

Topics in Behavioural and Experimental Economics

Reuben, Sapienza and Zingales (2014)

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1 Abstract

The underrepresentation of women in STEM (science, technology, engineering and mathematics) fields is an issue of concern for policymakers. Reuben et al. (2014) list three possible causes for this disparity: gender differences in ability, gender differences in preferences and discrimination against women. There is growing evidence that ability is unlikely to be the source of gender differences in employment in STEM fields. Preferences and discrimination, however, are difficult to disentangle in field data, because preferences cannot be observed. In addition, if beliefs about future discrimination lead to reduced investment in STEM-related human capital by women, the gender signal can become informative of realised ability.

To overcome the above problem, Reuben et al. (2014) conduct a lab experiment in which discrimination can be directly estimated. They use an experimental labour market in which employers hire employees to do an arithmetic task, comprising summing sets of four two-digit numbers. Employers are presented with pairs of candidates, and shown a photograph of each, which reveals the subjects' genders. In some treatments, they are also given self-reported employee expectations of future performance, or objective data about past performance. The latter comes from an initial stage, in which all subjects (including employers) perform the task. Employers' earnings are maximised if they hire the better performing employee in the pair, and employees earn more money if they are hired.

To estimate discrimination, Reuben et al. (2014) consider hiring choices in mixed-gender pairs. The experimental data set includes actual performance in the initial stage, actual performance in the labour market stage, employer estimates of performance and employee self-reports. Despite the absence of any gender difference in performance, employers in the control treatment with no information about candidates' performance choose the male candidate about 2/3 of the time. Self-reported estimates of future performance fail to improve the situation, and fail to do so for two reasons. Male candidates tend to overestimate their future performance, and female candidates the reverse, and employers do not fully account for this difference. Objective information about past performance reduces but does not eliminate discrimination against women.

Overall, Reuben et al. (2014) find substantial discrimination against female candidates by both male and female employers. Their results suggests that gender discrimination is driven by incorrect beliefs about gender differences in performance, rather than by any dislike of hiring female candidates. Employers of either gender mistakenly believe that male candidates will perform better at the experimental task than female candidates, and this bias is not entirely eliminated even by objective information about past performance. These findings contribute to understanding why the gender disparity in STEM employment exists, and how the situation might be improved.

2 Comments and Questions

Reuben et al.'s (2014) results suggest that discrimination against women in STEM fields is likely to be widespread, but is not taste-based, meaning that it is not driven by a dislike of hiring women. It is rather statistical, but based on incorrect beliefs about gender distributions of mathematical ability. Both male and female employers in the experiment incorrectly believed that male candidates would perform better, and both genders showed an implicit gender bias against women in an Implicit Association Test (IAT, Greenwald et al. 1998) linking gender with mathematical topics. A particularly interesting finding is that subjects with higher performance, both male and female, had higher average IAT scores, meaning a *greater* bias. It would be interesting to explore this connection in more detail.

As the name indicates, the IAT measures *implicit* rather than explicit associations, and subjects with higher arithmetic abilities exhibited stronger implicit associations between being male and higher arithmetic ability. Given that there was no actual correlation between being male and greater arithmetic ability in the experiment, the implicit association is erroneous. The surprising result is thus that higher ability subjects are more prone to erroneous bias.

A possible explanation for the positive correlation between ability and bias could be exposure to the existing distributions of gender in STEM fields. Those with higher ability are arguably more likely to take an interest in the fields, and thus become aware of the gender imbalances that exist. They may come to believe that the disproportionately high levels of male participation reflect a higher average aptitude, when in fact

they do not. Given that this effect would be most pronounced amongst high-ability boys and girls likely to be able to perform well in STEM fields, an effect of this kind should be especially concerning to policymakers. It implies a path dependency in career choices, whereby under- or overrepresentation of particular groups that is unrelated to underlying group differences can persist because of erroneous statistical discrimination.

Another interesting aspect of the IAT bias is that it exists in both male and female subjects. Indeed, if anything, the implicit bias is actually stronger amongst female than male subjects. This finding contrasts with findings from psychology that women tend to exhibit a stronger automatic in-group bias than men (Rudman and Goodwin 2004), and underlines that it is not a dislike of hiring women that drives discrimination in the experiment, but rather erroneous beliefs. Male gender is interpreted as a positive signal of ability, when in fact the signal contains no information.

Despite the clear evidence of mistaken beliefs, a potential issue that is overlooked by Reuben et al. (2014) is the role of competition. In a review of experimental results relating to gender, Niederle (2014) finds that women tend to compete less well against men than against other women. Given the competitive framing of the employer choice, it is plausible that potentially correct beliefs about performance in a competitive setting enter into beliefs formation. Even if these competition-related differences were not actually relevant in the experimental setting, where there was no gender difference in performance, they might nevertheless have influenced beliefs, owing to the framing. This possibility could perhaps be investigated by comparing beliefs about performance in single-sex and mixed-sex applicant pairs.

A final question concerns the apparent ability of employers to do significantly better than random in selecting high-performance employees from only a photo, in spite of the gender bias. Even if the gender signal contains no information about ability, that is apparently not the case for other signals revealed by appearance. In a psychological study related to this topic, Naumann et al. (2009) find that people are remarkably good at identifying personality traits from full-body photographs. However, of the ten personality traits studied, the most likely candidate for a link to ability, conscientiousness, is one of the few where subjects failed. From a scientific perspective, it would be interesting to identify the attributes that correctly signalled ability in Reuben et al.'s

(2014) experiment, and to discover why. It is possible that, like male gender, they are attributes that are overrepresented amongst individuals working in STEM fields, but that, unlike gender, they are actually correlated with performance.

References

- Greenwald, a G., Greenwald, a G., McGhee, D. E., McGhee, D. E., Schwartz, J. L., & Schwartz, J. L. (1998). Measuring individual differences in implicit cognition: the implicit association test. *Journal of personality and social psychology*, *74*(6), 1464–80. doi:10.1037/0022-3514.74.6.1464
- Naumann, L. P., Vazire, S., Rentfrow, P. J., & Gosling, S. D. (2009). Personality judgments based on physical appearance. *Personality and social psychology bulletin*, *35*(12), 1661–1671. doi:10.1177/0146167209346309
- Niederle, M. (2014). *Gender* (No. 20788). *NBER Working Paper Series*. doi:10.3386/w20788
- Reuben, E., Sapienza, P., & Zingales, L. (2014). How stereotypes impair women's careers in science. *Proceedings of the National Academy of Sciences of the United States of America*, *111*(12), 4403–8. doi:10.1073/pnas.1314788111
- Rudman, L. A., & Goodwin, S. A. (2004). *Gender differences in automatic in-group bias: why do women like women more than men like men?* *Journal of personality and social psychology* (Vol. 87).