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### Gender Beliefs and Cooperation in a Public Goods Game

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### Abstract

This paper identifies gender beliefs in a public goods game and studies their impact on cooperation. On average, the beliefs of men, but not those of women, depend significantly on the group gender composition, with men expecting groups to be more cooperative when more females are present in the group. Gender beliefs of women are not absent, however, but show more variance than those of men. The contributions to the public good are driven by gender beliefs, and after controlling for them, contributions do not depend on the gender group composition directly.

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## 1. Introduction

Existing experimental studies offer conflicting insights about the impact of group gender composition on cooperation in public goods games. Women are sometimes identified as more cooperative than men (Novell and Tinkler 1994, Sell 1997), but the gender differences are far from systematic (Ledyard 1995, Croson and Gneezy, 2009, Anderson et al. 2011). We propose that these findings can be explained by accounting for the role of gender beliefs. We measure them explicitly in our experiments, and link to the subject's contributions.

Gender beliefs can be defined as different interpretations and expectations concerning the personality traits (how women and men are) and behavior (how women and men behave) of men and women. Moreover, gender beliefs are not only descriptive, but also prescriptive, stating how women and men should be and should behave (Heilman 2001).

In the public goods game experiments, the modal type of behavior is conditional cooperation, where one's own contribution increases in the (expected) contribution of others (Keser and van Winden 2000, Fischbacher et al. 2001). Gender beliefs would significantly affect public goods contributions if groups of some gender compositions are believed to be more cooperative than others.

The characteristics of gender beliefs concerning men and women can be summarized around achievement-oriented traits for men — agentic traits — and service-oriented traits for women — communal traits (Wood and Eagly 2012). This leads to the prescriptive gender belief concerning women "that women should be nurturing and service-oriented (communal), but not tough and achievement-oriented (agentic)" (Heilman 2001, p. 667).

Both descriptive and prescriptive dimensions of gender beliefs contribute to individual self-definitions as masculine or feminine, and operate at the interpersonal level "defining the behaviors that are appropriate to various social contexts, influencing individuals' expectations for and interpretations of others' behavior, and guiding the manner in which people interact with members of their own and the other gender" (Whitley and Ægisdóttir 2000, p. 962).

Empirical studies have identified that men hold stronger gender beliefs than women (Baber and Jenkins Tucker 2006, Smiler and Gelman 2008). This gender difference in gender beliefs can be explained by social dominance theory and expectation states theory, which argue that because men tend to have a higher socio-economic status than women, they have a stake in preserving that advantaged position and traditional stereotypes about gender roles supporting their status (Whitley and Ægisdóttir 2000, Ridgeway, 2001, Gerber 2009).

Some previous experimental studies addressed gender beliefs indirectly. Women have been identified as considered more cooperative (Aguiar et al. 2009, List 2006, Oberholzer-Gee et al. 2010, Gabardine and Sonic 2009). And, gender beliefs were found asymmetric, with men holding stronger beliefs than women (Boschini et al. 2012, Dufwenberg and Muren 2006).

In this paper we measure gender beliefs directly, and use them to explain behavior of participants in a public goods game.

## 2. Experimental design and hypotheses

We implement a three-person public goods game with the payoff function given by  $\pi(x, Y) = 15 - x + 0.6(x + Y)$ , where  $x$  denotes the subject's contribution, and  $Y$  is the contribution of the other two group members.

In the experiment, the groups are composed randomly, and subjects know that the group gender composition will be announced at the end of the experiment. Subjects submit their contributions to the public good for each possible gender group composition. After the experiment, the realized group gender composition determines the payoff-relevant decision. Subjects also report their beliefs about the joint contribution of the other two subjects for each possible group composition: for the case if matched to two women (WW), two men (MM), or one woman and one man (WM). Gächter and Renner (2010) discuss the tradeoff involved in incentivizing beliefs, and observe that incentivized beliefs are somewhat more precise than stated beliefs, but affect contributions to the public good. As it is our intention to link the reported beliefs to the contributions, we choose the method results in behavior most resembling the case when no beliefs are elicited (see Gächter and Renner 2010). Consequently, we do not incentivize the beliefs reported by the subjects.

Our subjects, 80 students (31 women, and 49 men) of programs in economics and business at Radboud University, the Netherlands participate in cca 10 minutes short pen-and-paper experiment. After the experiment, 10 randomly selected participants are paid in anonymity for their decisions, on average 7.10 Euro.

We test the following hypotheses:

**Gender beliefs and cooperation:** Women are believed to be more cooperative. Consequently, (i) subjects' reported beliefs about the joint contribution of others in the public goods game increase with the number of women in the group; (ii) the contribution of an individual to the one-shot public good increases with the number of women in the group.

**Gender differences in gender beliefs:** Men hold stronger gender beliefs than women. Consequently, subjects' beliefs about the joint contribution of others in the public goods game increase with the number of women in the group more for men than for women.

### 3. Results and discussion

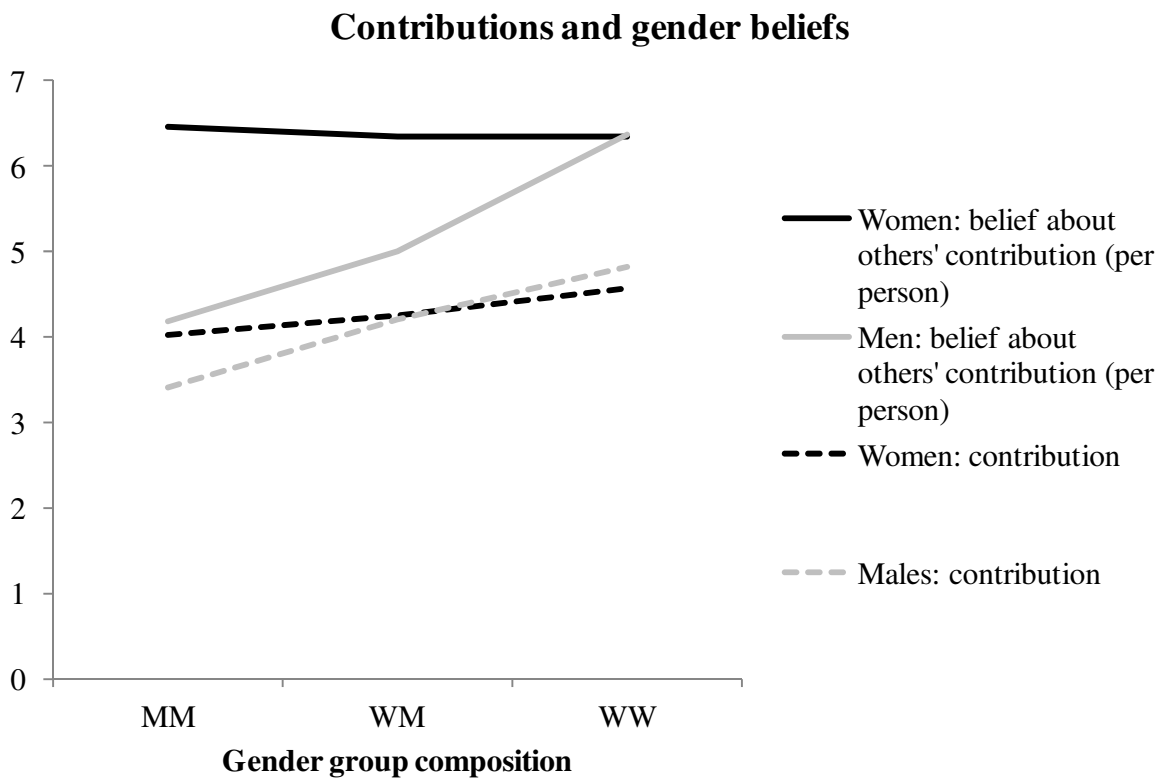
Figure 1 summarizes the reported gender beliefs and contributions of women and men in the experiment, by presenting how these beliefs depend on the gender of the other two group members. On average, women do not change their belief about contributions of others with the group composition, while men believe that the contributions will be higher when the number of women in the group is higher. Men and women hold similar beliefs about contributions in a group with two other women, but men are less optimistic than women about contributions in a group with other two men.

We construct an individual measure of gender beliefs by subtracting the beliefs about contributions in the MM scenario from those in the FF scenario. The average difference is negative for women and positive for men (equal to -0.23 and 4.23, respectively). This gender difference in gender beliefs is significant (Mann-Whitney U test,  $p=0,054$ ), albeit marginally. Gender beliefs are expressed stronger by men. According to their beliefs, women are more cooperative.

Investigation of the individual gender beliefs reveals, however, that gender beliefs of women are possibly not weaker, but instead show more variation than those of men (see Table 1).

A majority of men (59%) expresses the belief that contributions increase with the number of women, with the remaining 41% split equally between expecting decreasing, constant, or nonmonotonous contributions. Among women, beliefs are less uniform, with 42% of women expecting increasing contributions with more women while 35% expecting exactly the opposite pattern of decreasing contributions. On average, female beliefs therefore seem not to condition on the gender group composition.

**Figure 1.** Contributions and gender beliefs by a subject (man or woman), depending on the gender group composition: MM=two men, WM=one woman and one men, WW=two women.



**Table 1. Gender beliefs categories.**

| Gender beliefs about contribution of others depending on number of other women in the group |            |            |          |               |    |
|---------------------------------------------------------------------------------------------|------------|------------|----------|---------------|----|
|                                                                                             | increasing | decreasing | constant | nonmonotonous | N  |
| Women                                                                                       | 42%        | 35%        | 3%       | 19%           | 31 |
| Men                                                                                         | 59%        | 14%        | 14%      | 12%           | 49 |

We explain public good contributions by gender beliefs using OLS regression, accounting for individual effects, see Table 2. Model 1 explains subjects' contributions by the number of other women in the group, while controlling for the gender of the contributing subject. The fit of the model is poor, but the gender group composition variable is significant, with contributions increasing with the number of other women in the group. Including the gender beliefs in model 2 improves the explanatory power of the model, and this variable also explains contributions. Subjects behave as conditional cooperators. The higher the expected contribution of others, as identified by the subject's gender beliefs, the higher is the subject's contribution.

Finally, when including both gender beliefs and gender group composition in model 3, we find that the gender beliefs predict contributions, and the impact of the group gender composition is exerted via these gender beliefs. We do not find evidence for chivalry or other motivations that are purely driven by the gender group composition. The differences in contributions across gender seem to be explained by the variations in gender beliefs across men and women, and after controlling for beliefs, are not affected anymore purely by the group gender composition.

**Table 2. OLS regression explaining contributions in the public goods game (standard errors in parentheses).**

|                                              | Model 1             | Model 2             | Model 3             |
|----------------------------------------------|---------------------|---------------------|---------------------|
| Gender (1=female, 0=male)                    | 0,148<br>(0,828)    | -0,359<br>(0,679)   | -0,331<br>(0,682)   |
| Belief about contribution of the others      |                     | 0,213***<br>(0,030) | 0,201***<br>(0,031) |
| # of other females in the group (0, 1, or 2) | 0,538**<br>(0,177)  |                     | 0,278<br>(0,180)    |
| Constant                                     | 3,605***<br>(0,545) | 1,935***<br>(0,523) | 1,776***<br>(0,536) |
| Individual effects included                  | yes                 | yes                 | yes                 |
| Rsquare overall                              | 0,0122              | 0,2777              | 0,2756              |
| N                                            | 240                 | 240                 | 240                 |

\*\*\* coefficient significant at  $p < 0.001$ , \*\* coefficient significant at  $p < 0.01$ .

#### 4. Conclusions

To summarize, we observe the following. First, beliefs of subjects about contributions of others are gendered, conditioning on the gender group composition. Second, the gender beliefs of men are more uniform, and women are expected to be more cooperative according to them. The expectations of women are on average independent of gender. However, at an individual level,

beliefs of women are also gendered, but show more variance than those of men. Third, regression analysis shows that the group gender composition affects contributions via the channel of gendered beliefs, and when controlling for beliefs, we find no direct effect of the group gender composition.

Our findings explain prior observations that only men hold gender beliefs. Their effect is easier to identify because they are more uniform. In strategic environments, beliefs affect behavior, and differences in behavior attributed to the preferences might stem from belief differences across gender. This might explain why gender differences in behavior have been identified in some experiments in the past, but not in others.

More broadly, accounting for gender beliefs might help to explain gender differences in behavior, and such phenomena as gender wage gap and the performance of diversified boards.

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