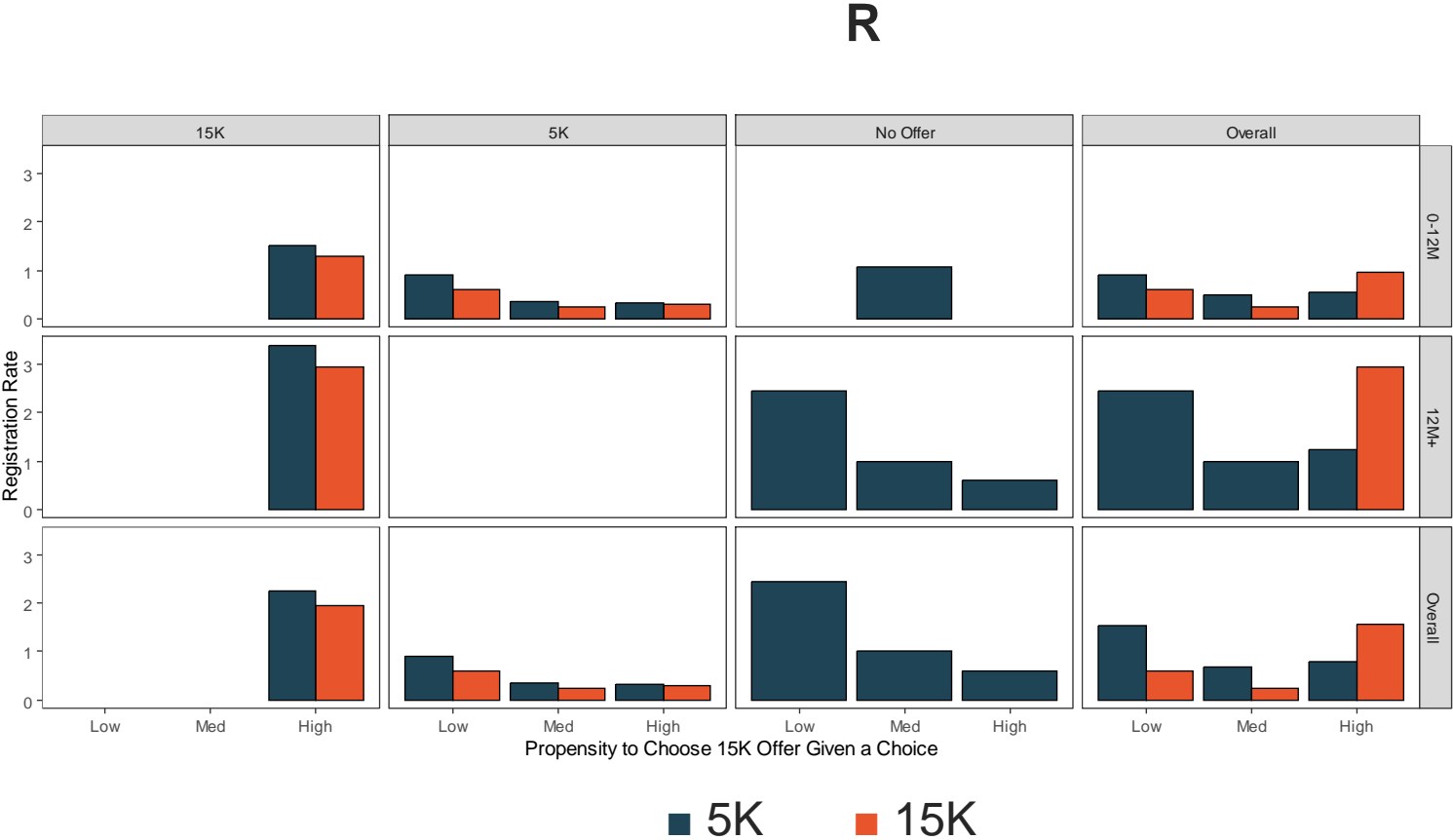
Registration Rate by Tenure & P(Registration)



Choice Model Efficacy

Talk about reg rate for
 $P(15K|Choice)$

Move to appendix



Appendix

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3			Low	5K	25,807	77,435	25,756	1.9%	2.9%	-1.20%	0.57%	-3.79%	-0.11%
4		Low	High/Med/Low	5K	721,843	2,165,718	721,322	0.3%	0.4%	-0.84%	-0.24%	-0.01%	0.35%
5	12M+	High	High	15K	246,376	82,128	82,431	2.9%	3.4%	0.11%	3.53%	-0.03%	1.11%
6			Med/Low	-		385,660	385,592		3.5%		0.68%		-0.01%
7		Med/Low	High/Med/Low	-		1,167,185	1,167,348		0.6%		0.77%		1.19%
Overall Incremental Revenue										\$649,712	\$1,229,287	\$22,853	\$1,158,417

Tell a Story – Steven Example Story arc

TELL A STORY

1. Neg inc- new members major neg, existing members better control group selection
2. New members show neg inc. Existing members control group distribution breakdown across member attributes (ei. business/leisure, region mix)
3. Top three characteristics that show why the control group outstayed the test groups. (Think about how changing the characteristics would change the inc revenue outcome). Bus mix and region mix have to be equal distr.
4. Recommend that these characteristics are selected evenly across the control and test groups.

