Propose with a Rose

Signaling in Internet Dating Markets

Soo hyung Lee (University of Maryland)
Muriel Niederle (Stanford and NBER)
Signaling models

• Costly signaling models (education…)
• Preference Signaling
  – Sending signals is not costly per se
    • Everyone can send any signal
  – Cost of signals through limiting their number
    • Need to decide to whom to send the signal

• College admission in the US: early action
  – Single early action, but no (other) costs to apply early
• AEA Job Market
  – Can send signals to 2 universities…
Does Preference Signaling work?

Theory: Preference Signaling

• College Admission: Avery & Levin 2009
• Labor markets: Coles, Kushnir and Niederle 2009

Practice: Does a signal increase the chance of success:

• College admission: get an offer.
• Junior econ market: get an interview.

Empirical Work

• In college admission: Avery et al (2003) show that GPA of early admits are lower than of regular admits.
  – Problem: Lots of unobservables, maybe simply a way to reduce competition for financial aid.
• AEA job market (Coles et al, 2010)
  – About 1000 users a year (with about 700 fresh Ph.D.’s)
  – Signals seem to increase the chance of receiving an interview
The goal of this paper

Provide clear evidence that preference signaling increases the chance of success.

Online dating: When making a proposal
• Can add a rose to signal special interest
• 2 roses, 10 offers.
• Randomly chosen 20%: 8 roses.
Advantages of online dating

• While the market is decentralized, it is observable as much as internet transactions can be.

• Unusually detailed information about the participants, and participants have less than unusual unobservable shared information.

• Since dating is a continuous market: Can portion off a small part and have a field experiment on it.
Korean Match Making Company

Information about participants

• National Household Registration Card
  – age, birth order, marital history, region, parent’s marital status

• Other (legally verifiable) documents
  – education, industry,

• Information provided by participants:
  – income, wealth, religion, father’s education, father’s occupation, parental wealth, head-to-shoulder photo, height, weight...

2/3 of participants: full legal verification, only 3% have no legal verification.

Subset of information: constitutes online profile
Internet dating site

• Company assigns to each participant a desirability grade (0 to 100) – that is a function depending on gender, and other attributes.

• Grade is not visible to participants

• Lee (2009), bigger dataset, show that the desirability grade is a good predictor of behavior: Acceptance of proposed matches, and even marriage.
Participants in the field experiment

Create a thick market: Never married college educated
Men: 26-38, Women: 22-34.

304 men and 309 women

2 sessions:
one with about 200,
second with about 400 members
Experimental design

Special internet dating event:
• 5 days to make up to 10 offers.
• Day 6: All offers are transmitted at once
• 4 days to respond to offers (max 10 yes)
• Accepted proposal: Exchange of contact information

Special
• Participants can attach a rose to a proposal
The Battle of Roses with 300 singles in an online space! Obtain E-Roses!
A one-week online event with a maximum of 20 first dates!
This event is designed for participants to experience SUNOO’s new system. This new system is designed for people who would like to meet multiple partners within a short period. In addition, in this system, people can use E-Roses to evaluate the extent to which a partner would like them.
Treatments

1. 2 Roses: 80% of participants
   - Empowerment treatment + 2 Roses: 30%

2. 8 roses: 20% (and empowerment)
   - Receive 8 roses

• Are proposals with roses more likely to be accepted?
• Are participants with 8 roses more successful?
Sending a proposal with/without a rose

- Generic note is sent to the other participant
- Option to attach a rose
- Other participant’s Short Profile
- Button to send a proposal
Proposals

Men are more active than women

**Men:**
- 54.28% of men send a proposal, send 1261.
- Those send on average 7.64.
- 53.94% exhaust their proposals.

**Women:**
- 36.89% of women send a proposal, send 660.
- Those send on average 5.79,
- 27.19% exhaust their proposals.
Roses

Conditioning on sending a proposal, a rose is attached to at least one proposal by:
90.3 percent of men,
64.91 percent of women

Use up all roses
75% of men, 47% of women

Participants with two roses use on average 1.79 and 1.54 roses (for men and women, respectively),
Fraction of Proposals Initiated by Participants' Type (cumulative)

- Participants of each desirability decile are equally active in making proposals
Fraction of Roses sent by Participants' Type (cumulative)

Participants of all desirability levels are equally likely to send a rose
Desirable participants receive more proposals. Women seem less “diversified” than men.
Who sends a proposal to whom

Distribution of proposals by desirability of sender and recipient

<table>
<thead>
<tr>
<th>Own Rank</th>
<th>Male Sender</th>
<th>Female Sender</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bottom</td>
<td>Middle</td>
</tr>
<tr>
<td>Bottom</td>
<td>23.61</td>
<td>39.79</td>
</tr>
<tr>
<td>Middle</td>
<td>12.91</td>
<td>41.58</td>
</tr>
<tr>
<td>Top</td>
<td>10.44</td>
<td>36.66</td>
</tr>
<tr>
<td>Average</td>
<td>15.26</td>
<td>39.37</td>
</tr>
</tbody>
</table>

The more desirable the sender, the more their proposals go to desirable recipients.

However, large overlap in offers: about 80% for both women and men.
Who receives Roses?
Fraction of proposals with roses

Decile of Desirability
Proportion of Roses by number of offers received

Alternative measure of desirability

Number of offers vs. proportion of roses.
Summary: Proposals

Participants of each desirability level are equally active.

Men are more active than women.

More desirable people receive more offers, especially from more desirable senders.
Roses

• Like with proposals: participants of all desirability levels send roses with an equal probability.

• Roses, on aggregate, follow offers “proportionally”, they are not concentrated on the most desirable recipients (which is opposite to proposals).
Accepting a proposal

Window to check received proposals

List of participants who sent a propose and their short profile

Indicate whether you responded to the proposal
Informing contact number to a couple for a first date

Your dating partner’s Cell phone number is 000-000-0000
Acceptances

After 5 days of making offers, participants receive all proposals (including roses). Participants can say YES / NO / No R.
Yes to at most 10 proposals

168 men and 226 women receive at least one proposal.

About 40% use only Yes or No, we will interpret NR as No.

Acceptance rate: 15.35%, Men: 20.76%, Women: 12.53%  
30 participants propose to each other,  
  – accepted each other w. 3 women not responding
Impact of Roses on Acceptance

Acceptances by Men:
- 478 proposals: no rose: 19.67% accepted
- 182 proposals: rose: 23.63% accepted

Acceptances by Women:
- 773 proposals: no rose: 12.29% accepted
- 488 proposals: rose: 12.91% accepted
<table>
<thead>
<tr>
<th>Recipients</th>
<th>all</th>
<th>men</th>
<th>women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rose:</td>
<td>0.033**</td>
<td>0.053</td>
<td>0.026</td>
</tr>
<tr>
<td></td>
<td>[0.016]</td>
<td>[0.033]</td>
<td>[0.018]</td>
</tr>
<tr>
<td>S_Middle</td>
<td>0.048**</td>
<td>0.066*</td>
<td>0.031</td>
</tr>
<tr>
<td></td>
<td>[0.019]</td>
<td>[0.037]</td>
<td>[0.022]</td>
</tr>
<tr>
<td>S_Top</td>
<td>0.178***</td>
<td>0.177***</td>
<td>0.175***</td>
</tr>
<tr>
<td></td>
<td>[0.020]</td>
<td>[0.040]</td>
<td>[0.023]</td>
</tr>
<tr>
<td>R-sq</td>
<td>0.5</td>
<td>0.54</td>
<td>0.46</td>
</tr>
</tbody>
</table>

| no of proposals | 1,902 | 657 | 1,245 |
| no of recipients | 393 | 168 | 225 |

Linear recipient fixed effect model. Control variables sender’s verification level, age, living in greater Seoul, squared age difference, and dummy of whether the sender lives in the same location.

Acceptance from the recipients perspective.

Roses increase acceptance by about 20%.

Comparable to benefit enjoyed by Middle rather than Bottom group sender.
Top recipients do not react to roses

Middle recipients increase acceptance rate by 40% when the offer comes with a rose.

Effect: larger than benefit: bottom to Middle for Sender.

Bottom recipients: like Middle, but not significant (though often yes if one-sided...).

<table>
<thead>
<tr>
<th>Recipients</th>
<th>all</th>
<th>men</th>
<th>women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rose: R_Bottom</td>
<td>0.054</td>
<td>0.273</td>
<td>0.038</td>
</tr>
<tr>
<td></td>
<td>[0.047]</td>
<td>[0.218]</td>
<td>[0.046]</td>
</tr>
<tr>
<td>Rose: R_Middle</td>
<td>0.078***</td>
<td>0.103</td>
<td>0.073***</td>
</tr>
<tr>
<td></td>
<td>[0.027]</td>
<td>[0.076]</td>
<td>[0.027]</td>
</tr>
<tr>
<td>Rose: R_Top</td>
<td>-0.001</td>
<td>0.035</td>
<td>-0.023</td>
</tr>
<tr>
<td></td>
<td>[0.021]</td>
<td>[0.037]</td>
<td>[0.027]</td>
</tr>
<tr>
<td>S_Middle</td>
<td>0.047**</td>
<td>0.066*</td>
<td>0.029</td>
</tr>
<tr>
<td></td>
<td>[0.019]</td>
<td>[0.037]</td>
<td>[0.022]</td>
</tr>
<tr>
<td>S_Top</td>
<td>0.176***</td>
<td>0.175***</td>
<td>0.174</td>
</tr>
<tr>
<td></td>
<td>[0.020]</td>
<td>[0.040]</td>
<td>[0.023]</td>
</tr>
<tr>
<td>R-sq</td>
<td>0.5</td>
<td>0.54</td>
<td>0.46</td>
</tr>
<tr>
<td>no of proposals</td>
<td>1,902</td>
<td>657</td>
<td>1,245</td>
</tr>
<tr>
<td>no of recipients</td>
<td>393</td>
<td>168</td>
<td>225</td>
</tr>
</tbody>
</table>

Linear recipient fixed effect model.

Control variables: sender’s verification level, age, living in greater Seoul, squared age difference, and dummy of whether the sender lives in the same location.
<table>
<thead>
<tr>
<th>Recipients</th>
<th>all</th>
<th>men</th>
<th>women</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>R_Bottom</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S_Bottom Rose</td>
<td>-0.052</td>
<td>0.163</td>
<td>-0.059</td>
</tr>
<tr>
<td></td>
<td>(0.064)</td>
<td>(0.311)</td>
<td>(0.062)</td>
</tr>
<tr>
<td>S_Middle Rose</td>
<td>0.125*</td>
<td>0.500</td>
<td>0.103</td>
</tr>
<tr>
<td></td>
<td>(0.070)</td>
<td>(0.311)</td>
<td>(0.068)</td>
</tr>
<tr>
<td>S_Top Rose</td>
<td>0.160*</td>
<td>0.075</td>
<td>0.136*</td>
</tr>
<tr>
<td></td>
<td>(0.084)</td>
<td>(0.452)</td>
<td>(0.081)</td>
</tr>
<tr>
<td><strong>R_Middle</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S_Bottom Rose</td>
<td>0.106**</td>
<td>0.211</td>
<td>0.089*</td>
</tr>
<tr>
<td></td>
<td>(0.049)</td>
<td>(0.151)</td>
<td>(0.050)</td>
</tr>
<tr>
<td>S_Middle Rose</td>
<td>0.019</td>
<td>-0.074</td>
<td>0.039</td>
</tr>
<tr>
<td></td>
<td>(0.039)</td>
<td>(0.118)</td>
<td>(0.040)</td>
</tr>
<tr>
<td>S_Top Rose</td>
<td>0.124***</td>
<td>0.209*</td>
<td>0.102**</td>
</tr>
<tr>
<td></td>
<td>(0.040)</td>
<td>(0.112)</td>
<td>(0.041)</td>
</tr>
<tr>
<td><strong>R_Top</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S_Bottom Rose</td>
<td>-0.003</td>
<td>-0.030</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>(0.044)</td>
<td>(0.081)</td>
<td>(0.052)</td>
</tr>
<tr>
<td>S_Middle Rose</td>
<td>0.034</td>
<td>0.058</td>
<td>0.021</td>
</tr>
<tr>
<td></td>
<td>(0.032)</td>
<td>(0.054)</td>
<td>(0.040)</td>
</tr>
<tr>
<td>S_Top Rose</td>
<td>-0.033</td>
<td>0.040</td>
<td>-0.072*</td>
</tr>
<tr>
<td></td>
<td>(0.032)</td>
<td>(0.058)</td>
<td>(0.037)</td>
</tr>
</tbody>
</table>

Roses increase acceptance, whenever the offer comes from a sender that is in a higher desirability group.
Impact of Roses for Proposers

Men with 8 roses, compared to those with 2 roses have 55% more dates and, more importantly, 61% more initiated dates.

• Even among men who made at least one offer, men with 8 roses: 15% more dates (though not significant).

Women with 8 roses: 12% more dates (n.s.), and 67% more initiated dates.

• Among women who made at least one proposal: 49% more initiated dates.
Do Roses affect the number of acceptances?

Do roses increase the total number of acceptances?

Or do roses displace other acceptances?

Consider active recipients who received 1-3 offers, check their number of accepted offers as a function of whether they received a rose.
Number of accepted proposals

<table>
<thead>
<tr>
<th>Recipient</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Middle</td>
<td>Middle</td>
</tr>
<tr>
<td>Received at</td>
<td>0.648**</td>
<td>0.038</td>
</tr>
<tr>
<td>least 1 rose</td>
<td>[0.294]</td>
<td>[0.283]</td>
</tr>
<tr>
<td>Constant</td>
<td>0.727***</td>
<td>0.545**</td>
</tr>
<tr>
<td></td>
<td>[0.152]</td>
<td>[0.204]</td>
</tr>
<tr>
<td>Obs</td>
<td>30</td>
<td>23</td>
</tr>
<tr>
<td>R-sq</td>
<td>0.1474</td>
<td>0.0009</td>
</tr>
</tbody>
</table>

Roses increase total number of acceptances among Middle recipients (recipients who most respond to roses)
Preference Signaling Technology: Roses

Use Internet dating: clean market design experiment whether sending a preference signal increases chance of success.

Roses attract positive answers, especially when
- sent to the middle group,
- Sent to less desirable participants than the sender

Participants with 8 roses are more successful: receive more dates.

Roses increase the total number of acceptances.
Market Design: Preference Signaling

- Cheap to implement
- Can affect outcomes