Social Networks, Personalized Advertising, and Privacy Controls

Catherine Tucker, MIT Sloan
Social networking sites are attractive places to advertise but...

- Facebook now accounts for 31 percent of display advertising
- In the US 142 million people spend on average 6 hours on these websites.
- Wealth of personal information to target on
- More personal info → Better targeting → More valuable ads
Privacy concerns and Reactance have bedevilled such sites

- Intrusive advertising can lead to reactance (Clee and Wicklund 1980)
- Very personal advertising can lead to a lot of reactance (White et al 2008)
- May explain low click through rates attributed by commentators to privacy concerns
- Study how websites’ attempts to resolve these privacy concerns affects advertising outcomes.
  - If consumers have perception of control they may be more likely to click on ads
  - Or consumers may resent privacy-intrusive advertising more
Relatively Clean Empirical Setting

- Study May 2010 policy change on Facebook
  - Highly publicized shift in privacy policy
  - No change in advertising mechanism
- Use data from randomized field test conducted by non-profit
  - Field test set up before policy change known about
  - Compared personalized vs targeted vs untargeted advertising
- Difference-in-Difference setting
  - Randomization across ads which get personal in their content, and ads that don’t
  - Before and after policy change
Findings

• Click-through rate for personalized ads (match content to users’ personal information) **double** after the policy change
  • Ads that do not match content do not change in effectiveness
• Increase more pronounced for personal information that is more unusual
  • Very personal advertising perceived as more intrusive and more likely to lead to reactance *(White et al 2008)*
  • Direct confirmation of reactance through supplementary online randomized scenario-test.
Implications

• Huge debate in Europe and US about regulation of privacy and online advertising.
• Policy focus has been on restricting use of data
• Little discussion of whether business owners have an incentive to protect privacy of their users
  • Focus on user-centric privacy controls surrounding types of information might lead to better outcomes for advertising-supported online firms
Outline

Data and Institutional Background
  Non-Profit
  Facebook
  Facebook Policy

Initial Data Analysis
  Data

Econometric Analysis

Mechanism

Summing
Non-Profit launched field test on Facebook

- Mission to increase awareness in US of its educational programs for women in East Africa.
- Wanted to increase social media presence on Facebook.
- Unsuccessful untargeted campaign in April 2010
- Wanted to try more ‘tailored’ advertising but worried it might be ‘creepy’
  - Use randomized field test on Facebook to compare targeted with personalized with untargeted campaigns
- Wanted to increase clicks to its Facebook page
Targeting Variables

- Two campaigns
  - People who declared themselves fans of certain female celebrities associated with educational empowerment
  - Certain liberal arts colleges
- Created a personalized and non-personalized version
<table>
<thead>
<tr>
<th>Targeting Variable</th>
<th>College</th>
<th>Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personalized</td>
<td>As a [undergraduate institution name] graduate you had the benefit of a great education. Help girls in East Africa change their lives through education.</td>
<td>As a fan of [name of celebrity] you know that strong women matter. Help girls in East Africa change their lives through education.</td>
</tr>
<tr>
<td>Non-Personalized</td>
<td>You had the benefit of a great education. Help girls in East Africa change their lives through education.</td>
<td>You know that strong women matter. Help girls in East Africa change their lives through education.</td>
</tr>
</tbody>
</table>
Then each of these messages was displayed aside the same picture
By May 2010 Facebook faced a lot of pressure over privacy. They were also being sued/investigated by FTC. On May 26th unveiled new privacy controls.
Change in policy had three components

① Easier access to data sharing controls
② Information no longer had to be public
③ Third-party sharing easier to turn off and opt out of.
Allow users to change privacy settings
Before

Privacy Settings

Personal Information and Posts
Control who can see your photos and videos, and who can post to your wall.

Contact Information
Control who can contact you on Facebook and see your contact information and email.

Friends, Tags, and Connections
Control whether your friends, tags and connections display on your profile.

Search
Control who can see your search result on Facebook and in search engines.

Applications and Websites
Control what information is available to Facebook-enhanced applications and websites.

Block List
Control who can interact with you on Facebook.

Choose Your Privacy Settings

Basic Directory Information
To help find great friends and pages, some basic information is shared with everyone. We also suggest sharing interests and hometowns so friends can see those who connect with you. Web settings.

Sharing on Facebook

Everyone
- My status, photos, and posts
- My links
- My events
- My apps and games
- My music
- My videos
- My events
- My photos
- My stories
- My tags

Friends of Friends
- My status, photos, and posts
- My links
- My events
- My apps and games
- My music
- My videos
- My events
- My photos
- My stories
- My tags

Friends Only
- My status, photos, and posts
- My links
- My events
- My apps and games
- My music
- My videos
- My events
- My photos
- My stories
- My tags

Recommended
- My status, photos, and posts
- My links
- My events
- My apps and games
- My music
- My videos
- My events
- My photos
- My stories
- My tags

Applications and Websites
Get your settings for using applications, games and websites.

Block Lists
Get your settings for blocking people and applications.

Connecting How You Share
Get your settings for sharing your data on Facebook.

After
Change in policy had three components

1. Easier access to data sharing controls
2. Information no longer had to be public
3. Third-party sharing easier to turn off and opt-out of.
Warmly received in Press

The addition of simplified options (combined with the continued ability to fine-tune your settings if you wish) and user control over Facebook’s ‘connections’ are significant improvements to Facebook’s privacy.

Chris Conley, American Civil Liberties Union
But advertising data and methodology did not change

- Facebook sent out an email to its advertisers saying that ‘this change will not affect your advertising campaigns’
- Facebook views advertising data as anonymous.
- This means that our study measures solely the change in advertising effectiveness due to changing consumer fears about privacy
  - Useful to tease apart consumer-side effects
Data are relatively straightforward

- 5 weeks of data
  - 2.5 weeks before and 2.5 weeks after
- Clicks, unique impressions, date
  - Cost per click, cost per impression, reach of each of advertising campaigns.
  - Data on news media
<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std Dev</th>
<th>Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Impressions</td>
<td>15892.7</td>
<td>63274.2</td>
<td>33</td>
</tr>
<tr>
<td>Average Clicks</td>
<td>25.3</td>
<td>53.7</td>
<td>0</td>
</tr>
<tr>
<td>Average Cost Per Click</td>
<td>0.38</td>
<td>0.096</td>
<td>0.1</td>
</tr>
<tr>
<td>Cost per 1000 views</td>
<td>0.095</td>
<td>0.12</td>
<td>0</td>
</tr>
<tr>
<td>Ad-Reach (000000)</td>
<td>0.095</td>
<td>0.21</td>
<td>0.0000</td>
</tr>
<tr>
<td>Aggregate Click-Through Percentage</td>
<td>0.17</td>
<td>0.23</td>
<td>0</td>
</tr>
<tr>
<td>News Stories Index for Facebook and Privacy</td>
<td>54.48</td>
<td>34.78</td>
<td>11</td>
</tr>
<tr>
<td>Google Trend Index for Searches about Facebook and Privacy</td>
<td>59.91</td>
<td>27.95</td>
<td>24</td>
</tr>
</tbody>
</table>

Campaign level data. 79 Different Campaigns (78 campaigns based on 39 different targeting variables each with personalized and targeted variants. 1 untargeted campaign)
Figure: Comparison in click-through rates before and after
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Mechanism

Summing
Move to econometric analysis

- Use simple model to evaluate advertising effectiveness

We model the click-through rate $\text{ClickRate}_{jt}$ for ad $j$ on day $t$ in the following manner:

$$\text{ClickRate}_{jt} = \beta \text{Personalized}_j \times \text{PostPolicy}_t + \alpha \text{Personalized}_j + \theta \text{MediaAttention}_{jt}$$

$$+ \gamma_k + \delta_t + \epsilon_j$$  (1)

- Linear and Logit Specifications
<table>
<thead>
<tr>
<th></th>
<th>Initial 10-Day Window</th>
<th>Not 10-Day Window</th>
<th>Full</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>Personalized × PostPolicy</td>
<td>0.0236***</td>
<td>0.0554***</td>
<td>0.0149**</td>
</tr>
<tr>
<td></td>
<td>(0.0102)</td>
<td>(0.0208)</td>
<td>(0.00711)</td>
</tr>
<tr>
<td>Personalized</td>
<td>-0.0119*</td>
<td>-0.0112</td>
<td>-0.0141***</td>
</tr>
<tr>
<td></td>
<td>(0.00627)</td>
<td>(0.0115)</td>
<td>(0.00464)</td>
</tr>
<tr>
<td>News Articles</td>
<td>-0.00101</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0550)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personalized Ad × News Articles</td>
<td>0.0538</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0667)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Google Searches</td>
<td>-0.0433</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.173)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personalized Ad × Google Searches</td>
<td>-0.152</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.123)</td>
<td></td>
<td></td>
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<tr>
<td>Date Fixed Effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Targeting Variable Fixed Effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Observations</td>
<td>2730</td>
<td>780</td>
<td>1950</td>
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<tr>
<td>$R^2$</td>
<td>0.060</td>
<td>0.118</td>
<td>0.044</td>
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</tbody>
</table>

OLS Estimates. Dependent variable is percentage daily click through rate. Robust standard errors clustered at ad-level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$; $PostPolicy_t$ is collinear with the date fixed effects and dropped from the specification.
Also, collected additional data to show:

- Little change in click conversions (correlation unchanged)
- Little change demographics
- Little change usage behavior
- Little change prices
- No change in kind of ads served.
There is a prior literature which is suggestive of the mechanism

- Reactance occurs when advertising is intrusive or invasive of privacy
- Reactance will be strongest when personalization is more unique (White et al. 2008)
- Therefore positive effect of perceived control should be strongest for people exposed to ads that feel more personalized and therefore potentially intrusive
- Test this using data on ad reach
  - How many users in target group
- Also a lab experiment
<table>
<thead>
<tr>
<th></th>
<th>Main</th>
<th>10-Day Window</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-Policy × Personalized × Ad-Reach</td>
<td>-0.0852**</td>
<td>-0.199***</td>
<td>-0.0852***</td>
</tr>
<tr>
<td></td>
<td>(0.0421)</td>
<td>(0.0966)</td>
<td>(0.0313)</td>
</tr>
<tr>
<td>Personalized</td>
<td>-0.0153**</td>
<td>-0.0228</td>
<td>0.377</td>
</tr>
<tr>
<td></td>
<td>(0.00670)</td>
<td>(0.0188)</td>
<td>(0.364)</td>
</tr>
<tr>
<td>Post-Policy × Personalized</td>
<td>0.0317**</td>
<td>0.0662***</td>
<td>0.0243**</td>
</tr>
<tr>
<td></td>
<td>(0.0147)</td>
<td>(0.0251)</td>
<td>(0.0114)</td>
</tr>
<tr>
<td>Personalized × Ad-Reach</td>
<td>0.0354</td>
<td>0.125</td>
<td>0.0354*</td>
</tr>
<tr>
<td></td>
<td>(0.0214)</td>
<td>(0.0850)</td>
<td>(0.0211)</td>
</tr>
<tr>
<td>Post-Policy × Ad-Reach</td>
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<td>-0.00677</td>
<td>0.0150</td>
</tr>
<tr>
<td></td>
<td>(0.0350)</td>
<td>(0.0497)</td>
<td>(0.0204)</td>
</tr>
<tr>
<td>Personalized Ad × Number Facebook News Articles</td>
<td>0.0538</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>(0.0356)</td>
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</tr>
<tr>
<td>News Articles</td>
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</tr>
<tr>
<td></td>
<td>(0.0269)</td>
<td></td>
<td></td>
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<tr>
<td>Google Facebook Privacy Searches</td>
<td>0.0472</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0632)</td>
<td></td>
<td></td>
</tr>
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<td>Personalized Ad × Google Facebook Privacy Searches</td>
<td>-0.152</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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$PostPolicy_t$ is collinear with the date fixed effects and dropped from the specification. $Ad-Reach_k$ is collinear with the targeting variable fixed effects and also dropped from the specification.
There are of course limitations

1. Non-profit setting
2. Experiment conducted at time of heightened publicity about privacy
3. Policy change was unusual in that it did not affect advertising delivery
First study of how user privacy control affects ad performance

- We find that when social networking sites give users more control over how their private information is shared,
  - Effectiveness of personalized advertising dramatically increases
  - More so for ads where the information really is quite personal
- Also first study of advertising on Facebook
- More general implications for privacy debate
Facebook emphasis on user-control is different from proposed policy

• Pressure for regulation in US
  • Multiple bills being discussed in Congress to limit behavioral targeting

• Goldfarb and Tucker (Management Science, 2011) that studies the effect of E-privacy directive in Europe (Management Science, January).
  • Found 65 percent drop in advertising effectiveness

• Concern that proposed bills resemble EU policy: Limitation on targeting techniques rather than user-centric control
Summary: The form of privacy protection does matter.

Criticism of those who:

*Cling to a flimsy argument that the economic health of the Internet will be jeopardized if the FTC imposes reasonable consumer privacy safeguards.*

- Currently, debate is conducted in empirical vacuum
  - Empirical research is not shameful
- These 2 papers suggest that the form of privacy law matters
- (Very speculatively) suggest that laws orientated towards giving users control over their private information rather than restrictions on techniques may be preferable for sustaining advertising-supported internet
Figure: Comparison in click-through rates before and after