Competition in Online Dating Markets

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INTRODUCTION

Studies of mate seeking competition in animals suggest that the extent of mating competition varies in different dating environments. However, little is known about the competition in online dating market. Using data containing 5.5 million American users coupled with 40 million messages and 3 million votes, we quantitatively analyzed competitive behavior among humans along three dimensions:

- **(1) Scrambling;**
- **(2) Intersexual Aggression;**
- **(3) Courtship Intensity.**

These metrics are measured by the number of partners in play at a given time, same sex down voting activities, profiling efforts, respectively. We found that the online courtship behavior varies across cities, as well as a host of individual attributes including gender, age, race, education, height, figure, type of relationship sought and more. We developed and estimated mixed effect models to quantify the relative contributions of individual characteristics and city attributes to variation in mate-seeking competitive behaviors.

METHODS

Generalized Linear Mixed-Effects Model:

G(outcome) = Contextual Vars + Global Vars + Random Effect

- Outcomes:
  - Scrambling: I. conversation count; II. initial message count
  - Intersexual Aggression: gap of vote score between same and opposite sex
  - Courtship Intensity: I. unique word count in essays; II. photos in profile
- Contextual covariates: individual-level
  - Demographic: gender, race, education, body type, age, height
  - Preference: type of relationship sought, have/want kids or not
- Global covariates: city-level
  - City population, city sex ratio, frac of males holding at least college degree
- Random effect: city name

RESULTS

(1) Scrambling

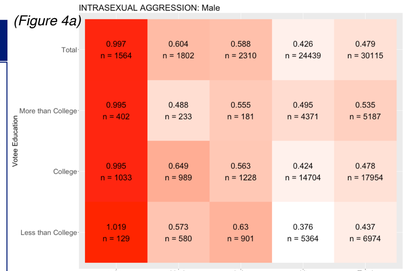
Scrambling measures how many people each user is interacting with at a given point in time. Figure 1 and Figure 2 show that the scrambling patterns differ across cities and demographics. The Y-axis of figure 1 and figure 2 show the number of conversations per week. “conversation” is defined as the message exchange with at least 2 rounds. The slope is the fraction of “go deep” interacted people. While age pattern is more clean to female, race pattern is more clear to male. Figure 3 shows people send more initial messages and have more conversations in a bigger city at a given point in time. Besides, quadratic effects of population to both initial messages and conversations are significant for either female or male.

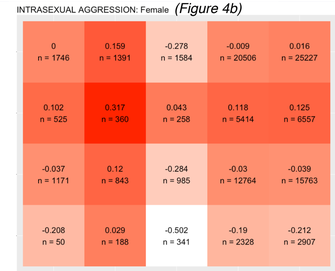
(2) Intrasexual Aggression

From Figure 4a 4b, the patterns of voting gap between same and opposite sex voter differ across votees’ race.Latin women are more picky to Latin women while black women are more generous. White men are more picky to white men, while Asian men are more generous. Quadratic age effects to gap are significant for both gender. While men in age 50s are more likely to be down-voted by other men, young women in 20s are more likely to receive down-votes from other women (Figure 4c).

(3) Courtship Intensity

Courtship intensity reflects how much effort men and women put into presenting themselves on the dating site. This includes word count and the quality of their essays(unique word count), the number of photos in profile. The median number of unique words is 256 and 246 for female and male respectively. The median number of photos in profile is 4 for either gender. Table 1 shows the coefficients and significance of generalized multilevel mixed-effects model. Random effects are significant for all models. Negative binomial link are Poisson link are applied to unique word count and photo count model respectively. People put more efforts into mate seeking as sex ratio(fraction of women in the city) decreases or the fraction of well-educated mean increases.





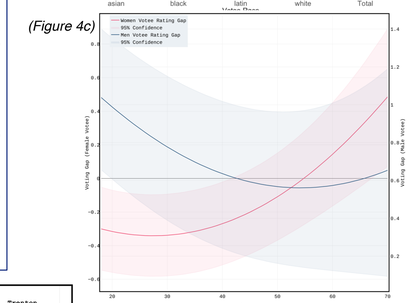
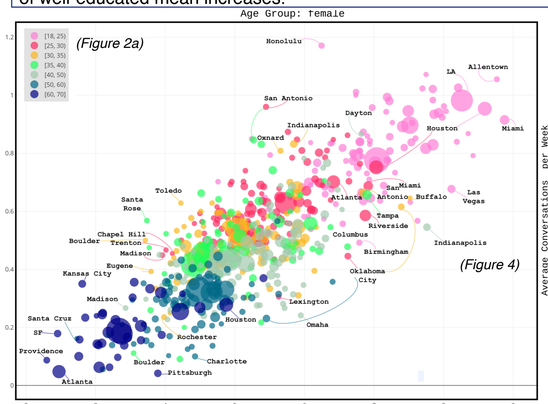


Fig 4. Intrasexual aggression, measured by votes (1-5, integer)
Fig 4-a, 4-b. Average rating gap to votees between same-sex and opposite-sex voters, crossed by education level and race of votees. “n” is the number of votees who belong to a given category. Left and right panel represent male and female votees, respectively. Fig 4-c. Age effects to voting gap; For example, gap=-0.3 for 18 years old women, which means the average diff of vote scores to 18 years old women by other women and men is -0.3; i.e., 0.3 less score given by women



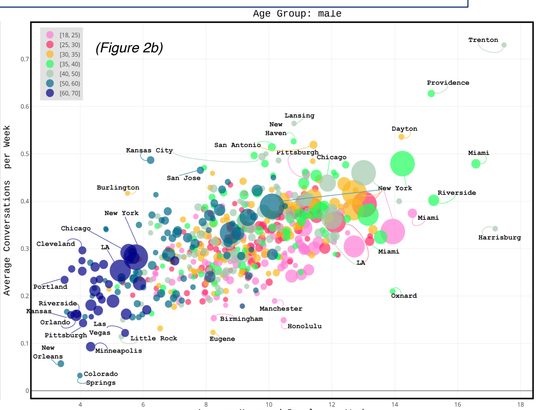
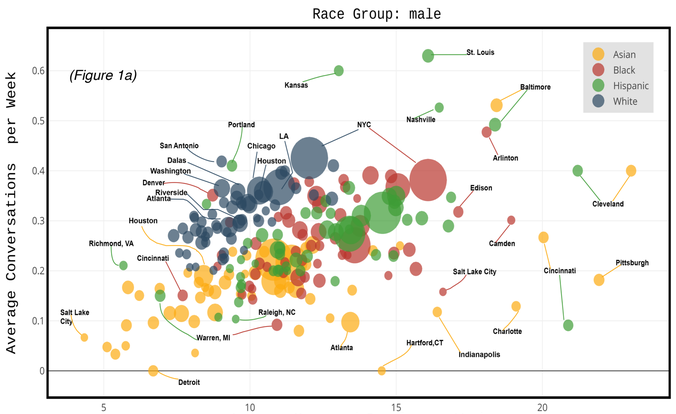


Fig 2. Average conversation(at least 2 rounds) count per week v.s. Average interacted people per week for 53 major cities/metro areas, broken by **Age** and gender(male: Fig. 2a; Female: Fig. 2b); at least 3k monthly active users in each of the major cities



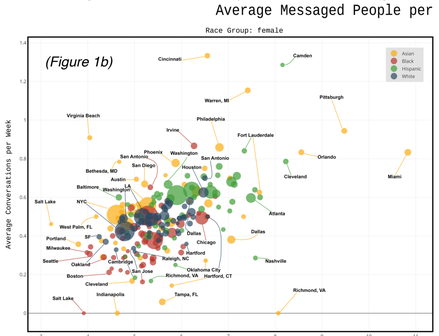
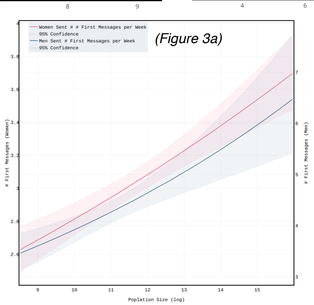


Fig 1. Average conversation(at least 2 rounds) count per week v.s. Average interacted people per week for 53 major cities/metro areas, broken by **Race** and gender(Fig. 1a: male; Fig. 1b: Female); at least 3k monthly active users in each of the major cities



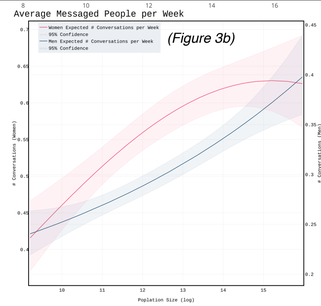
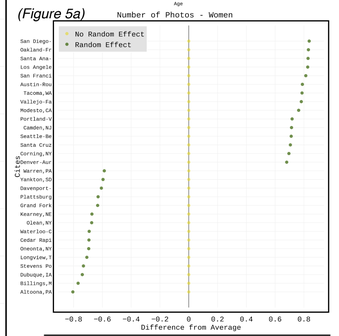
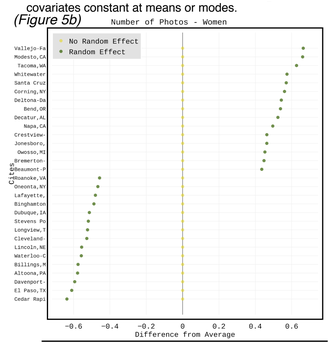
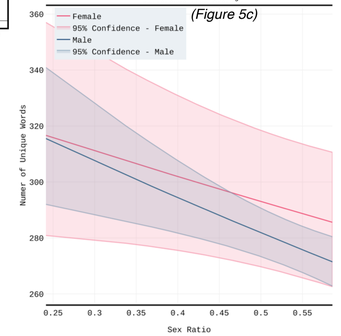


Fig 3. City population effects to outcomes: I. Initial Messages(Fig. 3a); II. Conversation count(Fig. 3b). The set of graphs is generated by predicting outcomes with holding all covariates but population as constant at their means or modes. By varying population, predicted values are calculated by fixed effects models. Shadow represents 95% confidence interval.







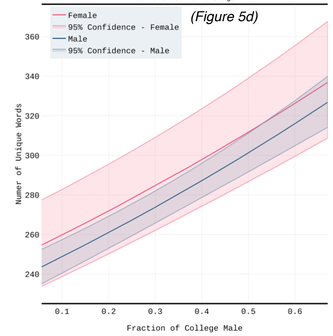


Fig 5. Courtship Intensity, measured by the number of photos and unique word count in essays.
Fig 5a, 5b. show the top 30 cities affected by random effects(either positive or negative). Left panel is the model built by individual vars + random effect. Right panel is the model including city level variables.
Fig 5c and 5d are the effect of sex ration and the fraction of male holding at least college degree in a specific city to the unique word count in profile essays, by holding all other covariates constant at means or modes.

Model	City Sex Ratio	Frac of male edu>=college	Population	Race: Asian-White	Race: Black-White	Race Latin-White	Edu: ">college" - "<college"	Edu: "=college" - "<college"	Seeking: LongTerm - ShortTerm	Seeking LongTerm/ShortTerm - ShortTerm	Seeking LongTerm/SexPartner - ShortTerm	Seeking ShortTerm/SexPartner - ShortTerm	Seeking LongTerm/ShortTerm/SexPartner - shortTerm	Body: Chubby-Thin	Body: Average-Thin	Body: Fit-Thin	Nokids-HasKids	NoWantKids-WantKids)	Age	Age Square	Height	Intercept	*Sample*	*Groups*	*ICC of full model(ICC of model excluding city-vars)*
Unique essay word count(women)	-0.1046 *	0.2798 ***	-0.0224	0.0004	-0.0996 ***	-0.0290 ***	0.0853 ***	0.0325 ***	0.1037 ***	0.1664 ***	-0.2419 ***	-0.1256 ***	-0.0358 *	0.0550 ***	-0.0335 ***	0.0179 ***	0.0770 ***	0.0247 ***	1.0569 ***	-0.9743 ***	0.0659 **	5.0985 ***	*193,973*	*942*	*.0085(.0126)*
Unique essay word count(men)	-0.1524 ***	0.2939 ***	0.0494 **	-0.0130 *	-0.0820 ***	-0.0252 ***	0.1059 ***	0.0355 ***	0.0709 ***	0.1296 ***	-0.1543 ***	-0.0977 ***	-0.0365 ***	0.0696 ***	-0.0097 ***	-0.0709 ***	0.0772 ***	0.0377 ***	0.8347 ***	-0.8191 ***	-0.0957 ***	5.2517 ***	*289,126*	*952*	*.0074(.0135)*
Photo count(female)	0.0393	0.0748 ***	0.1716 ***	-0.0933 ***	-0.0374 ***	0.0557 ***	-0.0131 ***	0.0070 ***	0.1058 ***	0.1332 ***	-0.1409 ***	-0.1000 ***	-0.0369 ***	-0.0081 ***	-0.0188 ***	0.0558 ***	0.0142 ***	-0.0210 ***	0.6934 ***	-1.2279 ***	0.1290 ***	1.2924 ***	*193,973*	*942*	*.0027(.0051)*
Photo count(male)	-0.0996 **	0.1106 ***	0.1877 ***	-0.1128 ***	0.0312 ***	0.0523 ***	0.0031 .	0.0105 ***	0.0418 ***	0.1021 ***	-0.0996 ***	-0.0949 ***	0.0086 **	-0.0986 ***	-0.0064 ***	0.1013 ***	0.0127 ***	-0.0228 ***	0.7148 ***	-1.0486 ***	-0.0348 **	1.3021 ***	*289,126*	*952*	*.0022(.0048)*

Table1: Coefficients and significance of covariates; Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

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