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Gender differences and the effect of facing harder competition☆

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ABSTRACT

Gender differences in competition have been demonstrated in a variety of contexts, yet it remains unclear how people respond to competitors they perceive to be hard or easy, and whether gender differences exist in this response. I run an experiment in eighteen public high school classrooms to study the effect of competing in a math task against different levels of competitors. I exploit natural sorting within grade levels in Malaysian public schools to randomly assign competitors of different perceived difficulty levels. Using a standard competition measure, males are significantly more competitive than females. However, when students face harder competitors, males respond by lowering performance while the performance of females does not vary significantly by level of competition.

1. Introduction

Many studies have shown that females are less competitive than males in stereotypically male tasks (see Niederle and Vesterlund, 2011 for review), which explains some of the gender differences in later education and career outcomes (Almås et al., 2016; Buser et al., 2014, 2017; Ors et al., 2013; Zhang, 2013). One important aspect of competition is the perceived difficulty of the competitors: people may react differently in competition when facing easier or harder opponents. Gender differences in these reactions can help explain dynamics of competition and inform policy decisions about the characteristics of competitions in schools or the workplace. Existing research on the perceived difficulty of the competition primarily relies on information provided in a laboratory context which may have limited applicability in the field. In the current study, I exploit natural sorting within grade levels to randomly assign competitors of different perceived difficulty levels to examine

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the effect of facing harder competitors by gender in addition to replicating the standard gender gap on a math task in Malaysian public schools.

Gender gaps in competition have been categorized by both choice and performance. Females are shown to be less likely than males to choose into competition, a well-established finding in the literature (Niederle and Vesterlund, 2007). Recent research explores how factors such as task or information affect this gender gap (see Niederle, 2016 for review). There is less consistent evidence, however, of gender differences in performance in competitive environments. A seminal paper finds that females perform worse than males when solving puzzles under a competitive incentive scheme, although there is no difference in performance under a non-competitive incentive scheme (Gneezy et al., 2003). Other studies use similar designs and puzzle tasks with similar results (Datta Gupta et al., 2013; Günther et al., 2010). Niederle et al. (2013) finds that males outperform females in math tasks under competition. However, other studies show no gender differences in performance under either non-competitive or competitive incentives in math tasks (Ertac and Szentes, 2011; Niederle and Vesterlund, 2007; Wozniak et al., 2014).

The literature indicates that gender differences in competitive performance cannot be simply explained by differential ability, which has shifted some recent literature to study how features of competition may differentially affect males' and females' performance. One aspect of competition is how people respond to harder or easier competitors and whether there are gender differences in these responses, the focus of the current study.

Prior research has examined reactions to different levels of competition by providing information or relative feedback during competition[1] in a laboratory environment (Buser, 2016; Cason et al., 2010; Eriksson et al., 2009; Ertac and Szentes, 2011; Gill and Prowse, 2014; Kuhnen and Tymula, 2011; Wozniak et al., 2014), with one recent study conducted in a field setting (Wozniak et al., 2016). In these studies, information about either random competitors or deliberately lower- or higher-performing competitors is given to subjects prior to subsequent competition decisions and performance.

Rational behavior predicts that people would be more reluctant to enter into competition against more difficult competition. Cason et al. (2010) created groups of relatively weaker, stronger, or superstar competition and the study finds that, as expected, the fraction of entry into a tournament is highest against the weaker group and lowest against the superstar group. No breakdown by gender is provided, although there is some indication of gender differences– females under-enter a proportional pay tournament given their expected payout, with no gender difference in under- or over-entry for the winner-take-all tournament. A clear gender difference in choice of competition is demonstrated in an unpublished study by Niederle and Yestrumskas (2008), which shows that females choose a less difficult and less lucrative task than males; however, both genders receive lower payout than if they had optimally chosen their task difficulty.

There is consistent evidence that information about target or relative score provided to subjects decreases or even eliminates the gender gap in entry into competition (Ertac and Szentes, 2011; Wozniak et al., 2014), although Wozniak et al. (2016) finds a persistent gender gap in competition entry among low-ability participants even after information is provided. However, the effect of information on gender differences in performance is less clear.

When subjects must compete, there are mixed results in reactions to information about competitors. Eriksson et al. (2009) finds that feedback on relative performance does not significantly change performance. The study reports positive peer effects in tournaments; frontrunners do not slack off and underdogs rarely quit, although continuous feedback reduces the quality but not quantity of effort for underdogs. However, Gill and Prowse (2014) finds that subjects reduce effort after a loss, although males reduce effort only after failing to win large prizes. Buser (2016) shows somewhat different results depending on gender. Buser created three groups based on random pairing in a first round winner-take-all tournament: winners, losers, and those who receive scores, which he refers to as the no information group. Losers from the first round seek harder challenges, are less successful in the challenges and overall make less money in the second round compared to the winners. While there are no gender differences in average outcomes, such as the challenge level selected or performance in the challenge, males react to losing by becoming more challenge-seeking than winners and females react by lowering their performance.

The findings in these previous studies are contingent on random or contrived information about competitors to elicit a reaction from subjects. Although there is a range in the type of information provided, from relative scores to more direct messages of winning or losing, the explicit information acts as a treatment. The use of explicit information may contribute to results in the previous studies– a study shows that the possibility of receiving feedback induces subjects to work harder even when they are not compensated for the extra effort, which demonstrates how responsive subjects can be to explicit information (Kuhnen and Tymula, 2011).

I focus on the effect of competitor level on competition performance, a relatively less understood aspect of gender differences in competition. I explore reactions to a subtler but realistic scenario of the perception of competitor difficulty, since people often compete with incomplete information about their competitors. For example, students may not know their rankings in class prior to taking a test; even if these rankings are known from a prior test, they do not perfectly transfer to another subject or even another test in the same subject. Despite this uncertainty, students must perform on assignments or tests. Thus, it is important to explore how a noisier yet realistic signal of competitor difficulty affects performance in

[1] The following discussion of existing literature focuses on studies that involve competition in a math-related task and explore gender differences, although Gill and Prowse use a slider task specifically designed to measure effort (Gill and Prowse, 2014). Other studies examine how information affects performance without any differences in incentives and will not be discussed (e.g. Azmat and Iriberri, 2010).