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Gender Differences in Volunteer's Dilemma: Evidence from Teamwork among Graduate Students

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Gender differences in volunteer's dilemma: Evidence from teamwork among graduate students*

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Abstract

Using data from room bookings at the Harvard Kennedy School, I find that female students volunteer significantly more than male students in booking rooms for team meetings. I also find that gender difference in undertaking this logistical task is statistically and quantitatively significant only when students have limited interaction prior to teamwork. Even though booking a room involves a relatively small (time) cost, such costs can add up, and also contribute to gender stereotyping in allocation of tasks in other team settings.

Keywords: Gender; Volunteer's Dilemma; Low-promotability tasks.

JEL Codes: C71; I23; J16.

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1 Introduction

Number of studies have shown that women are more likely to undertake tasks with low-promotability[1] than men. For instance, in academia there seems to be gender differences in amount of time spent in committee work, which is most often not considered as a major criteria for tenure decisions.[2] While such gender differences can be party explained by the demand-side differences (i.e., women *being asked* to contribute more than men), evidence also point to supply-side differences (i.e., women *volunteering* to contribute more than men).[3] For example, drawing on data from a large public university in the U.S., Babcock et. al. (2017) have found that a significantly higher proportion of female faculty (relative to male faculty) volunteered to join the Faculty Senate Committee, even though all faculty received the same invitation to join. Laboratory experiments ran by the authors also show that women volunteer significantly more than men for the benefit of the group.[4] As the authors point out, to the extent that more time on low-promotability tasks imply less time on high-promotability tasks, such gender difference can create barriers to the advancement of women.

In this paper, I explore whether such gender differences in volunteering exist among graduate students in a professional school setting. The low-promotability task I consider is booking rooms for teamwork; it is a mundane task, which does not require special skills but involves a (relatively small) time cost. A team member deciding whether or not to book a room for a team meeting can be best described as being engaged in a volunteer's dilemma.[5] It takes one volunteer to generate a

[1] Babcock et. al. (2017a) define low-promotability tasks as those that benefit the organization but are given relatively little weight in performance evaluations and promotion decisions.

[2] See, for example, Misra et al. (2012) and Mitchell and Hesli (2013).

[3] As Babcock et. al. (2017) shows, women may also have a higer propensity than men to accept such tasks when they are asked. See also Babcock et. al. (2017b). For the purposes of this paper, I focus on the propensity of women to volunteer for such tasks when they are not explicitly asked for them.

[4] The authors also find that women, relative to men, are more likely to be asked to volunteer, and accept direct requests to volunteer.

[5] Volunteer's dilemma, named and popularized by Diekmann (1985), refers to a special case of voluntary contributions game in which the provision point is one. It describes a situation where the benefit to the entire group arises when only one of the players volunteers to take a costly action.

benefit for the entire team.[6] Every team member prefers some other member to book the room for the meeting, but will do it if no one else is doing it, resulting in multiple equilibria.

I use data from room bookings done by graduate students at the Harvard Kennedy School over the course of four academic years. Controlling for the number of rooms students have booked for individual purposes, I find that female students volunteer significantly more than male students to book rooms for their teams. Furthermore, an exogenous change in the way teams were formed provides a natural experiment.I find that the gender difference is particularly large and statistically significant when team members have limited interaction prior to teamwork. This suggests that when students' preferences are not completely known to each other, beliefs that most female (some male) students will (not) undertake such logistical tasks, or gender stereotyping, may disfavor female students who end up volunteering significantly more than male students. This finding is also consistent with the experimental findings of Babcock et. al. (2017a) where group composition plays an important role in decisions to volunteer. In particular, they find that the gender gap in volunteering is eliminated when participants are paired only with members of their own sex. Similarly, authors interpret this finding to be driven by the beliefs participants hold about the likelihood of others to volunteer (that is, the belief that women volunteer more than men).

This paper is also related to a set of experimental studies that have tested volunteer's dilemma focusing on dimensions other than participants' gender.[7] Most recently, Gooere et. al. (2017) have explored the relationship between volunteering and group size, and have found the probability of volunteering to be decreasing with the group size.[8] Similarly, I find both the number of bookings and the rate of volunteering (defined as the ratio of a student's bookings for the team to the

[6]Unlike the previous field data used in this line of literature where beneficiaries of low-promotability tasks are large organizations such as universities, benefits in this setting accrue to a small number of team members. In this regard, this setting is more similar to the laboratory experiments set up by Babcock et. al. (2017a).

[7]See, for example, Diekmann (1993) and Healy and Pate (2009) for asymmeties in cost of volunteering.

[8]For a similar finding in a one-shot volunteer's dilemma game, see the prior work by Frazen (1995).

total number of bookings for the team) to be decreasing with group size. Given the relatively small variation in team sizes in my data, this negative relationship is a strong sign of diffusion of responsibility.

The paper is organized as follows. I begin with a detailed description of the context and date. In Section 3, I present the analysis of the data for four academic years. In Section 3, I split the data according to the way in which the teams are formed, and present the findings for each model. In Section 4, I discuss possible explanations of the findings. Finally, I conclude.

2 The context and data

A large number of rooms and study spaces at Harvard Kennedy School (HKS) is available for students' use, both for individual purposes (such as study, interview, etc.) and for groups (teamwork, group studies, events, etc.). Allocation of such spaces is managed through an online system, SpaceBook, which requires students to specify the purpose of the booking. The data for this study concerns the participants of the Spring Policy Exercise (SPREX), which is required for the first-year Master of Public Policy (MPP) degree. SPREX is spread over two weeks and involves students working in randomly assigned teams on a policy issue. Through SpaceBook data, I observe the room bookings of 863 SPREX participants over the course of four years, both before and during the SPREX. I combine this data with SPREX team information (size, gender composition) and student level data (gender) and ask if there are any gender differences in room bookings for teamwork.

First-year MPP curriculum and required teamwork (SPREX)

Each year around 200 students enroll at HKS's highly-selective two-year MPP program. Upon their enrollment, incoming MPP students are randomly assigned to one of four cohorts: Alpha, Beta, Gamma, and Delta. The first-year MPP curriculum consists of set of required courses, such as economics, quantitative analysis, ethics, politics, management and leadership, and negotiations. These core courses are taught in four sections. During the Fall semester each section of a course (A, B, C, D) is generally dedicated to a specific cohort of students.(Alpha, Beta, Gamma, Delta).[9] Of particular interest to this paper is the SPREX, which is a requirement for all first-year MPP students.[10] This exercise takes place in the Spring semester, and involves application of the tools and concepts students have acquired in the core curriculum. The number of all SPREX participants as well as the share of female students during the observation period are reported in Table 1.[11]

Table 1: Summary Statistics | SPREX Participants and Gender

	Overall	Female	
Academic Year	Number	Number	Share
2014-15	192	92	0.48
2015-16	227	114	0.50
2016-17	229	102	0.45
2017-18	215	101	0.47
All years	863	409	0.47

On average, SPREX participants are 26 years old, and have 3 years of work experience prior to their MPP studies. The average age of female students is slightly (8 months) lower than male students. Overall, international students make up 35% of SPREX participants.[12]

As part of SPREX, students are randomly assigned to teams to develop policy recommendations

[9]Some mixing of cohorts happen in Economics and Statistics, as one of the four sections in those courses is more advanced, and students can self-select into them. Also, stundents with strong backgrounds can take an exam to be expempted from these two courses.

[10]Since SPREX is a requirement for all students, there are no self-selection concerns that may be inherent in elective course work.

[11]These numbers also represent the first-year MPP student body for AY 2016-17 and 2017-18. A total of 14 (9 male, 5 female) and 7 (6 male, 1 female) first-year MPP students were exempted from SPREX in AY 2014-15 and 2015-16, respectively.

[12]See Table A1 and Table A2 in Appendix A for more detail.

on a given policy issue over the course of two weeks.[13] Since the team compositions are exogenously given to the students, there is no interaction between team formation and teammates' anticipated behavior in subsequent teamwork.

SPREX Team Data

SPREX team data are obtained from the MPP office and includes the following information for each year: student name, gender, the assigned team and other members of the team, and the SPREX topic and date. There is a total of 163 SPREX teams over the course of four academic years, with a median team size of 5.[14] Figure 1 shows the distribution of the female student ratio in teams. With the exception of ten teams, all teams are composed of either 40, 50, or 60 percent female.

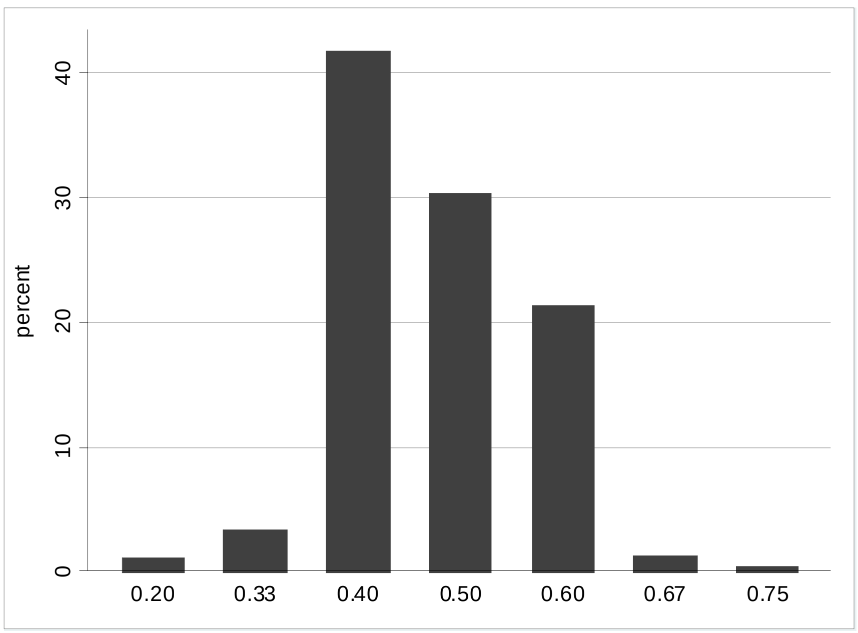

Figure 1: Distribution of Team Female Share (n=163)

[13] Even though the team assignments are random, an explicit attempt is made to avoid gender-inbalanced teams, including single-sex teams.

[14] Majority of the teams, 110 out of 163, have 5 members. There are 51 teams with 6 members and 2 teams with 4 members. See Table A3 in Appendix A for the number of SPREX teams by year.

Room Bookings Data

Rooms and study spaces at HKS have different capacities and can be booked for individual purposes (such as Skype or phone call, interviews) or for a group (team meetings, study groups, social gatherings, caucus meetings, etc.). There is an arguably small fixed cost of learning how to book a room through SpaceBook[15]. Once the student learns how to book a room, then each booking involves a small constant marginal (time) cost.[16]

The students' room reservation data is obtained from the Office of Facilities Management at HKS and consists the following information for each reservation: Building [Name], Booking Date, Event Start [Time], Event End [Time], Room Description, Booking Status, Setup Count, Event Name, Client [Name], and Client Phone. Booking Date.[17] Setup Count specifies the number of people that will be using the room, and the Event Name specifies the purpose for booking.

Over the course of four academic years, I observe 7,345 pre-SPREX bookings made by the SPREX participants. Using the Setup Count and Event description, I classify bookings prior to SPREX into two categories: Group Bookings (G-bookings), and Individual Bookings (I-bookings). Group Bookings include all bookings that have a setup count larger than one, excluding "office hours."[18] Individual Bookings include all bookings that have a setup count one, but excludes any booking if the description includes "team," "group," "meeting" or any other word that suggests that the booking is made for a group of students rather than an individual. Group Bookings constitute 76% of the pre-SPREX bookings are made for the use of a group of students.[19]

A non-trivial proportion of SPREX participants (169 out of 863) have not booked any room

[15] All incoming students receive an email with a document titled "How to Reserve a Study Space" which explains step-by-step how to book a room. Instructions are also available on HKS's intranet.

[16] It takes about 2-3 minutes to complete a reservation.

[17] Booking Date refers to the date for which the booking is made, and not the date at which the booking is made.

[18] Rooms and spaces booked by teaching assistants for office hours are coded as "Individual Bookings" as those bookings are made as part of teaching responsibilities.

[19] The true number of bookings used by groups of students must be higher as some of these bookings are likely to be misidentified as individual bookings. This is because spaces with set up 1 can accomodate up to 3-4 students, and such spaces tend to be used for small group work and meetings, especially during the busy times.

prior to SPREX.[20] These students make 20% of male and 19% of female participants.[21] Among the students with positive number of pre-SPREX bookings, the average number of booking is 10.6.On average, female students book more rooms than male students, and the gender difference in average bookings are particularly high for Group Bookings.[22]

SPREX bookings happen over the course of two weeks each year. There are a total 1,219 SPREX bookings in the data; with an average booking of 1.4 per SPREX participant. A significant number of students (313 male, 231 female) have made no SPREX bookings.[23]

Table 2: Summary Statistics | Pre-SPREX and SPREX bookings

	Number			Average		
Academic Year	Overall	Male	Female	Overall	Male	Female
Pre-SPREX bookings	7,345	3,248	4,097	8.51	7.15	10.02
Group	5,578	2,434	3,144	6.46	5.36	7.69
Individual	1,767	814	953	2.05	1.79	2.33
SPREX bookings	1,219	465	754	1.41	1.02	1.84
All bookings	8,564	3,713	4,851	9.92	8.18	11.86

3 Analysis

Combining booking data with SPREX participants and team data, I generate student-level observations with student's gender, number of pre-SPREX G-bookings, number of pre-SPREX I-bookings number of SPREX bookings, size of the student's team, female share in team, total number of SPREX bookings made by the team, and the "volunteering rate" of the student, defined as the

[20] Majority of these students (154 out of 169) do not book any room for SPREX either.
[21] Gender information of these students can be found in Table B1 in Appendix B
[22] See Table B2 in Appendix B for details.
[23] See Table B3 in Appendix B for summary statistics on average number of SPREX bookings.

ratio of the student's SPREX bookings to total number of bookings made for the same team. I then study gender differences in (i) probability of booking a room prior to SPREX, (ii) probability of booking a room for SPREX, (iii) number of pre-SPREX bookings, (iv) number of SPREX bookings, and (v) rate of volunteering in booking a SPREX room.

Probability of booking a room I find no gender differences in the probability of booking a room prior to SPREX. Female participants' probability of booking a room for their SPREX team, however, is significantly higher than male participants. Table 3 below reports the results from Probit regressions. A student's probability of booking a positive number of rooms for SPREX is 0.37. Controlling for year fixed-effects, team characteristics such as team size and female share in team, and the number of pre-SPREX I-bookings students have made, gender (female) coefficient remains positive and significant. As it can be seen from column (4), the female coefficient is 0.11.

Column (5) reports the regression with team fixed effects.

Table 3: Probability of booking a room | Probit Estimates

	pre-SPREX	SPREX			
	(1)	(2)	(3)	(4)	(5)
Female	0.018	0.124***	0.120***	0.111***	0.128***
	(0.027)	(0.031)	(0.031)	(0.031)	(0.035)
Team size			−0.103*	−0.090*	
			(0.044)	(0.044)	
Female share in team			0.112	0.105	
			(0.227)	(0.223)	
Pre-SPREX I-bookings				0.017***	0.022***
				(0.004)	(0.005)
Team fixed effects		*No*	*No*	*No*	*Yes*
No. of observations	863	863	863	863	863

Notes: The table reports marginal effects. Delta-method standard errors in parenthesis.

Year dummies included in all regressions. Standard errors clustered by 163 SPREX teams in (2), (3), (4), and (5).

*** Denotes significance at 0.1% level; ** denotes significance at 1% level; * denotes significance at 5% level.

I also find that a higher number of pre-SPREX I-bookings increase the probability of SPREX booking. The size of the team has a negative effect on the probability of booking a SPREX room, which is consistent with findings in the volunteer's dilemma experimentations that suggest a negative relationship between probability of volunteering and group size. [24]

[24] See Franzen (1995) and Gooere et. al. (2017).

Number of SPREX bookings As reported on Table 2, on average, a SPREX participant books 1.4 rooms for their team. Both OLS and Tobit (data are censored at zero at the low-end) estimates are reported in Table 4 and Table 5, respectively, and show a very significant gender effect on the number of student's SPREX bookings. Not surprisingly, number of pre-SPREX I-bookings student that have booked a room prior to SPREX, book more rooms for SPREX.[25] Team size has a negative and significant effect on student's number of SPREX bookings. Given relatively small variation in the team size, this negative effect is particularly telling.[26]

[25] Since G-bookings involve other teamwork and group studies, booking behavior is likely to be correlated with the SPREX booking behavior, and hence, is not included as a control variable.

[26] See Table A4 in Appendix A for the team size distribution.

Table 4: Number of SPREX bookings | OLS Estimates

	pre-SPREX I-bookings	SPREX			
	(1)	(2)	(3)	(4)	(5)
Female	0.529	0.816***	0.804***	0.742***	0.735***
	(0.301)	(0.194)	(0.191)	(0.191)	(0.213)
Team size			−0.641**	−0.559**	
			(0.208)	(0.209)	
Female share in team			0.394	0.350	
			(1.014)	(0.990)	
Pre-SPREX I-bookings				0.120***	0.133***
				(0.030)	(0.037)
Team fixed effects		No	No	No	Yes
No. of observations	863	863	863	863	863

Notes: Year dummies included in all regressions. Standard errors in parenthesis.

Standard errors clustered by 163 SPREX teams for (2), (3), (4), and (5).

*** Denotes significance at 0.1% level; ** denotes significance at 1% level; * denotes significance at 5% level.

Table 5: Number of SPREX bookings | Tobit Estimates

	pre-SPREX I-bookings	SPREX			
	(1)	(2)	(3)	(4)	(5)
Female	1.360*	2.069***	2.028***	1.875***	1.905***
	(0.639)	(0.453)	(0.450)	(0.443)	(0.462)
Team size			−1.676**	−1.468**	
			(0.557)	(0.559)	
Female share in team			1.310	1.292	
			(2.715)	(2.654)	
Pre-SPREX I-bookings				0.251***	0.290***
				(0.045)	(0.061)
Team fixed effects		No	No	No	Yes
No. of observations	863	863	863	863	863

Notes: Year dummies included in all regressions. Standard errors in parenthesis.

Standard errors clustered by 163 SPREX teams for (2), (3), (4), and (5).

*** Denotes significance at 0.1% level; ** denotes significance at 1% level; * denotes significance at 5% level.

Rate of Volunteering The finding on gender difference is very robust to a different measure of volunteering. Instead of number of SPREX bookings made by the student, consider the student's "rate of volunteering," defined as the ratio of student's SPREX booking to the total bookings made for the team. This measure may be more informative, as for any given number of SPREX bookings made by the student, the student's rate of volunteering can be high or low, depending on the number of bookings made by the other team members. Let $v_i \in [0, 1]$ denote the rate of volunteering for Student i.

In my data, I observe four teams every year (16 teams with 85 students in total) with no SPREX bookings. Table C1 in Appendix C reports rate of volunteering for students in the remaining teams (147 teams and 778 students) with positive SPREX bookings. A very significant portion of these students (60%) are "free-riders" in booking rooms ($v_i = 0$). The ratio of free-riders among male students is significantly higher; 66% of male students as opposed to 51% of female students. There are a total of 47 teams for which only one team member undertakes all bookings for the team. There is no significant gender difference among these full volunteers (7% of male students and 6% of female students).

Table 6 shows the OLS estimates where the independent variable is student's volunteering rate. Given that the average rate of volunteering is 0.189 in this sample, the female coefficient is very significant with all the controls.

Table 6: Rate of volunteering | OLS Estimates

	(1)	(2)	(3)	(4)
Female	0.087***	0.090***	0.084***	0.083***
	(0.023)	(0.023)	(0.024)	(0.026)
Team size		−0.034***	−0.024***	
		(0.001)	(0.005)	
Female share in team		−0.089**	−0.095**	
		(0.024)	(0.031)	
Pre-SPREX I-bookings			0.120***	0.015***
			(0.003)	(0.004)
Team fixed effects	No	No	No	Yes
No. of observations	778	778	778	778

Notes: Year dummies included in all regressions.

Standard errors in parenthesis, clustered by 147 SPREX teams.

*** Denotes significance at 0.1% level; ** denotes significance at 1% level; * denotes significance at 5% level.

Table 7: Rate of volunteering | Tobit Estimates

	(1)	(2)	(3)	(4)
Female	0.213***	0.211***	0.197***	0.206***
	(0.050)	(0.512)	(0.051)	(0.054)
Team size		−1.124***	−1.101***	
		(0.029)	(0.030)	
Female share in team			0.110	
			(0.144)	
Pre-SPREX I-bookings			0.024***	0.032***
			(0.005)	(0.007)
Team fixed effects	No	No	No	Yes
Nb of observations	778	778	778	778

Notes: Year dummies included in all regressions.

Standard errors in parenthesis, clustered on 147 SPREX teams.

*** Denotes significance at 0.1% level; ** denotes significance at 1% level; * denotes significance at 5% level.

4 A natural experiment: cohort-based versus topic-based teams

In AY 2016-17, SPREX was changed in a way that has some bearing on the results of this paper. Until then, i.e., during the first half of our data window, all students worked on the same policy topic, and SPREX teams were randomly formed within each of the four cohorts. This meant that students worked with their cohort-mates whom they knew since the beginning of the Fall semester.[27]

[27] Besides taking the same sections of the courses, students organize and participate in various cohort-specific social activities, such as retreats, potlucks and other gatherings. Quoting from a student: "As MPPs we are assigned to a cohort, I know, it may not sound like a life changing experience, but it is, trust me. The cohort becomes your family (...) . I never imagined that I was going to feel so comfortable with a group of people that 6 months ago were total strangers. We have shared everything together, long hours solving problem sets, failures and successes, parties, brunches and trips." HKS Admissions Blog (http://hksadmissionblog.tumblr.com/post/157535823033/2017-student-

I will refer to teams formed with this model as "cohort-based teams."

During the second half of our data window, students were provided with four different topics to choose from. Teams were then formed randomly, but this time, based on the topic students' choice. This meant that students worked with students from other cohorts, with whom they had limited interaction prior to SPREX. I will refer to teams formed with this model as "topic-based teams." Note that, even though it is possible for students from different cohort to know each other, on average, mixed-cohort teams imply less familiarity among the members than same-cohort teams.

When divided up this way, the data contains 78 cohort-based teams (with 419 students) and 85 topic-based teams (with 444 students). While cohort-based teams consist of students from a single cohort, the average number of cohorts represented in a topic-based team is 3.19 (median 4).

As it can be seen from Tables 8 and 9, the effect of gender on probability of booking a SPREX room and on number of SPREX bookings are both quantitatively and statistically very significant (all estimates yield significance at 0.1% level) for the topic-based teams. The estimates for the cohort-based teams, however, yield much smaller female coefficients and are statistically insignificant.[28] (When cohort-based and topic-based teams are pooled together, the estimated coefficients on female are generally not statistically significantly different across the two types of teams. This is due to the relatively large standard error in the cohort-based subsample.)

life-insight-series-post-5)

[28]Except for the OLS estimate without fixed team effects, which yields a coefficient significant the 5% level. See Table 9, column (1a).

Table 8: Probability of booking a pre-SPREX and SPREX rooms by team types | Probit

	Cohort-based			Topic-based		
	pre-SPREX	SPREX		pre-SPREX	SPREX	
	(1a)	(2a)	(3a)	(1b)	(2b)	(3b)
Female	0.051	0.056	0.065	−0.013	0.164***	0.187***
	(0.039)	(0.046)	(0.051)	(0.038)	(0.041)	(0.045)
Team size		−0.043			−0.121**	
		(0.066)			(0.060)	
Female share in team		−0.010			0.146	
		(0.317)			(0.305)	
Pre-SPREX I-bookings		0.017**	0.019**		0.018**	0.024**
		(0.005)	(0.007)		(0.006)	(0.008)
Team fixed effects		No	Yes		No	Yes
Nb of observations	419	419	419	444	444	444

Notes: The table reports marginal effects. All regressions include year dummies.

Standard errors in parenthesis, and are clustered on 78 cohort-based and 85 topic-based SPREX teams.

*** Denotes significance at 0.1% level; ** denotes significance at 1% level; * denotes significance at 5% level.

Columns (1a) and (1b) show the effect of gender (female) on the probability of booking a room prior to SPREX, for cohort-based and topic-based years, respectively. Since the way SPREX teams are formed is irrelevant for bookings made prior to SPREX, the gender effect on student's probability of booking a pre-SPREX room is not expected to be different in these two sub-samples. As can bee seen from Table 8, gender does not have a statistically significant effect on probability of booking a room prior to SPREX. If anything, being female reduces the probability of booking a room prior to SPREX for topic-based years, but this effect is not statistically significant.[29] The effect of gender on the probability of booking a room for the SPREX team, however, depends on the type of teams. While there is no significant gender effect for cohort-based teams, female students' probability of booking a room is significantly higher than male in topic-based teams.

Both OLS and Tobit estimates show quantitatively and statistically significant gender effect on the number of SPREX bookings for topic-based teams. Team size has a similar effect on rate of volunteering in cohort-based and topic-based teams. While percentage of female in the team does not have an impact on student's rate of volunteering in the cohort-based teams, it has a significant effect within topic-based teams.

[29] Probabiliy of booking an individual room yileds very similar female coefficients for cohort-based and topic-based years, 0.063 and 0.072, repectively, but they are not statistically significant.

Table 9: Number of SPREX bookings and team types

	Cohort-based teams				Topic-based teams			
	OLS		Tobit		OLS		Tobit	
	(1a)	(2a)	(3a)	(4a)	(1b)	(2b)	(3b)	(4b)
Female	0.592*	0.582	1.349	1.412	0.898***	0.895**	2.236***	2.253***
	(0.280)	(0.311)	(0.714)	(0.745)	(0.258)	(0.287)	(0.572)	(0.589)
Team size	−0.816*		−1.521		−0.390		−1.318*	
	(0.368)		0.949		(0.246)		(0.662)	
Female share in team	0.456		0.727		0.083		0.998	
	(1.584)		(4.455)		(1.260)		(3.160)	
Pre-SPREX I-bookings	0.095*	0.108*	0.246***	0.259**	0.149**	0.163**	0.266***	0.329***
	(0.040)	(0.047)	(0.068)	(0.0846)	(0.046)	(0.057)	(0.064)	(0.088)
Team fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Nb of observations	419	419	419	419	444	444	444	444

Notes: All regressions include year dummies.

Standard errors in parenthesis, and are clustered on 78 cohort-based and 85 topic-based SPREX teams.

*** Denotes significance at 0.1% level; ** denotes significance at 1% level; * denotes significance at 5% level.

These findings are robust to using rate of volunteering as the dependent variable. OLS and Tobit estimates for the rate of volunteering are reported in Appendix D, in Tables D1 and D2, respectively.[30] Notably, percentage of female in the team does not have an impact on student's rate of volunteering in the cohort-based teams, but it has a significant effect within topic-based

[30] There are 70 cohort-based SPREX teams (376 students) and 77 topic-based teams (402 students) with positive number of bookings.

teams.

5 Discussion and interpretation

Volunteer's dilemma in teamwork

In this section, I provide a theoretical explanation of the findings using a simple two-player volunteer's dilemma game. Consider two-players, Female and Male, simultaneously making a binary decision: Volunteer (V) or Don't Volunteer (D). In the payoff matrix below, b denotes the benefit from volunteering to each player, c denotes the cost of volunteering, and the payoff of the players when no one volunteers (and hence there no public good is provided) is normalized to zero without any loss of generality.

Symmetric Volunteer's Dilemma

		Male	
		V	D
Female	V	$b-c$, $b-c$	$b-c, b$
	D	b, $b-c$	$0, 0$

As is well known, this game features a volunteer's dilemma if $b > c > 0$. The distinctive feature of volunteer's dilemma is that the cost of volunteering is small relative to the benefit it generates to the volunteer. Therefore, each player prefers to volunteer if the other player is not volunteering, yielding two Nash equilibria in pure strategies, (V, D) and (D, V).[31]

Payoff dominance does not select the equilibrium, since neither equilibrium Pareto dominates the other. It is also straightforward to show that risk dominance à la Harsanyi and Selten (1988)

[31] There is also a mixed strategy equilibrium in which each player volunteers with probability $(b-c)/b$, and yields each player an expected payoff of $(b-c)$. The $n-$player game yields $n-$Nash equilibria in pure strategies, with a different player volunteering for the group benefit in each equilibrium.

does not help select the equilibrium either. Not volunteering in this game involves a risk, as players may receive a payoff of 0 if no one ends up volunteering. Players receive a sure payoff of $(b-c)$ from playing Volunteer, and the less risky strategy for each player points to a different equilibrium.[32] Therefore, in this symmetric game, both pure-strategy equilibria are plausible. If booking rooms for teamwork is well characterized by this symmetric game, we should expect no significant gender differences in room bookings.

Potential sources of asymmetries One of the two equilibria may stand out if we introduce a slight asymmetry in the payoffs. Consider the case, for instance, where Female is more efficient in volunteering. Let c_F and c_M denote the cost of volunteering for Female and Male, respectively. While preserving the volunteer's dilemma feature of the game, let's consider that $c_F < c_M$. The asymmetric version of this volunteer's dilemma game yields the same two pure-strategy equilibria. Even though it would be more efficient for Female to undertake the task, neither equilibrium Pareto dominates the other. Risk dominance, however, selects the equilibria (V, D) equilibrium over (D, V), even for small asymmetries.[33] To see this, let $GFV = (b - c_F)$. That is, the gain Female obtains from correctly predicting that Male will play as in (V, D) and playing her best-response to that prediction (which brings her $(b - c_F)$) instead of wrongly predicting that Male will play as in (D, V) and playing her best-response to that prediction (which would bring her 0).

Let $GMD = c_M$. That is, the gain Male obtains from correctly predicting that Player 1 will play as in (V, D) and playing his best-response to that prediction (which brings him b) instead of wrongly predicting that Female will play as in (D, V) and plays his best-response to that prediction (which brings him $(b - c_M)$). Similarly, let $GFD = c_F$ and $GMV = (b - c_M)$.

[32] Let $\overline{r}_M$ (and $\overline{r}_F$) denote the threshold probability of Male (Female) volunteering, below which volunteering is the risk-dominant strategy for Female (Male). In this symmetric game, we have $\overline{r}_M = \overline{r}_F = \overline{r} = (b - c)/b$. For a given b, a lower cost of volunteering implies a higher threshold. Risk dominance does not select the equilibrium; if $r < \overline{r}$, (V, D) involves less risk for Female, whereas (D, V) involves less risk for Male.

[33] See Cabralesa et al. (2000) for set of cases where this selection mechanism might be most appropriate.

According to Harsanyi and Selten (1988), (V, D) risk dominates (D, V) if $GFV \cdot GMD > GFD \cdot GMV$, in this case if

$$(b - c_F)(c_M) > (c_F)(b - c_M),$$

which holds for any $c_M > c_F$. Diekmann (1993) refers to players with a lower cost of volunteering (or more efficient in the provision of the public good) as "strong players" and shows that they may be "taken advantage of" by the "weak players."

One could argue that there are potential asymmetries in the perceived benefits. A recent body of literature points to gender differences in social preferences as the source of asymmetric payoffs, and hence different behaviors between male and female players.[34] If for example, women are more altruistic, one could imagine Female player to internalize (at least to some degree) the benefits from volunteering that accrue to Male player, and hence perceive a higher benefit from volunteering (i.e., $b_F > b_M$). Technically, a higher benefit is tantamount to a lower cost for the same player, and hence, risk dominance selects (V, D).

Finally, one could also consider that Female perceives a higher benefit (in gross terms) if she volunteers than when someone else does. That is, along side with the benefit she receives from the public good, she obtains an additional payoff from being the one who provides it. If the volunteer's dilemma feature is preserved (if the benefit she receives when the other player volunteers is greater than the net benefit when she volunteers), risk dominance once again selects the equilibrium in which Female volunteers.

In the context of room bookings at HKS, the cost of volunteering is less likely to be a source of asymmetry. None of the first-year MPP students (female or male) have prior experience in using HKS's online room booking system, SpaceBook. As part of their orientation, all students receive

[34] In a comprehensive survey, Neiderle (2016) highlights the three most common traits studied in this line of work: attitudes to competition, altruism or cooperative attitudes, and risk attitudes.

an E-mail with clear instructions about how to book a room, which is relatively straightforward, and involves a small time cost. Learning how to use this tool has no other benefits (long-term or otherwise) than the benefit one obtains through the use of the booked room.

Asymmetries in risk preferences in an otherwise symmetric volunteer's dilemma could also lead to an outcome where the more risk-averse player ends up volunteering.[35] This would be similar to considering a lower payoff for Female than Male in the event no one volunteers, which would also lead to selection of (V, D) with risk dominance.

In short, under complete information, differences in gender preferences and/or efficiency in volunteering could explain why a particular equilibrium in which Female volunteers may stand out. However, the findings in this paper are also consistent with symmetric gender preferences under incomplete information.

Volunteer's dilemma with incomplete information

Consider a variant game with asymmetric information, in which Female is uncertain about Male's preferences. Male could be one of two possible types: With probability p, he has the same payoff structure as in the symmetric Volunteer's Dilemma game (I will call him $V - type$), and with probability $(1 - p)$ his dominant strategy is not to volunteer, D (I will call him $D - type$).[36] Given that Female is playing this game with a $D - type$ with some likelihood, Female will play V, if that likelihood is sufficiently high. Put it differently, if the probability of having a $V - type$ in the game is sufficiently small, more specifically, if $p < (b - c)/b$, volunteering yields a higher expected payoff to Female (once again, Female obtains a sure payoff of $(b - c)$ by volunteering and her expected payoff from D is pb). Therefore, for $p < \overline{p} = (b - c)/b$ the Bayesian Nash Equilibria involves Female

[35] Based on the review of lab and field evidence Croson and Gneezy (2009) find women to be more risk-averse than men (with the exception of those in managerial positions).

[36] This may be true, for instance, if the cost of volunteering is too high and/or the perceived benefit from the public good is too low, resulting $(b - c) < 0$.

Volunteering, and Male of both types not volunteering.

Not surprisingly, the threshold probability below which this equilibria where Female volunteers emerges, is the same as $\overline{r}$ (the threshold probability of Player 2 playing D, below which V is the risk dominant strategy for Player 1) in the complete information game. The interpretation here is slightly different though. Consider that we have $p < \overline{p}$, but that the actual type of Male in the game is $V-$type (whose best-response to D is V). Asymmetric information puts Female at a disadvantage, since with the uncertainty in Male's payoffs, the Female ends up taking the costly action to provide the group benefit. Under complete information, however, when Female knows Male is $V - type$, the equilibrium in which Male volunteers (D, V) is plausible.

In the context of room bookings, since the cost of volunteering is relatively small, even a very small likelihood of having a $D-$type Male in the game yields an equilibrium in which Female ends up volunteering.

Alternatively, one could consider private information held by Female, who could either have preferences depicted as in the original game (would volunteer only if Male is not volunteering) or be a type who would always undertake the task. If Male holds a prior that Female is more likely to be the latter type, then in equilibrium Male ends up not volunteering whereas Female volunteers regardless of her type.

This may explain why the gender difference in booking behavior is very significant when teams are formed by students from a mix of different cohorts. In contrast to single-cohort teams, teammates have spent a full semester together, both in classroom and in social settings, and hence, the game resembles one with complete information. If female students were more efficient in booking rooms and/or derived more benefit from having a room for the team meeting, we would expect the room behavior to be very similar, regardless of the way in which teams are formed.

6 Conclusion

Among graduate students with high levels of professional and academic achievement, I find that female students volunteer significantly more than male students in booking rooms for teamwork. Even though such tasks can be considered as important for a productive team meeting, they do not require any special skills and come with a time cost (albeit small). Gender differences in volunteering in such tasks may or may not be happening at a larger scale than booking rooms, however, given that my sample concerns a symmetric environment (there are no gender differences in the admission criteria or in the expected academic performance among the admitted students). Beyond the relatively small time costs, gender differences in undertaking low-promotability tasks can contribute to gender stereotyping in allocation of tasks in other professional settings. My findings also suggest that the underlying cause of gender differences in undertaking such tasks may be informational rather than differences in efficiency or gender preferences.

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Appendix

Appendix A: Summary statistics on SPREX participants and teams

Table A1: Age and Years of Professional Experience of the SPREX Participants

	Average					
	Age			Professional Experience		
Academic Year	Overall	Male	Female	Overall	Male	Female
2014-15	25.9	26.2	25.5	2.8	3.2	2.5
2015-16	26.2	26.2	26.1	3.1	3.1	3.0
2016-17	26.4	26.8	26.0	3.3	3.7	2.9
2017-18	26.2	26.8	25.7	2.9	3.3	2.6
All years	26.2	26.5	25.8	3.0	3.3	2.7

Table A2: International SPREX Participants

	Share of international SPREX participants		
Academic Year	Overall	Male	Female
2014-15	0.29	0.27	0.30
2015-16	0.38	0.37	0.40
2016-17	0.39	0.35	0.43
2017-18	0.35	0.35	0.35
All years	0.35	0.34	0.37

Table A3: Number and Size of SPREX Teams		
Academic Year	Number	Median Size
2014–15	38	5
2015–16	40	6
2016–17	45	5
2017–18	40	5
All years	163	5

Table A4: Team size distribution and female share (n=163)

	Team Size			Team Gender Composition (% of Female)						
	4	5	6	0.20	0.33	0.40	0.50	0.60	0.67	0.75
Nb of teams	2	110	51	2	5	72	45	36	2	1

Appendix B: Summary statistics on room bookings

Table B1: SPREX participants with no pre-SPREX booking

	All		Male		Female	
Academic Year	Number	Overall share	Number	Share of Male	Number	Share of Female
2014–15	37	0.19	20	0.20	17	0.18
2015–16	45	0.20	27	0.24	18	0.16
2016–17	52	0.23	29	0.23	23	0.23
2017–18	35	0.16	17	0.15	18	0.18
All years	169	0.20	93	0.20	76	0.19

Table B2: Average number of pre-SPREX bookings*

	All bookings (7,345)			I-Bookings (1,767)			G-Bookings (5,578)		
Academic Year	All	Male	Female	All	Male	Female	All	Male	Female
2014-15	13.14	11.08	15.35	3.13	2.38	3.93	10.01	8.70	11.41
2015-16	9.58	8.15	10.85	2.10	2.06	2.15	7.47	6.09	8.71
2016-17	9.18	7.52	11.23	1.77	1.63	1.94	7.41	5.89	9.29
2017-18	10.78	9.55	12.23	3.26	2.98	3.58	7.53	6.57	8.65
All years	10.58	9.00	12.30	2.55	2.26	2.86	8.04	6.74	9.44

(*) For participants who have booked at least one room prior to SPREX.

Table B3 Average number of SPREX bookings

	Average number of bookings per student					
	(non-bookers excluded)			(non-bookers included)		
Academic Year	Male	Female	Overall	Male	Female	Overall
2014–15	1.21	2.64	1.90	0.97	2.15	1.54
2015–16	1.69	1.81	1.75	1.28	1.53	1.41
2016–17	1.00	2.39	1.62	0.77	1.85	1.25
2017–18	1.29	2.33	1.77	1.10	1.91	1.48
All years	1.29	2.26	1.76	1.02	1.84	1.41

Appendix C: Summary statistics rate of volunteering

Table C1: Rate of Volunteering ($n = 778$)

	Male		Female		Overall	
	Number	Ratio	Number	Ratio	Number	Ratio
$v_i = 0$ (free-riders)	271	0.66	188	0.51	459	0.59
$v_i = 1$ (full volunteers)	23	0.07	24	0.06	47	0.06
$v_i \in (0, 0.20)$	27	0.09	37	0.10	64	0.10
$v_i \in [0.20, 0.40)$	42	0.10	44	0.12	86	0.11
$v_i \in [0.40, 0.60)$	22	0.05	30	0.08	52	0.07
$v_i \in [0.60, 0.80)$	13	0.03	32	0.09	45	0.06
$v_i \in [0.80, 1)$	4	0.01	10	0.03	14	0.02
Mean v	0.148		0.234		0.189	

Appendix D

Table D1: Rate of volunteering and team types | OLS Estimates

	Cohort-based teams		Topic-based teams	
	(1a)	(2a)	(1b)	(2b)
Female	0.060	0.059	0.109***	0.108**
	(0.034)	(0.038)	(0.032)	(0.035)
Team size	−0.027***		−0.020*	
	(0.006)		(0.009)	
Female share in team	−0.021		−0.171***	
	(0.044)		0.049	
Pre-SPREX I-bookings	0.009*	0.011*	0.015***	0.019**
	(0.004)	(0.005)	(0.004)	(0.006)
Team fixed effects	No	Yes	No	Yes
Nb of observations	376	376	402	402

Notes: All regressions include year dummies.

Standard errors in parenthesis, and are clustered on 78 cohort-based and 85 topic-based SPREX teams.

*** Denotes significance at 0.1% level; ** denotes significance at 1% level; * denotes significance at 5% level.

Table D2: Rate of volunteering and team types | Tobit Estimates

	Cohort-based teams		Topic-based teams	
	(1a)	(2a)	(1b)	(2b)
Female	0.131	0.138	0.253***	0.260***
	(0.081)	(0.086)	(0.065)	(0.068)
Team size	−0.071		−0.117**	
	(0.047)		(0.039)	
Female share in team	−0.029		0.119	
	(0.259)		(0.173)	
Pre-SPREX I-bookings	0.023***	0.027**	0.026***	0.039***
	(0.007)	(0.010)	(0.007)	(0.011)
Team fixed effects	No	Yes	No	Yes
Nb of observations	376	376	402	402

Notes: All regressions include year dummies.

Standard errors in parenthesis, and are clustered on 78 cohort-based and 85 topic-based SPREX teams.

*** Denotes significance at 0.1% level; ** denotes significance at 1% level; * denotes significance at 5% level.