Gender Salience and Chat-Based Communication in Teams

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The COVID-19 pandemic led to a substantial rise in remote work, with some industries seeing more than a 30 percentage point increase in the share of workers who work from home (Pabilonia and Redmond, 2024). This is a fundamental shift in the labor force in the United States, accompanied by an increase in various technologies that help support geographically spread out teams. These technologies, including chat-based platforms, allow team members to efficiently communicate even when not in the same physical location.

The increase in remote work coincides with a rise in the share of women who work. While shares initially fell, the share of employed mothers in 2024 has increased by 1.9% compared to pre-pandemic levels (George, 2024). This rise contributes to increased gender diversity in various professional settings. Greater gender diversity in the workplace increases the number of mixed-gender interactions in the workplace, where collaboration is important for efficiency and flexibility (Eckel and Grossman, 2005).

While collaboration can increase productivity, workplace diversity can also trigger gender-based stereotypes, biases, and out-group discrimination. Prior experimental studies find that people are more likely to identify with members of their own group and are more likely to trust and cooperate with those with whom they identify (Chen et al., 2014; Chen and Li, 2009; Eckel and Grossman, 2005). With the rise in remote work, less is known about the impact of gender diversity in remote work settings and the direct impacts of chat-based communication on productivity.

In this paper, I explore whether collaboration and chat-based communication suffer in mixed-gender groups when gender is salient. I assess the effects of priming gender identity on collaboration and communication through a laboratory experiment with a real-effort task. I find that while priming gender identity leads to unbalanced communication, with men speaking more and women speaking less, mixed-gender groups also score higher on the real-effort task, pointing to the value of diversity in teams.

In this experiment, I randomly assigned subjects to two-person teams. Teams engaged in a real-effort task of answering trivia quiz questions. All subjects had the same set of trivia questions on individual computers, and team members were allowed to send chat messages to each other to discuss answers, ask questions, and provide assistance. I additionally randomized subjects to a control or treatment group prior to the real-effort task. In the treatment, I used standard priming methodology to make participants' gender identity salient. I study communication patterns in the chat and productivity on the task and compare the degree to which gender priming affects individuals based on their own gender and the gender of their teammate.

I. Experimental Protocol

I used a 2 x 2 experimental design. I first randomly assigned participants to either a control or a treatment group in which I primed subjects' gender identity using a pre-experimental questionnaire based on the approach used by Shih, Pittinsky and Ambady (1999). The questions prompted subjects to reflect on their everyday interactions with the same and the other gender and to consider whether they preferred spending time with one gender over the other and why. Subjects had five minutes to respond to these questions privately. Subjects in the control group answered a similar questionnaire with the same number of questions, but the questions were identity-neutral and focused on subjects' activities in leisure time as well as their favorite

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foods.[1]

Immediately following the priming or control questionnaire, subjects participated in a real-effort task consisting of answering trivia questions across four different rounds. In round one, subjects had 5 minutes to answer 20 multiple-choice trivia questions individually to establish an individual baseline. All trivia questions were intended to be gender-neutral and covered a variety of general interest topics such as history, geography, literature, popular media, and politics. Sample questions are included in the supplemental appendix. Subjects saw 10 questions on each screen and could move freely between the two screens and change their answers before the time was up. Subjects earned $0.30 for every question they answered correctly and did not receive any feedback until the end of the experiment.

During each of the next three rounds, subjects had 10 minutes to answer a new set of 40 multiple-choice trivia questions in pairs. In round two, they were randomly paired with another person in the room. In round three, they were paired with a partner of the same gender. In round four, they were paired with an opposite-gender partner.[2] Subjects did not know the identity of their partner, but they knew that they would see a fictitious name for their partner that was indicative of gender. The names used for women were traditionally female U.S. names - Emily, Margaret, Kaitlyn, and Elizabeth. Similarly, male names were Spencer, Nate, and Jacob. Each person in the pair was given an identical quiz, and each subject's payment was $0.30 x the average number of questions that both partners answered correctly. During this task, subjects could communicate with their partner through a two-way, free-form chat box on their screen. To incentivize the use of the chat, subjects were told that participants who work together receive on average $2 more than those who work alone, which was calculated based on pilot data. The use of a chat tool in this setting is novel and reflects many organizational settings which rely on teamwork.

A total of 216 students participated in the study (106 women and 110 men) across 10 experimental sessions at Brigham Young University. The control group consisted of 90 subjects and the treatment group included 126 subjects. Each individual participated in one experimental session lasting approximately 45 minutes and earned approximately $10 on average. Subjects were paid for one round, which was chosen at random at the end of the experiment. I use data from all three team rounds of the task for each of the subjects, giving a total of 464 observations in my analysis.[3]

In addition to behavioral outcomes from the real-effort task, I also collected information on subjects' age, gender, race, grade point average (GPA), and major field of study as part of a post-experimental questionnaire. The characteristics of the control and treatment groups are well-balanced and not statistically different across gender (51% vs. 48% female), age (22.5 vs. 21.5), GPA (3.44 vs. 3.46), marital status (22% vs. 19% married), and university major (64.4% vs. 64.3% business majors), with all p-values exceeding 0.25. I control for these covariates in my regression analysis below.

II. Results

I start by exploring subjects' chat communications: gender priming causes men to communicate more and women to communicate less. Figure 1 plots mean communication and task outcomes by gender and treatment. Outcomes include the number of trivia questions each individual answered correctly on the team quiz, the individual's total number of chat entries, the total number of statements the individual made in the chat, the total number of questions the individual asked, and the total number of words written.[4] Due to the small sample sizes, I use Mann-Whitney-Wilcoxon nonparametric tests to calculate p-values. I find that women write significantly fewer words when gender is

[1]The full text of both questionnaires is included in the supplemental appendix.

[2]The initial experimental protocol did not include the random round, which was added to mitigate potential order effects or fatigue. The first protocol had 130 subjects and the second had 86. There were no significant differences in the results between the two protocols.

[3]This number accounts for 54 dropped observations due to technical difficulties and the fact that 130 subjects participated in the first experimental protocol with two group rounds instead of three.

[4]Chat entries were coded as either a statement or a question. Chat entries that consisted of only punctuation marks or were a correction to the previous entry marked with an "*" were counted as entries but were not coded as either a statement or a question.

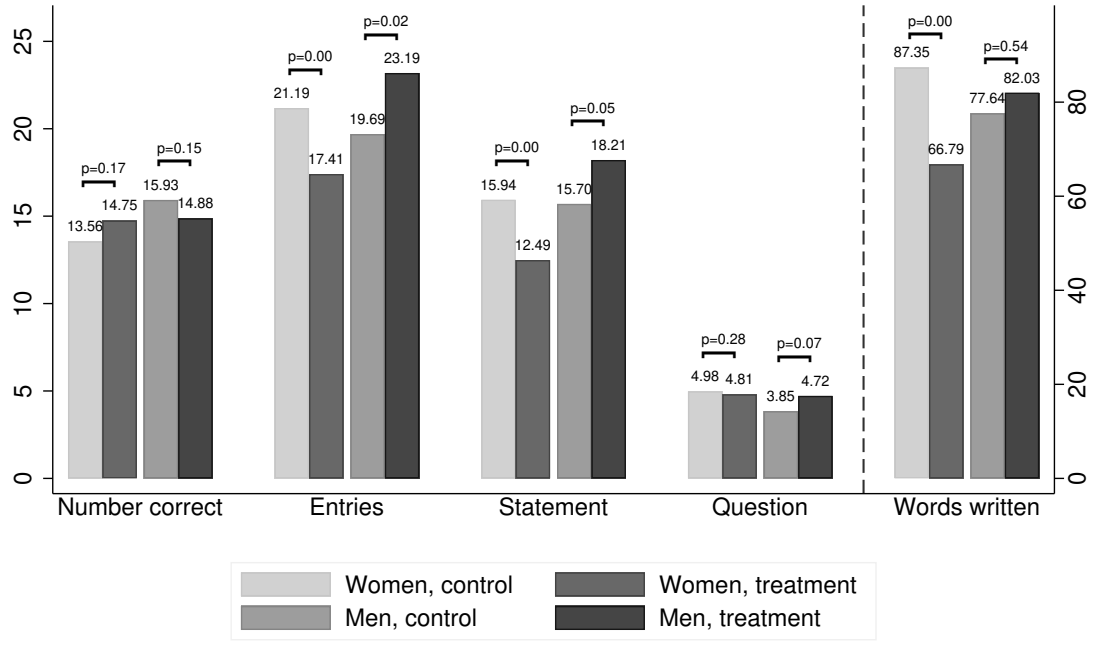

FIGURE 1. MEAN COLLABORATION AND COMMUNICATION BEHAVIOR BY TREATMENT AND GENDER

Note: The figure above plots mean values for individual quiz score on the team trivia quiz, number of chat entries, number of statements made in the chat, number of questions asked in the chat, and number of words written, separately by both gender and treatment. The dashed vertical line separates the two y-axes. The left axis applies to the measures on the left of the dashed vertical line: number correct, chat entries, statements, and questions. The right axis applies to the average number of words written plotted on the right of the dashed vertical line. There are 102 observations for women in the control, 127 for women in the treatment, 98 for men in the control, and 137 for men in the treatment. P-values above the bars are calculated for the within-gender differences across treatment status. I use Mann-Whitney-Wilcoxon nonparametric tests to calculate the p-values due to the small sample sizes.

salient compared to no gender priming (66.79 vs. 87.35). The same is true for the number of chat entries for women (17.41 vs. 21.19), which is driven by women making fewer statements (12.49 vs. 15.94) with no change in the number of questions they ask (4.81 vs. 4.98). Men write slightly more words when gender is primed (82.02 vs 77.64), but make significantly more chat entries (23.19 vs. 19.69), with a significant increase in both statements (18.21 vs. 15.70) and questions (4.72 vs. 3.85).

Next, I examine the extent to which communication and performance differ in mixed-gender and same-gender teams by estimating the following regression:

$$\begin{aligned} y_i = {} & \beta_1 \mathrm{F}_i + \beta_2 \mathrm{treat}_i + \beta_3 \mathrm{F}_i \times \mathrm{treat}_i + \beta_4 \mathrm{SGT}_i \\ & + \beta_5 \mathrm{F}_i \times \mathrm{SGT}_i + \beta_6 \mathrm{treat}_i \times \mathrm{SGT}_i \\ & + \beta_7 \mathrm{F}_i \times \mathrm{treat}_i \times \mathrm{SGT}_i + \beta_8 X_i + \varepsilon_i \end{aligned} \tag{1}$$

where y_i are the following outcomes: group quiz score, words written, and chat entries. F_i is an indicator for being female, treat_i is an indicator for being in the treatment, and SGT_i is an indicator for being in a same-gender team. I include all interactions of each of these indicators, and also estimate each regression separately without the interaction terms. Finally, X_i includes controls for demographic characteristics including age, race/ethnicity, marital status, college major, GPA, and individual quiz score.

Table 2 reports the results of these regression-based tests. Consistent with the raw means, gender salience has a significant effect on the communication patterns of both men and women. When gender is primed, men make 3.28 more chat entries (p=0.037) while women make 7.38 fewer chat entries (p=0.000) and write 27.27 fewer words (p=0.001). Increasing gender salience causes women to communicate considerably less in team settings and men to communicate more.

TABLE 1—IMPACT OF GENDER PRIMING AND TEAM GENDER COMPOSITION ON PERFORMANCE AND COMMUNICATION

	Team Quiz Score		Words Written		Chat Entries	
Female	-2.15	-1.95	13.45	0.64	1.66	1.55
	(0.76)	(0.73)	(6.24)	(7.31)	(1.38)	(1.36)
Priming	-0.73	-1.12	4.84	1.68	3.28	3.09
	(0.72)	(0.97)	(5.83)	(7.76)	(1.57)	(1.89)
Female × Priming	1.89	1.87	-27.27	-11.27	-7.38	-5.19
	(1.00)	(1.15)	(8.19)	(10.02)	(2.04)	(2.35)
Same-gender team (SGT)	-3.08	-3.31	15.42	8.35	1.19	2.06
	(0.50)	(1.09)	(3.94)	(8.31)	(1.08)	(2.09)
Female × SGT		-0.38		24.17		0.17
		(1.43)		(11.65)		(2.54)
Priming × SGT		0.72		6.00		0.32
		(1.42)		(11.14)		(3.03)
Female × Priming × SGT		0.05		-30.20		-4.10
		(1.93)		(15.21)		(3.85)
Sample Mean	14.77		78.10		20.43	
Observations	464		464		464	

Note: This table reports regression estimates from Equation 1. Robust standard errors are given in parentheses. All regressions control for individual quiz score, age, GPA, marital status, and university major. Each regression is clustered at the team level.

Communication and performance differ in mixed-gender and same-gender teams. When compared to mixed-gender teams, same-gender pairings communicate more (15.42 more words written). Women write significantly more words in same-gender teams in the control (24.17 words), but this increase is entirely offset in same-gender female teams when gender is primed (30.20 fewer words). Same-gender pairings also perform significantly worse on the team task (scoring 3.1 points lower). The real-effort task in this setting includes questions across a variety of topics, drawing on the different relative strengths between men and women, potentially leading to the strong increase in scores for mixed-gender teams. Gender diversity and gender salience reduce collaboration but improve performance on the trivia quiz task, pointing to the value of having multiple perspectives on a team.

III. Conclusion

In this paper, I investigate the effect of gender salience on chat-based communication in mixed-gender teams through a controlled laboratory experiment. Priming gender identity activates stereotypes about gender roles in communication, causing men to speak significantly more and women to speak significantly less. Individuals, and especially women, collaborate more in same-gender teams than in mixed-gender teams when gender is not made salient. In the treatment, gender priming offsets these communication gains for women in same-gender teams, again causing women to speak less. Although there is less communication in mixed-gender teams, both men and women score higher on the quiz in mixed-gender teams than in same-gender teams.

Prior research in social sciences provides several potential explanations for my findings regarding the effects of gender priming on com-

munication. Similar to my findings, Karpowitz and Mendelberg (2014) show that women are less likely than men to talk and to influence others when discussing matters of common concern in a series of experiments involving a deliberation task. Other work highlights internal barriers, which impact women significantly more than men (Sandberg, 2013). Women are shown to exhibit lower self-confidence and internalize negative societal cues about gender stereotypes much more than men.

My findings are also largely consistent with the social-psychological phenomenon of stereotype threat. Making gender more salient in this experiment makes subjects more likely to perform in accordance with the gender-specific stereotype. Although the results may not immediately generalize beyond this specific population and setting, the chat-based setting is novel, highlighting an underexplored aspect of collaboration in remote work settings. The conclusions around unbalanced communication but increased productivity on the real-effort task underscore the need for further research on the role of gender and other identities in remote work environments, particularly as teams in the workplace become increasingly diverse.

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