Implicitly countering the implicit:
The effect of counter-stereotypes on implicit gender stereotyping

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Abstract - From gender inequality in pay, inequality on the labour market, even inequality in legal rights; the foundation of many of these inequalities lies in an implicit stereotype in which women are thought of as the less assertive gender. The present study aims to find a solution to this phenomenon, by examining the effect of counter-stereotypes on implicit gender prejudice. Through an online survey experiment, where some participants were randomly encouraged to visualise a gender counter-stereotype, before participating in an Implicit Association Test, this effect was measured. It found that when an individual is primed to think of a strong woman, implicit gender stereotyping decreases. An important limitation to this study that the effect that was found merely holds for Dutch students; further research is necessary to examine the effects within the entire Dutch population.

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Disclaimer - The views stated in this thesis are those of the author and not necessarily those of the supervisor, second assessor, Erasmus School of Economics or Erasmus University Rotterdam.

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1. Introduction

In neoclassical economic theory, the 'Homo Economicus' is the centre-point around which theories are built. According to the Oxford Dictionary, this economic man is a rational agent, that has consistent and stable preferences, acts only out of self-interest, and will pursue the highest utility in any situation. In behavioural economics, this concept is expanded. With the introduction of new fields such as neuroeconomics, where brain mechanisms are used to gain economic insights, it has become clear that individuals do not merely employ rationality when making decisions; rather they use emotions, instincts, impulses, or habits (Camerer et al, 2004). In 1974, Tversky and Kahneman showed that the psychology underlying decision making is key to understanding the irrationality of choices. According to Tversky and Kahneman (1974), individuals use heuristics, that is mental shortcuts, to simplify the decisions that they face under uncertainty. Tversky and Kahneman (1974) show that there are three heuristics that people us in probability judgement: representativeness, availability and adjustment and anchoring. The topic of this research is stereotyping, which is a consequence of the representativeness heuristic.

Imagine you were shown a sample of 100 individuals, which you were told consisted for 30 percent out of kindergarten teachers and for 70 percent out of lawyers. Taken from this sample is Linda, a woman that can be best described as quiet, patient, kind, funny and compassionate. What occupation would you expect Linda to hold? It is likely that, from this description, you believe there is a high probability that Linda is a kindergarten teacher. Though this could be correct, with this reasoning, the likelihood for Linda to be of that profession is estimated by her similarities to the stereotype of a kindergarten teacher instead of the probabilities of belonging to the two categories, which would favour the expectation that Linda is a lawyer. This is precisely what stereotyping is: having a set of beliefs about traits as characteristics of members of a social group (Greenwald & Banaji, 1995).

Through the years, women still experience the consequences from being thought of as caring and selfless, whilst men are the ones believed to be assertive and in control of their own destiny (Haines et al., 2016). Within the stereotype literature, there is an ongoing debate as to whether stereotypes contain a 'Kernel of Truth'. Whether you believe that they do contain a degree of truth or not, stereotypes are very real (e.g. Ellemers, 2017; Joshi et al., 2015; Moss-Rucasin, 2012). When women decide they do want careers similar to men, for example, women seem to

be less hireable (Moss-Rucasin et al., 2012) or less likely to receive a promotion (Joshi et al., 2015), compared to male candidates. Studies on stereotype threat have even suggested that, when performing in a situation where there is a negative stereotype, individuals are affected in such a way that their behaviour will lead to confirmation of the stereotype (Steele & Aronson, 1995). The consequences of stereotyping show the social significance of reducing gender stereotyping and pursuing a more equal (and truthful) view of the genders. Following this reasoning, the present study examines the effect of counter-stereotypes on gender prejudice, within The Netherlands. A similar study, set in The United States, showed that counter-stereotypes were effective in reducing stereotyping. The theoretical relevance of this study subsequently lies in that similar effects have not yet been researched within a different national context. In short, this study intends to answer the following question: *"What is the effect of counter-stereotypes on implicit gender stereotyping?"*

This study uses an Implicit Association Test (IAT), as developed by Greenwald et al. (1998), to measure the degree to which an individual has implicit stereotypes towards genders. To examine whether counter-stereotypes have an effect on implicit gender stereotyping, a randomized experiment was used. In this experiment respondents were randomly assigned to a treatment- or control group. The treatment group was asked to visualize a strong woman prior to the test and provide a description as to what came to mind. In this study it was found that counter-stereotypes do indeed have a decreasing effect on implicit stereotyping.

In the remainder of this paper, several aspects of this research will be discussed. First, the theoretical framework will be presented; the fundamental concepts underlying this research in addition to the existing literature will be shown. Furthermore, the methodology section will present the methods used to test the relationship between counter-stereotypes and implicit gender stereotyping, in addition to a description of the sample. Subsequently, the results found will be presented. Lastly, the results that were found will be discussed and placed their wider perspective.

2. Theoretical framework

2.1. Irrationality and biases

Within behavioural economics, the concept of cognition is widely examined and can be defined as all mental processes such as perceiving, conceiving, remembering, reasoning, judging, imagining, and problem solving (APA Dictionary of Psychology, 2021). In 'Thinking Fast and Slow', Daniel Kahneman explains that cognition within the human brain operates in two systems: the first being fast and the second being slow (Kahneman, 2011). Whereas system two consists of thought processes that are deliberate, thought-through and those that require mental effort, system one is made up of all mental processes that are automatic, unconscious, and uncontrollable (Kahneman, 2011). Whilst neoclassical economics sees individuals as completely rational, the first system is used for 98% of the mental processes that individuals have, meaning nearly all decisions are made unconsciously or automatically. In a study that lies at the foundation of the aforementioned book, Tversky and Kahneman (1974) argued that individuals use three mental aids that make decision-making less effortful. Specifically, individuals use the following three heuristics: representativeness, availability and adjustment and anchoring (Tversky & Kahneman, 1974). The availability heuristic entail that individuals judge probabilities by how easily an instance comes to mind. Though this heuristic could be helpful in assessing frequencies, it could lead to biases by overestimating frequencies of instances that indeed do come to mind easily. Additionally, following the availability and anchoring heuristic, individuals use an initial reference point to come to a final answer. In practice, individuals often adjust insufficiently or incorrectly use the (random) initial value to arrive at the ultimate answer. Finally, following the representativeness heuristic, individuals use the similarities of two items to assess their probabilities. To see how this reasoning could lead to biases, one could consider the example of Linda, that was mentioned earlier. The probability that Linda is indeed a teacher is not assessed by the provided 70-30 percent ratio between lawyers and teachers, respectively, but by the similarities Linda has to the stereotype of a kindergarten teacher. In this case, the probability that Linda is of this profession is judged too high, whilst the probability that Linda is a lawyer is judged too low. In short, Tversky and Kahneman (1974) showed that whilst effortless and automatic decision-making could be useful and efficient, it can lead to errors in judgement. Similarly, Greenwald et al. (1995) defined the phenomenon 'implicit social cognition' as instances where individuals are unconsciously influenced by past experiences and consequently form attitudes and/or stereotypes. The important distinction in this is that these biases, defined by Greenwald et al. (1995), are implicit, meaning that individuals are unable or unwilling to report them. Whilst attitudes are a negative

or positive association with a concept (social group), stereotypes are an association between a concept (social group) and a specific trait belonging to that group (Greenwald et al., 1995). In this research, the implicit bias, stereotypes, is the main concept of interest; that is the association between a social group (women) and specific traits belonging to that group.

2.2. Gender Stereotypes and Kernel of Truth

Now that the heuristics, specifically that of representativeness, as explained by Tversky and Kahneman (1974) and the concept of implicit biases, specifically that of stereotypes, as explained by Greenwald et al., (1995), have been described, the topic of this research can be defined. Within this study, implicit gender stereotypes will be examined. More specifically, the association between women and specific traits that are believed to belong to women, in addition to, though less prominently, the association between men and specific traits believed to belong to men. Women are stereotyped to be more communal (caring and selfless), whilst men are thought of as agentic (assertive and in control of their own destiny) (Haines et al., 2016). Within the literature, there is an ongoing debate as to whether stereotypes contain a 'Kernel of Truth', that is: despite being a potential exaggerated generalization about a social group, it could contain accurate features (VandenBos, 2007). According to Jussim et al. (2015), the common consensus that stereotypes are inaccurate should be addressed and re-evaluated, as they find people do not ignore individual differences or use stereotypes to form a generalized judgement. Specifically, in the case of genders, they find stereotypes to be accurate. Though this may be the case, inequalities between women and men are very real and problematic. The European gender wage-gap was 14.1% in 2019 (Eurostat, 2021), meaning women earn 89,9 euros to every euro a man earns. Current projections are that it will take 108 years for this gap to close, in other words: women are expected to earn less than men for 108 years to come (World Economic Forum, 2018). Whilst this is a prime example of inequality among women and men, women face more subtle inequalities in every aspect of their lives. Research, for instance, shows that (implicit) stereotype-users perceive identical performances differently, determined by the gender that provided the performance (Ellemers, 2017). Namely, in application processes, female candidates are perceived as less competent and hireable than identical male candidates (Moss-Racusin et al., 2012). Subsequently, after receiving the position, women's professional performances are often undervalued and under rewarded compared to their male colleagues (Joshi et al., 2015). Women seem to get the short end of the stick in many aspects of life in a world that seems to be built for the male population. Consider, for example, the fact that women across the world only have 75% of the (economic- or human-) rights men have, even in

developed countries (The World Bank, 2021). Though, women are not merely under-represented in the law, namely only 22% of professionals globally are female (World Economic Forum, 2018). This low percentage is not due to lack of capabilities, in fact; women on average score higher grades during their studies than men (O'Dea et al., 2018). Additionally, cognitive differences between women and men have decreased substantially, meaning women are (at least) equally capable in any aspect (Feingold, 1998). These findings can be interpreted to believe that gender stereotypes are not necessarily accurate. In other words, it is of great importance to decrease gender stereotypes and subsequently the inequalities between women and men.

2.3. Counter-stereotypes through mental imagery

In existing literature, a range of interventions have been implemented and have shown to reduce stereotyping; several of which were considered. For instance, Fiske & Neuberg (1990) found that individuating, that is making someone belonging to a social group more personal, reduces stereotyping. Additionally, Huntsinger et al. (2010) showed that influencing an individual's mood could even affect stereotyping behaviour. Research has similarly suggested that counter-stereotypes reduce the use of stereotypes (Burns et al., 2017). Interestingly, Plant et al. (2009) showed that Barack Obama's presidential campaign, which served as a counter-stereotype, decreased anti-Black prejudice and stereotypes. Related to gender stereotyping, Blair et al. (2001) found, in a study set at an American university, that counter-stereotypes reduced gender prejudice. A counter-stereotype goes against typical stereotypes that exist; it is its opposite. Examples for gender counter-stereotypes, that explain what it entails, are women engineers or male nannies; they challenge the beliefs we have about characteristics belonging to certain social groups. The use of counter-stereotypes has been shown to have additional benefits, as it increases creative thinking in other aspects of life; it has positive external effects (Gocłowska & Crisp, 2013). Within this research, counter-stereotypes are used through mental imagery; individuals are asked to visualize a strong woman and provide a description on what came to their mind. The choice for mental imagery comes from a study by Blair et al. (2001), which shows counter-stereotypes are most effective when the individual is made to think of one themselves.

2.4. Hypothesis

As was briefly mentioned, similar effects of counter-stereotyping on implicit gender stereotypes have been researched by Blair et al. (2001), though this study was aimed more towards

researching the effect of mental imagery. In any case, an identical effect on gender stereotyping has not yet been researched in Europe, or more specifically, The Netherlands. An important question to consider is what would be expected to be different within the national context of The Netherlands, compared to the United States. Compared to Europeans, and people from The Netherlands in particular, Americans are generally more religious (Pew Research Center, 2018). Research has shown that religion is an important factor in enforcing gender stereotypes as well as gender norms (Basow, 1992). As the national context in which this study takes place is different from previous research, it is interesting to examine what results the present study find. Even though there is a difference between the two countries, counter-stereotypes are expected to have a decreasing effect on implicit gender stereotypes. Taking into consideration the context of this research and its expected results, the hypothesis that will be tested in this study is the following:

> **Hypothesis 1.** *Counter-stereotypes have a decreasing effect on implicit gender stereotyping*

3. Methodology

The question that is posed within this research is what the effect of counter-stereotypes on implicit gender stereotyping is. To provide an answer to this question, quantitative data on implicit stereotyping, as well as the effect that counter-stereotypes have on this phenomenon, is necessary. The quantitative method that was used in this research is an online survey experiment, in which implicit stereotyping was measured using an Implicit Association Test, and the effect of counter-stereotypes was measured using random assignment.

3.1.Stereotype measurement

According to Schneider (2004), it is undesirable to use direct measures to measure stereotyping, as people may be reluctant to disclose theirs or will provide socially desirable answers. The use of indirect measures, such as reaction time, are more favourable in this case. Reaction time can be used as a measurement under the assumption that one might react faster when items are easily associated, as opposed to being not closely associated (Schneider, 2004). To measure the association between two concepts, by the means of reaction time, an Implicit Association Test can be used (Greendwald et al., 1998). When partaking in an IAT, the participant assigns attributes (such as positive, negative) to a target group (such as flowers or insects). The IAT was originally designed to capture implicit attitudes, which are positive or negative associations with a social group (Greenwald et al., 1995). However, by replacing the attributes that are assigned to targets the IAT can be adjusted to measure implicit stereotypes (Greenwald et al., 1998). The D-score, that can be computed by response latencies between the rounds, shows the strength of this association (Greenwald et al., 2003). To compute the D-score, the average is taken from the difference between practice rounds 6 and 3 and test rounds 4 and 7. By taking the average difference between these rounds, the difference between the association between female-family/male-career and female-career/male-family is measured during the practice and test rounds. When the D-score is positive, this reflects a stronger association between female-family and male-career, compared to the reverse situation of female-career and male-family. In this research, the D-score will be calculated across all individuals, in both treatment- and control group.

Other measurements for stereotypes were considered before choosing the IAT as an assessment tool within this research. First, the Attitudes Towards Women Scale (AWS) was considered, where participants indicate if they strongly disagree (0) to strongly agree (3) with statements concerning rights and roles of women (Spence & Hahn, 1997). Second, the Neo Sexism Scale

(NSS) was taken into consideration, in which participants indicate whether they agree with a statement regarding equality between the sexes on a scale of 1 (strongly disagree) to 5 (strongly agree) (Tougas et al., 1995). Given that this research examines implicit stereotypes, as opposed to explicit, which are stereotypes that you deliberately think about and report (Implicit Project, 2021), the IAT was eventually chosen as the most appropriate research tool. Additionally, the IAT is less subject to social desirability bias, as the questioning is indirect as opposed to the relatively more direct questioning in the AWS and NSS (Fisher, 1933).

3.2. Data collection methods

As was briefly mentioned, the main approach taken to address the research question and test the hypothesis is a randomized online survey experiment in Qualtrics. The choice for a randomized experiment comes from its ability to solve selection bias (Khandler, Koolwal & Samad, 2010), which will be explained briefly. The main issue in examining whether a certain treatment was successful, is observing the counterfactual. The counterfactual represents what would have happened to the treated, had they not been treated; this, however, can never be observed. When participants are randomly selected and randomly assigned to a study condition, treatment- and control groups are considered equal (in observable characteristics) before any treatment occurs. The treatment effect that is subsequently found, can then be attributed to the treatment only, not to other (observable) differences between the treatment- and control group.

3.2.1. Experimental design

In this experiment, respondents were randomly assigned into one of two study-arms: a treatment- or control group. This division makes this study a between-subjects design: respondents are assigned to one out of two conditions, only. The groups are similar in that participants partake in the identical tasks during the IAT, though differ in that the treatment group receives a counter-stereotype treatment while the control group does not receive any treatment. The survey consists of five demographical questions, a possible treatment question and seven rounds of tasks during the IAT, to be completed by the participant. After providing consent and demographical information, the randomly assigned treatment group was asked to visualize a mental image and provide a brief description of this mental image. More specifically, respondents were asked to think about a strong woman and provide a brief description on what came to mind. After receiving the counter-stereotyping treatment or no treatment, respondents will complete an IAT. During this test, respondents are asked to assign an attribute (Career or Family) to a target (Male or Female). In the Appendix, Table I shows a

list of attributes and targets and the stimuli that belong to each group (Nosek et al., 2017). Additionally, Table II in the Appendix shows the order of the rounds that participants will complete (Carpenter et al., 2019). To start, respondents will practice three consecutive rounds: first with assigning the targets (male, female) to the left and right hand, second with assigning the attributes (career, family) to the left and right hand and lastly combining the two in the third round. The fourth round is an official round in which the association between male-career and female-family is tested. The fifth and sixth round are practice rounds, again: first the respondent will practice with reversed targets (female, male) and assign them to the left and right hand, second respondents will practice assigning the attributes to the reversed targets. The seventh and last round is an official round in which the association between female-career and male-family is tested.

3.2.2. Sample description

The sample of this study was collected through online distribution of the survey, which was used to collect responses from the 6th of May 2021 until the 4th of June 2021. The number of participants in this study was 78. Of this group, 19 responses were excluded on the basis that they were incomplete. The final sample consisted of 49 participants, of which 23 and 26 were in the control- and treatment group, respectively.

Prior to partaking in the IAT, respondents provided some demographical information, which is shown in Table 1. Participants were asked to provide their age, gender, current employment status, their highest level of completed education and the composition of their siblings. It can be found that of the 49 respondents, 76% is female and the average age is 22, with the participants' ages between 22 and 55 years old. Additionally, 39%, 4%, 43% and 14% of participants indicated to have a high school diploma, HBO-, bachelor's- or master's degree as their highest completed education, respectively. Furthermore, 90% of the sample consisted of students, whereas 10% is currently employed. Lastly, 45%, 26%, 25% and 4% of participants indicated to have: solely sister(s), solely brother(s), both brother(s) and sister(s) and no siblings, respectively.

3.3. Description of the variables

3.3.1. Independent variable

The independent variable in this research is the treatment variable, which indicates whether an individual was randomly assigned to the treatment- or control group. The treatment variable was chosen as an independent variable to measure the effect of counter-stereotypes. The

treatment variable is a dummy variable; it is 1 when an individual is assigned to the treatment group and 0 when an individual is in the control group.

3.3.2. Dependent variable

The dependent variable in this research is implicit stereotyping, or: the strength of the association between women and family and men and career. As this research's purpose is to examine whether counter-stereotypes have an effect on implicit stereotyping, the latter is the dependent variable. The (magnitude of) the implicit stereotype is measured using the difference between response latency when associating women with family, men with career and vice versa. The response latency will be computed in the D-score, which subsequently shows the strength of the implicit gender stereotype.

3.4. Data analysis methods

To examine the effect of counter-stereotypes on implicit gender stereotyping, an ordinary least squares regression is used. In using the OLS method, the treatment effect, or: the effect of counter-stereotypes on the D-score, will be estimated. The D-scores, which is computed for all participants, is calculated using response latencies. As was previously explained, within this research, an individual's D-score shows their strength of association between female-family and male-career, compared to the reverse. The formula used to compute the D-scores, including an explanation, is presented in the Appendix. The regression formula that will subsequently be estimated is the following, in which Y is the dependent variable (average D-score of the treatment group), α is the average D-score for the control group and β shows the average effect of counter-stereotyping on the D-score: $Yi = \alpha + \beta * Xi$.

It is expected that the treatment effect (β), will be negative. In other words, counter-stereotyping by the means of mental imagery is expected to reduce the association between male-career and female-family.

4. Results

4.1. Descriptive statistics

In providing a description of the sample within this study, the majority of the variables and their descriptive statistics have previously been presented. In Table 1 it can additionally be found that the D-score, within the sample, was on average 0.446, with -2.88 and 0.893 being the lowest and highest obtained D-score, respectively. This positive average D-score indicates that, within this sample, the association between female-family and male-career is stronger, on average, than its reverse. However, seeing as the minimum D-score is negative, there is bias in the opposite direction within the sample, which are individuals that have a stronger association between female-career than male-family, compared to the reverse. From the positive D-score mean it can be concluded that, on average, there is implicit gender bias within this sample, as individuals more easily associate female with family and male with career.

Table 1: Descriptive statistics

Variable	Obs.	Mean	St. Dev.	Min	Max
D-Score	49	0.446	0.309	-2.88	0.893
Female	49	0.755	0.434	0	1
Age	49	22.673	4.714	22	55
High School	49	0.388	0.487	0	1
Post-Secondary Vocational Education (MBO)	49	0	0	0	0
Higher Vocational Education (HBO)	49	0.041	0.200	0	1
Bachelor's Degree	49	0.429	0.500	0	1
Master's Degree	49	0.143	0.354	0	1
Student	49	0.898	0.306	0	1
Employed	49	0.102	0.277	0	1
Unemployed	49	0	0	0	0
Other Employment	49	0	0	0	0
Only sister(s)	49	0.449	0.503	0	1
Only brother(s)	49	0.265	0.446	0	1
Sister(s) and brother(s)	49	0.245	0.434	0	1
No siblings	49	0.041	0.200	0	1

4.2. Tests for randomization

As was previously described, a randomized experiment is a method in which selection bias could be solved. To achieve this, participants should be randomly selected and randomly assigned to, in this case, one of two study-arms. To examine the latter condition, the treatment-

and control group are tested on their similarities of observable characteristics. Using the demographical information provided by respondents, it can be tested whether, based on these observable characteristics, both study-arms are considered equal. In Table 2, baseline summary statistics for both groups are given, in addition to the P-value of the t-test that was performed to test for differences. It can be seen that there are no statistically significant differences between de demographical variables in the treatment- and control group. In other words, the proportion or mean belonging to each group are considered equal. Though this is the case, the difference in proportion of students (and subsequently employed individuals, as they are each other's opposite) is quite large; whilst the control-group consists of students for 96%, this is only 85% within the treatment-group. A solution will be provided below.

Table 2: Baseline summary statistics and p-values from tests for randomization

	Control Group		Treatment Group		P-Value Difference Test
Variable	Obs.	Mean	Obs.	Mean	
Female	23	0.783	26	0.731	0.680
Age	23	22	26	23.269	0.327
High School	23	0.391	26	0.385	0.963
Post-Secondary Vocational Education (MBO)	23	0	26	0	.
Higher Vocational Education (HBO)	23	0.043	26	0.038	0.932
Bachelor's Degree	23	0.478	26	0.385	0.520
Master's Degree	23	0.087	26	0.192	0.293
Student	23	0.957	26	0.846	0.198
Employed	23	0.043	26	0.153	0.198
Unemployed	23	0	26	0	.
Other Employment	23	0	26	0	.
Only sister(s)	23	0.391	26	0.500	0.455
Only brother(s)	23	0.304	26	0.231	0.572
Sister(s) and brother(s)	23	0.261	26	0.231	0.812
No siblings	23	0.043	26	0.038	0.932

4.3. Hypothesis testing

The results of the regression, that was used to test the hypothesis, can be found in Model 1 displayed in Table 3. The model shows, as was expected, a negative coefficient ($\beta = -0.196$) for the counter-stereotype treatment. The coefficient is found to be statistically significant on a 5%

significance level (p = 0.024). Whilst the control group has an average D-score of 0.549, the score decreases on average with 0.196 when an individual is in the treatment group, resulting in an average D-score of 0.353. These results provide support for the hypothesis that counter-stereotypes through mental imagery have a negative effect on the implicit gender stereotypes individuals have.

As was previously mentioned, the difference in proportion, between the treatment- and control group, of students (and employed individuals) was relatively large (approximately 10 percentage points). Of the entire sample of 49 respondents, roughly 10% (5 individuals) indicated to be currently employed. As this is only a small portion of the sample, and it creates noise (or: imbalance between the groups), an additional regression was run for a sample that consisted merely of 44 students. The results of this regression can be found in Model 2, displayed in Table 3. The model shows, similar to Model 1, a negative coefficient (β = -2.19) for the counter-stereotype treatment. Similarly, the coefficient is statistically significant on a 5% significance level (p = 0.010). Among the group of students that were in the control-group, the average D-score is found to be 0.587, which decreases on average with 0.219 when an individual is in the treatment group, resulting in an average D-score of 0.368. These results show that, within the sample of students, counter-stereotypes have a negative effect on implicit gender stereotyping.

Table 3: Regression results

	Model 1 D-score	Model 2 D-score (student only sample)
Counter-Stereotype Treatment	-0.196**	-0.219**
	(0.084)	(0.081)
Constant	0.549***	0.587***
	(0.055)	(0.042)
Number of observations	*49*	*44*
R-squared	*0.102*	*0.149*

Note: Standard errors shown in parenthesis. ***p<0.01, **p<0.05, *p<0.1

4.4. Counter-stereotypes

Respondents that were assigned to the treatment group were encouraged to imagine what a strong woman is to them and describe her. In addition to the effect that this counter-stereotype has on implicit stereotyping, which was previously shown, it is interesting to look at what these respondents thought made a strong woman. In Table III, shown in the Appendix, the

descriptions of a strong woman, that the 23 respondents in the treatment group visualized, are shown. Most frequently, namely by 11 out of 23 respondents, it was indicated that, in their vision, this woman was independent. Additionally, descriptions such as being outspoken, standing up for herself, what she believes in and for others, voicing her opinions and being happy are aspects of a strong women that participants envisioned. Lastly, some participants even envisaged a specific woman, such as themselves, women in their family or famous women such as Michelle Obama or Angela Merkel.

5. Discussion and conclusion

By questioning whether counter-stereotypes have an effect on implicit gender stereotyping, this research aimed to deepen the understanding of this relationship, within the national context of The Netherlands. To examine to what extend this study achieved this aim, the main findings, contribution to the existing literature, possible policy implications, limitations and possibilities for further research will be presented.

5.1. The main findings (in their wider perspective) and practical implications

By the means of an online survey experiment, in which respondents were randomly assigned to a treatment- or control group, the main hypothesis, which stated that counter-stereotypes have a decreasing effect on implicit gender stereotyping, was tested. It was found that when an individual in the treatment group was encouraged to imagine a strong female, and asked to provide a description of her, implicit gender stereotyping decreased. Within this study, implicit gender stereotyping was measured using an IAT, in which respondents were asked to assign attributes (family or career) to targets (female or male). By comparing response times when respondents assigned female-family/ male-career to when they assigned female-career/ male-family, the D-score was measured. Within the sample, which consisted of 49 respondents, it was found that whilst the control group had an average D-score of 0.549, the treatment group had an average score of 0.353, resulting in a statistically significant negative treatment effect of 0.196. These results offered support for the hypothesis, and showed that within this sample, implicit gender stereotyping decreased when an individual was encouraged to imagine a counters-stereotype. These results are in line with previous research; Blair et al. (2001) found that, at an American university, counter-stereotypes through mental imagery were successful in decreasing implicit gender stereotypes. To examine whether this similar effect holds for students from universities in The Netherlands, a student only sample was used. Within this sample of 44 students, it was found that the control group had an average D-score of 0.587, the statistically significant treatment effect was 0.219, which resulted in a D-score of the treatment group of 0.368. In other words, within the two samples that were used to show the effects of counter-stereotypes on implicit gender stereotyping, the effect is found to be negative.

Contrary to rational neoclassical economic theory, behavioural economic theory shows the aspects of the irrationality of individuals within their decision making and judgement. This research was aimed at studying a solution to one of the consequences of the irrationality that is stereotyping. Tversky and Kahneman (1974) showed that individuals use mental aids in their

judgement, which are automated mental shortcuts to decrease the effort it takes to judge an individual or situation. One of the three shortcuts (or heuristics) described is representativeness, which can be explained as the judgement of two items based on their similarities. The risk for error occurs when an individual is judged to their similarities to a group, regardless of whether the key characteristics that are believed to belong to this group contain truth. This has been an element of discussion within the literature of stereotypes, as the question of whether they contain a kernel of truth was raised. For the genders, however, these characteristics might seem to be an outdated view of reality, though women, in particular, are still judged accordingly. Research increasingly shows that women are at least as capable as men, when considering their cognitive skills and performances. Still, women are faced with the stereotype of being the less agentic gender every day as they are less likely to be hired and their performance is likely to be undervalued compared to their male colleagues. This research recognizes this inequality amongst and studied the effects of counter-stereotypes as a solution. Placed within the bigger picture, this study has two main contributions. First, within the sample (both with and without employed individuals) that consists of people from The Netherlands, there is implicit gender bias; women are associated more strongly with family than career concepts, whilst the opposite holds for men. Second, within the sample it is shown that counter-stereotypes are an effective mechanism in reducing said bias.

This last contribution is key to providing suggestions for practical implications. Counter-stereotypes are not merely effective in reducing gender prejudice, they contain additional external benefits. Through counter-stereotypes, students are encouraged to think more non-conventionally, which has shown to increase creativity in other courses and aspects of their lives. An important suggestion is to include counter-stereotypes in study materials and create more visibility for counter-stereotypical figures in schools.

5.2. Limitations and further research

This study aimed to measure the effect of counter-stereotypes through a randomized experiment, for reasons that were previously explained. The main appeal of this research method stems from its ability to reduce selection bias and subsequently find an unbiased treatment effect, that can only be attributed to the treatment and no other (observable) differences between participants. However, there are still possibilities for selection bias to occur during an experiment. Within this research, as 90% of the sample is a student, sampling bias is highly likely to have occurred. As the distribution of the survey mainly targeted students, the

sample is unrepresentative of individuals outside the student-population. In addition, the sample that was collected through the online survey was relatively small, as it consisted of 49 participants. The small sample size could decrease the power of the analysis, decreasing the ability to draw statistically robust conclusions. Fortunately, the effect found within this research is statistically significant. Yet, by the means of a larger sample size the found measures, such as the confidence intervals, could have been more precise. A last limitation to be taken into consideration is related to the Implicit Association Test, which is used within this research to measure whether an individual has an implicit gender stereotype and its strength. There is an ongoing debate in the literature as to whether the IAT, which makes use of reaction time, is an effective tool in measuring prejudice. The criticism is mostly concerned with the IATs reliability and validity. First, its reliability is called into question as an individual's test scores are often different between tests. Mostly, however, the IATs validity is a point of discussion, as research shows it is low (Rezaei, 2011), limiting its ability to predict actual behaviour. This study shows that, within the sample, counter-stereotypes are effective in reducing gender prejudice. However, considering the measure for gender prejudice has received some criticism, this should be considered when interpreting this research's findings.

A suggestion for further research stems from the limitations within this study. To measure an effect of counter-stereotypes that is generalizable to the entire Dutch population, a sample which exceeds the student population should be used. Additionally, other measures of implicit stereotypes could be used to address the IATs reliability and validity. In other words; a wider spread sample in the Netherlands and measuring implicit gender stereotypes using different tests would be advisable for further research.

Appendix

Appendix A. Link to the online survey experiment.

https://erasmusuniversity.eu.qualtrics.com/jfe/form/SV_5nHS63KvMmah6FE

Appendix B. Further explanation to the gender-career Implicit Association Test

Table I: List of Target and Attributes and their consecutive stimuli (Nosek et al., 2017).

Target	**Stimuli**
Male	Ben, Paul, Daniel, John, Jeffrey
Female	Rebecca, Michelle, Emily, Julia, Anna
Attribute	Stimuli
Career	Career, Cooperation, Salary, Office, Professional, Management, Business
Family	Wedding, Marriage, Parents, Relatives, Family, Home, Children

Table II: Order of rounds that respondents completed, which is 'compatible first' (Carpenter et al., 2019).

Round	**(Non-) Compatibility**	**Left Hand – 'E-key'**	**Right Hand – 'I-Key'**
1		Male	Female
2		Career	Family
3	Compatible	Male + Career	Female + Family
4	Compatible	Male + Career	Female + Family
5		Family	Career
6	Non-compatible	Male + Family	Female + Career
7	Non-compatible	Male + Family	Female + Career

Appendix C. Formula for calculation of the D-score

D-score formula: $\frac{1}{2}\left(\frac{\mathrm{RT_{nc,p}} - \mathrm{RT_{c,p}}}{\mathrm{SD_{nc,p\ \&\ c,p}}}\right) + \frac{1}{2}\left(\frac{\mathrm{RT_{nc,t}} - \mathrm{RT_{c,t}}}{\mathrm{SD_{nc,t\ \&\ c,t}}}\right)$

Where: RT = response time, nc = Non-Compatible, c = Compatible, p = Practice and t = Test

Appendix D. List of counter-stereotypes visualized by the treatment group

Table III: counter-stereotypes, created through mental imagery by respondents in treatment group

Having an opinion! Standing up for something
a woman who is opinionated and very educated. someone who is considerate of other minorities and always tries to speak up for them. a woman who does whatever she wants and likes, without worrying about men's opinion. someone who is independent, ambitious, and well educated.
My mother
A strong woman is a woman who is independent. She does what she wants and what makes her happy
Independent, happy, smiling
Myself
Independent
An independent woman
A woman who is not afraid to speak up for what she believes in
Confident, people who take others opinion into consideration but make clear discissions
Outspoken and assertive
Independent, black, "big", not afraid to speak her mind
A woman who is not afraid to say what is on her mind
A woman who stands for what she believes in and doesn't let angry jealous men get to her
Angela Merkel, Michelle Obama
A woman who independent and not afraid to stand up for herself
Working women with a career
Pro-active, opinionated, loud
An independent lady who embraces who she is and follows her dreams
A strong woman is someone who goes after what she wants, who can be independent and does not let others hold her back from reaching her goals
A confident woman, who knows what she stands for and is not afraid to work hard
Wonder Woman, independent, does not care what others think
Independent confident

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