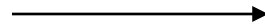
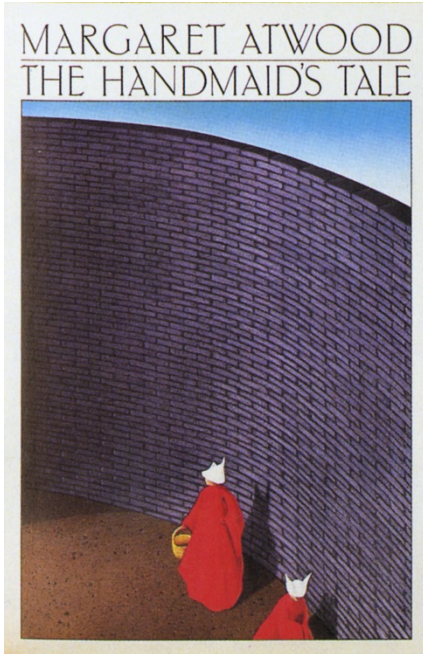


Targeted Promotions on an E-Book Platform: Crowding Out, Heterogeneity, and Opportunity Costs

Nathan Fong, Yuchi Zhang,
Xueming Luo, and Xiaoyi Wang



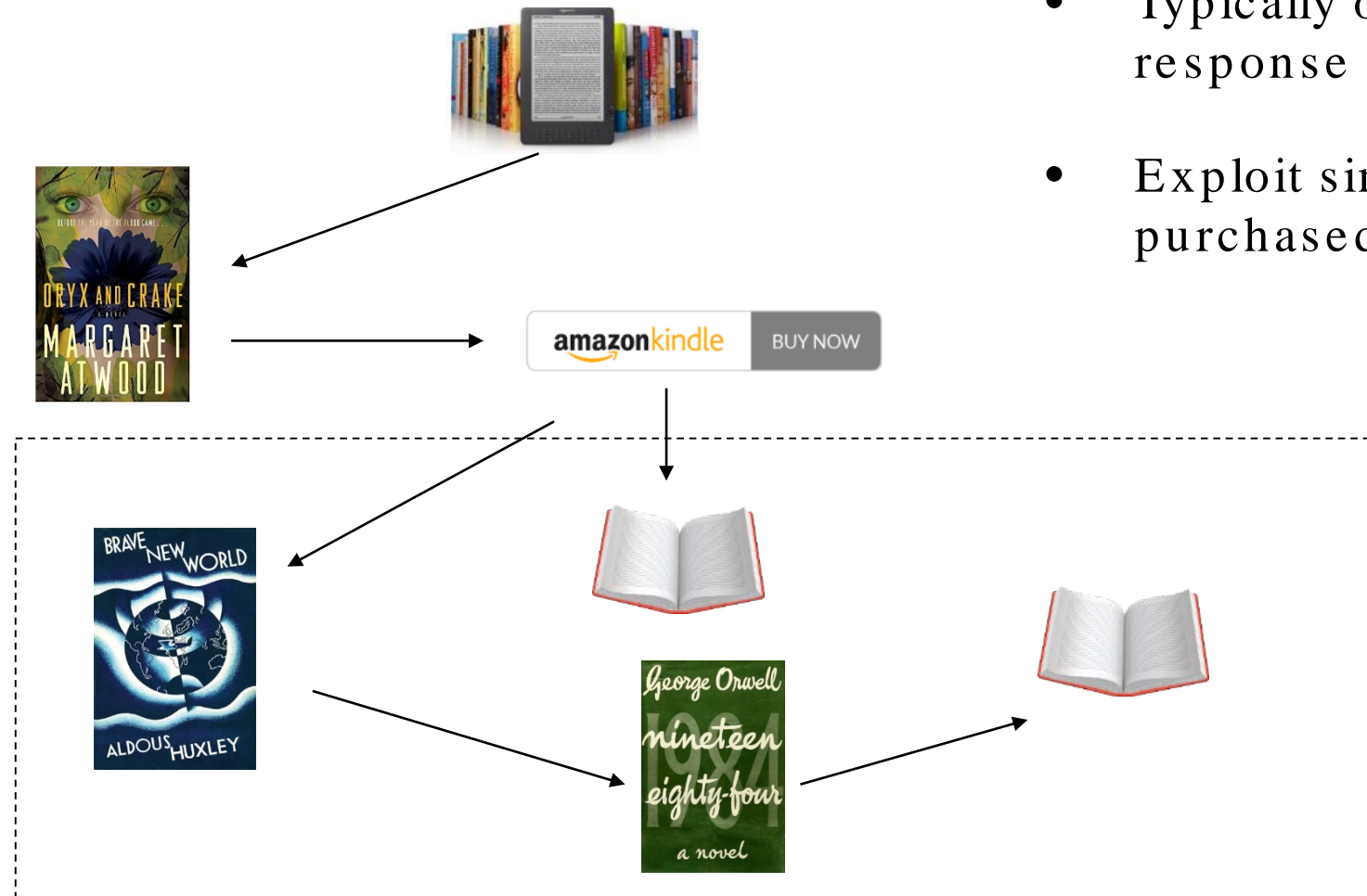
Nathan Fong,

Are you looking for something in our Literary Fiction eBooks department? If so, you might be interested in these items.

Literary Fiction eBooks

	<p>Oryx and Crake Margaret Atwood</p> <p>Price: \$8.72</p>	<p>Learn more</p> <p>Add to Wish List</p>
	<p>The Year of the Flood Margaret Atwood</p> <p>Price: \$8.56</p>	<p>Learn more</p> <p>Add to Wish List</p>
	<p>The Blind Assassin: A Novel Margaret Atwood</p> <p>Price: \$7.99</p>	<p>Learn more</p> <p>Add to Wish List</p>

What is the Opportunity Cost?



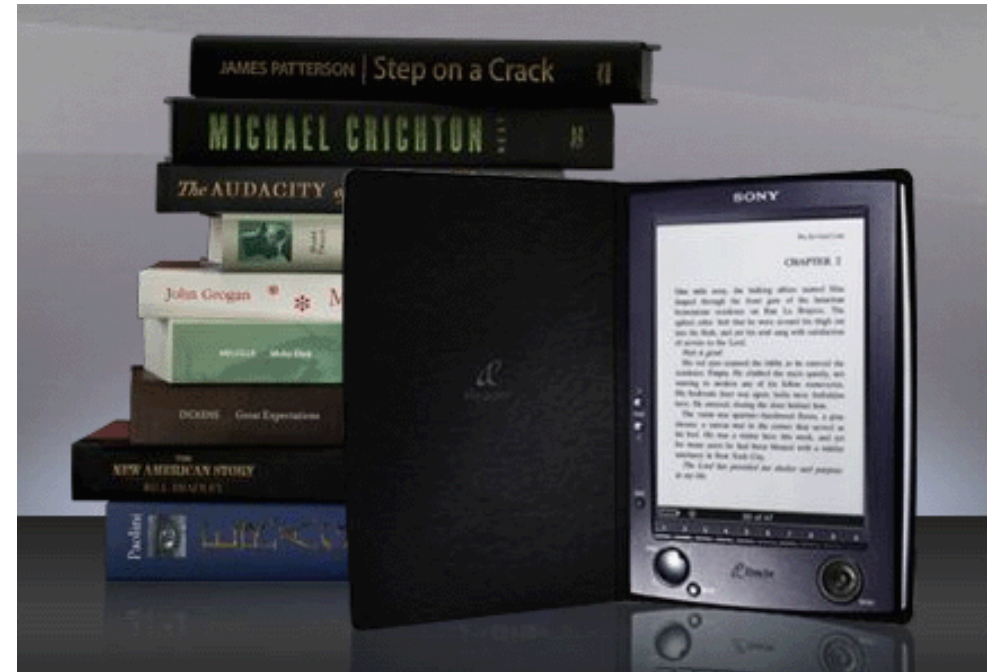
- Typically optimize for direct response
- Exploit similarity to previously purchased/clicked items

Targeting and Customer Search

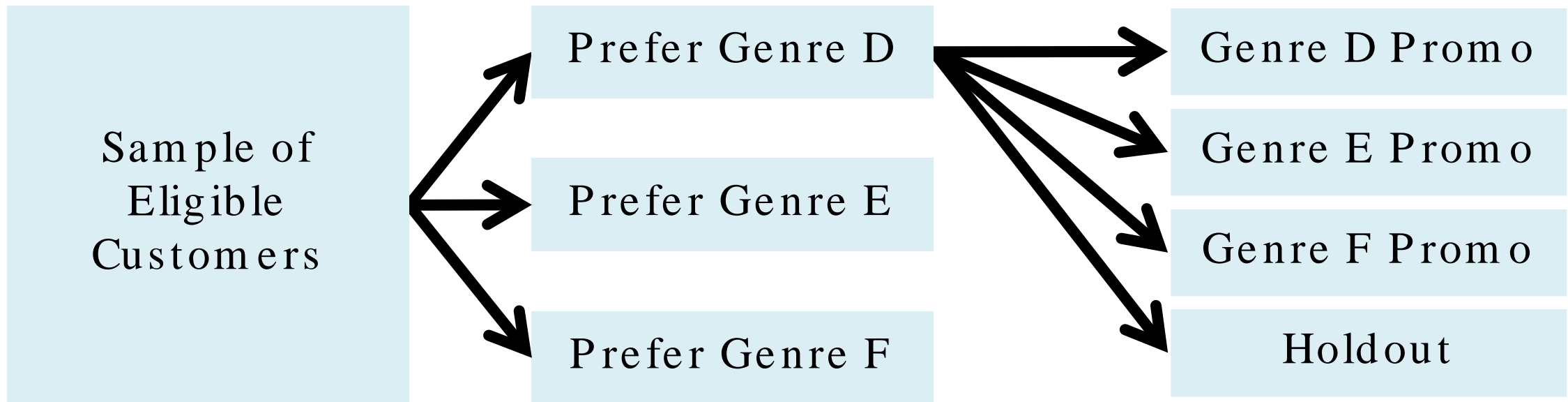
- Targeting decreases search activity
 - Web content (Tam and Ho 2006)
 - Product listings (Dellaert and Häubl 2012)
 - Targeted email promotions (Fong 2017)
- Generally seen as efficient (saves effort)
 - Positive spillovers (Anderson and Simester 2013, Sahni 2016)
- Targeting could limit exposure
 - Hypothesis: negative spillovers for dissimilar products

Field Experiments on a Mobile Platform

- E-book app
- Promotes new titles using push notifications
- “Tapstream” data
 - 5 months pre-test
 - 3 weeks post-test

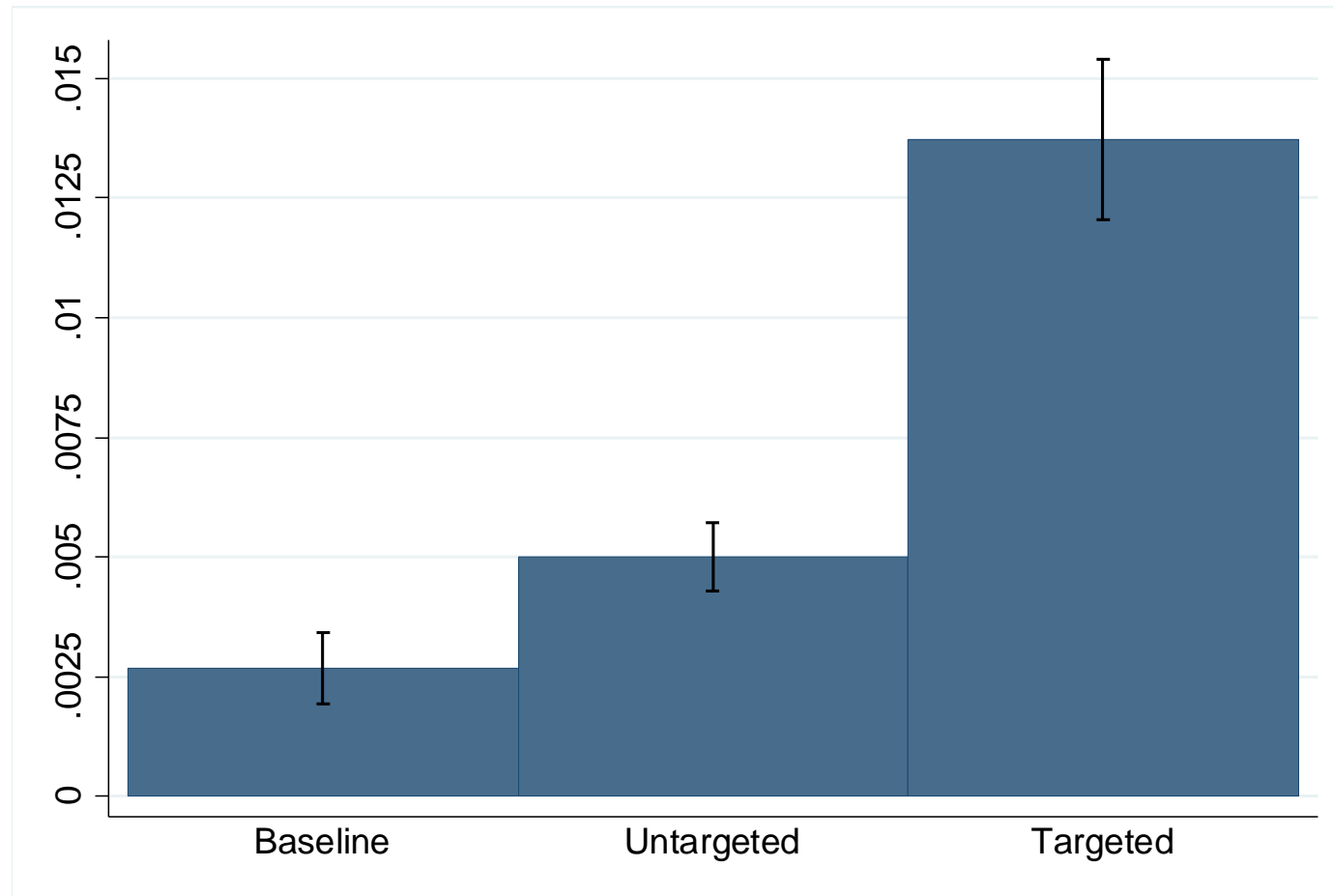


Study 2 Design



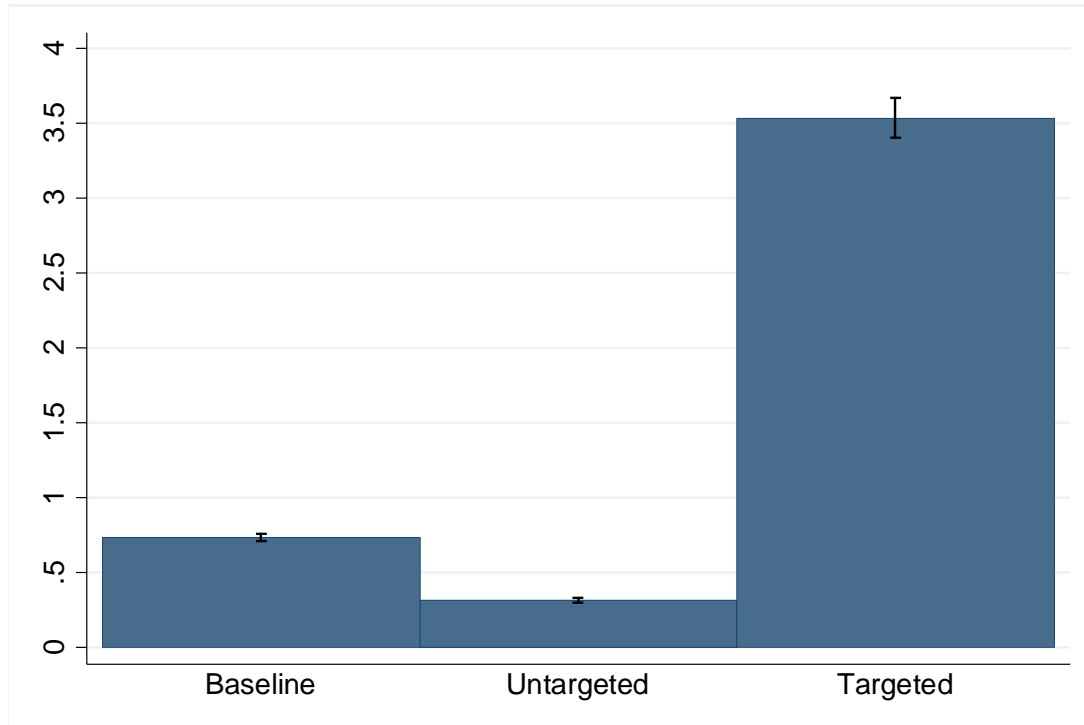
- Preference defined by cutoff in share of reading
 - 67% cutoff: 19,522 eligible users

Targeting Increases Direct Response (Promoted Book)

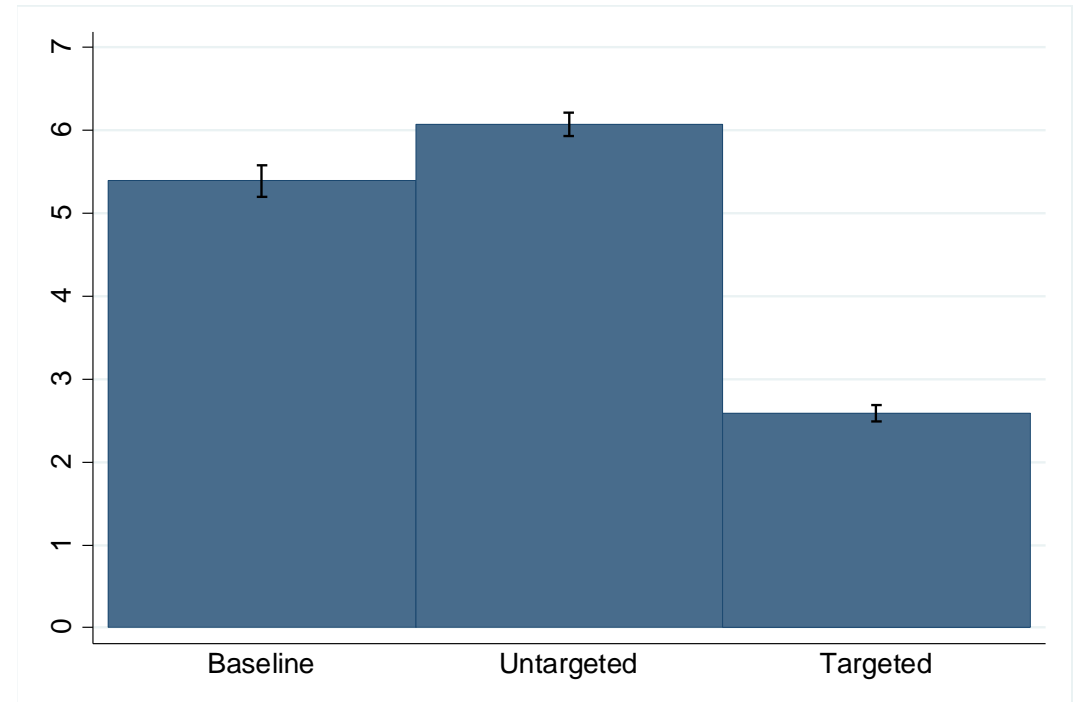


Spillover Effects

Same Genre: Positive



Cross-Genre: Negative



Robustness to Targeting Definition

- Cutoff is arbitrary
- Does not account for volume
- Trying a lot of books increases genre share
- Are genres really categories?

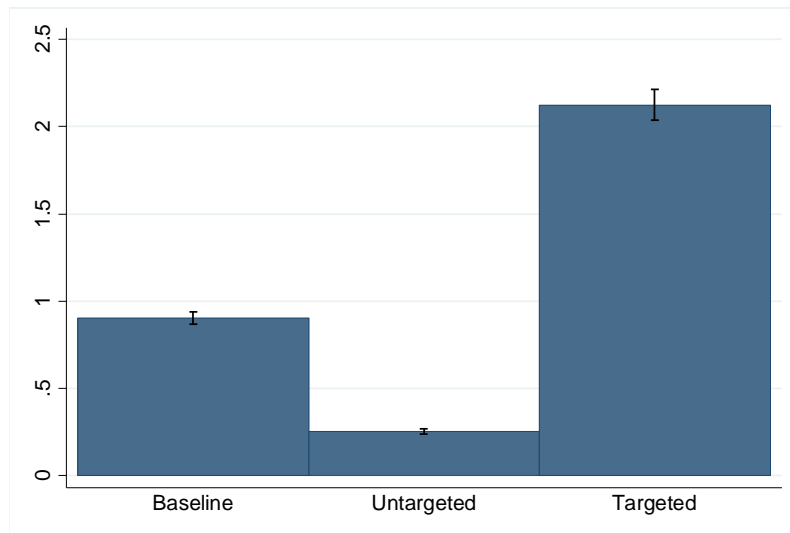
- Test sensitivity to cutoffs
- Use continuous measures of fit
- Target based on completion
- Use broader categories in product hierarchy

Source of the Negative Spillovers?

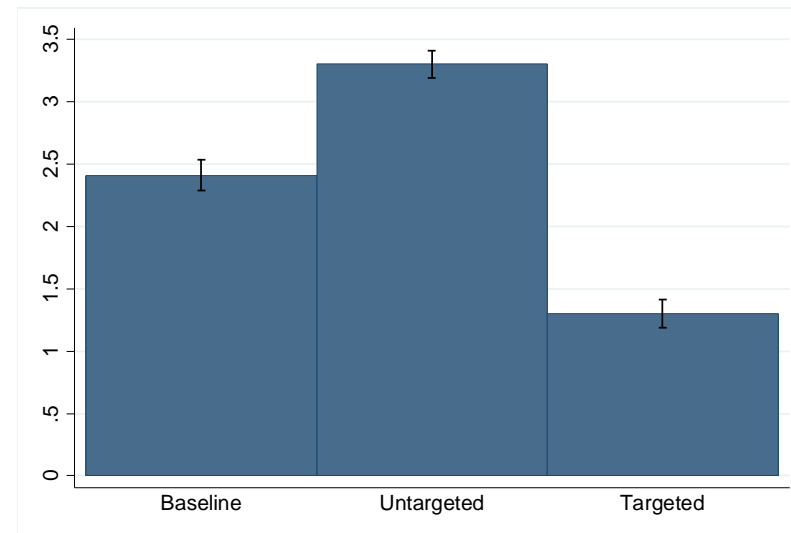
- Pure substitution?
 - Study 1: Differences in total purchasing
- Reactance to targeting?
 - Positive same-genre spillovers

Targeting Affects Depth of Search

Unique Titles Inspected Without Purchase



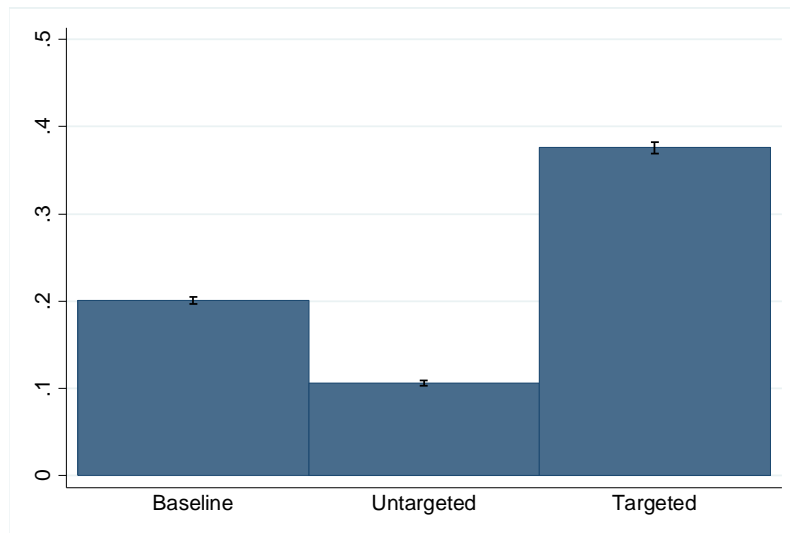
Same Genre



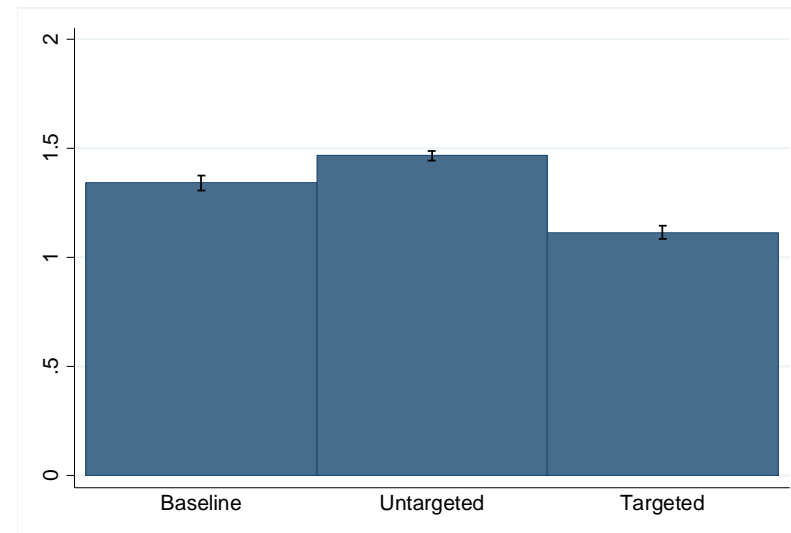
Cross-Genre

Targeting Affects Breadth of Search

Unique Categories Searched

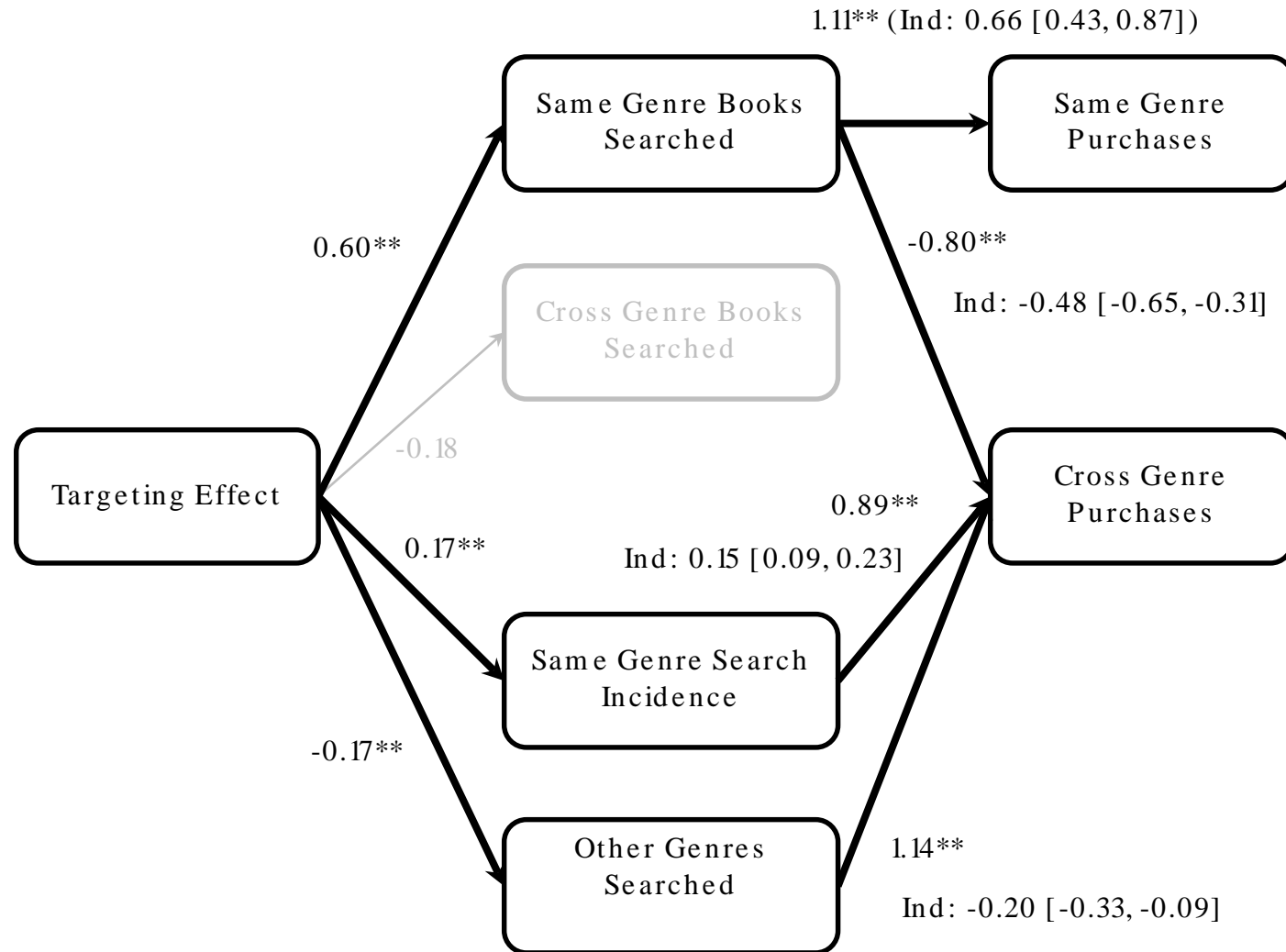


Same Genre



Cross-Genre

Search Depth and Breadth Mediate Crowding Out Effects



Quantifying the Opportunity Cost

- Targeting for direct vs. total response
- Fit causal tree for each promotion g and outcome o , predict $\delta_{g,i}^o$ for each user i
- Targeted treatment: $t_i^o = \operatorname{argmax}_g \{\delta_{g,i}^o\}$
- The “opportunity cost” of optimizing one outcome o in terms of suboptimal result for other outcome p :

$$\sum_i \left(\delta_{t_i^p, i}^p - \delta_{t_i^o, i}^p \right)$$

Targeting for Direct Response Exploits

Genre Preferences

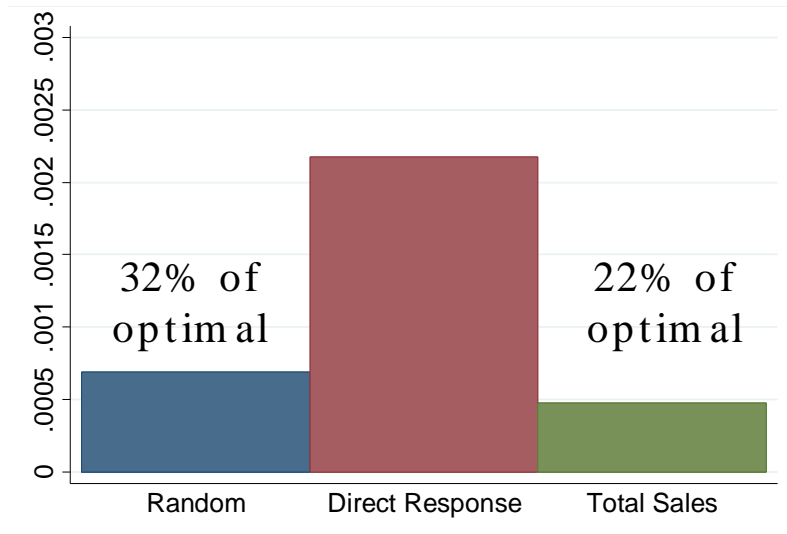
Targeting on	Genre D	Genre E	Genre F	Total	Books			
Direct Response	Share	Share	Share	Sales	Finished	Search	Dispersion	N
No Promo	13.7%	12.3%	0.2%	69.6	2.3	51.1	2.0	2,767
Genre D	18.2%	14.8%	0.9%	83.3	3.9	66.7	1.4	41,148
Genre E	6.2%	26.2%	1.7%	22.9	0.7	16.0	1.1	30,061
Genre F	5.4%	11.9%	18.5%	27.6	1.9	16.7	2.0	3,540

Targeting on	Genre D	Genre E	Genre F	Total	Books			
Total Sales	Share	Share	Share	Sales	Finished	Search	Dispersion	N
No Promo	7.7%	53.6%	0.4%	341.8	5.4	329.7	2.0	1,382
Genre D	8.6%	8.5%	1.4%	185.4	7.1	159.1	1.8	7,849
Genre E	14.8%	19.9%	2.2%	25.3	0.7	17.6	1.2	51,071
Genre F	9.1%	18.1%	1.6%	69.1	5.4	47.7	1.5	17,214

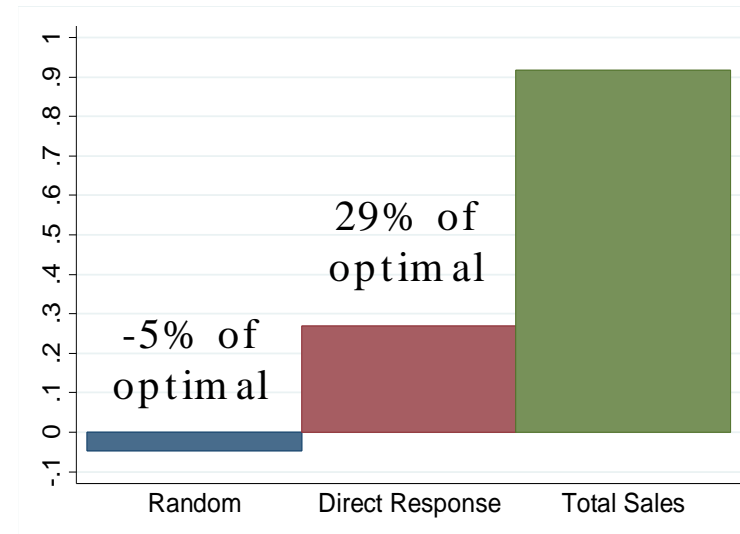
Average	12.8%	19.0%	2.0%	56.9	2.5	44.2	1.3	77,516
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Targeting Schemes Differ Substantially

Incremental Effect by Targeting Scheme



Outcome: Direct Response



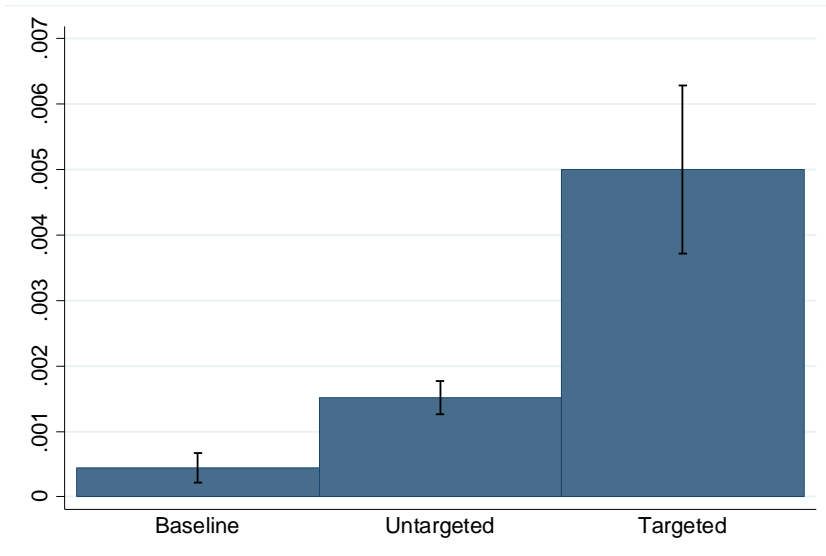
Outcome: Total Sales

Conclusions

- Targeted promotions can generate negative spillovers for dissimilar products
 - Active search redirects sales
 - Direct response metrics can mislead
- Purchasing breadth important for:
 - High variety-seeking markets (e.g. content)
 - Retailers with wide assortments

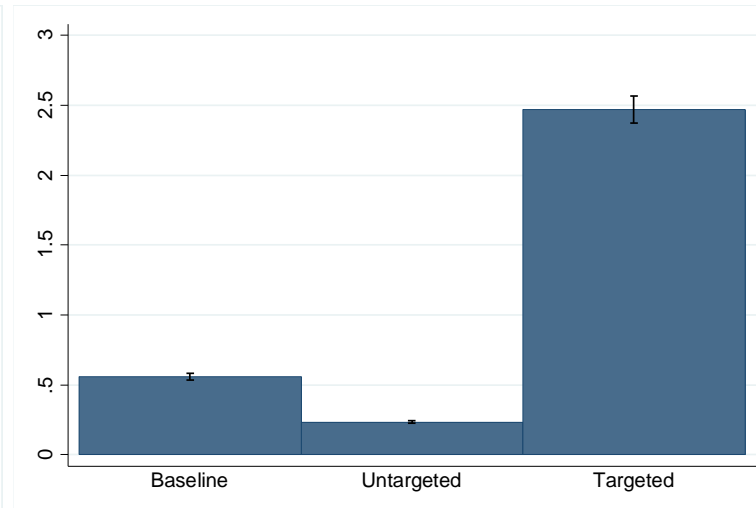
Targeting on Completion

Direct Response

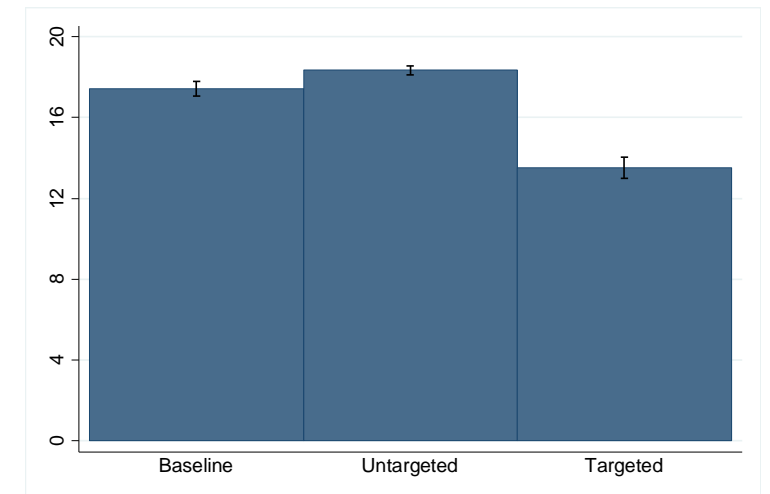


Promoted Product

Spillover Effects



Same Genre

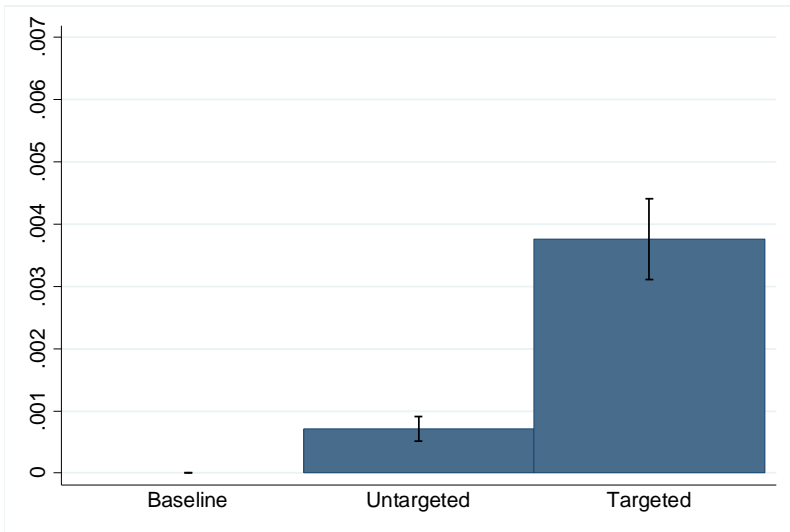


Cross-Genre

Note: Sample includes all those completing at least one full book during pre-test period (35,704 users). Targeting based on completing a book in the promoted genre (3,002 users)

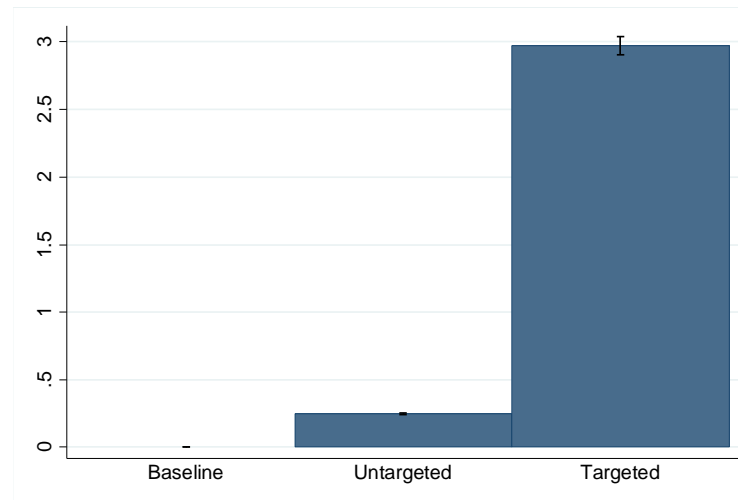
Targeting on Broader Categories

Direct Response

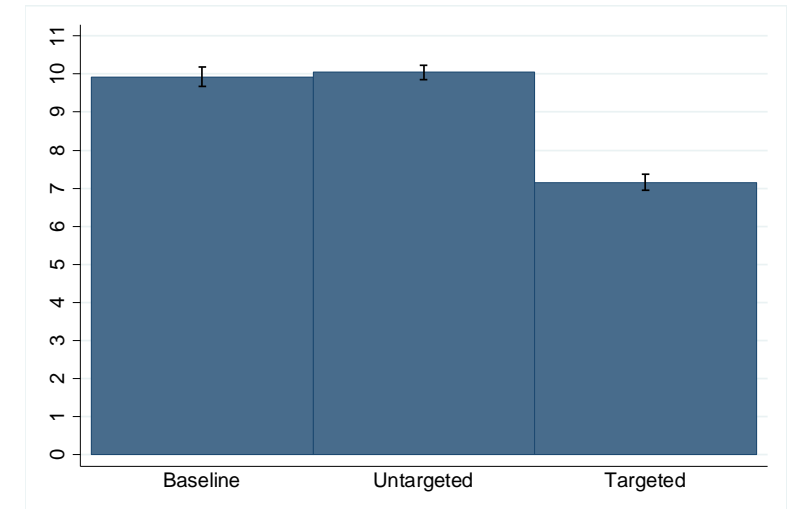


Promoted Product

Spillover Effects



Same Genre



Cross-Genre

Note: Targeting based on 10 broader categories instead of 239 narrow genres