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Article

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EXPOSURE TO FEMALE COLLEAGUES BREAKS THE GLASS CEILING – A SUMMARY OF THE FINDINGS FROM A LAB EXPERIMENT IN THE FIELD¹

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Introduction

Women are under-represented at higher levels of the corporate ladder across the world. Is this because the majority group (males) who hire leaders base their decisions on sexist stereotypes about how suitable women are as leaders? If so, to what extent are these beliefs malleable? Will, for example, men's exposure to female colleagues change their perception and evaluation of female leaders? These are important questions, but they are hard to answer; both detecting discrimination and how exposure affects discrimination requires a careful research design.

Discrimination occurs if employers treat workers, or job applicants, with the same individual productivity characteristics differently (less favourably) because

they belong to a specific group (gender or ethnicity). The problem with using observational data to measure discrimination is that those who hire and promote within firms typically observe productivity clues that are hidden for the researchers, and these unobserved characteristics may be correlated with gender. We used a vignette experiment to circumvent this problem. In vignette experiments or in correspondence studies more generally, "job applicants" are given (by the researchers) the same productivity characteristics, except for gender or ethnicity. In our experiment participants read the résumé of a person applying for a low-end leader position. We randomly varied the gender of the applicant.

For exposure it can also be misleading to use data on self-reported or observed contact with minority groups to estimate how exposure impacts discrimination. In non-experimental data there will typically be non-random variation in exposure, it is for example very likely that those who have intensive contact with minority groups are – at the outset – more positively disposed towards the minority group (reversed causality). We avoid this selection problem by also having an experimental design for exposure. With a research design that features random variation in gender of the applicant and in exposure, we can shed light on how majority-minority contact affects discrimination.

The experiment was conducted on recruits in the Norwegian army. At the end of a two-month boot camp the soldiers were asked to evaluate the résumé of an applicant for a squad leader position. We had two versions of the résumé, a short and a long résumé. The latter included more information about the candidate. Varying information in this way can help us understand whether the discrimination is statistical or taste-based; if male candidates are valued higher than females; and the bias does not decrease when adding information, this is an indication that the discrimination is taste-based.

Variation in relevant exposure comes from the fact that in the boot camp, men and women live in mixed rooms. Around ten percent of the soldiers are women. There is a rule that there should be – if possible – always at least two women in a room (there are between four and eight persons in a room). Given this condition, we instructed



¹ This paper is an abridged (and slightly rewritten) version of a paper entitled: "Exposure to Female Colleagues Breaks the Glass Ceiling – Evidence from a Combined Vignette and Field Experiment" that is forthcoming in the *European Economic Review*. Any reference to the findings in our study should cite the *EER* version of the paper; Finseraas et al. (2016). Thanks go to The Norwegian Defense Research Establishment (FFI), in particular to Frank Steder and Torbjørn Hanson. This study could not have been conducted without the help of FFI and their project "Research on Cohorts". The paper has benefited from comments from Sara Cools, Raquel Fernandez, Magnus Johannesson, Arnfinn H. Midtbøen, and Øyvind Skorge, as well as seminar participants at the University of Bergen, University of Oslo, University of Stavanger, Norwegian Social Research, Linnaeus University, and NOVA. We thank Ada Fuglset, Eirik Strømland, and Wiktoria Szczesna for excellent research assistance. Thanks also to the soldiers and staff at the North Brigade. The project is part of the research activities at the Centre for the Study of Equality, Social Organization, and Performance (ESOP) at the Department of Economics, University of Oslo. ESOP is supported by the Research Council of Norway.

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those in charge of allocating soldiers to rooms to randomly place women in different rooms. A room is an important unit during this period. Apart from living together, roommates solve a number of tasks together, and operate often as a team within the platoon. This then means that the male soldiers in our data have by construction been differently exposed to and interacted with, female soldiers in an environment that is highly relevant for the squad leader application that they evaluated in the vignette.

There is an extensive body of literature on applying vignette studies, correspondence studies, and audit tests to study discrimination (Azmat and Petrongolo 2014; Guryan and Charles 2013; Midtbøen 2014; Pager 2007; Riach and Rich 2002 and Rich 2014 provide extensive surveys of the literature). The method of varying the information contained in the correspondence in order to separate taste-based discrimination from statistical discrimination, has also been used before (Guryan and Charles 2013). To our knowledge, however, we are the first to have a credible test for how peer exposure to female colleagues reduces discrimination against female applicants for a leadership position.

Exposure and discrimination

A priori it is not obvious how exposure to a minority group should affect an initial bias, if there is one. The effect is likely to depend on the type of exposure, and the setting in which contact takes place. If exposure takes place in a competitive environment, bias is more likely to increase (e.g. Semyonov et al. 2006). The so-called inter-group contact theory (Allport 1954; Pettigrew 1998) argues that prejudice and the negative stereotyping of minorities may decline with contact with out-group members if those in contact have equal status in the particular context, if they share common goals, if they are in a cooperative context, and if the contact takes place under some form of authority (Pettigrew 1998). Hence, in our setting we should expect contact to reduce bias. Soldiers of private rank have equal social status within the army, they share the common goals of the unit, they need to cooperate to solve their tasks, and contact takes place in a context with an explicit, enforcing authority. In fact, the army explicitly promotes views of unity and equality among soldiers of the same rank.

There are different reasons why exposure could reduce discrimination in the setting of our experiment. The most straightforward mechanism is that exposure leads

to experiences that make men update their beliefs about the suitability of female leaders (as suggested by Carrell et al. 2015 to be the reason for why interracial exposure reduces bias). Other reasons may be linked to identity, homosociality, and critical mass. Norms about gender differences are salient in leadership perceptions in male-dominated settings (Ridgeway and Correll 2004), and as people tend to favour leaders that are similar to themselves, a self-fulfilling process of homosocial reproduction may occur (Kanter 1977a, b). A qualitative field study of gender-mixed rooms (including the camps of the soldiers in our sample) was conducted after the boot-camp period. This study concludes that mixed rooms reduces gender essentialist notions, and increases feelings of sameness among the soldiers (Hellum 2015).⁶ Hence, it is possible that intense exposure makes male soldiers perceive themselves as more similar to female soldiers and therefore less sceptical to having them as leaders.

A handful of studies have found that exposure to peers with other characteristics reduces biased perceptions. Boisjoly et al. (2006) find that white students who were randomly assigned to live with an African-American in college were more positive towards African-Americans and towards affirmative action, than white students who had white roommates. Carrell et al. (2015) find that white freshman cadets at the US Air Force Academy become more positive towards blacks if randomly assigned to squadrons with black students, and Van Laar et al. (2005) find improved inter-group attitudes among college students using randomized exposure.

The experiments

The field experiment

Our sample includes all incoming soldiers in the August 2014 contingent to the The Second Battalion of the North Brigade of the Norwegian Armed Forces. The soldiers met on their first day of service at a military camp close to Oslo. They were tested for medical and psychological fitness, and flown to Northern Norway if they passed the tests. The soldiers attended a session with a questionnaire during this day, which included questions on motivation, intentions to complete higher education, as well as a set of background characteristics. The soldiers were not told the purpose of the study. The instructor stressed

⁶ Yet another qualitative study claims to find that mixed rooms have positive effects (Lilleaas 2014). Unfortunately, the study lacks randomization and in combination with the low number of observations, it is ill-suited to draw conclusions about the effects of mixed rooms.

Table 1

From the instructions					
<p>SQUAD LEADER</p> <p>The unit is choosing new squad leaders. The squad leader is the link between officers and soldiers. For some, this position can be very physically and mentally demanding. The position requires high skills. As squad leader, one is responsible not just for oneself, but also for the team.</p> <p>A potential candidate</p> <p>Name: Ida Johansen/Martin Hansen</p> <ul style="list-style-type: none"> • Grades from high school: 4.1 (average). • Career plans: Does not wish to continue in the armed forces, plans to pursue higher education in the field of economics and administration. • Family background: Has a sister, dad is an engineer, and mother is a teacher. Comes from a middle-sized city in the eastern part of Norway. • Motivation: Thinks that serving in the armed forces is both meaningful and important. • Physical capacity: Among the top 20 percent in his/ her cohort (armed forces). Exercise regularly. • Leadership experience: Was the leader of a youth organization. <p>Ida Johansen/ Martin Hansen would very much like to become a squad leader, indicate how well suited you think he/ she is for the job: (1=very badly, 6=very well) - put a circle around your choice.</p> <p>1 2 3 4 5 6</p>					
Source: The authors.					

that the survey results were of research purposes only, and anonymous for all representatives of the armed forces. At the point of testing, the soldiers had never met before, and they did not know with whom they were going to share rooms with until they arrived in Northern Norway. Hence, the first survey constitutes the baseline data for the field experiment.

In Northern Norway the soldiers were immediately assigned to the rooms where they were to stay during the whole recruitment period (the boot camp). The key feature of our experiment was that we randomized the composition of the rooms. Concretely, officers were instructed to use a randomizer in terms of a template Excel spread sheet for each platoon. The allocation was completely random within the platoons, except for a decision rule which assigned at least two women to the same room if possible. The “two-if-possible” decision rule was a requirement on the part of the Armed Forces.⁷

The boot camp was a period of intense training, and soldiers spent a great deal of time with their roommates.

⁷ There were rooms with only one woman, despite this rule. There were several reasons for this: i) that there was only one woman in the platoon, ii) that the number of women was uneven and they did not want too many women in one room, or iii) that some women left the army during the first few weeks (albeit not to a stronger degree than the male soldiers, since we find that attrition is unrelated to treatment status and gender).

They performed various tasks together, such as cleaning the room for inspection each morning. They also served in the same platoon, and constituted a squad within the platoon. There were strict rules for what soldiers could and could not do during the boot camp – they had to wear uniforms at all times, and were not allowed to sleep outside of the base.

After eight weeks we surveyed the soldiers a second time, and linked their answers to the first round using an anonymous reference number for each soldier. At this time we conducted the vignette experiment to see whether eight weeks of exposure had affected the soldiers’ perceptions about female leaders.

The vignette experiment

To detect discrimination, we presented to the soldiers a hypothetical (but realistic) case description of a candidate applying for a position as squad leader. We chose a position in the military, as all of the soldiers could relate to this position.

The soldiers were asked to rate the fictional candidate on a scale from one to six based on a short text, presented in Table 1. The experiment consists of four between-sub-

Table 2

Descriptive statistics across assigned cases				
	(1) Ida basic Mean SD	(2) Martin basic Mean SD	(3) Ida more Mean SD	(4) Martin more Mean SD
<i>Dependent variable</i> Score on the candidate (1=very bad, 6=very good)	3.771 (1.004)	4.145 (0.926)	4.376 (0.893)	4.720 (0.817)
<i>Background</i>				
Mother has high education	0.763 (0.428)	0.620 (0.488)	0.707 (0.458)	0.685 (0.467)
Father has high education	0.882 (0.325)	0.797 (0.404)	0.837 (0.371)	0.815 (0.390)
Mother works	0.855 (0.354)	0.886 (0.320)	0.868 (0.340)	0.902 (0.299)
Father works	0.947 (0.225)	0.962 (0.192)	0.989 (0.105)	0.978 (0.147)
Parents are divorced	0.276 (0.450)	0.253 (0.438)	0.366 (0.484)	0.253 (0.437)
Plan higher education	0.750 (0.436)	0.633 (0.485)	0.774 (0.420)	0.750 (0.435)
IQ	5.795 (1.488)	5.602 (1.306)	5.810 (1.555)	5.687 (1.353)
<i>N (on dependent variable)</i>	83	83	101	100

Source: The authors.

ject treatments. The treatments differ with respect to the gender of the candidate, and in how much information the soldiers receive about the candidate. In the first treatment (“Ida basic”), the soldiers were provided with basic information about the female *Ida Johansen*: they were given information about her high school grades, career plans, family background, and motivation. The second treatment (“Ida more”) provided more information about the candidate: in addition to the basic information, the soldiers received information about her physical capacity and her leadership experience (in bold text). We provided information on physical strength and leadership experience because these characteristics of the candidates are relevant for the position. Although one might argue that this framing could prime the subjects to discriminate, our aim was not to study discrimination per se, but to examine whether exposure to female soldiers affect this type of discrimination.

The other two treatments were identical to “Ida basic” and “Ida more”, with the exception that the female name *Ida Johansen* was replaced by the male name *Martin Hansen*. The forenames are gender specific, and to avoid any name effects, we chose, as in Carlsson and Eriksson (2014), the most common names of the soldiers’ age group. These are the most common surnames in Norway (Statistics Norway 2014). We ran the experiment on 26 September 2014, and in total 413 people participated in eight sessions. Session sizes varied depending on the size of the room where we conducted the experiment, and on when the soldiers were available for participation, see Table 2. The experiment was conducted on a military base, and soldiers used pen and paper in the vignette experiment.

Results

Evidence for discrimination

Table 2 depicts the mean score for the different resumes. We can see that the female candidate with basic information receives the lowest score, while the male candidate with more information receives the highest score. It is reassuring that the background characteristics for the candidate are balanced across the treatments, as they should be given a random variation in gender and added information.

To test formally if there was discrimination against the female candidates, we regressed the score on the gender of the candidate. Column 1 of Table 3 shows that the female candidate was perceived as less suited to be a squad leader. Hence, there was discrimination against the female candidate by the male soldiers in our sample. The coefficient for female candidate in column 1 captures the combined effect across the cases with more and less information. In column 2, we add baseline controls, and the results are similar.

When adding positive information about the candidates, we test if discrimination is statistical based on the added information. Column 3 shows the difference-in-difference results where we separate the cases with and without information. We find that information improves the evaluation of both our male and female candidates, but it does not reduce the degree of discrimination. The interaction term is negative, implying that if anything, information helps the male candidate more, but the coefficient is not statistically significant.

Adding baseline controls (column 4) yields similar results.

Exposure reduces discrimination

When we test whether random variation in exposure to female soldiers reduces discrimination, the analysis is restricted to men, and the female peers merely inform the treatment status. In total we had 89 rooms, with four to eight persons in each room. Eight percent

of the soldiers were women and between zero and four women lived in the rooms. The share of women in the rooms ranged from 0–0.67 with a mean of 0.07 and a standard deviation of 0.15. In total, 21 percent of the men were treated, i.e. they shared a room with at least one woman. The share of exposure for those treated varied from 17 to 67 percent. When we test for differences between the treatment and the control group we find small and not statistically significant differences. Most importantly, the small F-value in the joint test of whether all variables together predict treatment sta-

Table 3

Gender discrimination: Dependent variable is score of the candidate				
	(1)	(2)	(3)	(4)
	Pooled		Less and more information	
Female candidate	-0.326*** (0.108)	-0.365*** (0.103)	-0.275* (0.140)	-0.318** (0.143)
Information added			0.551*** (0.134)	0.456*** (0.135)
Female candidate*Information			-0.109 (0.166)	-0.096 (0.176)
Mean of dependent variable	4.281	4.266	4.281	4.266
Observations	367	335	367	335
R-squared	0.128	0.191	0.190	0.232
Platoon and Session FE	Yes	Yes	Yes	Yes
Baseline controls	No	Yes	No	Yes
Notes: The sample only includes male respondents. Standard errors clustered at the room level in parentheses. *** p<0.01, ** p<0.05, * p<0.1				

Source: The authors.

Table 4

Exposure and discrimination: Dependent variable is score of the candidate				
	(1)	(2)	(3)	(4)
	Treatment		Information and Treatment	
Female candidate	-0.430*** (0.124)	-0.438*** (0.119)	-0.277 (0.170)	-0.305* (0.179)
Information added			0.657*** (0.153)	0.550*** (0.162)
Female*Information			-0.254 (0.186)	-0.232 (0.203)
Treated	-0.230 (0.145)	-0.201 (0.141)	0.085 (0.221)	0.062 (0.226)
Treated*Female candidate	0.513** (0.204)	0.358* (0.213)	0.111 (0.277)	0.005 (0.281)
Treated*Information			-0.493* (0.250)	-0.437* (0.257)
Treated*Female candidate*Information			0.635 (0.396)	0.637 (0.433)
Mean of dependent variable	4.281	4.266	4.281	4.266
Observations	367	335	367	335
R-squared	0.139	0.196	0.204	0.242
Platoon and Session FE	Yes	Yes	Yes	Yes
Baseline controls	No	Yes	No	Yes
Notes: Standard errors clustered at the room level in parentheses. *** p<0.01, ** p<0.05, * p<0.1				

Source: The authors.

tus allows us to conclude that the randomization was successful.

In column 1 of Table 4, we present results based on regressing the score of the candidate on the gender of the candidate, a treatment dummy equal to one if sharing a room with a female soldier, and treatment interacted with gender of the candidate. There was discrimination among men sharing a room with only men (as shown by the negative and statistically significant coefficient for the female candidate not interacted with treatment). Men sharing a room with women discriminated significantly less against women (as shown by the positive and statistically significant interaction term). These results show that the random intense, and relevant, exposure to women that comes from sharing room and being part of the same squad not only reduces discrimination, but actually eliminates it. The results are similar when we add baseline controls in column 2, although the interaction term is only statistically significant at the ten percent level. In column 3, we interact treatment with adding information and the results indicate that exposure reduces discrimination more strongly in combination with added information. Unfortunately, we do not have enough power to estimate the effects separately. Adding baseline controls yields similar results as seen in column 4.⁸

Conclusion

Fewer women than men reach higher levels of leadership, even in gender-equal societies like Norway (Bertrand et al. 2014), and especially in the military (Teigen 2014). Such differences can be explained by supply side factors, such as differences in preferences and differences in competitiveness across the sexes (Croson and Gneezy 2009). The differences may, however, also stem from demand-side discrimination, i.e., that men are valued more highly than women with identical qualities and aspirations. Discrimination may be statistical, in the sense that it is based on unbiased statistical inference, or it may be preference based, so that it is driven by negative attitudes or biased perceptions of women's abilities. This paper aims to shed light on three important questions related to gender discrimination. Firstly, to what

extent are women seeking leadership positions in a male dominant environment discriminated against?⁹ Secondly, if women are discriminated against when two candidates are equally qualified for a job, does it help to add more information? Thirdly, does working together with women in a male dominant environment induce men to discriminate less against women aspiring to leadership roles?

What stands out in this study is that a random sample of male soldiers was allocated to share rooms with female soldiers. By sharing rooms, they also shared the responsibility for many different tasks and formed a team within the platoon. We find that discrimination disappears if we expose male soldiers to female peers in an environment that is relevant for the leadership position.

By combining a vignette experiment with a randomized field experiment, our results have strong internal validity. Previous literature finds discrimination against women in male-dominated spheres (Azmat and Petrongolo 2014), and we believe that our results can be generalized to such settings. One should be careful in generalising the results to settings where males dominate to a lesser extent, as dynamics are likely to be different in such cases. It is plausible that direct personal contact matters less in such settings than in their male-dominated counterparts. The particular selection of men and especially of women in our setting is similar to other male-dominated settings. Limits to the external validity may arise, however, from other peculiarities of the military setting. The advantage of our context, in addition to the ability to establish causality, is that we can derive the clear theoretical prediction that bias should be reduced. If our findings extend beyond the army setting, they have important policy implications. We have shown that the glass ceiling that prevents female candidates from obtaining leadership positions in a masculine context can be broken by exposure.

⁸ In columns 3–4 we find that the treatment group reacts less strongly to the information treatment. One explanation for this finding might be that men are valued higher than women for some positions due to an undervaluation of women's capacities and an overvaluation of men's capacities. It is possible that both these factors are affected by being treated. It is perhaps no longer seen as very important for the leadership position to be a very strong man once you have been exposed to other types of people that are equally fit to be leaders without such masculine characteristics.

⁹ We do not directly examine whether women are seeking leadership positions since we have no such outcomes. Our results show how direct personal contact can reduce discrimination. Less discrimination can reduce the costs/increase the expected outcome from seeking such positions for female candidates. In the event that female leader candidates pursue leadership positions to a lesser extent than men due to discrimination, reduced discrimination can hence affect female leader candidates' behaviour.

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