Winners, Losers, and Facebook
The Role of Social Logins in the Online Advertising Ecosystem

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Social logins in the online ecosystem
Benefits of providing the social login: Data...

- **User data**
  - Name, gender, age, location, Email
  - Friends, birthday, ...
  - Data depends on user decision & service

- **Usage data**
  - Date & Time
  - URL
  - IP, User-ID, Browser, OS
  - ...

Schätzle (2014), Gigya (2012), Facebook (Developer)
GOAL OF THIS STUDY

Identify the strategic effects on competition and market outcomes if a social networking site and a website voluntarily agree to share user and usage data by means of a social login.

RESULT 1
Full characterization of the conditions under which social logins are offered and adopted.

RESULT 2
The adoption of social logins may yield a prisoner's dilemma-like situation for the content providers.

RESULT 3
Social logins may create market failures due to underprovisioning.

RESULT 4
Model robust to a variety of extensions.
The Model

Coopetition in Online Advertising Markets
Key ingredients of the model

Ad
Advertiser Z

A\Ad\G
B\Ad\G

Competition for users

facebook

CP A

CP B

02-07-17
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Key ingredients of the model (cont’d)

**Competition** for users and advertising-budget.

- **Single-homing** users w.r.t. special-interest CP $A$ and $B$:
  \[ U_A(x) = u_A - \tau x \text{ or } U_B(x) = u_B - \tau (1 - x) \]

- **Multi-homing** users w.r.t. CP $i$ and CP $G$.
  - Screen attention probability $\delta (1 - \delta)$: active at CP $i (G)$
  - Two time periods $t = 1, 2$ considered.

**CPs are ad-financed.**

- **Revenue** depends on #users ($u_i, \tau, \delta$) & targeting rate ($\alpha_j$)
- **Adopting the social login**
  - $u_i = u_i + \theta$ (transaction costs, personalization, etc.)
  - $\alpha_j = \min\{\phi_j \cdot \alpha_j; 1\}$ (info about users’ preferences)

**Advertiser** values effective view-throughs.

- Multiple ad-impressions are wasted ($n_j$)
- Price ($p_j$) depends on own and competitor’s targeting rate

\[
\Pi_Z = \Gamma_A (n_A - p_A) + \Gamma_B (n_B - p_B) + \sum_{i=A,B} \Gamma_{G(i)} (n_{G(i)} - p_{G(i)})
\]

**Notation**

- Special-interest outlets: $CP \ i, \ i = \{A, B\}$
- All considered outlets: $CP \ j, \ j = \{A, B, G\}$
- Considered scenarios: $b = \text{base case (no login)}, \ l = \text{social login}$.
Timing of the game

1. $CP_G$ decides whether to offer a social login.

2. $CPs_i$ simultaneously decide whether to adopt the social login and users decide which $CP_i$ to use.

3. $CPs$ set price $p_j$ for advertising impressions simultaneously.

4. Advertiser $Z$ decides at which CP(s) to advertise.
Results

Competitive Effects and Market Outcomes
Illustration of market outcomes (symmetric CPs)

Used parameters: $\alpha_i^b = 0.5, \alpha_G^{b(i)} = 0.5, \tau = 0.5, \theta = 0.1, \delta = 0.5$
Illustration of market outcomes (symmetric CPs)

Prisoner’s dilemma (below)
Adoption threshold (above)
Offer threshold (below)

Used parameters:

\( \alpha^i = 0.5, \alpha^G(\delta) = 0.5, \tau = 0.5, \theta = 0.1, \delta = 0.5 \)
Illustration of market outcomes (symmetric CPs)

Results

- Social Login only used in (I) and (II)
- Prisoner’s dilemma for CP \(i\) in (II)
- Comparative Statics:
  - Adoption more likely: \(\delta \uparrow, \phi_i \uparrow, \phi_G \downarrow, \alpha_j \downarrow\)
  - Offer more likely: \(\delta \downarrow, \phi_i \downarrow, \phi_G \uparrow, \alpha_j \downarrow\)
  - PD more likely: \(\theta \uparrow, \tau \downarrow, \alpha_i \uparrow\)

Used parameters: \(\alpha^b_i = 0.5, \alpha^b_{G(i)} = 0.5, \tau = 0.5, \theta = 0.1, \delta = 0.5\)
Extensions (selection)

Base model

Asymmetric special-interest CPs

Competing general-interest CPs

Users multi home special-interest CPs

Competition for users

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Extensions (selection)

Base model

\[ \Phi^o - \Phi^a - \Phi^{ap} \]

\( \phi_i \) \( \phi_G \)

III VI

V

I II

IV

Competing general-interest CPs

Asymmetric special-interest CPs

\[ \Phi^o - \Phi^{a'} \]

\[ \Phi^{ap} - \Phi_B^{a'} \]

\( \phi_G \)

V

I II VII

IV

Users multi home special-interest CPs

CP A

CP B

Competition for users

CP G

CP F

G

A' Ad B

A' Ad G

B Ad F

B Ad G
Extensions (selection)

Base model

Asymmetric special-interest CPs

Competing general-interest CPs

Users multi home special-interest CPs

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Extensions (selection)

Base model

Asymmetric special-interest CPs

Competing general-interest CPs

Users multi home special-interest CPs

\[
\Phi^o, \Phi^a', \Phi^ap
\]

\[
\Phi^o, \Phi^a', \Phi^ap, \Phi^o', \Phi^a', \Phi^ap', \Phi^a', \Phi^ap'
\]

\[
\Phi^o, \Phi^a, \Phi^ap, \Phi^o', \Phi^a', \Phi^ap', \Phi^a', \Phi^ap'
\]

\[
\Phi^o, \Phi^a, \Phi^ap, \Phi^o', \Phi^a', \Phi^ap', \Phi^a', \Phi^ap'
\]
Thank you!

Discussion...

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The number of effective view-throughs per CP determine the equilibrium prices

- Effective view-throughs ($n_j$) per CP affected by the own and the competitor's targeting-rate (see $t = 2$)
- Advertising at one CP increases the number of view-throughs at this outlet in $t = 2$
- Eq. prices leave the advertiser indifferent between advertising at both or one CP only
Timing, pricing & profits: Determine equilibrium prices and profits by backward induction (cont’d)

3 Advertising prices constrained by competition for selection by $Z$.
   - Equilibrium prices leave $Z$ indifferent between selecting both CPs or one CP exclusively (superscript $e$).
   - Due to zero marginal costs, an equilibrium with only one $CP_i$ (exclusivity) can not be an equilibrium.

\[
\begin{align*}
n_{G(i)} - p_{G(i)} + n_i - p_i &= n_{G(i)}^e - p_{G(i)}, \\
n_{G(i)} - p_{G(i)} + n_i - p_i &= n_i^e - p_i.
\end{align*}
\]

2 Adoption of the social login by a special-interest $CP_i$ depends on resulting profits under all possible scenarios given its rival’s decision.
   - Adoption, if profit difference positive, i.e., $\Delta^{l,d-b,d} = \pi^{l,d}_i - \pi^{b,d}_i > 0$ with $d \in \{b, l\}$
   - Assuming symmetry, either both or no $CP_i$ adopts the login.

1 $CP_G$ willing to offer the social login, if the corresponding profit increases.
   - Offer, if profit difference positive, i.e., $\Omega = \pi^{l,l}_G - \pi^{b,b}_G > 0$
Related literature

- **Federated identity management & single sign-on schemes**
  - Technical aspects: security, identification, authentication, authorization: Breuer et al. (2015, Conf. on PST); Chen et al. (2014, ACM SIGSAC); Kontaxis, Polychronakis & Markatos (2012, IJIS); Miculan & Urban (2011, SofSem); Wang, Chen & Wang (2012, IEEE SSP)

- **Access to user data, data ownership, price discrimination & privacy**

- **Online advertising markets & targeted advertising**
  - Online advertising markets: Anderson & Coate (2005, RES); Athey, Calvano & Gans (2012; 2014, WP); Evans (2008, RNE)

- **Open Access Rationale & Social Login Adoption**
  - Social Login: Egelman (2013, CHI); Gafni & Nissim (2014, IISIT); Ko et al. (2010, Computer)
Welfare implications

It can readily be shown that adoption of the social login is always (weakly) welfare improving in case there are no costs for offering or adopting it.

1) First, adoption improves the users’ experience \((\theta \geq 0)\) and thus, the social login is always (weakly) increasing consumers’ surplus.

2) Second, adoption of the social login (weakly) increases the CPs’ targeting ability \((\phi_j \geq 1)\), which allows them to generate more view-throughs that are valuable to the advertiser Z. Therefore, the social login increases the sum of the advertiser’s and CPs’ profit.

   » Note: advertising prices \((p_j^*)\) simply represent welfare neutral profit transfers between the advertiser Z and the CP, i.e., they do not affect total welfare.

- Taken together, total welfare must therefore increase with the adoption of the social login.
The model is based on three stylized facts:

1. Special-interest and general-interest Content Providers (CPs)

2. Heterogeneous users and user-experience

3. Competition of special- and general-interest CPs
Wrap-up, implications, and future work

GOAL OF THIS STUDY

Identify the strategic effects on competition and market outcomes if a social networking site and a website voluntarily agree to share user and usage data by means of a social login.

MAIN MECHANISM

Better content/service relevant for competition for website visitors. Sharing precious user/usage data affects competition in the advertising market.

MANAGERIAL IMPLICATION

Weigh positive short term effects of direct competition against the (potentially) negative long run effects of indirect competition in the advertising market.

POLICY IMPLICATION

Social logins beneficial for consumers and total welfare. Login is not offered to all CPs. Policy intervention may call for neutrality obligations to increase welfare (“data neutrality”).

LIMITATIONS & FUTURE WORK

- (Further) Analyses of asymmetry (e.g., general-interest CPs, or targeting-rate).
- Endogenization of variables (e.g., targeting-rate, or screen-attention).
- Competing advertisers (i.e., not focusing on special-interest user group).
- Privacy concerns (i.e., users do not value the possibility to use a social login).
The model is based on three stylized facts

1. **Special-interest and general-interest Content Providers (CPs)**
   - Special-interest CPs offer a narrow range of content in the same domain of interest
     - A website providing information on fishing or celebrities
   - General-interest CPs offer a much broader range of (complementary) content
     - A social networking site where users discuss about fishing and celebrities

2. **Competition of special- and general-interest CPs**
   - Special-interest CPs compete for users
   - Special- and general-interest CPs compete for revenues in the advertising market

3. **Heterogeneous users and user-experience**
   - The user experience at special-interest CPs providing a social login increases
     - Lower transaction costs, less password fatigue, personalization and customization, …
Possible Extensions

- Latent demand from users not considered in the competitive segment
  - May mitigate the likelihood of a prisoner’s dilemma
- Strategic threats for CPs adopting the social login
  - Commitments (e.g., server capacities)
  - Lock-in / hold-up
  - Data transferred once, may be ‘lost’
- Consider different (more) forms of asymmetry
  - Between competing general-interest CPs (Facebook >> Google+)
  - With respect to the targeting rate of special- (general-) interest CPs
- Endogenize further parameters of the model
  - Screen attention with respect to base-utility
  - Targeting rate with respect to demand
- Consider competing advertisers
Pros & cons of providing or using a (social) login

**Facebook**

+ Better targeting through knowledge of users' current interests ("usage")
+ "Global" knowledge about user
+ User-revealed interests
+ Positive spillovers on friends

- Exclusivity of user data
- Development costs

**The User**

+ No need to remember login data (passw. fatigue)
+ Central data-storage
+ Quick registration-process
+ "Social Sharing"-Benefits
+ Trustful (?) provider managing data
+ Personalized services
+ Lower transaction costs

- Privacy concerns
- Single point of failure

**The Website**

+ (Accurate) User data
+ Lower implementation costs
+ (More) new registrations
+ "Valuable Users" (Pageviews, Time spent, purchase-likelihood)
+ Reduced Support Costs

- Dependency on Facebook (strategic threat)
- Non-exclusivity of data
Timing, pricing & profits: Determine equilibrium prices and profits by backward induction

4 The **Advertiser** determines the *effective* view-throughs per CP

\[
\begin{align*}
n_i &= \alpha_i \delta D_i + \alpha_i \delta (D_i - \alpha_i \delta D_i - \alpha_{G(i)} (D_i - \delta D_i)) \\
&\text{period } t = 1 \\
&\text{period } t = 2 \\
n_G &= \sum_{i=A,B} \alpha_{G(i)} (D_i - \delta D_i) + \alpha_{G(i)} (1 - \delta) (D_i - \alpha_i \delta D_i - \alpha_{G(i)} (D_i - \delta D_i)) \\
&\text{period } t = 1 \\
&\text{period } t = 2
\end{align*}
\]

**Note**

- \( n_j \) depends on \( j \)'s and the competitor's targeting-rate
- Advertising at one (both) CP only increases (decreases) the amount of view-throughs in period \( t = 2 \) (at one outlet)

3 **Advertising prices** (= CPs' profits assuming zero marginal costs) are constrained by the competition for selection by \( Z \).

- Equilibrium prices leave \( Z \) indifferent between selecting both CPs or one CP exclusively

\[
\begin{align*}
n_G(i) - p_G(i) + n_i - p_i &= n^e_{G(i)} - p_G(i) \\
n_G(i) - p_G(i) + n_i - p_i &= n^e_i - p_i
\end{align*}
\]

Ad-relevant users if advertising *exclusively* at CP \( j \)
Timing, pricing & profits: Determine equilibrium prices and profits by backward induction

2. \( CP_i \) calculates the resulting profits under all possible scenarios:

<table>
<thead>
<tr>
<th>Login (I)</th>
<th>CP A</th>
<th>CP B</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \pi_{CP_A}^{l,l}, \pi_{CP_B}^{l,l} )</td>
<td>(( \pi_{CP_A}^{l,l}, \pi_{CP_B}^{l,l} ))</td>
<td></td>
</tr>
<tr>
<td>No Login (b)</td>
<td>( \pi_{CP_A}^{b,l}, \pi_{CP_B}^{b,l} )</td>
<td>( \pi_{CP_A}^{b,b}, \pi_{CP_B}^{b,b} )</td>
</tr>
</tbody>
</table>

- \( CP_i \) considers the net effect of the social login on its anticipated profits given its rival’s decision (\( d = \{b, l\} \))

\[
\Delta_{l,d-b,d} := \Pi_{i}^{l,d} - \Pi_{i}^{b,d}
\]

+ Pos. effect in consumer’s valuation, i.e., market share (\( \theta \)),
+ Pos. effect on targeting rate, i.e., effect. view-throughs (\( \phi_i > 1 \)),
- Neg. effect of intensified competition in advertising market (\( CP_G \)’s targeting rate also increases, i.e., \( \phi_{G(i)} > 1 \)).

- Either both or none \( CP_i \) adopt the social login (assuming symmetry)

1. \( CP_G \) willing to offer the social login, if:

\[
\Omega_{l,l-b,b} = \Pi_{G}^{l,l} - \Pi_{G}^{b,b} > 0
\]
Timing, pricing & profits: Numerical example for the number of expected clicks per outlet and the resulting prices

The **advertiser** has 4 options regarding his decision to advertise (considering $SN$ and $CP1$)

1) Advertise at both outlets
2) Advertise only at $CP1$
3) Advertise only at $SN$
4) Do not advertise at all

\[
\begin{align*}
 n_{G(i)} - p_G(i) + n_i - p_i &= n_G^e(i) - p_G(i) \\
 n_{G(i)} - p_G(i) + n_i - p_i &= n_i^e - p_i,
\end{align*}
\]

<table>
<thead>
<tr>
<th>$\alpha_{CP1}$</th>
<th>$\alpha_{SN}$</th>
<th>1) Advertising at both outlets</th>
<th>2) Advertise only at $CP1$</th>
<th>3) Advertise only at $SN$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>TTL</td>
<td>TTL</td>
<td>TTL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(CP1,1,MH)</td>
<td>(CP1,2,MH)</td>
<td>(SN,1,MH)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(SN,1,MH)</td>
<td>(SN,2,MH)</td>
<td>(SN,1,SH)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.2025</td>
<td>0.045</td>
<td>0.7975</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.1</td>
<td>0.04</td>
<td>0.84</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.1275</td>
<td>0.04</td>
<td>0.2775</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.2</td>
<td>0.04</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.125</td>
<td>0.075</td>
<td>0.4375</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.15</td>
<td>0.105</td>
<td>0.51</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.15</td>
<td>0.105</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.15</td>
<td>0.105</td>
<td>0.12</td>
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<td>0.15</td>
<td>0.105</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.15</td>
<td>0.105</td>
<td>0.12</td>
</tr>
</tbody>
</table>

\[\delta = 0.5 \mid \text{potential number of clicks: 1} \]

(i,t,w) represents the considered scenario with Outlet $i \in \{CP1,SN\}$, Period $t \in \{1,2\}$ and decision $w \in \{SH, MH\}$ (single- or multi-homing)

- A targeting ability of $\alpha_{SN} = 0$ translates into 0 clicks at $SN$. Consequently, the number of users clicking in period $t = 2$ is independent from the decision whether the advertiser is multi-homing or not.
  
  \[\Rightarrow p_{CP1} = 0.2775 \mid p_{SN} = 0.0\]

- A higher targeting ability of $CP1$ leads to more expected clicks at $CP1$. The advertiser’s willingness-to-pay for showing ads at $CP1$ is consequently higher.
  
  \[\Rightarrow p_{CP1} = 0.2475 \mid p_{SN} = 0.16\] (net profits: MH: 0.03 | SH @ $CP1$: 0.03 | SH @ $SN$: 0.03)
Research questions and Results

RQ 1

What are the implications on competition in the advertising market between a specialized and a general outlet if the social login is offered and / or adopted?

1. Voluntary adoption of the social login (may) leave special-interest CPs worse off (prisoner’s dilemma).

RQ 2

What are the implications on competition for users between specialized (general) outlets if the social login is offered and / or adopted?

2. Social logins may create market failures due to underprovisioning.

RQ 3

What drives the adoption (offer) of social logins?

3. Positive Effects: CP visited relatively more often & Strong competition for user. Negative Effects: Own ability to target user is already high.
Research questions (excerpt)

<table>
<thead>
<tr>
<th>RQ 1</th>
<th>What are the implications on competition <em>in the advertising market</em> between a specialized and a general outlet if the social login is offered and / or adopted?</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ 2</td>
<td>What are the implications on competition <em>for users</em> between specialized (general) outlets if the social login is offered and / or adopted?</td>
</tr>
<tr>
<td>RQ 3</td>
<td>What drives the adoption (offer) of social logins?</td>
</tr>
</tbody>
</table>
Illustration of market outcomes (symmetric CPs)

Result 3a “Comparative Statics” (RQ 3)
- A higher targeting rate makes the login less attractive
Illustration of market outcomes (symmetric CPs)

$\alpha^b_i = 0.5, \alpha^b_{G(i)} = 0.5, \tau = 0.5, \theta = 0.1, \delta = 0.5$

Result 3b “Comparative Statics” (RQ 3)

- A higher screen attention makes the login more attractive.
- The stronger the competition for users, the more the login is adopted.
Although Facebook has vast user data, usage data can improve the ability to target ads properly.

Most websites provide content free of charge and derive revenues from advertising (cf. Kourandi, Krämer & Valletti, 2015, ISR)

- “… the distinguishing feature of Internet Advertising is its ability to convey information to a targeted audience” (Bergemann & Bonatti, 2011, RAND, p. 417)
- Data (i.e., information) about users improves the accuracy of advertising campaigns (cf. Aquisti, Taylor & Wagman, 2015, JEL)

<table>
<thead>
<tr>
<th>User data</th>
<th>Usage data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Facebook Targeting options</strong></td>
<td><strong>Facebook (Developer), ZillowGroup.com</strong></td>
</tr>
<tr>
<td>- Custom audience (website visitors)</td>
<td></td>
</tr>
<tr>
<td>- Location</td>
<td></td>
</tr>
<tr>
<td>- Demographic (education, school, ...)</td>
<td></td>
</tr>
<tr>
<td>- Age &amp; Gender</td>
<td></td>
</tr>
<tr>
<td>- Interests</td>
<td></td>
</tr>
<tr>
<td>- Behaviors</td>
<td></td>
</tr>
<tr>
<td>- Connections</td>
<td></td>
</tr>
</tbody>
</table>
Specialized outlets inherently know the users’ interest, while social networks serve a heterogeneous user base

- **Facebook** has user-specific information (user data), but **uncertainty** with respect to choosing an appropriate ad (usage data)
- “[targeting] leads to higher impression prices, higher profits, and higher social welfare” (Athey & Gans, 2010, AER, p. 610)
Data obtained via the social login helps choosing an appropriate user-specific ad and enables to personalize services.
Stylized market situations and ensuing consumer demand

In Panel (1) market shares are symmetric, i.e., either no login is adopted, or both social logins (F and G) are adopted by each CP i. In Panel (2) CP A adopts both logins, while CP B adopts none. Panel (3) denotes the situation where CP A only adopts CP F, but CP B does not adopt a login. Finally, in Panel (4) CP A adopts both social logins, but CP B only adopts CP F.

Market shares for different social login decisions assuming $\theta > 0$. 
Normal form game of the general-interest CPs adoption decision with competing general-interest CPs

With regard to the adoption decision of special-interest CP $i$ in stage two, each CP $i$ chooses between the adoption of both logins ($FG$), adoption of a single login ($F$ or $G$), or no adoption ($\emptyset$). Consequently, there are 16 possible configurations as shown in Table 2. Thereby, $\Pi_i^{d,-d}$ denotes the profit of CP $i$ given its decision $d$ and its rival's decision $-d$, with $d$ and $-d \in \{\emptyset, F, G, FG\}$.

<table>
<thead>
<tr>
<th>CP $A$</th>
<th>No SL</th>
<th>SL $F$</th>
<th>SL $G$</th>
<th>SL $F, G$</th>
</tr>
</thead>
<tbody>
<tr>
<td>No SL</td>
<td>$(\Pi_A^0, \Pi_B^0)$</td>
<td>$(\Pi_A^{0,F}, \Pi_B^{F,0})$</td>
<td>$(\Pi_A^{0,G}, \Pi_B^{G,0})$</td>
<td>$(\Pi_A^{0,FG}, \Pi_B^{FG,0})$</td>
</tr>
<tr>
<td>SL $F$</td>
<td>$(\Pi_A^{F,0}, \Pi_B^{0,F})$</td>
<td>$(\Pi_A^{F,F}, \Pi_B^{F,F})$</td>
<td>$(\Pi_A^{F,G}, \Pi_B^{G,F})$</td>
<td>$(\Pi_A^{F,FG}, \Pi_B^{FG,F})$</td>
</tr>
<tr>
<td>SL $G$</td>
<td>$(\Pi_A^{G,0}, \Pi_B^{0,G})$</td>
<td>$(\Pi_A^{G,F}, \Pi_B^{F,G})$</td>
<td>$(\Pi_A^{G,G}, \Pi_B^{G,G})$</td>
<td>$(\Pi_A^{G,FG}, \Pi_B^{FG,G})$</td>
</tr>
<tr>
<td>SL $F, G$</td>
<td>$(\Pi_A^{FG,0}, \Pi_B^{0,FG})$</td>
<td>$(\Pi_A^{FG,F}, \Pi_B^{F,FG})$</td>
<td>$(\Pi_A^{FG,G}, \Pi_B^{G,FG})$</td>
<td>$(\Pi_A^{FG,FG}, \Pi_B^{FG,FG})$</td>
</tr>
</tbody>
</table>
Facebook’s platform policy is very explicit about its intent to collect data.

6. Things you should know

1. We can analyze your app, website, content, and data for any purpose, including commercial.

We Can Analyze Your App

For example, we can analyze your app for targeting the delivery of ads and indexing content for search and measurement.
Details: users, content providers and the advertiser

**Internet users**

- Unit mass of heterogeneous users with natural preference for one of the special-interest CPs, i.e., CP A (CP B) is located at \( x = 0 \) (\( x = 1 \)) (Hotelling, 1929)

- Derived **utility** determined by base utility \((u_i)\) and degree of competition \((\tau)\), i.e., consumer \( x \) derives utility of \( U_A(x) = u_A - \tau x \) \( (U_B(x) = u_B - \tau(1 - x)) \).

- The **demand** for CP \( i \) is denoted by \( D_i \). We assume \( D_A + D_B = 1 \).

- **Users visit one special- and the general-interest CP**. They **split their attention** according to \( \delta \) (probability of visiting the special-interest CP). We assume \( t = 2 \) periods
  
  - \( CP i \) expects \( D_{i,t} = D_i * \delta \) in period \( t \)
  
  - \( CP G \) expects \( D_{G,t} = (D_A+D_B) * (1 - \delta) = (1 - \delta) \) in period \( t \)
Details: users, content providers and the advertiser

Content Providers
- Receive revenues predominantly from selling advertisement space.
- \( CP \, i \) competes with \( CP \, G \) for views; **prices** depend on:
  - The **number of viewers** in time period \( t \) (depending on competition for users and \( \delta \))
  - The **targeting rate**, i.e., the fraction of view-throughs, denoted by \( \alpha_j \)
- \( CP \, G \) may offer \( CP \, i \) a social login, i.e., \( G \) and \( i \) share information about their users leading to an increase in…
  - … base utility \( u^l_i = u^b_i + \theta \) (lower transaction costs, better personalization, etc.)
  - … targeting rate \( \alpha^l_j = \min\{\phi_j \alpha^b_j, 1\} \) (more information about users’ preferences)

Advertiser
- Values the effectiveness by effective view-throughs (Hamman and Plomion, 2013; Asdemir et al., 2012; Bleier and Eisenbeiss, 2015).
- Multiple impressions of the ad are wasted (cf. D’Annunzui and Russo, 2015; Calvano and Jullien, 2012; Athey et al. 2014; etc.).
- The advertiser maximizes

\[
\Pi_Z = \Gamma_A (n_A - p_A) + \Gamma_B (n_B - p_B) + \sum_{i=A,B} \Gamma_{G(i)} (n_{G(i)} - p_{G(i)})
\]
Calculating relevant threshold (market outcomes)

Possible **market outcomes** are illustrated by calculating the thresholds for offering / adopting the social login and solving with respect to $\phi_i$ (NOTE: $\alpha_j^l = \phi_j \cdot \alpha_j^b$)

- **Special-interest CP i’s adoption decision.** The threshold for CP i assuming the competitor adopts the social login is *below* the unilateral incentive to adopt the login, i.e., both CP i adopts the social login, if

  $$\Delta_{l,b} = \pi_i^{l,b} - \pi_i^{b,b} = \frac{\delta \alpha_i^l (\tau + \theta)}{2 \tau} \cdot (2 - \delta \alpha_i^l - 2 \alpha_G^l (1 - \delta)) - \frac{1}{2} \delta \alpha_i^b \cdot (2 (1 - \alpha_G^b) + \delta (2 \alpha_G^b - \alpha_i)) > 0$$

  $$\iff \bar{\phi}_i \geq \frac{1}{\delta \alpha_i^l (\tau + \theta)} \cdot \left( \left((\phi_G \alpha_G^{b(l)} (\delta - 1)) + 2 \alpha_G^{b(l)} (\delta - 1) (\phi_G - \alpha_i^b) + (\delta \alpha_i^b - 1)^2 \right) - \left((\phi_G \alpha_G^{b(l)} (\delta - 1)) + 2 \alpha_G^{b(l)} (\delta - 1) (\phi_G - \alpha_i^b) + (\delta \alpha_i^b - 1)^2 \right) \right)^{1/2}$$

- **General-interest CP G offers** the social login always to both CP i or none, if

  $$\Omega_{l,l} = \pi_i^{l,l} - \pi_i^{b,b} > 0 \land \pi_i^{l,b} - \pi_i^{b,b} > 0 \land \pi_G^{l,l} - \pi_G^{b,b} > 0$$

  $$\iff \tilde{\phi}_i < \frac{\alpha_G^{b(l)} (\phi_G^2 - 1) (\delta - 1) + 2 (\delta \alpha_G^{b(l)} + \phi_G - 1)}{2 \delta \phi_G \alpha_i^b}.$$ 

- **CP i is worse off** if the profit with social login is below the profit without. i.e., if

  $$\pi_i^{l,l} - \pi_i^{b,b} = \frac{1}{2} \delta \alpha_i^l \cdot (2 (1 - \alpha_G^l) + \delta (2 \alpha_G^l - \alpha_i^l)) - \frac{1}{2} \delta \alpha_i^b \cdot (2 (1 - \alpha_G^b) + \delta (2 \alpha_G^b - \alpha_i^b)) < 0$$

  $$\iff \tilde{\phi}_i < \frac{1}{\delta \alpha_i^b} \cdot \left( (\phi_G^{b(l)} (\delta - 1) \phi_G + 1) - \left((\phi_G \alpha_G^{b(l)} (\delta - 1)) + 2 (\delta - 1) \alpha_G^{b(l)} (\phi_G - \alpha_i^b) + (\delta \alpha_i^b - 1)^2 \right) \right)^{1/2}$$

  → **Prisoner’s-Dilemma-like situation**
Socially Logged-in Users Behave Differently

+67% Page Views
Socially logged in users view 66.7% more pages.

+56% More Time
Socially logged in users spend 56.2% more time on site.

5x More Likely to Purchase
Online Retailer Giantnerd found that Social users are five times more likely to make a purchase.

Gigya (2014)
Social Login has a Direct Impact on Key Business Metrics

**+33% New Registrations**
Websites average a 33.2% increase in new registrations with Social Login.

**+26% Data Accuracy**
Social Login improves the quality of registered user data by an average of 25.8%.

**+37% ROAS (Return on Advertising Spend)**
By layering social graph data plus behavioral data you get actionable intent that delivers more effective media targeting and performance.

**Reduced Support Costs**
30% of support calls are regarding forgotten password support, and average cost for a password reset is $70.
Social login may lead to increased interactions.

64% Are more likely to return to a website that remembers them without a username and password.

49% Would read more articles using their mobile devices if social login made it easier to log in.

42% Would make more purchases online using their mobile devices if social login made it easier for them to login.

Q1. Below is a list of opinions. For each, please rate the degree to which you agree or disagree with the statement: 3) I expect that by using ‘social login’ it will improve my experience at a website (showing respondents who rated 5-10 on a 1-10 scale) n=594

Q16. Rate each of the statements below based on your level of agreement. A “1” means you completely disagree with that statement and a “10” means you completely agree with that statement. If social login made it easier for me to login to sites using my mobile phone, iPad and/or tablet computer, I would... (showing respondents who rated 5-10 on a 1-10 scale) n=594
Social login users are more engaged and are stronger brand advocates.

‘Percent that use their social network to...’

<table>
<thead>
<tr>
<th></th>
<th>Non-Social Login User</th>
<th>Social Login User</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share a Positive Comment</td>
<td>68%</td>
<td>84%</td>
</tr>
<tr>
<td>Seek out or avoid a company based on reviews</td>
<td>56%</td>
<td>79%</td>
</tr>
<tr>
<td>Share a negative comment</td>
<td>61%</td>
<td>74%</td>
</tr>
<tr>
<td>Ask for feedback/Suggestions before making a purchase</td>
<td>32%</td>
<td>54%</td>
</tr>
<tr>
<td>Recommend a company’s website to others</td>
<td>22%</td>
<td>40%</td>
</tr>
</tbody>
</table>

Q12. How often do you do the following? (excludes percent selecting “never”) SU Users n=320; SU Non-users n=274
Q9. If a company personalizes your experience and the information on their website by catering to your specific interests/preferences (e.g. recommending articles to read, videos to watch, products/services to consider based on your profile, interests and/or purchases or perhaps those of your friends), how much more or less likely, if at all, are you to do the following? (excludes percent selecting ‘no impact’ or ‘less likely’) SU Users n=320; SU Non-users n=274
Fluctuation of Top 10 between 69% and 74%

Share of total revenues (US-data)
Pricing models (US-market)
Targeting – visualization
Facebook has several targeting options to specify the desired audience

**Facebook Targeting options**
- Custom audience (website visitors)
- Location
- Demographic (education, school, ...)
- Age & Gender
- Interests
- Behaviors
- Connections

Defining a too **specific set** will result in a small reach and the effectiveness is questionable as the **current interests** are rather unclear.
The Model

We consider **two specialized outlets** (CP1 and CP2) at the ends of an hotelling line and **one general outlet** (SN)

- CP1 and CP2 offer substitutive services
- SN offers different / complementary services
- Financed purely via advertising revenues (CPI model)

Users are homogeneous and are active at SN and additionally at CP1 or CP2

- Single- & Multihoming occurs simultaneously
- The usage of the **specialized outlet** depends on the valuation ($v_{CP1}$ and $v_{CP2}$) and the transportation costs $\tau$
  - The indifferent user lies at $x$ (i.e., $x$ represents the market share)
- ‘Screen attention’ is represented using the parameter $\delta$
  - Screen attention for CP1: $x \cdot \delta$
  - Screen attention for CP2: $(1-x) \cdot \delta$
  - Screen attention for SN: $x \cdot (1-\delta) + (1-x) \cdot (1-\delta) = 1 - \delta$

The advertiser values a consumer clicking on his impression with $\nu$.

- Price paid for displaying the ad: $p_i$
- The advertiser is free in his decision whether to display ads at CP1 and/or CP2 and/or SN
$$C_1 = \delta^* (\delta^* \alpha_{CP1}^* x + (1 - \delta)^* \alpha_{SN}^* x)$$

$$\text{# EFFECTIVE CLICKS}$$

# Clicks after t=2 (CP1 with M/S $\delta$)

$$= \delta^* \alpha_{CP1}^* x + (\delta^* x - C_1)^* \alpha_{CP1}$$

$$= \delta^* \alpha_{CP1}^* x + (\delta^* x - \delta^* (\delta^* \alpha_{CP1}^* x + (1 - \delta)^* \alpha_{SN}^* x)) \alpha_{CP1}$$

$$= 2^* \delta^* \alpha_{CP1}^* x - 2^* \alpha_{CP1}^2 x - \delta^* \alpha_{CP1}^* \alpha_{SN}^* x - \delta^* \alpha_{CP1}^* \alpha_{SN}^* x$$