The Effect of Peer Participation on Risk Attitudes in Fantasy Sports[i]

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Abstract

The fantasy sports industry plays an important role in the popularity of today's sports. In 2015, around 20% of the U.S. population played some type of online fantasy sport. Daily Fantasy Sports (DFS), a newer part of this market distinguishes itself from other sports betting by encouraging peer participation through aggressive marketing. This is the first paper to study the user decision-making aspects of DFS. Does peer-participation distort the risk preferences of potential DFS participants? Does targeted advertising/social media exacerbate this response? If DFS platforms are leveraging peer pressure, this may be something that policy makers should consider when regulating the industry. In my experimental study, participants customize several of their own hypothetical DFS contests to reveal their risk preferences. I find that peer participation substantially increases risk-taking, but not quite at a statistically significant level, perhaps due to the limited sample size. The results allow us to learn more about the power of social influences on DFS participants, helping inform legislators interested in regulating this new market.

Keywords: Risk preferences, peer effects, sports betting
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Professor Michael Kuhn

1. Introduction

Daily Fantasy Sport (henceforth DFS) is an online, competitive gambling tournament system that is based on the performance of individual athletes in professional team sports. The host of the DFS tournament assigns each athlete a price. The athletes who are expected to perform well on a given day receive high prices and athletes who are not expected to perform well receive low prices. A DFS player's task is to use a fixed salary –common to all players in a tournament—to create a team of a set size. The host of the tournament also specifies the mapping from athlete performance to DFS team points. DFS players can enter several different sizes of contests with varying number of fellow players. Contest sizes range from very small, with only a handful of friends, to sweepstakes-style, where only a few winners are selected from hundreds of thousands of entries.

The DFS market has rapidly increased in popularity over the past five years. Because sports betting is largely prohibited in the U.S., and fantasy sports are very popular, the low-stakes, low-commitment business model cultivated a very large consumer base almost overnight. In 2015, industry experts estimated $2.6 billion in entry fees, with projected growth of 41% annually through 2020 (*Heitner, 2015*). DraftKings and FanDuel, which control nearly 95% of the market, were both valued at greater than $1 billion in September 2015 (*Kolodny, 2015*).[1]

The advertising battle between these firms has been an expensive one. In the first 10 months of 2015, they spent more than $200 million on advertising (*Kang, 2016*). Advertisements in this industry typically take the approach of a friend recruiting you to

[1] These two firms agreed to a merger that will close in the latter part of 2017.

join in. Testimonials are shown from past winners that truly believe in DFS. The advertisements are spun as casual, hypothetical peer participation; the social aspect of fantasy sports is a huge recruitment mechanism for Draft Kings and Fan Duel. Given the incredible growth in this industry and the unique peer-participation advertising model, the goal of this study is to determine whether social competitions with peers engender different risk-taking behaviors than anonymous competitions.

The idea of group dynamics influencing decisions is not a new one; it has been studied both in psychology and behavioral economics. Gardner and Steinberg (2005) conducted a risk-preference study in which people were sorted into three age groups of 13-16, 18-22, and 24 and older, to take questionnaires evaluating risk. The relevant conclusion they made was that for all age groups, individuals influenced others to take more risk. However, they found that the older someone is, the less risk tolerant they become, and that peer influence diminishes with age. A similar mechanism was found in a psychology study purposefully pairing risk-averse participants with risk-loving participants in groups of three (*Wallach and Mabli, 1970*). The groups were asked risk-based questions which were discussed until a consensus had been reached. Each subject was asked the question privately, both before and after the group discussion. Regardless if risk-averse individuals were in the minority or majority, their risk tolerance increased.

Group identity may play an important role as well. While putting individuals into a group makes them more willing to take risks, this effect is amplified when all individuals within a group share traits in common (*Gioia 2016*). The Gioia group identity study matched participants both randomly and by art preferences. Participants did not know each other prior to the experiment, and yet, something as simple as art preferences provided a high enough level of familiarity. As the ‘sense of membership’ is strengthened, the group becomes increasingly willing to take risks. This could apply to DFS in a social context because everyone shares their voluntary participation, and interest in sports as a common trait.

Non-experimental research on peer influences in risk-taking usually involve young individuals, exhibiting some negative behavior. Looking at peer influence in teens, one study (*Maxwell, 2002*) defined “risky behaviors” as smoking cigarettes, drinking alcohol, using marijuana, and tobacco chewing. A same-sex peer has varying levels of influence, depending on the specific behavior, in both starting and stopping a risk behavior. Focusing on teen pregnancy and school dropouts, peer group effects significantly increase both variables (*Evans et al., 1993*). This study contributed to the literature through analyzing the effects of voluntary residential location, interacting with peer influences in a group setting. Similar location-based findings came to light in looking at drug use, alcohol use, cigarette smoking, school drop-outs, and church-going in tenth graders (*Gaviria and Raphael, 2001*). Church-going, something not tested previously, was significantly affected by peer influences. In a sample consisting of college students, high risk behavior of randomly assigned roommates was analyzed (*Kremer and Levy, 2008*). Students who were assigned roommates who had previously drank alcohol before coming to college, had a significantly lower GPA than those who did not, and the authors find suggestive evidence that this operates via increase drinking.

Much research has been done on peers influencing risk behaviors, however, little has been done on the effects of peer-participation on gambling, and there is no research on the determinants of DFS participation or risk-taking within a gambling context. As the industry expands in some states, policy makers are beginning to focus on developing industry regulations for DFS. Given the lack of economic research into these platforms I view this paper as an important first step in understanding how people choose to take risks differently in these contests, and how advertising may indirectly affect risk preferences through the social nature of participation:

Does peer-participation distort the risk preferences of potential DFS participants? In the specific context of the study, I observe how individuals' risk/reward tradeoff in a DFS context varies as a function of peer participation. I also decompose this result by exposure to DFS advertising to explore whether this peer response could be purposefully cultivated to increase profits. All else equal, participants assigned to the social treatment group showed a trend suggesting an increase in risk-tolerance due to peer-participation. Results lacked significance at the most convincing levels but still proved enough consistency to reasonably speculate.

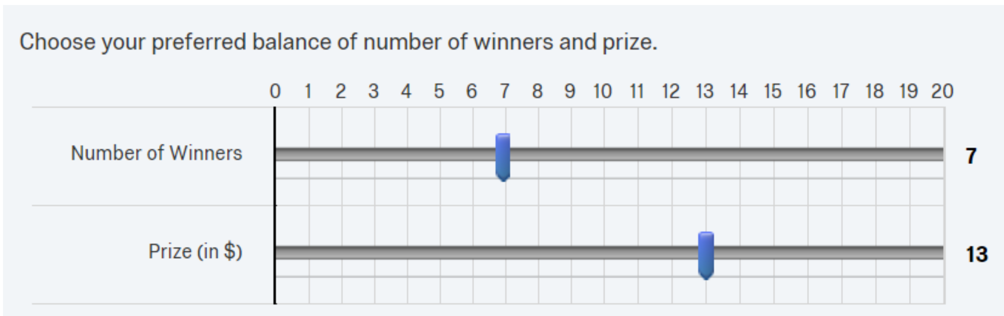
While this question is of interest directly to the DFS market, whether participating in risky ventures or contests with peer influences risk preference is largely unexplored, and of interest in a wide variety of economic situations.

2. Methodology and Data

2.1. Experimental Design

Risk preference data was collected through an online survey simulating hypothetical DFS contest scenarios. Participants completed the survey on their own device, on their own time, using a link provided by the experimenter. I explain recruitment process and subject pool in detail in Section 2.2. At the beginning of the survey, participants were informed what a DFS contest is and how it works to establish a baseline understanding of the platform, even for individuals with no prior knowledge of DFS. They were told to imagine they were using real money during the simulation. However, they were also aware that two individuals would be randomly selected from the study participants to have their choice implemented for real, with a random number generator taking the place of an actual DFS competition.

Figure 1



The actual decisions that subjects made were to select the risk/reward tradeoff of a DFS competition they would participate in. They did this by trading off between the number of winners within a fixed set of competitors and the amount that the winners earned. This risk/reward tradeoff was implemented by Andreoni and Harbough (2010) in a study examining several different aspects of risk preferences. Assuming a power-utility function over prize amounts, subjects faced the following maximization problem

$$\max_{p,x} \ p \cdot x^{\alpha} \quad \text{such that} \quad Mp + x = M \qquad (1)$$

where p, the probability of winning a contest, is equal to the number of winners divided by the number of entrants, x is the prize size, α is the power-utility parameter, and M is the maximum prize size. The solution to this problem is

$$p^{*} = \frac{1}{\alpha+1} \quad . \qquad (2)$$

Structural equation (2) is the demand for probability in terms of the power-utility parameter. This allows me to estimate the participants' risk attitude based on choices in the study.

Participants used sliding bars on a graphic to indicate how many winners a hypothetical contest will have, as well as how big the prize for winning will be - displayed in Figure 1. The number of winners, combined with the prize, totaled a fixed amount. In the case of Figure 1, the sum of the winners and prize had to equal 20. This tradeoff between risk a reward is a direction function of subjects' risk preferences. More risk averse individuals should select more winners and smaller prizes, and more risk tolerant individuals should select fewer winners and larger prize. Before performing the eight slider tasks that were all equally likely to be randomly selected for payment, subjects were given a sample scenario they could use to understand the procedure. Table 1 presents the characteristics of each of the eight choices.

Table 1: Characteristics of Risk/Reward Budgets

Budget	# Entrants	Max. Prize	Min. Prize
1	20	20	0
2	10	10	0
3	4	4	0
4	50	50	0
5	15	15	0
6	20	25	5
7	20	14	0
8	100	100	0

After being introduced to the survey mechanics, participants were assigned to either the "social" set of questions or the "anonymous" set of questions. These questions followed the same format in that they contained the same 'number of winners' and 'prize amount' choices, but the wording for the two sets of questions were different. The “social” DFS contests prompted the participant to list three friends that they spend the most time with (without any reference to DFS). The names of these three friends were carried through the DFS contest language to simulate the influence of playing with them in an actual contest. For example, question in the social scenario was worded “You are in an online DFS competition with 6 people, including friend1, friend2 and friend3”. The anonymous version had similar wording, but did not prompt the participant for names or provide any information on others in their competition group.

The slider questions varied in the overall size of the DFS competition. Some will represent smaller pools of people (more commonly used by a small group of friends) while some will represent a larger pool of people. Varying the contests in this way allows us to accurately measure risk preferences for each participant. The sliders were programmed such that subjects had to move them at least once in order to advance, so as to minimize non-response or uninformed response. Also, the extremes of the slider both offered degenerate options: everyone in the contest winning $0 or nobody in the contest winning a large amount. As such, corner solutions were strongly discouraged.

Following this task, subjects provided demographic information in a survey. This included gender, ethnicity, language spoken, age, salary, employment status, and education level. These are used to control for the effects of each variable, therefore isolating the effect of our social treatment.

In addition, I asked the participants some abstract risk questions. For example, I directly asked how risk averse the participant is. This allows me to relate contextual and general risk preference. Gambling history questions will help detect any differences in behavior between those who regularly gamble and those who do not.

The data is analyzed using Stata statistical software. I use the random treatment variation to ask: does social context affect the level of risk that subjects take? I also analyze the differences across different types of choice: does social context affect the way that risk-taking changes when the nature of the available contests change? The reduced-form approach has a corresponding interpretation in a structural estimation of subjects' risk preferences. Within the context of a simple expected utility model, does the estimated coefficient of relative risk aversion depend on social context?

2.2. Subject Population and Recruitment

I recruited undergraduate students by making an announcement in a large, introductory economic course. An advantage to using this population is that their social networks may be stronger than those of random participants because they tend to live with and near close friends. The variation between the anonymous and social conditions would thus be stronger in this population.

Prior to making the announcement in class, an email was sent to each enrolled student with a link to state their interest by collecting their email. The actual survey link was sent to both students expressing their interest and those who did not. The initial email was to bring in more participation through a 'foot in the door' approach. A reminder email to complete the survey was sent out four days later, a day before the deadline.

Payment consisted of four $50 prizes and two performance-based prizes, to be randomly drawn after the survey window closed. Students were informed that there would be some type of performance-based prize but did not know what they'd be doing to earn it until taking the survey. Upon starting the survey, participants were told there was a chance we'd randomly select one of the slider questions and run it with real money.

This was to encourage authentic choices and reduce noise from participants not taking the task seriously.

2.3. Features of data

In total, 87 students participated in the survey. Two questions were inserted to control for poor attentiveness while taking the survey. A simple prompt "select *Somewhat Agree*" was given at the end to detect any mindless completion. In total, about 88.51% of participants selected the correct option; these participants will be referred to as "alert subjects". However, the first attentiveness test was slightly more complex, imitating the risk sliders given immediately before that. In the earlier slider questions, there is a tradeoff between prize and number of winners – in this one there is no tradeoff but just simply a fixed prize where number of winners is chosen. Ideally, the participant would then select the maximum number of winners to guarantee the fixed prize. Only 33.33% of total participants selected the maximum number of winners. This may be due to the fact this question was asked as the last slider question. It can be reasonably assumed that participants viewed the 'total number' given and assumed it was in the same format as the previous eight questions. Another interpretation is that this task represents a pure preference for competition: perhaps the monetary prize only has value when not everyone obtains it.

In Table 2, I test for balance of observable characteristics of subjects across the social and anonymous treatments. 'Male' has a value of one if the participant is male and a value of zero for anything else. This holds true for 'Gambling' (previous experience with gambling), 'White', and 'English'. However, 'Ads' was split up into three different levels of exposure to Advertisements from DFS companies (holding a value of 0, 1, or 2).

Looking at the main variables of interest, we can see there is no significant difference in means across anonymous (regular slider questions) and social (slider questions with names of friends). When looking at the pure effect of the social condition, we can be sure that the effect isn't being influenced by any of these variables.

Table 2: Balance of Sample across Treatments

Variable	Anonymous Mean	Social Mean	Difference
	(1)	(2)	(3)
Male	.578	.500	.0780
	(.075)	(.078)	(.108)
Ads	.911	.810	.102
	(.118)	(.124)	(.171)
Gambling	.511	.548	-.037
	(.075)	(.078)	(.108)
White	.733	.643	.091
	(.067)	(.075)	(.100)
English	.933	.929	.005
	(.038)	(.040)	(.055)
Winners/Players	.316	.244	.072
	(.032)	(.024)	(.040)
Number of Subjects	405	378	

*Significance level: *p<.1, ** p<.05, *** p<.01*
Standard Errors in Parenthesis

3. Results

3.1. Main Results

Individuals were generally risk-loving, with a (winners/total players) ratio of about 1/3. This means that they would much rather gamble for the higher prize when they could have nearly guaranteed themselves some sort of prize. This contrasts with typical laboratory studies in economics that identify substantial risk aversion over small-stakes gambles (*Charness et al. 2012*).

I split the main results into three samples of interest and two types of OLS regression within each: Full sample, Standard Budgets Only, and Standard Budgets Only and Alert Subjects Only. Full sample results are presented in columns (1) and (2) of Table 3. The standard budgets, 1-5 and 8 from Table 1, are those slider questions that maintain a standard correspondence between winners and prize: if everyone wins, the prize is zero, and if only one person wins, the prize is equal to the number of entrants minus $1. The 'standard' sliders also exclude the last slider question, which was used as one of the two attentiveness questions. Results are presented for these budgets in columns (3) and (4) of Table 3. The results for the standard budgets and the sample limited to alert subjects only, using the survey question, are presented in columns (5) and (6) of Table 3. In the odd-numbered columns, I include only the social scenario dummy variable as an independent variable. In the even-numbered columns, I add gender, gambling history and exposure to DFS advertisements and their interactions with the social scenario dummy variable to determine if the effect of peer influence is different across groups.

The dependent variable in the regressions in Table 3 is the number of winners selected in a slider question; as the number decreases, the risk increases. This is regressed on only a dummy variable for whether and individual is in the social scenario or not, in the odd-numbered columns. In the regressions in columns (1), (3), and (5), there is consistently riskier behavior in the social scenario, although the difference is not statistically significant at conventional levels. The effect is larger on the standard budgets only, and larger again on alert subjects, reducing noise. For example, the estimate in column (5), indicates that subjects in the social scenarios select about 1.5 fewer winners per contest, which is over a reduction of more than 20% relative to the anonymous scenario.

The only significant variables in Table 3 (at the 10% level), were the “Gambling” and “GamblingXSocial”. Recall that the “Gambling” variable represents participants’ previous experience with gambling. The “Gambling” in both the (2) and (4) regressions represent females with no DFS advertisement exposure, in the anonymous treatment group. The other significant variable in the (2) and (4) regressions, “GamblingXSocial” represents females with no DFS advertisement exposure, in the social treatment group. Previous gambling experience proved to have a profound impact on risk behavior in females with no DFS advertisements.

Additionally, both “Male” (male participant) and “Ads” (exposure to DFS advertisements) slightly increased a subject’s risk tolerance separately. When ad exposure combined with being in the social treatment, the effect was amplified. If a male participant was in the social treatment, they became slightly more risk averse. However, looking at the standard errors in the MaleXSocial (males in the social treatment), we can see they’re quite large relative to the coefficients.

Table 3: Main Estimates of Treatment on Risk-taking

	Full Sample		Standard Budgets Only		Standard Budgets with Alert Subjects	
Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)
Social	-1.295	.901	-1.543	.371	-1.656	.927
	(.964)	(1.710)	(1.127)	(1.949)	(1.137)	(2.120)
Male		-1.360		-1.885		-2.5312
		(1.624)		(2.066)		(2.257)
MaleXSocial		.610		1.383		1.119
		(2.198)		(2.659)		(2.649)
Gambling		2.524*		2.960*		2.433
		(1.404)		(1.637)		(1.956)
GamblingXSocial		-3.461*		-4.073*		-4.0916
		(1.931)		(2.239)		(2.462)
Ads		-.306		-.674		.040
		(1.011)		1.195		(1.393)
AdsXSocial		-1.030		-.862		-1.269
		(1.240)		(1.454)		(1.581)
Constant	8.911	8.685	9.237	9.427	8.908	8.994
	(.679)	(1.276)	(.797)	(1.395)	(.850)	(1.499)
Number of Obs.	783	783	522	522	462	462
Number of Clusters	87	87	87	87	77	77

*Significance level: *p<.1, ** p<.05, *** p<.01*
Standard errors clustered by individual.

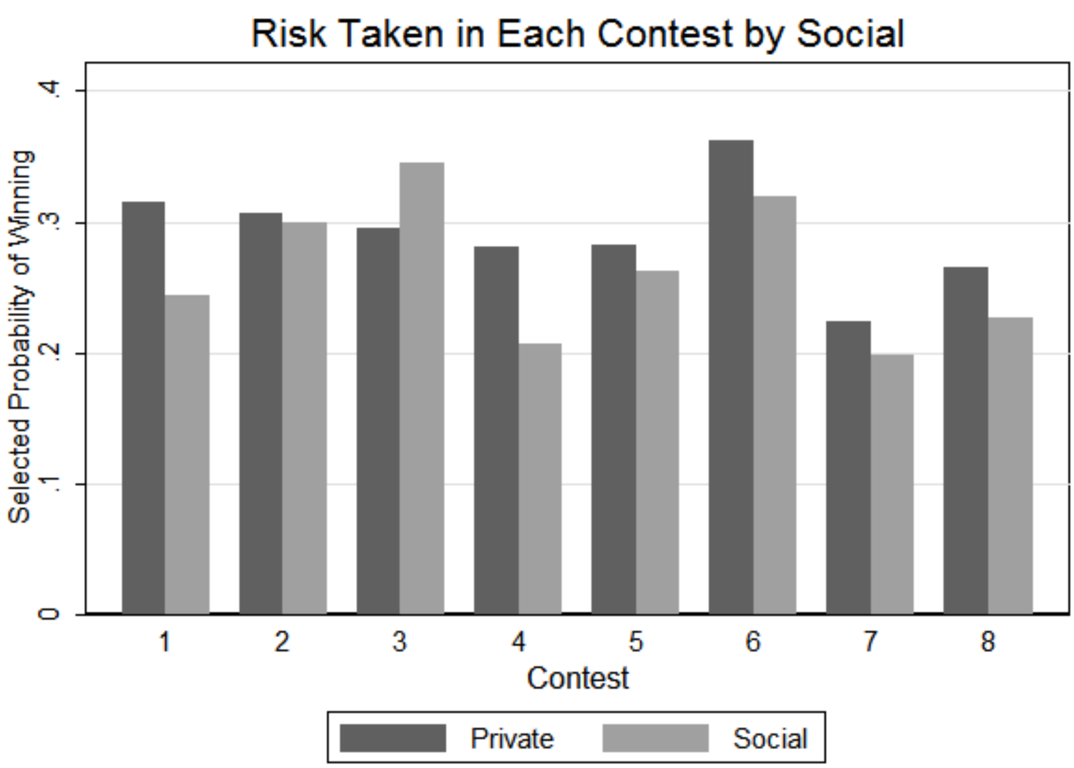
3.2. Disaggregated Results

Figure 1 shows the effect social influence on selected probability of winning, broken down by question. In all but one question, (#3), the social group selected a lower probability of winning, suggesting a higher risk preference when peer participation was involved. The third question consisted of only four people total in the slider question as opposed to a much higher number use in the rest of the question. I suspect that because we prompt the social group for three friends, therefor leaving no unknown players, the social mechanism would operate differently.

Running regressions by individual question shows that both the first and fourth showed a significant effect of the social scenario on risk preference. The first question was significant at the 10% level and the fourth at the 5% level. In general, the social effect appears to be stronger in large contests, and not particularly different in the skewed contests (6) and (7).

Looking at the unique slider question, question nine, there is a slight, insignificant difference in the social treatment. The social treatment group chose about 1.3 less winners than the anonymous treatment group, following a similar pattern as the previous eight questions. As mentioned in section 2.3, it's reasonable to think that subjects followed the same structure with a total number given, even though it was to distinguish alert subjects.

Figure 1



3.3 Alternative Measures of Choice

To understand how the peer influence mechanism is working, a probit analysis was used to supplement the OLS regressions. Using the ratio that participants selected (Number of Winners/Number of Players), the variable 'Risky' represents ratios under the threshold of ½. This is simply putting the risk preference into fraction form, testing if the overall effect of the social scenario is driven by the marginal effect of peer influence on playing it safe versus taking a risk. The results show that the although social treatment increases the level of risk tolerance, it does not push risk averse individuals into the 'Risky' category. Results are in Table 4.

Table 4: Probit Estimates of Treatment on Risk-taking

	Full Standard	Question 6	Question 7
Independent Variables	(1)	(2)	(3)
Social	.038	.003	-.026
	(.057)	(.098)	(.042)
Constant	.896	.557	2.001
	(.157)	(.199)	(.412)
Number of Obs.	522	87	87

*Significance level: *p<.1, ** p<.05, *** p<.01*
Standard errors clustered by individual in column (1).
Estimates are marginal effects of treatment on the probability Risky = 1.

Using the solution, equation (2), to the utility maximization problem laid out in equation (1), I can map any choice in the study to a value of the utility parameter in the power-utility function. Recall that if this parameter is greater than one, an individual is risk-loving, and if it is less than one, they are risk-averse. This comes from the model where the demand for probability is ½ for a risk-neutral preference. Table 5 shows the effects of the social scenario on the risk preference utility parameter of subjects in the sample.

Table 5: Estimates of Treatment on Risk Utility Parameter

Independent Variables	Full Standard (1)	Budget 6 (2)	Budget 7 (3)
Social	1.611	.147	.359
	(1.048)	(.751)	(1.307)
Baseline Risk Attitude	4.724	2.641	6.481
	(.483)	(.523)	(.940)
Number of Obs.	519	87	87

*Significance level: *p<.1, ** p<.05, *** p<.01*
Standard errors clustered by individual in column (1).

In general, participants were very risk-loving. We see this by looking at the constant term in Table 5. All individual regressions capture an increase in risk tolerance by the social variable in Table 5. The effect is the highest for the full, standard regression (1).

4. Conclusion

We study the effects of peer participation within DFS on risk preferences. This is done through giving slider questions to simulate DFS contests. Limited research has been done on the social influences on risk taking, but this is the first project to study peer influence on DFS risk preferences.

The gambles made by subjects in our sample may have been generally riskier than expected, but our analysis shows a higher risk preference in the social treatment group. Combining all budgets, the estimates do not quite achieve statistical significance at the 10% level, but there are significant effects on some of the budgets with a larger number of entrants. Subjects who have gambled are dramatically affected by the social treatment. They take significantly less risk in the anonymous treatment, and the social treatment significantly increases their risk taking. This is particularly interesting, since it suggests a strong role of peer influence on risky behavior among those most susceptible to risky behavior. Simply mentioning the names of close friends was enough of a primer to reveal a trend that has real external application. The peer effect on participation may even be higher as it's nearly impossible to replicate real social pressures within a study of this type.

Future work should reproduce the study with a larger, more diverse sample. Generalizing from the results here, policy makers looking to regulate this industry can look at this for insight into large DFS companies such as FanDuel and DraftKings. These companies benefit from higher participation and riskier players. Current advertisements that use a peer-influence mechanism to attract new players might be particularly effective at drawing in gamblers and keeping them in. Individuals who risk more on DFS than they would prefer ex-ante to participation may have been into riskier behavior by the DFS advertising strategy.

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