Pre-analysis plan for "The Formation of Competitive Preferences"

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Abstract

Women are less likely than men to enter competitions but we do not know how stable such preferences are. We test if competitiveness changes from before to after an 8-week boot camp in a traditionally male setting, the Norwegian Armed Forces (NAF). This plan describes the hypotheses to be tested and how we will test them. It includes a description of how variables will be coded, how we will deal with missing values, and the specification of the estimation equations. All deviations from the plan will be highlighted in the final paper.

Keywords

Competitivenss, peer effects, gender

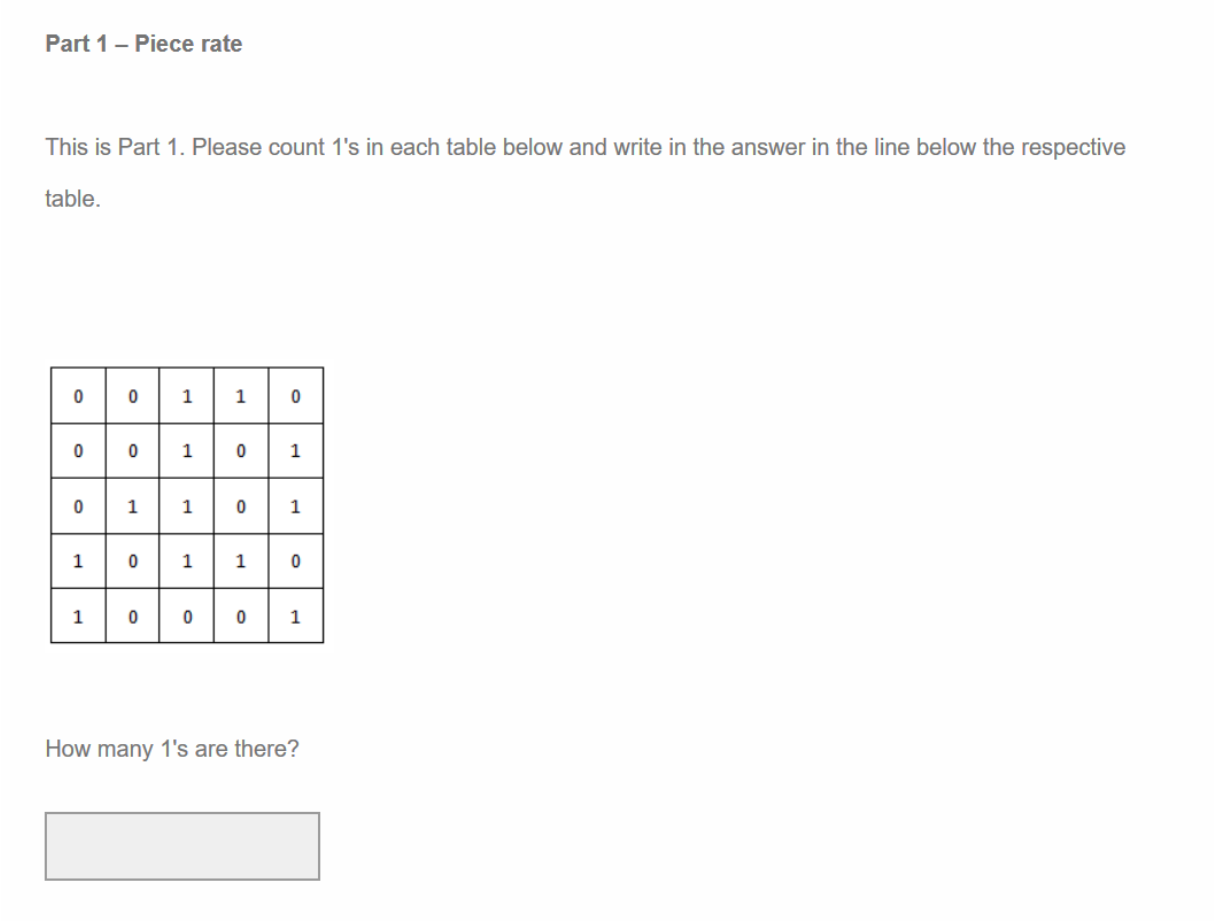
Introduction

Women are less likely than men to enter competitions but we do not know how stable such preferences are. We test if competitiveness changes from before to after an 8-week boot camp in a traditionally male setting, the Norwegian Armed Forces (NAF). We conduct a classic competition experiment after bootcamp and we investigate how competitive preferences, as measured by survey questions, evolve over time.

Design

We follow the design of the classic competition experiment by Niederle and Vesterlund (2007). Our experiment consists of 3 sessions in which subjects solve as many tasks as they manage within 90 seconds. After these sessions they respond to a survey. All subjects receive a show-up fee of 50 NOK. In addition one session of the experiment is randomly chosen for payment. The task consist of calculating the number of 1's in a matrix of zeros and ones, as illustrated in Figure 1.

Figure 1: Example of a task.



In the first session of this experiment, participants earn 5 NOK for every task solved. In session 2, payment is based on relative performance; the person performing best in a group of 4 receives an additional payment of 20 NOK per matrix that is correctly solved (if there is a tie at the top each of them get 20 per matrix). The groups are composed by randomly drawing three additional individuals from a pilot sample.[1] This information is known by all respondents.

After Session 2 respondents are asked to accurately self-asses their relative position in the group. The answer they give is incentivized by giving them 5 NOK if they answer correctly. This self-assessment is done in order to measure the importance of gender difference in self-confidence.

In Session 3 the participants perform the same counting task, but they can now choose which type of payment they want: piece rate as they got in session 1, or payment based on relative performance (competition) as in session 2. This choice is measuring willingness to compete. After they make their decisions, the respondents start the counting task in Session 3. Importantly, in the case of competitive pay the respondents are competing against their group's (the same group as in session 2) performance in Session 2. This assures the participants that they will be competing against all members of the group, not just the ones with high willingness to compete. After Session 3 the participants answer survey questions related to their risk preferences, attitudes, and behavior.

Data and coding choices

Main dependent variables

General self-reported competitiveness: We follow Bönte et al. (2017) and Hauge et al. (2020) and create a measure of general self-reported competitiveness using the following four questions: "I enjoy competing against others", "I find competitive situations unpleasant", "I like situations where I compete against others" and "When I try to reach a goal I prefer to compete against others instead of trying to reach the goal on my own". Answers are given on a scale from 1 (does not apply at all) to 7 (fully applies). We reverse code the answers to the question "I find competitive situations unpleasant" and we use the average score on these

[1] We use the same pilot data as in Hauge et al. (2020). They conducted a pilot of 40 students at the University of Oslo in the beginning of April 2019. Participants were recruited through the mailing list of OECONLAB of students who previously have agreed to receive invitations to experiments.

questions to create a measure of competitive preferences. This variable is available at both baseline and endline.

Willingness to compete (Compete):

Our other main dependent variable measures the willingness to compete by the choice made in Session 3 of the experiment. We code *Compete* to equal 1 if the respondent chose competitive remuneration and zero if piece rate is chosen.

Independent variables

Female: Administrative data on sex connected to most individuals in the baseline survey. Replaced with information from the follow up data if missing at baseline

High grades: Self reported grades from high school at baseline, equal to 1 if grades are above median and zero otherwise.

Performance under piece rate: Number of problems correctly solved in in Part 1.

Performance under competitive incentives: Number of problems correctly solved in Part 2

Performance under choice: Number of problems correctly solved in in Part 3.

Earnings: How much money is earned in each part (not including the show-up fee) if that part had been chosen.

Confidence: Based on a direct question of relative tournament performance as in Niederle and Vesterlund (2007). The variable takes 4 values (1^{st}, 2^{nd}, 3^{rd}, 4^{th}).

Risk aversion: Answer to the question "In general, how willing are you to take risks?" The answer categories are from 1 to 10 where 1 is labeled "not willing to take risk at all", and 10 is labeled "very willing to take risk".

Mother and Father employed (2 variables): Based on the question: "Are your parents working?" Original: 1= Yes, both, 2=My mother is in work, my father is not, 3=My father is in work, my mother is not, 4=No, neither of them is in work. Recode: We recode into two variables: *Mother employed* (1/2=1, 3/4 = 0) and *Father employed* (1 and 3=1, 2 and 4=0)

Mother and Father with high education (2 variables): Based on the question: "Do your parents have higher education (university/college)?". Original: 1= Yes, both have higher education,

2=My mother has higher education, my father has not, 3= My father has higher education, my mother has not, 4=No, neither of them have higher education Recode: We recode into two variables: *Mother with high education* (1/2=1, 3/4= 0) and *Father with high education* (1 and 3=1, 2 and 4=0)

Planned education: Based on the question: "Do you plan to take higher education?" Original: 1=Yes, 2=Don't know, 3=No Recode: 2/3=0.

Room level variables

Mixed gender=1 if there is at least 1 person of each sex in the room, zero otherwise.

Room level baseline competitiveness: The average score on the competitiveness scale for all others in the room (excluding the person herself)

Variables to be used when investigating mixed rooms (all measured at baseline)

Attitude towards mixed gender teams: Based on the statement: "A team performs better when it consists of people with the same gender". The answer categories are on a five point scale from Agree a lot to Disagree a lot. We will create dummy variables so that at least 5 percent of the individuals are in each group.

Attitude towards mixed living in mixed gender rooms: Based on the question: "To what degree do you prefer to live in a room where everyone has the same gender as you?" The answer categories are on a five point scale from Strongly prefer that everyone is of the same gender to Strongly prefer a mixed gender room. We will create dummy variables so that at least 5 percent of the individuals are in each group.

Attitude towards women in the Armed Forces: : Based on the statement: "A higher share of women in the Armed Forces reduces the defense capacity." The answer categories are on a five point scale from Agree a lot to Disagree a lot. We will create dummy variables so that at least 5 percent of the individuals are in each group.

Share of friends of opposite gender: Based on the question: "During your last year of school. How many of your friends were of opposite sex than you?" The answer categories are on a seven point scale from No one to All. We will create dummy variables so that at least 5 percent of the individuals are in each group.

In addition we will use other variables collected at endline such as perceived competitiveness in the room and how much the soldiers like their room to describe differences and correlations with own and room competitiveness.

Empirical strategy and tests of hypotheses

Test of main hypotheses/hypothesis

We will test our main hypotheses using different specifications and samples. We start by testing the gender difference in the total sample where we expect that women score lower than men on the competitiveness scale.

We estimate the following regression:

$$Competitiveness_{i2} = \beta Female_i + \chi X_{it1} + \varepsilon_i \quad (1)$$

where i indexes individuals and t is time (t2 then implies follow up). A first question is whether β is negative, which we know it is at baseline. X_{it} includes the controls stated above, including baseline levels of competitiveness. We will present results with and without these controls. To make the models fully saturated, we partition the covariate space and add control variables as indicator variables rather than using their multi-valued codings (Athey and Imbens, 2017). If cells are too small, with less than 5 percent of the observations, adjacent cells are combined. When using interaction terms and in tests of balance we will retain the continuous coding of the variables. If we have missing values on explanatory variables we will code the variables as zero and include dummy variables controlling for missing status so that we do not lose observations. We cluster the standard errors at the room level in all estimations that involve room level explanatory variables and we use robust standard errors otherwise.

We also estimate a similar regression for compete, which is only available in the follow up (t2):

$$Compete_{i2} = \beta Female_i + \chi X_{it1} + \varepsilon_i \quad (2)$$

Finally, in order to test our main hypothesis we will stack the data so that each individual has two observation and interact the female dummy with a dummy variable for the follow up survey (T2). The standard errors will be clustered at the individual.

$$Competitiveness_{it} = \beta Female_i + \partial T2_i + \lambda T2_i * Female_i + \chi X_{it1} + \varepsilon_{it} \quad (3)$$

The main hypothesis is that λ is statistically significantly different from zero. The main specification is one without any controls. Note that we treat it as an open question whether there is a smaller or larger gender difference in the follow up. The coefficient for ∂ is also of interest as it will show how competitiveness change over time for men.

Exploratory hypotheses

We have two secondary hypotheses, which regards the effects of the room assignment. First we hypothesize that living in mixed rooms influence competitiveness, and second we investigate whether the average competitiveness in the room, measured at baseline, has an effect of competitiveness.

We begin by investigating whether an indicator for mixed room explains variation in female and male competitiveness. In doing so, we restrict the sample to either the female or the male soldiers, add our measure of mixed rooms, and estimate the following regression:

$$Compete_{irp3} = \lambda Mixed_r + \chi X_{irt1} + \varepsilon_{ir} \qquad (4)$$

We add the subscript r for room. The error term ε_{ir} is clustered at the room level. The hypothesis is that λ is statistically significantly different from zero. The control variables now include the extra room level questions and, importantly, troop level fixed effects. We treat it as an open question whether there is a smaller or larger difference in mixed rooms.

Next we test if the gender difference is moderated by mixed rooms. When testing this hypothesis, we use the full sample of both men and women, add a female dummy and an interaction term between Female and mixed rooms, and estimate the following regression:

$$Compete_{irp3} = \beta Female_{ir} + \partial Mixed_r + \lambda Mixed_r * Female_{ir} + \chi X_{irt1} + \varepsilon_{ir} \qquad (5)$$

Both of these specifications will be tested with *Competitiveness* as well as *Compete* as dependent variables. We will also estimate equations 4 and 5 both with *baseline competitiveness* of the others in the room instead of *Mixed* as the main independent variable.

General tests of mechanisms

In the literature on gender differences in competition a series of standard tests of mechanisms have been used (described below). We will conduct those tests and see how they affect our

interpretation of the gender differences as well as the effects of mixed rooms on female and male competitiveness and on the gender difference.

We will first conduct the same analyses replacing *Compete* with performance and earnings. We will then test whether performance explains differences in the gender gap and in the mixed rooms effect by controlling for Part 2 performance in the baseline regressions. As mixed rooms may affect performance, the post treatment caveat is noted.

We will move on to investigate the role played by confidence and risk by first replacing *Compete* in the baseline regressions with these variables. We will then go back to the specification with *Compete* as the dependent variable and add risk and confidence as controls (interacted with the mixed rooms coefficient in equation and with the mixed rooms*female coefficient, and the female coefficient in equations where these are included).

We will also use data collected on the military leaders. In particular we plan to explore whether their attitudes toward competition, their own competitiveness, and their gender seem to moderate any changes in competitiveness of the soldiers.

Missing data

We will examine whether missing outcomes are correlated with treatment group. We will use the treatment effect equation to conduct the test. If treatment status correlates with missing outcomes we will calculate extreme bounds and trimming bounds for the treatment effect for the always-reporters (see Gerber and Green 2012: 226ff).

If a respondent has a valid response to at least one component variable of an index, then missing values for other component measures are imputed as the mean of the random assignment group (see Kling et al. 2007).

Respondents with missing background information will be included in the analysis by giving them a missing value and missing indicators. The missing indicators will be included in the regressions.

IRB

This study was reviewed and approved by the IRB officer at the Frisch center. Informed consent for storing and combining the data is given by the participants.

Registration

The pre-analysis plan is archived before any outcome data is collected. We archive it at the registry for randomized controlled trials in economics held by The American Economic Association: https://www.socialscienceregistry.org/ on February 21 2020. We will start the experiment on February 24 2020.

References

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