LARGE-SCALE FIELD EXPERIMENTS:
where science benefits practice
Testing

One of the **Big** opportunities from Big Data

- By now most experts know that *Big Data* present an excellent opportunity for testing

1. Better Data than in the past
   - Create large samples for statistical power
   - Low opportunity cost -- only small portion of business exposed to unprofitable experimental conditions

2. Potentially Simpler Analysis than in the past
   - simple A-B testing RCT design (vs marketing-mix)
Some large-scale field experiments highlight the benefits of collaboration between marketing practitioners and academics.

Sometimes the basic RCT is insufficient.

- Models to fill in missing cells when optimum outside design
- Models/theory to design the “right” experiment
- Models/theory to analyze counter-intuitive results
Pricing
SMS Mobile Discounts

- Subject pool
  - large Asian city
  - 15 million subscribers living 2km from a theater and who purchased a ticket via phone in last 6 months
  - 4,200 randomly sampled

- SMS offer for admission voucher on any 3D showing of X-Men: Days of Future Past (regular price of 100 RMB)

- offer distributed on 5-21-2014 and expired at midnight 5-22-2014

To buy a voucher for general admission to any of X-Men: Days of Future Past’s 3D showings, follow this link...

Discount: Probability
20 RMB 17%
35 RMB 17%
50 RMB 17%
60 RMB 17%
75 RMB 17%

Control (17%)  Test (83%)
Pricing
SMS Mobile Discounts

tested prices & responses
tested prices & responses & revenues

Optimized price can be visualized (and it’s half the regular ticket price!)
Theory can be critical for designing the “right” experiment

Many firms exploring geographic targeting using mobile technology

Problem: Academics ask what if all firms target?

What does the theory of competitive price discrimination teach us?

- Competitive response moderates targeting profits
- But exact effect is ambiguous (equilibrium profits can rise/fall)

How to run an experiment that varies relative prices?
Targeted Pricing
SMS Mobile Discounts for Asian movie theaters

- Subject pool
  - 2 competing IMAX theaters in 2 respective malls
  - 57,000 mobile subscribers within 500m of each mall’s geofences
  - 18,000 randomly sampled

- Each subject receives separate SMS offers from each theater (sent minutes apart)
  - admission voucher to 2D movie (regular price 75 RMB)

- Offers distributed on a Saturday, 11am-12pm

- Source: Dubé, Fong, Luo and Fang (2015)
Targeted Pricing
SMS Mobile Discounts for Asian movie theaters

Both firms benefit from geo-targeting…
but
optimal equilibrium prices below tested region!
Targeted Pricing
SMS Mobile Discounts for Asian movie theaters

- A model can help by predicting the missing cells
- Fit demand and then compute the optimal price
- Note that one now fits the model to “reliable” data
  - Price variation is exogenous
Targeted Pricing
SMS Mobile Discounts for Asian movie theaters

- trinomial probit demand
- Lowest price tested
Targeted Pricing
SMS Mobile Discounts for Asian movie theaters

- Trinomial probit demand
- Optimal price 70% lower than posted price

Optimal price regular price

Lowest price tested
Targeted Pricing
SMS Mobile Discounts for Asian movie theaters

- What about **equilibrium**?
  - use model to locate intersection of best-response functions

- What about **targeting**?
  - use model to compute equilibrium targeting outcomes

**Expected revenues per customer messaged**

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<th>Firm A</th>
<th>Firm B</th>
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<tr>
<td>Uniform pricing (equilibrium)</td>
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<tr>
<td>Unilateral targeting</td>
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<td>3.04</td>
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<tr>
<td>Equilibrium targeting</td>
<td>1.97</td>
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Returns to targeting fall in equilibrium!
Opportunity for theory-guided RCT design

Mobile carrier also interested in non-price promotions

Cause marketing:

Bundle a charitable donation to a pre-determined cause for each ticket purchased

We need some theory here …

Why would charitable donations increase demand for a movie ticket?

Theory:

- **Altruism**: I value the charity or donating to charity
  (Donations and discounts synergistic)

  vs.

- **Self-signaling**: I want to convince myself (or others) that I am altruistic
  (Donations and discounts potentially non-synergistic)
Price vs. non-price promotions
SMS Mobile Promotion

- **Between-subjects design:**
  - Sample 30,300 subjects
  - 21 cells
  - 4 donation amounts: 0, 5, 10, 15 RMB
  - 6 discount amounts: 0%, 20%, 35%, 50%, 60%, 75%
To buy a voucher for general admission to any of X-Men: Days of Future Past’s 3D showings at a [XXX] RMB discount, follow this link...

Dear Customer, with your support [mobile service] can help the elderly poor. [mobile service] is offering a voucher for general admission to any of X-Men: Days of Future Past’s 3D showings for 100 RMB. For each voucher purchased, [YYY] RMB will be donated to the elderly poor. To buy a voucher follow this link...

Dear Customer, with your support [mobile service] can help the elderly poor. [mobile service] is offering a voucher for general admission to any of X-Men: Days of Future Past’s 3D showings at a [XXX] RMB discount. For each voucher purchased, [YYY] RMB will be donated to the elderly poor. To buy a voucher follow this link...
Price vs. non-price promotions

SMS Mobile Promotion

Small donation raises demand slightly
Larger donations create **counter-intuitive** upward-sloping regions of demand

Clearly altruism alone cannot explain this non-monotonicity.

But self-signaling theory can!
Price vs. non-price promotions
SMS Mobile Promotion

Predictions from a model with self-signaling fit the non-monotonicity closely.
Price vs. non-price promotions

SMS Mobile Promotion

Very non-standard demand under self-signaling...

So pricing will look quite different too …

…and so will the design of the cause marketing campaign.
Testing as the bridge between academics and data-driven marketing

- Collaboration needs
  - Models to fill in missing cells when optimum outside design
  - Models/theory to design the “right” experiment
  - Models/theory to analyze counter-intuitive results

- Benefits
  - Academic testing of cutting-edge theories
  - Innovate marketing decision-making