

Supplementary Document

“Propose with a Rose? Signaling in Internet Dating Markets”

This document provides details of the analyses cited in the main text of this paper, as well as additional results for robustness checks.

Index

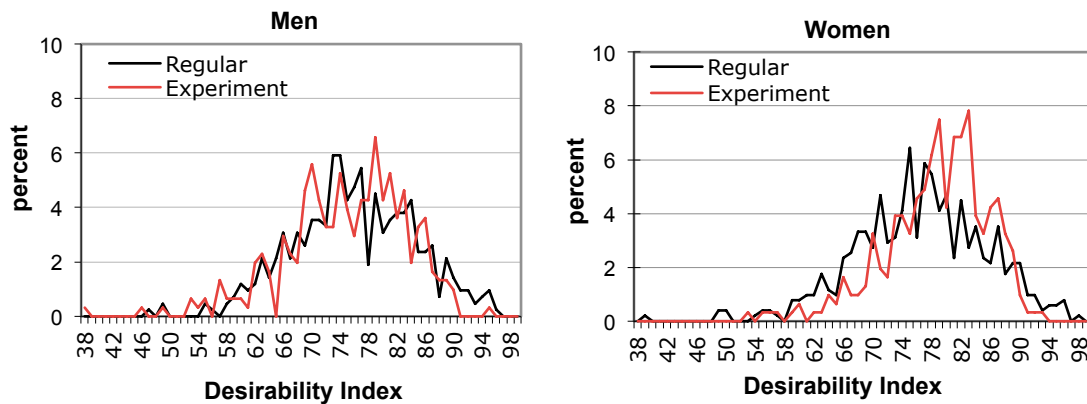
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1. Desirability Index

1.1 Comparing Experimental Participants to Other Clients

We first show that the experimental participants are comparable to regular clients of the online dating company. We compare the desirability distribution index of experimental participants with that of regular members of the dating company. Regular members are individuals who used the dating service between January 2005 and June 2006 and who satisfy the criteria required to participate in the experiment concerning age, education, and marital history. The black line in Figure A.A presents the desirability index distribution of regular male members, whereas the lighter red line presents that of male experimental participants. Similarly, Figure A.B presents the desirability index distribution of regular female members (black line) and female experimental participants (red line). The figures show that experimental participants are similar to regular members in terms of desirability index distribution, although female experimental participants have a slightly higher desirability index than regular female members.

Figure A



For each desirability index, the fraction of regular and experimental members with that desirability index.

1.2 The desirability index as a measure of desirability in the dating market

We show the extent to which a member's desirability index predicts his or her popularity as a dating partner. For this exercise, we use the dataset of regular members (collected by Lee (2009)) who used the dating service between January 2005 and June 2006 and whose age, education and marital history made them eligible for the experiment. In this dataset, the company proposed dates, and we know whether a participant accepted a date.

Suppose that the desirability index, together with the control variables we use in the main text of this paper, is a sufficient proxy for a person's characteristics in the dating market. Then,

using this subset of characteristics to predict a person's popularity as a dating partner will be comparable to using all the available characteristics. To examine this possibility, we regress whether or not a person accepted a dating partner suggested by the company on two sets of control variables.

The first set is the same as the regressors used in the paper: the type of participant. It includes participant-fixed effects, and, for the dating partner, his or her desirability index, age, residential location, as well as squared age difference between the participant and the dating partner, and whether the two live in the same location.

The second set of control variables includes participant-fixed effects and all the characteristics the dating partner submitted to the company, instead of using the desirability index, age, and residential location only. The characteristics of a dating partner are education level (college, or master's or PhD), income, father's education level (high school or less, junior college, college, master's or PhD), parents' wealth, whether a person is likely to be a primary caregiver for his or her parents, facial grade (*A* to *D*), height, body mass index, industry, employment type, religion, residential location, hometown, age, squared difference in age, year of the sample (2005 or 2006), and the top three priorities for spousal traits.¹

Since the second set of regressors includes the information the dating company used to produce the desirability index, the second set should fit the data better than a regression model based on the desirability index, age and location only. However, if the two regression models explain the data equally well, we can conclude that a person's desirability index, age, and residential location are sufficient to characterize the person's popularity as a dating partner.

Each column in Table A stands for a regression model. Columns 1 and 4 use the same set of regressors as the paper. Columns 2 and 5 also use the same set of regressors as the paper, except for dummy variables for the dating partner's desirability decile instead of three desirability groups. Columns 3 and 6 use the second set of regressors, that is, all the available information about a dating partner. As in the experiment, the desirability index is a significant predictor of whether a regular member was accepted for a date. For instance, the coefficient of the desirability index in column 1 suggests that a man is 1.2 percentage points more likely to accept a date with a woman when her desirability index increases by one point, a significant increase. This positive correlation between the desirability index and the likelihood of being accepted for a date is robust across gender (column 4) and when using flexible controls for the desirability index (columns 2

¹ Recall that some of the information that is part of a dating partner's characteristics and that is also used to compute the desirability index (for example, income) is actually not part of a person's public profile, that is, it is not available to other members of the dating site.

Table A Desirability Index and Popularity as a Dating Partner

Decider	Men			Women		
	Index (1)	Index (2)	All (3)	Index (4)	Index (5)	All (6)
Desirability index	0.012*** (0.001)			0.013*** (0.000)		
Desirability group						
- 1 st decile (baseline)						
- 2 nd decile		-0.004 (0.033)			0.011 (0.025)	
- 3 rd decile		0.077** (0.031)			0.035 (0.023)	
- 4 th decile		0.023 (0.030)			0.078*** (0.023)	
- 5 th decile		0.054* (0.030)			0.096*** (0.023)	
- 6 th decile		0.100*** (0.030)			0.133*** (0.023)	
- 7 th decile		0.155*** (0.030)			0.166*** (0.023)	
- 8 th decile		0.155*** (0.030)			0.215*** (0.023)	
- 9 th decile		0.193*** (0.030)			0.265*** (0.023)	
- 10 th decile		0.251*** (0.030)			0.343*** (0.023)	
Same location	-0.018 (0.017)	-0.015 (0.017)	-0.032* (0.018)	0.022 (0.015)	0.023 (0.015)	0.024* (0.014)
Age	0.021*** (0.005)	0.020*** (0.005)	0.018*** (0.006)	-0.038*** (0.005)	-0.037*** (0.005)	-0.035*** (0.005)
Age-sq diff	0.007*** (0.001)	0.007*** (0.001)	0.006*** (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.002*** (0.001)
No. of proposals	28,632	28,632	26,372	28,643	28,643	27,684
No. of potential dates	1,599	1,599	1,587	1,910	1,910	1,906
R-sq	0.21	0.21	0.22	0.17	0.18	0.18

Notes: OLS estimates with decider-fixed effects. The dependent variable is one if the decider accepted the dating proposal and zero otherwise. The desirability index, age, and residential location refer to characteristics of the dating partner. Standard errors are in parentheses. *, **, and *** indicate significance at 10, 5 and 1 percent, respectively.

and 5).

The most important observation from Table A is that the R-squared of the regression

models based on desirability index, age, and residential location is almost the same as that based on all the available information. This implies that a person's desirability index, age, and residential location explain as well as the full set of all characteristics whether he/she would be accepted as dating partner by another person in the present data.

2. Alternative Desirability Measures

2.1 The Number of Received Proposals

In this subsection we use the number of proposals a person received as a desirability measure instead of the company's desirability index, and we examine who sent a rose to whom. We perform two regression analyses. The first is to study whether more desirable participants are more likely to have a rose attached to their offer (see section V.B). The second concerns the effect of roses on the likelihood that an offer is accepted (see section IV.B).

For the first analysis, we regress the fraction of proposals with a rose on dummy variables of the following recipient characteristics: the number of received proposals, sex, verification level, living in greater Seoul, and age (columns 1 to 3 of Table B.1). Note that the omitted category is a dummy indicating that participants received five proposals. None of the coefficients relating to the number of received proposals a participant received are significant, except one. In columns 4 to 6, we estimate the same regression using the three categories of the desirability index used in the text. The fraction of proposals with a rose is significantly different only for the middle desirability group recipients, who are somewhat less likely to receive a rose (section V.B). Note that this effect is once more driven by male recipients and that gender specific regression yields no significant effect.

Next we re-estimate Model A of Table II of section IV.B. However, instead of using the desirability group of the sender, we use the number of proposals a sender received as a measure of a sender's desirability. Columns 1 to 3 of Table B.2 report the results. A recipient is 3.4 percentage points more likely to accept a proposal when a rose is attached. This effect is similar in size to the one reported in the main text. When we restrict attention to male and female recipients separately, the effects only barely fail to be significant (columns 2 and 3). The marginal effect is, however, similar in size, and a one-sided test estimating whether attaching a rose increases the acceptance of an offer would yield significance.

Table B.1 Fraction of Roses Attached Proposals

Recipient	No. of Proposals			Baseline		
	All (1)	Men (2)	Women (3)	All (4)	Men (5)	Women (6)
No. received proposals						
1	-0.106 (0.066)	0.034 (0.119)	-0.153* (0.080)			
2	-0.067 (0.070)	0.065 (0.124)	-0.129 (0.087)			
3	0.026 (0.075)	0.067 (0.131)	0.070 (0.093)			
4	-0.076 (0.081)	0.046 (0.145)	-0.124 (0.096)			
6	-0.076 (0.101)	0.005 (0.166)	-0.064 (0.129)			
7	0.071 (0.093)	0.183 (0.198)	0.039 (0.103)			
8	0.027 (0.110)	0.147 (0.174)	0.014 (0.145)			
9	-0.017 (0.156)	0.032 (0.277)	-0.086 (0.194)			
10 or more	0.015 (0.073)	0.132 (0.139)	-0.019 (0.084)			
Middle				-0.084* (0.045)	-0.117 (0.075)	-0.036 (0.056)
Top				-0.041 (0.046)	0.000 (0.075)	-0.041 (0.059)
No. of recipients	394	168	226	393	168	225
Pseudo R-sq	0.040	0.040	0.080	0.020	0.050	0.020

Notes: OLS estimates. Standard errors are in parentheses. The dependent variable is the fraction of proposals with a rose attached. In columns 1 to 3, the dummy indicating that participants received five proposals is omitted. In columns 4 to 6, the indicator for a bottom group recipient is omitted. All regression models control for recipient and sender's verification level (none, medium, full), age and a living in greater Seoul dummy. *, **, and *** indicate significance at 10, 5 and 1 percent, respectively.

Table B.2 Effect of Roses

Recipients	Measure 1			Measure 2		
	All (1)	Men (2)	Women (3)	All (4)	Men (5)	Women (6)
Rose	0.034** (0.015)	0.048 (0.031)	0.027 (0.017)	0.032** (0.016)	0.050 (0.033)	0.025 (0.018)
S_no. received proposals						
0	-0.225*** (0.043)	-0.179*** (0.062)	-0.275*** (0.070)			
1	-0.139*** (0.044)	-0.112* (0.061)	-0.191*** (0.071)			
2	-0.115** (0.045)	-0.102 (0.064)	-0.162** (0.072)			
3	-0.040 (0.047)	0.039 (0.072)	-0.111 (0.074)			
4	-0.084* (0.050)	-0.086 (0.069)	-0.091 (0.081)			
6	-0.069 (0.055)	-0.046 (0.079)	-0.094 (0.085)			
7	0.085 (0.067)	0.178* (0.091)	0.030 (0.114)			
8	0.079 (0.057)	-0.018 (0.099)	0.080 (0.081)			
9	-0.232 (0.148)	-0.155 (0.161)				
10 or more	0.150*** (0.047)	0.270*** (0.063)	-0.012 (0.077)			
S_Middle				0.066*** (0.020)	0.092** (0.037)	0.048** (0.023)
S_Top				0.184*** (0.022)	0.187*** (0.041)	0.181*** (0.026)
No. of proposals	1,921	660	1,261	1,902	657	1,245
No. of recipients	394	168	226	393	168	225
R-sq (log Lik.)	0.53	0.62	0.48	0.49	0.54	0.45

Notes: OLS estimates with recipient-fixed effects. The dependent variable is one if a recipient accepted a proposal and zero otherwise. Measure 1 uses the number of proposals a sender received to measure the sender's desirability (S_no. received proposals). The dummy indicating that participants received five proposals is omitted. Measure 2 uses the 20th and 80th percentiles of the desirability index as cutoffs of a participant's desirability group, instead of the 30th and 70th percentiles. "S_" denotes the characteristic of sender. For instance, S_Middle is one if a sender belongs to the middle desirability group. All regression models control for sender's verification level (none, medium, full), age, living in greater Seoul, a squared difference of age between a sender and a recipient, a dummy indicating whether the two are in the same location. Location has five categories: Greater Seoul, Kangwon, Chungchung, Chunra/Jeju, and Kyungsang. *, **, and *** indicate significance at 10, 5 and 1 percent, respectively.

2.2 Different Cutoffs Based on the Desirability Index

Instead of our baseline cutoffs (30th and 70th percentiles), we use the 20th and 80th percentiles of the desirability index to classify participants into three groups. We re-estimate Model A of Table II but include the new definition of a sender's desirability. Columns 4 to 6 of Table B.2 report the results, which are comparable to our baseline results in Table II. We find that, on average, a recipient is 3.2 percentage points more likely to accept a proposal when a rose is attached. When we restrict attention to male and female recipients separately, the effects only barely fail to be significant (columns 4 and 5). The marginal effect is, however, similar in size and a one-sided test estimating whether attaching a rose increases the acceptance of an offer would yield significance.

We additionally use three different specifications reported in Table B.3 below. We divide participants into 3 equal-sized groups (column (2)); we divide individuals into 4 equal-sized groups (column (3)); we use the desirability index rather than groups, but the value is standardized with mean 0 and standard deviation 1 (columns (4)). The results based on these three specifications are comparable to our baseline results reported in column (1). For simplicity, we report the results based on our estimations of Models A and B, but the results are also comparable for Model C. Model B requires additional explanation. In column (3), we report the effect of roses with four terms: R_Q1 Rose (the bottom group's response to roses), R_Q2 Rose (lower middle group's response to roses), R_Q3 Rose (upper middle group's response to roses), and R_Q4 Rose (top group's response to roses). Consistent with our earlier results, the point estimates of roses for the middle group, particularly the upper middle group, are larger than the effect of roses for the bottom group or top group recipients. In column (4), the main effect of roses (the coefficient of "Rose") is 0.061 and significant at 1% level. The two interaction terms R_index*Rose and R_index-sq*Rose capture the possibility that the effect of roses is a quadratic function of the recipient's index. The estimated coefficients imply that for the recipients who have average desirability index, the rose will increase their acceptance rate by 6.1 percentage points because the R_index for them is zero; thus terms R_index*Rose and R_index-sq*Rose are zero. If a recipient's desirability index is 2 standard deviations larger than the average, then the effect of roses for him/her will be $0.061 - 0.005*2 - 0.031*4 = -0.073$.

TABLE B.3 EFFECT OF ROSES

Number of groups	3	3	4	Index
Share	0.3:0.4:0.3	1/3:1/3:1/3	1/4:1/4:1/4:1/4:	
	(1)	(2)	(3)	(4)
Model A				
Rose	0.033** (0.016)	0.031** (0.016)	0.028* (0.016)	0.026* (0.016)
Model B				
R_Bottom Rose	0.054 (0.047)	0.063 (0.046)		
R_Middle Rose	0.078*** (0.027)	0.072** (0.028)		
R_Top Rose	-0.001 (0.021)	0.003 (0.021)		
R_Q1 Rose			0.028 (0.053)	
R_Q2 Rose			0.041 (0.046)	
R_Q3 Rose			0.075** (0.029)	
R_Q4 Rose			-0.002 (0.022)	
Rose				0.061*** (0.023)
R_index*Rose				-0.005 (0.023)
R_index-sq*Rose				-0.031 (0.018)
No. of proposals	1,902	1,902	1,902	1,902
No. of recipients	393	393	393	393

Notes: Standard errors are in parentheses. *, **, and *** indicate significance at 10, 5 and 1 percent, respectively.

3. Proposals and Roses

We use a linear regression model to estimate which participants send at least one proposal, and how many proposals are sent (conditional on sending at least one).² Table C.1 shows that the gender differences and that the proposer's own desirability is not a determining factor. The reported gender coefficient of -0.115 in column 1 suggests that women are 11.5 percentage points

² For regressions on whether a participant sent a proposal, the marginal effects from logit and probit models are very similar to the results from the linear probability model.

less likely to send a proposal than men are. Column 4 shows that, conditional on sending a proposal, women send 1.05 fewer proposals than men. The coefficients on the desirability index of the sender (S_Middle and S_Top) are sometimes large in magnitude but not significant in any regression, implying that the desirability of the sender may not be a significant predictor of whether participants send proposals and, if so, how many.³ Furthermore, while participants with eight roses seem slightly more active in all dimensions, only men were significantly more likely to make an offer compared to participants in the control who had only two roses. Finally, the empowerment treatment did not affect women in terms of whether they made a proposal or how many proposals they made. Note that we do not use the treatment status for male empowerment in this analysis because that treatment is given not at the proposal stage but later, at the response stage.

Table C.1 Sending Proposals

Sender	Sending a proposal			Number of proposals (if > 0)		
	All (1)	Men (2)	Women (3)	All (4)	Men (5)	Women (6)
Female	-0.115** (0.054)			-1.050* (0.610)		
Male with 8 roses	0.239*** (0.071)	0.208*** (0.070)		0.677 (0.563)	0.709 (0.549)	
Female with 8 roses	0.035 (0.080)		0.056 (0.080)	0.388 (0.838)		0.369 (0.898)
Female empowerment	0.037 (0.064)		0.048 (0.064)	-0.23 (0.706)		-0.271 (0.749)
S_Middle	0.001 (0.048)	-0.058 (0.068)	0.055 (0.067)	-0.264 (0.493)	0.269 (0.630)	-1.007 (0.805)
S_Top	0.061 (0.053)	0.073 (0.074)	0.028 (0.074)	-0.138 (0.521)	-0.028 (0.651)	-0.318 (0.879)
No. of observations	611 ⁺	304	307	278	165	113
R-sq	0.070	0.100	0.030	0.118	0.060	0.065

Notes: OLS estimates. In columns 1 to 3, the dependent variable is one if a participant sent at least one proposal and zero otherwise. In columns 4 to 6, the dependent variable is the number of proposals a participant sent. Female, Male/Female with 8 roses and Female empowerment are dummies for the described conditions. S_Middle and S_Top indicate whether the sender is from the middle or top desirability group, respectively. All regression models control for the verification level (none, medium, full), age, and a living in greater Seoul dummy. Standard errors are in parentheses. ⁺We omit 2 female participants from the analyses because of the lack of their desirability indexes.

*, **, and *** indicate significance at 10, 5 and 1 percent, respectively.

³ The conclusions are robust to more flexible controls of a participant's desirability index (such as using a second order polynomial instead of dummy variables for three desirability groups).

The linear regressions in Table C.2 show that women are significantly less likely to send at least one rose (column 1), and that participants of all desirability levels are equally likely to use a rose (columns 1 to 3). Men who make more offers are also significantly more likely to use at least one rose, while the effect for women, though similar in magnitude, is not significant.⁴ Conditional on using at least one rose and controlling for the number of proposals, women and men send a similar number of roses. Specifically, women only send 0.006 fewer roses than men (column 4). While desirability so far has no explanatory power, women in the bottom desirability group do not send as many roses as those in the middle or top group, conditional on using at least one rose (column 6). Similar to the proposal behavior, whether a female participant receives the empowerment treatment is not a statistically significant predictor for the participant's usage of

Table C.2 Sending Roses

Sender	Sending a rose			Number of roses (if > 0)		
	All (1)	Men (2)	Women (3)	All (4)	Men (5)	Women (6)
Female	-0.222*** (0.072)			-0.006 (0.238)		
Male with 8 roses	0.031 (0.066)	0.035 (0.051)		4.936*** (0.197)	4.973*** (0.175)	
Female with 8 roses	0.170* (0.098)		0.163 (0.127)	3.239*** (0.340)		3.263*** (0.411)
Female empowerment	-0.061 (0.083)		-0.073 (0.106)	0.112 (0.301)		0.168 (0.356)
No of proposals sent	0.019*** (0.007)	0.017** (0.007)	0.019 (0.014)	0.219*** (0.023)	0.207*** (0.026)	0.234*** (0.045)
S_Middle	0.012 (0.058)	0.056 (0.059)	-0.043 (0.114)	0.368** (0.183)	-0.061 (0.197)	1.272*** (0.379)
S_Top	-0.022 (0.061)	-0.079 (0.061)	0.066 (0.124)	0.307 (0.196)	-0.092 (0.211)	1.132*** (0.402)
No. of Observations	278	165	113	223	149	74
R-sq	0.140	0.080	0.080	0.8219	0.8740	0.7012

Notes: OLS estimates. The sample includes participants who made at least one proposal. In columns 1 to 3, the dependent variable is one if a participant sent at least one rose and zero otherwise. In columns 4 to 6, the dependent variable is the number of roses a participant sent. Female, Male/Female with 8 roses and Female empowerment are dummies for the described conditions. S_Middle and S_Top indicate whether the sender is from the middle or top desirability group, respectively. No of proposals sent is the number of proposals that a participant made. All regression models control for the verification level (none, medium, full), age, and living in greater Seoul. Note that we do not use the treatment status for male empowerment in this analysis because that treatment is not given not at the proposal stage but later, at the response stage. Standard errors are in parentheses. *, **, and *** indicate significance at 10, 5 and 1 percent, respectively.

⁴ For regressions on whether the participant sends a rose, that is, columns 1 to 3 from Table III, the marginal effects from logit and probit models are very similar to the results from the linear probability model.

endowed roses. Finally, conditional on participants who send at least one rose, participants with eight roses use on average an additional 3.2 (for women) and 4.9 roses (for men). Women with eight roses are also somewhat more likely to use at least one rose. This implies that if roses increase the chance of an offer being accepted, participants with more roses should have more of their offers accepted, especially if they do not differ in terms of whom they make offers or send roses to.

Table C.3 Who Sent a Rose to Whom?

Sender	All proposals			Sender sent at least one rose		
	All (1)	Men (2)	Women (3)	All (4)	Men (5)	Women (6)
S_female	-0.043 (0.040)			0.037 (0.048)		
S_male with 8 roses	0.577*** (0.025)	0.576*** (0.026)		0.585*** (0.027)	0.584*** (0.027)	
S_female with 8 roses	0.454*** (0.043)		0.441*** (0.043)	0.463*** (0.053)		0.448*** (0.057)
S_female empowerment	-0.017 (0.038)		-0.009 (0.038)	0.016 (0.049)		0.022 (0.051)
S_Middle	0.068 (0.062)	0.056 (0.071)	0.151 (0.142)	0.045 (0.066)	0.027 (0.072)	0.206 (0.177)
S_Top	-0.059 (0.072)	-0.083 (0.078)	0.202 (0.227)	-0.066 (0.079)	-0.089 (0.083)	0.203 (0.252)
R_Middle	-0.082* (0.049)	-0.049 (0.056)	-0.070 (0.106)	-0.073 (0.052)	-0.044 (0.057)	-0.036 (0.131)
R_Top	-0.027 (0.049)	-0.056 (0.058)	0.109 (0.104)	0.006 (0.053)	-0.029 (0.059)	0.205 (0.129)
S_Middle X R_Middle	-0.012 (0.073)	-0.038 (0.083)	-0.009 (0.158)	-0.016 (0.078)	-0.039 (0.085)	-0.064 (0.198)
S_Middle X R_Top	-0.027 (0.071)	-0.033 (0.084)	-0.085 (0.151)	-0.038 (0.076)	-0.052 (0.085)	-0.136 (0.189)
S_Top X R_Middle	0.129 (0.082)	0.105 (0.090)	-0.033 (0.240)	0.104 (0.089)	0.096 (0.095)	-0.087 (0.269)
S_Top X R_Top	0.082 (0.080)	0.107 (0.089)	-0.177 (0.233)	0.074 (0.088)	0.107 (0.095)	-0.207 (0.262)
No. of proposals	1,902	1,245	657	1,615	1,153	462
Pseudo R-sq	0.280	0.300	0.220	0.280	0.310	0.250

Notes: OLS estimates. The dependent variable is one if a rose is attached to a given proposal and zero otherwise. “S_” and “R_” denote sender and recipient characteristics, respectively. All regression models control for recipient and sender’s verification level (none, medium, full), age, living in greater Seoul, the squared difference of age between a sender and a recipient and a dummy indicating whether the two are in the same location. Location has five categories: Greater Seoul, Gangwon, Chungcheong, Jeolla/Jeju, and Gyeongsang. Standard errors are in parentheses. *, **, and *** indicate significance at 10, 5 and 1 percent, respectively.

In Table C.3, we use a linear model to regress whether a rose accompanied a proposal on the characteristics of the sender and the recipient. We use the full sample for columns 1 to 3, while columns 4 to 6 report results for senders who sent at least one rose. The coefficients pertaining to the desirability of the recipient are largely not significantly different from zero, which confirms that the decision to add a rose to a proposal seems not to be correlated with the characteristics of the recipient. Only in column 1 is R_Middle significant, but the coefficient is not significant when we consider men and women separately, or in any other regression. The results are the same when we condition on participants who sent at least one rose. Proposals from senders that have eight roses are more likely to be accompanied by a rose. However, neither the gender of the sender nor the empowerment treatment significantly correlates with the decision to add a rose to a proposal.

4. Treatment Group and Proposal Behavior

Table D extends our analyses earlier by including additional interaction terms between a sender's treatment status and to whom he or she made a dating request. For the sake of brevity, we report only a subset of estimation results including the estimated coefficients of the interaction terms.

Each column of Table D stands for one regression model. Panel A reports the main effect and panels B and C report the interaction terms depending on a sender's treatment status. Note that some interaction terms are automatically dropped due to collinearity. The estimate of 0.006 for "S_Middle X R_Middle" in Panel A column 1 implies that a middle group male participant is 0.6 percentage points more likely to send a proposal to a middle group woman than his counterpart in the bottom group. The estimate of 0.004 of "S_8 roses, S_Middle, R_Middle" in Panel B column 1 means that a middle group man endowed with eight roses is 0.4 percentage points more likely to send a proposal to a middle group woman than his counterpart who is endowed with two roses and belongs to the middle group. If an endowment of eight roses makes a middle group man send his proposals more (or less) often to a middle-group woman, then the estimate 0.004 should be statistically different from zero. However, the table shows that the estimate is not significant at a conventional level. Similarly, the other interaction terms have coefficients that are not significant. This result also holds when we restrict the sample to men who sent at least one proposal (column 3).

As with men, the women's decisions of whom to send proposals to do not depend on their treatment status (columns 2 and 4 of Panels A, B and C). The only exceptions are due to women in the middle desirability group. For instance, the estimate -0.004 of "S_R rose, S_Middle, R_Middle" in column 2, panel B, means that, compared to her counterpart endowed with two

roses, a middle group woman endowed with eight roses is 0.4 percentage points less likely to send a proposal to a middle group man. Therefore, when we examine the treatment effect for middle group women, we need to consider that some of the treatment effect may be due to the difference in the men to whom women sent proposals.

Table D. Treatment Group and Proposals

Sender	All proposals		If sender proposed	
	Men (1)	Women (2)	Men (3)	Women (4)
Panel A				
S_8 rose	0.012** (0.005)	0.006 (0.005)	0.005 (0.008)	-0.007 (0.006)
S_empowerment		0.000 (0.003)		0.001 (0.003)
S_Middle	-0.010*** (0.003)	-0.007** (0.003)	-0.018*** (0.005)	-0.021*** (0.008)
S_Top	-0.011*** (0.003)	-0.005** (0.002)	-0.026*** (0.006)	-0.013** (0.005)
R_Middle	0.006** (0.003)	0.005** (0.002)	0.013** (0.006)	0.012** (0.006)
R_Top	0.006* (0.003)	0.008*** (0.003)	0.010* (0.006)	0.022*** (0.008)
S_Middle X R_Middle	0.006 (0.005)	0.007 (0.007)	0.012 (0.009)	0.012 (0.014)
S_Middle X R_Top	0.013** (0.006)	0.026* (0.015)	0.025** (0.011)	0.050* (0.028)
S_Top X R_Middle	0.012* (0.006)	0.004 (0.006)	0.021* (0.011)	0.007 (0.012)
S_Top X R_Top	0.026*** (0.009)	0.023 (0.015)	0.046*** (0.015)	0.040 (0.027)
S_8 rose X S_Middle	-0.003 (0.004)	-0.003 (0.002)	-0.004 (0.011)	0.091 (0.067)
S_8 rose X S_Top	0.000 (0.005)		0.005 (0.010)	0.037 (0.044)
S_empowerment X S_Middle		0.015 (0.012)		-0.003 (0.004)
S_empowerment X S_Top		-0.001 (0.004)		-0.005* (0.003)
Panel B. Interaction – 8 roses				
S_8 rose, S_Bottom, R_Bottom	0.002 (0.006)	-0.003 (0.002)		
S_8 rose, S_Bottom, R_Middle	-0.003 (0.004)		-0.010 (0.008)	0.013 (0.016)
S_8 rose, S_Bottom, R_Top		-0.002 (0.001)	-0.003 (0.010)	0.004 (0.011)
S_8 rose, S_Middle, R_Bottom	-0.005 (0.004)			

(continued)

Table D. continued

Sender	All proposals		If sender proposed	
	Men (1)	Women (2)	Men (3)	Women (4)
S_8 rose, S_Middle, R_Middle	0.004 (0.005)	-0.004*** (0.001)	0.017 (0.015)	-0.008** (0.003)
S_8 rose, S_Middle, R_Top		-0.004*** (0.001)	0.011 (0.013)	-0.009*** (0.002)
S_8 rose, S_Top, R_Bottom	-0.002 (0.005)	-0.003 (0.002)	-0.002 (0.010)	-0.005 (0.007)
S_8 rose, S_Top, R_Middle	-0.001 (0.004)	-0.002 (0.003)	-0.002 (0.007)	0.000 (0.011)
S_8 rose, S_Top, R_Top		-0.003 (0.002)		
Panel C. Interaction- Empowerment				
S_emp., S_Bottom, R_Bottom				-0.004 (0.005)
S_emp., S_Bottom, R_Middle		0.002 (0.004)		-0.003 (0.004)
S_emp., S_Bottom, R_Top		0.005 (0.006)		
S_emp., S_Middle, R_Bottom				0.040 (0.029)
S_emp., S_Middle, R_Middle		-0.003** (0.001)		0.011 (0.008)
S_emp., S_Middle, R_Top		-0.004*** (0.001)		
S_emp., S_Top, R_Bottom		0.002 (0.008)		0.010 (0.008)
S_emp., S_Top, R_Middle		-0.001 (0.004)		
S_emp., S_Top, R_Top				-0.004 (0.005)
No. of proposals	51,032	49,121	29,104	19,720
Pseudo R-sq	0.0659	0.1206	0.0650	0.1487

Notes: Probit estimates. The dependent variable is one if a participant made a proposal to a given recipient and zero otherwise. We report marginal effects at the mean of each regressor or, in the case of dummy variables, at zero. “S_” and “R_” denote sender and recipient characteristics, respectively. For instance, “S_8 rose” is one if a sender had 8 roses and zero otherwise. “S_Middle X R_Middle” is one if a sender belongs to the middle desirability group and a recipient belongs to the middle desirability group. All regression models control for recipient and sender’s verification level (none, medium, full), age, living in greater Seoul, the squared difference of age between a sender and a recipient and a dummy indicating whether the two are in the same location. Location has five categories: Greater Seoul, Gangwon, Chungcheong, Jeolla/Jeju, and Gyeongsang. Standard errors of the marginal effect are in parentheses. *, **, and *** indicate significance at 10, 5 and 1 percent, respectively.

5. Treatment Group and Use of Roses

This section examines the possibility that a sender uses his or her roses differently depending on his or her treatment group. We replicate Table VI in our main text but include interaction terms between a recipient's treatment group and whether a rose is attached to a proposal. Note that some interaction terms are automatically dropped due to collinearity.

The estimate of 0.016 for "S_Middle X R_Middle" in Panel A column 1 implies that a middle group desirable man is 1.6 percentage points more likely to send a rose to a middle group woman than his counterpart in the bottom group. The estimate of 0.052 of "S_8 roses, S_Middle, R_Middle" in column 1 Panel B means that a middle group man endowed with eight roses is 5.2 percentage points more likely to send a rose to a middle group woman than his counterpart endowed with two roses. If an endowment of eight roses makes a middle group man send his roses more (or less) often to a middle group woman, then the estimate -0.046 should be statistically different from zero. However, the table shows that the estimate is not significant at a conventional level. Similarly, most of the remaining interaction terms have coefficients not significantly different from zero. This is also the case when we restrict the sample to men who sent at least one proposal (column 3). The results are similar when we consider female senders.

Table E. Treatment Group and Roses

Sender	All proposals		If sender sent a rose	
	Men (1)	Women (2)	Men (3)	Women (4)
Panel A				
S_8 rose	0.388*** (0.082)	0.126 (0.290)	0.560*** (0.100)	0.089 (0.313)
S_empowerment		0.115 (0.219)		0.041 (0.262)
S_Middle	0.016 (0.083)	-0.041 (0.308)	0.005 (0.083)	-0.118 (0.352)
S_Top	-0.106 (0.095)	-0.034 (0.306)	-0.074 (0.103)	-0.104 (0.349)
R_Middle	-0.077 (0.066)	0.011 (0.141)	-0.078 (0.067)	-0.005 (0.193)
R_Top	-0.030 (0.068)	0.125 (0.141)	-0.029 (0.069)	0.153 (0.196)
S_Middle X R_Middle	0.016 (0.098)	0.081 (0.323)	0.025 (0.099)	0.153 (0.375)
S_Middle X R_Top	-0.047 (0.099)	0.076 (0.316)	-0.038 (0.100)	0.188 (0.365)
S_Top X R_Middle	0.116 (0.109)	-0.010 (0.327)	0.107 (0.118)	-0.011 (0.372)
S_Top X R_Top	0.051 (0.108)	0.077 (0.316)	0.081 (0.118)	0.082 (0.363)
S_8 rose X S_Middle	0.203* (0.104)	0.621* (0.365)	0.019 (0.119)	0.313 (0.336)
S_8 rose X S_Top	0.181 (0.155)	0.727 (0.479)	-0.034 (0.170)	0.886* (0.531)
S_emp. X S_Middle		-0.214 (0.246)		0.198 (0.485)
S_emp. X S_Top				
Panel B. Interaction - 8 roses				
S_8 rose, S_Bottom, R_Bottom	0.105 (0.125)			
S_8 rose, S_Bottom, R_Middle	0.210* (0.114)	-0.271 (0.320)	0.149 (0.130)	-0.303 (0.363)
S_8 rose, S_Bottom, R_Top		0.273 (0.309)	-0.011 (0.133)	0.287 (0.342)
S_8 rose, S_Middle, R_Bottom	0.052 (0.139)		0.062 (0.141)	0.161 (0.339)
S_8 rose, S_Middle, R_Middle	-0.046 (0.090)	-0.044 (0.257)	-0.043 (0.091)	0.421** (0.196)
S_8 rose, S_Middle, R_Top		-0.214 (0.240)		
(continued)				

Table E. continued

Sender	All proposals		If sender sent a rose	
	Men (1)	Women (2)	Men (3)	Women (4)
S_8 rose, S_Top, R_Bottom				
S_8 rose, S_Top, R_Middle	0.050 (0.148)	-0.581 (0.484)	0.059 (0.156)	-0.624 (0.539)
S_8 rose, S_Top, R_Top	0.092 (0.144)	-0.318 (0.464)	0.065 (0.152)	-0.309 (0.518)
<i>Panel C Interaction - Empowerment</i>				
S_emp., S_Bottom, R_Bottom				
S_emp., S_Bottom, R_Middle		-0.049 (0.243)		0.051 (0.297)
S_emp., S_Bottom, R_Top		-0.129 (0.237)		-0.006 (0.291)
S_emp., S_Middle, R_Bottom		0.158 (0.340)		
S_emp., S_Middle, R_Middle				-0.420 (0.432)
S_emp., S_Middle, R_Top		0.073 (0.136)		-0.219 (0.415)
S_emp., S_Top, R_Bottom				
S_emp., S_Top, R_Middle		0.153 (0.254)		0.249 (0.299)
S_emp., S_Top, R_Top		-0.219 (0.232)		-0.124 (0.281)
No. of proposals	1,245	657	1,153	462
R-sq	0.300	0.270	0.310	0.310

Notes: OLS estimates. The dependent variable is one if a rose is attached to a given proposal and zero otherwise. “S_” and “R_” denote sender and recipient characteristics, respectively. All regression models control for recipient and sender’s verification level (none, medium, full), age, living in greater Seoul, the squared difference of age between a sender and a recipient and a dummy indicating whether the two are in the same location. Location has five categories: Greater Seoul, Gangwon, Chungcheong, Jeolla/Jeju, and Gyeongsang. Standard errors are in parentheses. *, **, and *** indicate significance at 10, 5 and 1 percent, respectively.

6. IV estimation

6.1 Setting

This section formally lays out the empirical model of the IV estimation. Equation (1) is the main equation used in Model A, column 2 of Table VI in the main text. In this model, the likelihood that recipient r accepts a dating request from sender s depends on whether the sender sent a rose $Rose_{r,s}$, observable characteristics $X_{r,s}$, recipient fixed effects θ_r , and a random component $\varepsilon_{r,s}$.

Our parameter of interest is α , that is, the causal effect of sending a rose on acceptance rate:

$$Accept_{r,s} = \alpha Rose_{r,s} + \beta X_{r,s} + \theta_r + \varepsilon_{r,s} \quad (1)$$

Estimating a fixed effects model based on our data may lead to a biased estimate of α when $Rose_{r,s}$ is correlated with the random component $\varepsilon_{r,s}$. For instance, it is possible that $\varepsilon_{r,s}$ includes a match-specific quality that is unobservable to researchers but observable to the sender s and the recipient r .⁵ If the likelihood of sending a rose is positively correlated with the unobservable match specific quality, then our fixed effects estimates will be biased upward.

6.2 Exclusion Restriction

Equation (2) models whether sender s attaches a rose to his or her proposal to recipient r . We assume that $Rose_{r,s}$ depends on whether sender s has eight roses, $8rose_s$, observable characteristics, recipient fixed effects, and a random shock $u_{r,s}$. We use the sender's treatment status, having eight roses, as a variable that affects whether sender s attaches a rose to the proposal to recipient r but not recipient r 's response to the proposal:

$$Rose_{r,s} = \delta_1 8rose_s + \delta_2 X_{r,s} + \sigma_r + u_{r,s} \quad (2)$$

We argue that this exclusion restriction holds in our data because, by our experimental design, a person's treatment status is randomly determined and unobservable to other participants including the offer recipient. Thus, it is unlikely to affect the recipient's decision conditional on observables.

There is still a possibility that this assumption fails. It could be that a person endowed with eight roses is more likely to initiate a date with a recipient whose unobservable match quality is high, compared to his or her counterpart with two roses. Since we observe a recipient's response only if a dating request is made, this scenario means that $E(\varepsilon_{r,s} | s \text{ sent a dating request to } r, X_{r,s}, \theta_r)$ depends on whether sender s has eight roses or not. Although we cannot formally test our exclusion restriction, we can examine the extent to which this scenario is plausible in our experimental setting. If this scenario generates a positive correlation between $Rose_{r,s}$ and $\varepsilon_{r,s}$, then we can estimate equation (1) additionally including

⁵ For instance, suppose men with short hair prefer women with long, wavy hair and vice-versa. Since participants can see head-to-shoulder photos of other people, this match quality is observable to both the sender and the recipient of an offer.

sender fixed effects, instead of using an IV strategy. As we discussed footnote 35 in the main text of this paper, the estimated coefficient of a rose barely changes compared to that without sender fixed effects. This suggests that it is unlikely that a person endowed with eight roses is more likely to initiate a date with a recipient whose unobservable match quality is high, compared to his or her counterpart with two roses.

6.3 Estimation Procedures

6.3.1 Model A

Equation (1) specifies Model A where recipients have the same response to a rose. Model A follows a standard textbook case where we have one excluded instrument, $8rose_s$, and one endogenous variable, $Rose_{r,s}$. Specifically, the IV estimates of the coefficients in equation (1) are the solution of system of equations (3):

$$E \left[(Accept_{r,s} - \alpha Rose_{r,s} - \beta X_{r,s} - \theta_r) \times \begin{pmatrix} 8rose_s \\ X_{r,s} \\ \sigma_r \end{pmatrix} \right] = 0 \quad (3)$$

It is worth noting that the solution of this system is identical to that of the following system of equations,

$$E \left[(Accept_{r,s} - \alpha Rose_{r,s} - \beta X_{r,s} - \theta_r) \times \begin{pmatrix} \widehat{Rose}_{r,s} \\ X_{r,s} \\ \sigma_r \end{pmatrix} \right] = 0, \quad (4),$$

where $\widehat{Rose}_{r,s}$ is the predicted value of $Rose_{r,s}$ from equation (2). The proof is straightforward.

We can express $\begin{pmatrix} \widehat{Rose}_{r,s} \\ X_{r,s} \\ \sigma_r \end{pmatrix}$ as the product of $\begin{pmatrix} 8rose_s \\ X_{r,s} \\ \sigma_r \end{pmatrix}$ and $\begin{pmatrix} \widehat{\delta}_1 & 0 & 0 \\ \widehat{\delta}_2 & I_X & 0 \\ \widehat{\sigma}_r & 0 & 1 \end{pmatrix}$, where $\widehat{\delta}_1$, $\widehat{\delta}_2$, and $\widehat{\sigma}_r$

are the OLS estimates of equation (2). When we solve the system of equations (4), the terms involved in the lower triangular matrix are cancelled out.⁶ This simply means that the IV estimates using the predicted probability of sending a rose $\widehat{Rose}_{r,s}$ are identical to those using $8Rose_s$ directly.

6.3.2 Models B and C

In Models B and C, we have multiple endogenous variables because $Rose_{r,s}$ is interacted with the recipient's desirability group (Model B) or both the recipient's and the sender's desirability group

⁶ Therefore, the standard errors of the estimates and F-statistics of the excluded instrument from the second method are the same as those from the first method, without incorporating the standard errors in the prediction of $\widehat{Rose}_{r,s}$.

(Model C). Therefore, estimation requires multiple variables that are excluded from the response stage. As with Model A, we have two ways to estimate the model.⁷ We will show that that using the predicted probability of sending a rose yields more reliable estimates in our data than only using a dummy for whether the sender was endowed with two or eight roses.

Consider Model B. The first procedure uses the following three variables as exclusion restrictions: $8rose_s \times 1(r = Bottom)$, $8rose_s \times 1(r = Middle)$, and $8rose_s \times 1(r = Top)$. Note that since we already include recipient fixed effects, these variables satisfy the exclusion restrictions as long as $8rose_s$ is not correlated with $\varepsilon_{r,s}$ in equation (5):

$$\begin{aligned} Accept_{r,s} = & \alpha_B Rose_{r,s} \times 1(r = Bottom) + \alpha_M Rose_{r,s} \times 1(r = Middle) \\ & + \alpha_T Rose_{r,s} \times 1(r = Top) + \beta X_{r,s} + \theta_r + \varepsilon_{r,s} \quad (5) \end{aligned}$$

The second procedure uses the predicted probability of attaching a rose, $\widehat{Rose}_{r,s}$, from equation (2) and interacts it with the three desirability groups of the recipient: $\widehat{Rose}_{r,s} \times 1(r = Bottom)$, $\widehat{Rose}_{r,s} \times 1(r = Middle)$, and $\widehat{Rose}_{r,s} \times 1(r = Top)$.

Since both sets of excluded instruments are uncorrelated with $\varepsilon_{r,s}$, both procedures asymptotically yield unbiased and consistent estimates of coefficients in equation (5). However, in the finite sample, the second procedure yields more efficient estimates than the first. The reason is that in the first stage, the second procedure uses more information about the endogenous variables. To see this, we first show the equation for $Rose_{r,s} \times 1(r = Bottom)$ using equation (2). Equation (6-1) multiplies equation (2) and $1(r = Bottom)$. If equation (2) is the true data generating procedure, then $Rose_{r,s} \times 1(r = Bottom)$ is a function of not only $8rose_s \times 1(r = Bottom)$ but also $X_{r,s} \times 1(r = Bottom)$:

$$\begin{aligned} Rose_{r,s} \times 1(r = Bottom) = & \delta_1 8rose_s \times 1(r = Bottom) + \delta_2 X_{r,s} \times 1(r = Bottom) \\ & + \sigma_r \times 1(r = Bottom) + u_{r,s} \times 1(r = Bottom) \quad (6-1) \end{aligned}$$

We now show the equation we obtain from each of the two estimation procedures:

$$\begin{aligned} Rose_{r,s} \times 1(r = Bottom) = & \delta_{1,B} 8rose_s \times 1(r = Bottom) + \delta_{1,M} 8rose_s \times 1(r = Middle) \\ & + \delta_{1,T} 8rose_s \times 1(r = Top) + \delta_2 X_{r,s} + \sigma_r + u_{r,s} \quad (6-2) \end{aligned}$$

⁷ See Wooldridge, "Econometric Analysis of Cross Section and Panel Data," 2nd edition, Chapter 21.

$$\begin{aligned}
Rose_{r,s} \times 1(r = Bottom) &= \delta'_{1,B} \widehat{Rose}_{r,s} \times 1(r = Bottom) + \delta'_{1,M} \widehat{Rose}_{r,s} \times 1(r = Middle) \\
&+ \delta'_{1,T} \widehat{Rose}_{r,s} \times 1(r = Top) + \delta'_2 X_{r,s} + \sigma'_r + u'_{r,s} \quad (6-3)
\end{aligned}$$

Equation (6-2) is the first stage equation for $Rose_{r,s} \times 1(r = Bottom)$ in the first procedure. It uses $X_{r,s}$ instead of $X_{r,s} \times 1(r = Bottom)$ to project the endogenous variable on instruments. Equation (6-3) is the first stage equation in the second procedure. By construction, $\widehat{Rose}_{r,s} \times 1(r = Bottom)$ is a linear function of both $8rose_s \times 1(r = Bottom)$ and $X_{r,s} \times 1(r = Bottom)$. Therefore, in contrast to the first procedure, the second procedure uses $X_{r,s} \times 1(r = Bottom)$ to project the endogenous variable on instruments.

Table F. F-Statistics of the two IV estimation procedures

	Procedure 1 Using $8rose$ (1)	Procedure 2 Using predicted value (2)
Model B		
- Rose (r=Bottom)	118.21	1,381.69
- Rose (r=Middle)	177.27	1,360.20
- Rose (r=Top)	140.76	1,141.80
Overall: Cragg-Donald F-stat	118.18	1,141.30
Model C		
- Rose (r=Bottom, s=Bottom)	44.02	423.95
- Rose (r=Bottom, s=Middle)	129.53	651.55
- Rose (r=Bottom, s=Top)	191.28	1,058.80
- Rose (r=Middle, s=Bottom)	54.27	482.21
- Rose (r=Middle, s=Middle)	108.64	730.48
- Rose (r=Middle, s=Top)	133.89	576.05
- Rose (r=Bottom, s=Bottom)	32.46	338.58
- Rose (r=Bottom, s=Middle)	85.15	461.91
- Rose (r=Bottom, s=Top)	99.15	564.57
Overall: Cragg-Donald F-stat	17.81	296.38

In our data, the excluded instruments used in the second procedure are more relevant to predict the endogenous variables than those in the first procedure, especially for Model C. Table E below reports the F-statistics testing the hypothesis that all the excluded instruments would not be relevant to each endogenous variable in the first stage. The numbers in column (1) are based on the first procedure (e.g., $8rose_s \times 1(r = Bottom, s = Bottom)$); those in column (2) are based on the second procedure (e.g., $\widehat{Rose}_{r,s} \times 1(r = Bottom, s = Bottom)$). In all endogenous variables, the second procedure leads to at least 5 times larger F-statistics (and thus more relevant

instruments) than the first procedure. Moreover, the Cragg-Donald F statistic⁸ measuring the overall relevance of excluded instruments for the endogenous variables is over 10 times larger if we use the second procedure instead of using the first. Therefore, we conclude that the IV estimates from the second procedure are less subject to weak instrument problems than those from the first procedure. This is why we chose the second procedure for our analysis.

7. Reaction to roses by recipients endowed with two and eight roses

This section tests whether a recipient responds differently to a rose depending on whether he or she is endowed with two or eight roses. We use the regression analyses of Table II from section IV.B but in addition include the interaction terms between two variables: whether a rose is attached to a proposal and whether a recipient is endowed with eight roses. If the response to a rose depends on the rose endowment, then the estimated coefficients of the interaction terms should be statistically different from zero. Table G reports the results. The overall effect of roses (e.g., the coefficient of “Rose” in Model A and “R_Middle Rose” in Model B) remains comparable to those reported in Table II, while none of the interaction terms are significant at a conventional level.

⁸ See Stock, Wright, and Yogo (2002, A Survey of Weak Instruments and Weak Identification in Generalized Method of Moments, Journal of Business and Economic Statistics) for further discussion.

Table G. Treatment Status and Effect of Roses

Model	FE-R (1)	FE-R-IV (2)	FE-R (3)	OLS (4)	FE Logit (5)
Recipients	All	All	Active	All	All
Model A					
Rose	0.035** (0.018)	0.078** (0.034)	0.056** (0.027)	0.035* (0.020)	0.454** (0.222)
R_8 roses X Rose	-0.013 (0.039)	-0.168** (0.070)	-0.010 (0.065)	-0.022 (0.040)	-0.059 (0.514)
R-sq (log Lik.)	0.50	0.49	0.46	0.13	-242.36
Model B					
R_Bottom Rose	0.075 (0.052)	0.049 (0.054)	0.126 (0.080)	0.013 (0.050)	1.269* (0.678)
R_Middle Rose	0.068** (0.031)	0.067** (0.031)	0.084* (0.044)	0.082*** (0.032)	0.561 (0.345)
R_Top Rose	0.007 (0.024)	0.015 (0.025)	0.020 (0.039)	0.010 (0.026)	0.171 (0.327)
R_Bottom_8 roses X Rose	-0.114 (0.122)	-0.083 (0.120)	-0.168 (0.166)	-0.054 (0.097)	-1.549 (1.507)
R_Middle_8 roses X Rose	0.039 (0.063)	-0.010 (0.064)	0.079 (0.106)	0.000 (0.059)	0.710 (0.864)
R_Top_8 roses X Rose	-0.038 (0.054)	-0.078 (0.054)	-0.038 (0.095)	-0.035 (0.051)	-0.197 (0.720)
No. of proposals	1,902	1,902	1,153	1,902	796
No. of recipients	393	393	226	393	103
R-sq (log Lik.)	0.50	0.50	0.46	0.13	-240.24

Notes: Columns labeled FE-R report OLS estimates with recipient fixed effects. FE Logit reports logit model estimates with recipient fixed effects. The dependent variable is one if a recipient accepted a given proposal and zero otherwise. “S_” and “R_” denote sender and recipient characteristics, respectively. All regression models control for sender’s verification level (none, medium, full), age, living in greater Seoul, the squared difference of age between a sender and a recipient and a dummy indicating whether the two are in the same location. Location has five categories: Greater Seoul, Gangwon, Chungcheong, Jeolla/Jeju, and Gyeongsang. Column 5 includes in addition control variables for recipient characteristics: number of proposals made, number of roses sent, number of proposals received, a dummy for whether at least one rose was received, the number of roses received, and the recipient’s characteristics corresponding to those of senders (verification level, age, living in greater Seoul, R_Middle and R_Top). Standard errors are in parentheses. *, **, and *** indicate significance at 10, 5 and 1 percent, respectively.

8. Non-Response

In Table H, we examine whether there is any systematic difference between rejections and non-responses. If a recipient dislikes a certain trait of a sender, then that trait should be positively correlated with the likelihood of receiving a rejection as well as receiving a non-response instead of an acceptance. To examine whether this is the case, we restrict our sample to proposals that are sent to recipients who used both an active response (yes or no) and a non-response. In column 1 of Table H we regress whether a proposal is accepted instead of being actively rejected on recipient-fixed effects and other control variables. Similarly, in column 2, we regress whether a proposal is accepted instead of receiving a non-response on recipient-fixed effects and other control variables. The estimated coefficients in column 1 have the same sign as their counterparts in column 2, consistent with the hypothesis that a recipient uses non-response as a way to reject a proposal.

Table H. Determinants of Using No-Response vs. No

Comparison Recipients	Yes/No		Yes/NR	NR vs. No	
	All (1)	All (2)	All (3)	Men (4)	Women (5)
Rose	0.010 (0.031)	0.085*** (0.032)	0.012 (0.018)	0.047 (0.039)	-0.001 (0.020)
S_Middle	0.119*** (0.038)	0.029 (0.041)	-0.005 (0.021)	-0.029 (0.043)	0.002 (0.024)
S_Top	0.342*** (0.042)	0.227*** (0.042)	0.052** (0.024)	-0.007 (0.046)	0.078*** (0.028)
S_age	-0.020** (0.008)	-0.018** (0.008)	-0.012*** (0.005)	-0.038** (0.017)	-0.012 (0.009)
S_fullproof	0.097 (0.110)	0.272 (0.202)	0.010 (0.085)	0.064 (0.175)	-0.011 (0.098)
S_mediumproof	0.130 (0.111)	0.219 (0.204)	0.035 (0.086)	0.124 (0.176)	-0.005 (0.099)
No. of observations	737	724	877	276	601
No. of recipients	227	164	179	66	113
R-sq	0.70	0.59	0.85	0.82	0.86

Notes: OLS estimates with recipient-fixed effects. In column 1, the dependent variable is one if a recipient accepted a proposal and zero if the recipient explicitly rejected the proposal. In column 2, the dependent variable is one if a recipient accepted a proposal and zero if the recipient did not respond to the proposal. In columns 3 to 5, the dependent variable is one if a recipient did not respond to a proposal, and zero if the recipient explicitly rejected the proposal. Other control variables include recipient-fixed effects, whether a sender and recipient live in the same location where location is defined as 5 categories, whether a sender lives in greater Seoul and the squared age difference between the sender and recipient. Standard errors are in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Furthermore, we examine whether participants who use both non-response as well as

explicit rejection use them differently depending on the characteristics of the person who made the proposal. We regress whether a proposal received a non-response instead of being explicitly rejected on recipient-fixed effects and sender's characteristics (columns 3 to 5). We find that all but two sender characteristics are not significant, consistent with the hypothesis that non-response and active rejection are used similarly. The exception is sender's age and whether the sender belongs to the top desirability group. However, columns 1 and 2 show that recipients prefer younger senders and top desirability group senders, regardless of whether the recipients made an explicit rejection or a non-response.