Measuring attitudes towards affirmative-action beneficiaries: Evidence from an Indian business school[1]

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Abstract

Affirmative-action beneficiaries can face backlash from non-beneficiaries. Although several studies measure attitudes towards AA beneficiaries, the robustness of these measures to social-desirability concerns has not been investigated. We study these issues in the context of possible post-admission discrimination within an Indian business school with caste-based reservation in admissions. We find that more than 40 percent students believe that this reservation is not justified and that its beneficiaries are "academically inferior." In their second year, students form study-groups endogenously. Study groups can affect grades, which can affect salaries. We compare anonymous survey responses about attitudes, with and without an additional 'veil' to reduce social desirability concerns. We find significant social-desirability bias in anonymous responses. With the additional veil, the self-report of the tendency to exclude reserved-category students from one's study group increases from 5 percent to 22 percent, and the tendency to exclude an academically-inferior student increases from 21 percent to 64 percent.

Keywords: Affirmative action, Social desirability bias; Caste; Study-group formation.

JEL Codes: C83, C93, I23, J15

1. Introduction

Affirmative action (henceforth AA) is a controversial issue that has been widely studied in the literature (Holzer and Neumark (2000), Fryer et al. (2005)). A subset of this literature, to which we contribute, studies after-effects of AA, including backlash, in perceptions and attitudes towards AA (Ritov and Zamir (2014), Shteynberg et al. (2011), Banerjee et al. (2018)). We study these after-effects in the context of caste-based AA (student-seat reservation) in an Indian business school.

We contribute to the AA literature more broadly by investigating the robustness of measuring attitudes and perceptions towards AA using the "standard" anonymous survey method. Multiple studies, academic and non-academic, rely on confidential surveys to measure discrimination, and the effects or attitudes towards AA policies designed to counter this discrimination (DiJulio et al. (2015), Frasure et al. (2021), Smith et al. (2022), Pew Research Centre (2022)).

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Focussing on caste and India, studies have used confidential surveys to investigate youth's opinion about reservation policy (Lokniti (2017)), religious and caste attitude (Pew Research Centre (2021)), and explicit prejudice against women and Dalits (Coffey et al. (2018)). Using the anonymous survey method, Pandey and Pandey (2018) find that reserved category students are perceived to have lower academic ability, while Deshpande (2019) finds that open category students evaluate performance of reserved category students prejudicially.

Despite the prevalence and importance of such academic/non-academic studies in informing policy, the robustness of using anonymous surveys to study discrimination and AA has not been investigated. We intend to contribute to this gap in the setting of caste-based reservation (the AA) in a higher educational institution in India. This reservation is designed to ensure advancement of socially and educationally backward classes of citizens, the Scheduled Castes (SC) and the Scheduled Tribes (ST) (Article 15(4) and Article 15(5) of the Indian Constitution). Under the current version of this policy, a certain percentage of seats are reserved for students belonging to traditionally marginalized groups: Scheduled Caste (SC, 15 percent), Scheduled Tribes (ST, 7.5 percent), and Other Backward Classes (OBC, 27 percent). This policy is colloquially referred to as "caste-based reservation" (cf. EPW Engage (2019)).

Caste-based reservation is a sensitive issue in India (Ghosh (2006), Ilaiah (2006)). Hence, it may come with social desirability bias (cf. Edwards (1953) and Krumpal (2013)). In a different context, Coffman et al. (2017) have shown that social desirability bias (SDB) can lead to anonymous surveys underestimating both LGBT population and antigay sentiments in the USA.

Here we study whether social desirability concerns can affect the measurement of attitudes towards caste-based reservation and its beneficiaries in an Indian business school where this discrimination can have significant educational and economic consequences. Ours is a significantly different study from Coffman et al. (2017) since sexuality is a significantly different topic from caste. Among several other differences, the formal recognition of LGBT equality rights in the USA is much more recent and still developing (Gruber and Medina (2022)). By contrast, caste equality laws and provisions for caste-based reservation in educational institutes have been in the Indian constitution since the constitution came into effect in 1950. In 1951, reservation was only targeted towards Scheduled Castes (SC) and the Scheduled Tribes (ST). Subsequently, since 1991, Other Backward Classes (OBC) were included under the ambit of reservation.

Our focus is to study attitudes relating to caste-based reservation and study-group formation in the second year of the two-year MBA. While caste is not officially disclosed, the literature suggests that caste of one's peers can be inferred based on indicators like admission test scores, last name, and educational background (Rao (2013), Sharma and Subramanyam (2020), and Vijay and Nair (2022)). Lakshman (2023) uses a survey conducted at an engineering institute in India to report that a large proportion of SC/ST students' entrance-exam rank and surname was asked by fellow students with the intention of knowing their caste background.

We study whether discrimination is present and/or underestimated in endogenous second-year study group formation in a business school. Second-year study groups can affect both academic and economic outcomes. Marks accruing to group projects contribute significantly towards the

overall GPA (typically 20 to 50 percent of a second-year course grade). Furthermore, Chakravarty and Somanathan (2008) showed, in a similar setting of an Indian business school, that grades were a significant determinant of one's future earnings. In particular, they showed that the difference in grades across the SC/ST category students and general category students was a key driver of the 35 percent lower placement-salary of the SC/ST category students.

We closely follow the methodology of Coffman et al. (2017), which utilizes the item count technique (Miller (1984)). Consider one sensitive yes/no question we asked: "In the 2nd year are/were you willing to include a reserved-caste category student in your study group?". Each respondent in the control group is asked this question under anonymity, but also asked 4 other unrelated yes/no questions in a block. The control-group respondent only reports the total number of yeses for the 4 block questions and the individual yes/no answer to the sensitive question. The treatment-group respondent is only asked the number of yeses for 4+1 questions in a block, where 4 questions are exactly the 4 block questions asked to the control-group respondent, and the 5th question is the same sensitive question as the control, except in the treatment, the sensitive question is also a part of the block.

The veiled treatment respondent reports the number of yeses out of these 5 questions. Notably, the treatment respondent never reports his/her answer to the sensitive question separately (unless the number of yeses is 0 or 5). This reduces social desirability concerns among the veiled treatment respondents.

This design yields two measures of the proportion of the sample saying yes to the sensitive question. *Direct measure*: the proportion in the control who say yes to the sensitive question (asked separately from the block of 4 questions), the typical measure of sensitive attitudes used in the current literature. *Veiled measure* with reduced social desirability concern: the average number of yeses out of 5 in the veiled treatment minus the average number of yeses out of 4 for the block questions in the control. Assuming successful randomization across the two groups, the two groups should have the same average number of yeses on the 4 common questions. Thus, the increase in the average yeses out of 5 questions in the treatment relative to yeses out of 4 questions in the control must be the proportion of the treatment sample saying yes to the 5th question of our interest.

Comparing the veiled and the direct measures yields the effect of reducing social desirability concerns from anonymous surveys. We find that the tendency to exclude reserved category students from one's study group is significantly underreported in the anonymous control survey. The direct measure of this tendency is 5 percent, as opposed to the veiled measure of 22 percent. We also find that the unwillingness to include an academically inferior student in one's study group is underreported by 43 percentage points.

In questions where we do not find significant underreporting, the direct-report measures present a significant negative attitude towards caste-based reservation. About 41 percent respondents state that reservation based on caste is not justified. On the question enquiring about academic ability, about 46 percent participants report that reserved category students are academically inferior relative to general category students.[3]

[3] The language asking whether a respondent considers reserved category students academically "inferior" is harsh. But it is precisely such sensitive attitudes that we want to investigate. Interestingly, we find no evidence of social desirability bias in answering this question, and more than 40 percent say "yes" or give the sensitive answer to

Overall, our findings show the presence of post AA discrimination in the context of caste-based AA in higher education. More broadly, we find that anonymous surveys can yield underestimates of both the *extent* of discrimination (tendency to exclude reserved category students from study groups), as well as the statistical *channel* of discrimination (tendency to exclude academically inferior students). Thus, our paper contributes to the extensive literature studying discrimination (cf. Guryan and Charles (2013), Bertrand and Duflo (2017), and Lane (2016)), and the literature studying channels of discrimination (statistical: (Phelps (1972), Arrow (1973)); taste-based discrimination (Becker (1957)); implicit discrimination (Bertrand et al. (2005)). Our results indicate that if one uses anonymous surveys to study the extent and/or channel of discrimination, then the results should be tested for robustness with respect to social desirability bias before drawing conclusions. This point also extends to non-academic studies (e.g. Pew Research Centre (2021), Lokniti (2017)) regarding discrimination and perceptions of AA.

Within the context of caste-based discrimination, Banerjee et al. (2009) and Siddique (2011) find differences in call-back rates favouring resumes sent out by upper-caste applicants. While this method avoids the measurement issues we study, these studies deal with discrimination at the hiring stage not post admission or post AA (as we do). Furthermore, measuring caste attitudes using direct anonymous surveys remains common (as mentioned earlier), and it is to that literature that we contribute.

Bohren, Imas, and Rosenberg (2017), and Coffman et al. (2021) show that beliefs are important determinants of discriminatory behaviour. Our findings raise fundamental questions of accurately measuring caste-related beliefs and attitudes using anonymous surveys.

Our work is also related to the literature studying peer effects (cf. Sacerdote 2014). Peer effects have been found to affect academic outcomes (Sacerdote (2001), Zimmerman (2003), Stinebrickner and Stinebrickner (2006), Carrell et al. (2009)), including at graduate business schools in India (Sen et al. (2012) and Jain and Kapoor (2015)). However, unlike in the current paper, these papers have not explored how endogenous peer groups are formed, and how that relates to caste.

Marmaros and Sacerdote (2006), Jain and Langer (2019), and Carrell et al. (2013) study endogenous sorting into groups. They identify race and geographic proximity, sharing the same room, and academic ability as the drivers of this endogenous sorting. We contribute to this literature by showing that drivers of such sorting can include officially confidential sensitive attributes like caste. Furthermore, we also show that anonymous surveys underestimate the degree to which caste and academic ability drive endogenous sorting.

The rest of the paper is organized as follows. Section 2 details the experimental design. Section 3 specifies our methodology for empirical analysis. Section 4 provides the empirical results and Section 5 concludes.

2. Experimental Design

The experimental design closely follows the methodology of Coffman et al. (2017), with certain additional robustness checks. The main part of the design has two randomized groups:

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this question with or without the veil. Thus the result showing social desirability bias on the question of including "academically inferior" students in one's study group should not be problematic from an estimation point of view.

(a) the control group which answered an anonymous survey regarding a sensitive question (among other questions), and (b) the veiled treatment group which was provided a 'veil' along with anonymity while answering the sensitive question. There were five sensitive questions (listed in Table 2) studied using this method.

These questions were designed to elicit the following: whether respondents believed that 'reservation was justified' (question 1); whether respondents believed that students of 'reserved-caste category have inferior academic ability relative to general category students' (Q2); whether respondents were willing to 'include inferior academic-ability student' in their study group (Q3); whether respondents were willing to 'include reserved-caste category student' in their study group (Q4); and whether respondents believed that there was 'sufficient informal interaction' between reserved-caste and general category students (Q5).

Approximately half the participants in our main sample of 226 participants were randomly allocated to the control group, and the other half to the veiled treatment group. The study was conducted offline. The survey forms were distributed to the students at their respective dormitories, who then deposited their anonymous response sheets in a common deposit box. The responses collected from the participants were completely anonymous in both treatments. No identifying information was collected and this was clearly communicated to the participants through the consent form at the start of the survey.

Table 1: Veiled Methodology

Control Group	Treatment Group
1. Do you feel you get as much exercise as you need?	1. Do you feel you get as much exercise as you need?
2. Do you think that air pollution in India is a pressing issue that needs to be addressed immediately?	2. Do you think that air pollution in India is a pressing issue that needs to be addressed immediately?
3. Do you think that the Indian government should completely ban cryptocurrency in India?	*3. In the 2nd year are/were you willing to include a reserved-caste category student in your study group?* (Emphasis added).
4. Do you get most of your news from electronic media compared to print media?	4. Do you think that the Indian government should completely ban cryptocurrency in India?
Please circle the total number of questions from the list above for which your answer is yes.	5. Do you get most of your news from electronic media compared to print media?
0 1 2 3 4 **(B)**	Please circle the total number of questions from the list above for which your answer is yes.
In the 2nd year are/were you willing to include a reserved-caste category student in your study group?	**0 1 2 3 4 5** **(A)**
Yes No **(C)**	

As per IRB guidelines, after survey forms were collected, a debriefing statement was given to each participant, which included a request to not share any details about the survey with anyone. Almost 60 percent of the responses were collected on the same first day within a few hours, and furthermore there is no statistical difference between responses on other days (days

2 and 3) relative to the first day. The control and treatment survey documents are provided in Appendix A.

To specify our methodology, consider one of the sensitive questions we asked: "In the 2nd year are/were you willing to include a reserved-caste category student in your study group?" The methodology for the control and the veiled treatment for this question is shown in Table 1.

In the control, for each sensitive question, each participant was presented with a block of unrelated 4 yes/no questions, and the sensitive question was presented separately. The participant was requested to only report the total number of yeses to these block questions, i.e., to report a number equal to 0, 1, 2, 3, or 4. In particular, she was not asked her yes/no answer to any of the 4 block questions individually. Next, she was separately asked her yes/no answer to the sensitive question. Thus, each participant in the control was asked the sensitive question "directly" but under anonymity.

In the veiled treatment, each participant was asked her/his number of yeses out of 5 on a block of five yes/no questions, 4 of which were exactly the same unrelated questions as asked to the control group participant in their block of 4 questions. The additional question in the block of five questions asked was the same sensitive question that was asked directly to the control-group respondent.

Note that in the veiled treatment, unlike in the control, the participant doesn't report her yes/no answer to the sensitive question; instead, each participant only reports her score out of 5 on the block of five yes/no questions, and the sensitive question of our interest is included within this block. Thus, in the veiled treatment, the participant knows she has not provided her answer to the sensitive question, unless she reports 0 or 5. To avoid respondents answering 0 or 5, we tried to pick the 4 unrelated questions such that they contain at-least one question to which most respondents would answer no and one question to which most respondents would answer yes.

This design yields two measures of the proportion of participants who say yes to the sensitive question. First, the *direct* measure from the control—the proportion of participants in the control group who say yes to the sensitive question. This is the standard anonymous survey method. Second, the *veiled* measure, which is an inferred measure obtained by comparing the control and the veiled treatment as follows.

The veiled measure is the mean number of yeses out of five (for the block of 5 yes/no questions) in the veiled treatment minus the mean number of yeses out of four (for the block of 4 yes/no questions that are common across the control and treatment). The key assumption in the veiled measure is that since the participants are randomized across the two groups, the mean number of yeses out of the 4 common questions in the respective blocks should be the same across the two groups, and therefore any difference in mean number of yeses (out of 4 vs out of 5) across the two groups is the proportion of participants in the veiled treatment who are saying yes to the additional question, which is the sensitive question of our interest. This assumption is lent credibility if on other observables there is no significant difference across the control and treatment.

Following Coffman et al. (2017), we argue that the veiled measure yields the proportion of participants answering yes to the sensitive question with their social desirability concerns (if any) reduced relative to the anonymous but direct measure. So, comparing the veiled measure

with the direct measure yields the effect of reducing social-desirability concerns, and (a part of) the degree of underreporting of the sensitive answer in the direct measure due to the presence of social-desirability concerns.

For example, consider the sensitive question shown in Table 1: the 'include reserved-caste category student' question (for short). When the question is asked separately from the block of 4 questions in the control, about 95 percent of participants in the control said yes (5 percent said no); this is the direct measure. To calculate the veiled measure, note that the number-of-yeses out of the block of 5 questions (including the sensitive question) in the veiled treatment was about 2.99 and the number-of-yeses out of the four-question block in the control (all four questions identical to the unrelated questions in the veiled treatment) was about 2.12, which yields a difference of about 0.87. Thus, the veiled measure yields the inference that 87 percent of participants answered yes to the sensitive question (13 percent said no). For this question, "no" is the sensitive answer. Comparing the two measures yields that the sensitive answer to this question is underreported by 8 percentage points in the anonymous setting, without the veil. Since differences in demographic variables across the two groups may be driving this difference in sensitive answers, we account for this in appropriate regressions (see Section 3) before coming up with our final estimate of the underreporting.

Table 2: Sensitive Questions

	Questions	Sensitive Answer
1.	Do you believe that caste-based reservation while allocating seats at your institute is justified?	No
2.	Do you believe that within your institute, reserved caste category students have inferior academic ability relative to general category students?	Yes
3.	In the 2nd year are/were you willing to include a student of inferior academic ability than yours in your study group?	No
4.	In the 2nd year are/were you willing to include a reserved caste category student in your study group?	No
5.	Do you believe that there is sufficient informal social interaction between general and reserved-caste category students within your institute?	No

There are five sensitive questions for which we elicit both measures, veiled and direct. These questions are reported in Table 2. In the control, each participant answered a five-part survey form. Each part contained a different block of 4 unrelated questions followed by a particular sensitive question, exactly as described for the 'include reserved-caste category student' question above. Following the five parts, there was a short demographic survey with questions on age, gender, reservation category, hometown area (rural/urban), program year (first/second), and religion. Note that none of these could help the experimenter identify the participant. In the veiled treatment, there were again five parts, where each part contained a block of 5 yes/no questions that had the four questions exactly the same as the corresponding part in the control, and the fifth question in each block was that part's sensitive question being asked with a veil.

Table 3: Descriptive Statistic

	Control Group	Treatment Group	Overall
Sub-Sample			
Main Study	105	121	226
Robustness sample for Question 2	37	36	73
Robustness sample for Question 3	32	32	64
Robustness sample for Question 4	34	34	68
Gender			
Male	150	178	328
Female	44	40	84
Did not report	14	5	19
Reservation Category			
General (Non-reserved)	124	132	256
Reserved Category (OBC, SC, ST)	51	73	124
Did not report	33	18	51
Religion			
Hindu	138	164	302
Non-Hindu	16	25	41
Did not report	54	34	88
Hometown Area			
Urban	155	172	327
Rural	32	42	74
Did not report	21	9	30
Year			
First Year Student	91	115	206
Second Year Student	103	104	207
Did not report	14	4	18

Accounting for internal consistency bias

A concern we try to address by experimental design is to check if there was any internal consistency bias (McFarland (1981)) while answering sensitive questions 2, 3, and 4 ('reserved-caste category have inferior academic ability', 'include inferior academic-ability student', and 'include reserved-caste category student'). These three questions are closely related. The respective answers yes-no-no would follow the typical statistical discrimination story. So, the answer to one question might affect the response to another question.

To perform a robustness-check against such internal-consistency bias we surveyed additional participants (over and above the main sample). Each of these additional participants was assigned to a particular sensitive question: Q2, Q3, or Q4. And within that question to either a robustness control or robustness veiled treatment. E.g., if a participant was assigned to the robustness control (respectively, veiled treatment) for question 3, she would be asked only part

3 of the main-sample control (veiled treatment) survey along with demographic questions. Thus, each of these additional participants was exposed to exactly one sensitive question, either in the control or in the veiled treatment. For each of questions 2, 3, and 4, we had more than 30 participants each in its robustness control and robustness treatment.

3. Empirical Analysis Methodology

To check whether the veiled treatment increased the proportion of participants who gave the sensitive answer to the sensitive question we specify the following regression model for each of the five sensitive questions. For sensitive question *q* whose sensitive answer is "yes" (e.g., the 'reserved-caste category have inferior academic ability' question) the dependent variable for individual *i* in the veiled treatment is the number of yeses out of 5. For each participant in the control, the dependent variable is the sum of the following two components: (a) the number of yeses out of the 4 non-sensitive questions, plus (b) 1 if the participant answers yes to the directly asked sensitive question and 0 otherwise. We also control for all observable demographic variables. Hence, for a question which has "yes" as its sensitive answer, we estimate

$$(\text{No. of yeses out of five})_{qi} = \text{Constant} + \beta X_i + \mu_q \text{Treatment\_Dummy}_i + \varepsilon_i. \quad (1)$$

In equation (1), Treatment_Dummy_i is an indicator variable which equals 1 if the participant is in the veiled treatment group. μ_q is the key variable that estimates the increase in the proportion of sensitive answers in the veiled treatment relative to the control. That is, μ_q measures the under-reporting of the sensitive answer under the standard anonymous direct-report method. X_i is the vector of observable demographics: age, gender, reservation category, hometown area (rural/urban), program year (first/second), and religion.

For a question *q* whose sensitive answer is "no" the dependent variable for individual *i* in the veiled treatment group is the *number of noes* out of 5, which is 5 minus the number of yeses. For each participant in the control group, the dependent variable is the sum of the following two components: (a) the number of noes out of the 4 non-sensitive questions, plus (b) 1 if the participant answers no to the directly asked sensitive question and 0 otherwise. The rest of the analysis is similar to (1). So, for a question which has "no" as its sensitive answer, we estimate

$$(\text{No. of noes out of five})_{qi} = \text{Constant} + \beta X_i + \mu_q \text{Treatment\_Dummy}_i + \varepsilon_i. \quad (2)$$

Again, μ_q estimates the increase in the proportion of sensitive answers in the veiled treatment relative to the control, or the degree of underreporting of the sensitive answer in the anonymous direct-report method.

3.1 Correlation between direct responses and observable demographics

For the questions where we find the direct responses in the control robust to the social desirability bias, i.e., for *q* where we find that the treatment effect μ_q is not significantly different from zero, we check for any correlation between observable demographics and the direct reports of the sensitive answer. We do this by fitting a linear probability model as follows

$$(\text{Direct sensitive answer to the sensitive question})_{qi} = \text{Constant} + \gamma X_i + \varepsilon_i \quad (3)$$

The dependent variable is 1 if the respondent reports the sensitive answer and X_i is the vector of observable demographics.

We skip this analysis for the questions where we find significant under-reporting of the sensitive answer in the direct measure. This is because in such questions there is evidence of social desirability bias in the direct responses. So, an analysis of these biased direct reports could lead to incorrect inferences, which is one of the key points we want to make in this paper.

3.2 Internal consistency robustness check

To empirically test for the presence of any internal consistency bias, for each of questions 2, 3, and 4, we specify the following regression model:

$$\textit{(No. of yeses (q2) or noes (q3, q4) out of five)}_{qi} = \text{Constant} + \beta X_i + \mu_q \textit{Treatment\_Dummy} + \alpha_1 \textit{Robustness\_Dummy} + \alpha_2 \textit{Treatment\_Dummy*Robustness\_Dummy} + \varepsilon_i. \quad (4)$$

Here α_1 captures if the main-sample control is different from the robustness control, while α_2 captures if the veiled treatment in the robustness sample had a differential impact relative to the impact of the veiled treatment in the main sample. (4) is the key specification we use to draw conclusions from our results since it includes all the data and controls. We estimate heteroscedasticity robust standard error in all our regression models.

4. Results

In total, 431 students participated in our survey, which is a substantial proportion of the entire relevant student body in the business school we studied.[4] These 431 students were allocated to the main sample or the samples for the three individual robustness checks, each with a separate between-subject control and treatment. The split of the sample into the various groups and the demographic details of the participants is detailed in Table 3.

About 60 percent of the students in our survey (main and individual robustness samples) report that they belong to the general category (non-reserved), and 29 percent report that they belong to the reserved category (OBC, SC, and ST). The remaining 11 percent chose not to answer this question. See Table 3 for these details.

Table 4: Comparison of demographic characteristics between treatment and control group (Chi-Square Test) (two tailed p-values)

Demographic Variables	Main study	Robustness sample Q2	Robustness sample Q3	Robustness sample Q4
Gender (Male/Female)	0.19	0.95	0.88	0.70
Reservation Category (General/Reserved)	0.62	0.14	0.91	0.99
Area (Urban/Rural)	0.86	0.24	0.76	0.33
Year (First/Second)	0.77	0.68	0.71	0.80
Religion (Hindu/Non-Hindu)	0.27	0.31	0.63	0.99

We perform chi-square tests to check if the randomization across the control and treatment was successful, i.e., to check if demographic characteristics were balanced across the treatment and

[4] We don't specify the exact percentage to preserve anonymity of the business school.

control groups. We find no significant difference in the proportion of observable demographic characteristics across the two groups. This is true for both the main sample and the three individual robustness checks (see Table 4). The check for balanced demographics is especially important for us since our identification strategy relies on the assumption of successful randomization; this assumption is validated by Table 4.

Table 5 presents the direct measure, that is, the percentage of respondents in the control who report the sensitive answer when asked directly under anonymity. Tables A1-A10 in Appendix A examine the category wise proportion of sensitive answer in the control group.

Table 6 shows the level of under-reporting of sensitive answers in the control group relative to the veiled treatment after controlling for observable demographics and accounting for the robustness samples. Table 7 reports the correlation between the demographic variables and direct responses for the questions where we do not find significant under-reporting.

Table 5: Proportion reporting sensitive answer in the control group

Question	Percent
1. Do you believe that caste-based reservation while allocating seats at your institute is justified?	41
2. Do you believe that within your institute, reserved caste category students have inferior academic ability relative to general category students?	46
3. In the 2nd year are/were you willing to include a student of inferior academic ability than yours in your study group?	21
4. In the 2nd year are/were you willing to include a reserved-caste category student in your study group?	5
5. Do you believe that there is sufficient informal social interaction between general and reserved-caste category students within your institute?	13

Our analysis shows that our results are robust to the internal consistency bias between questions 2-4. Columns (2), (3), and (4) in Table 6 report the results of regression equation 4 for the three questions (questions 2, 3, and 4) that could have been considered linked. There is no significant difference between the responses of robustness sample control and the responses of main sample control; see the coefficients of the robustness dummy. Also, for each of these 3 questions, the impact of the veiled treatment in the robustness sample is not significantly different from the impact of the veiled treatment in the main sample; see the coefficients of the interaction between the robustness and treatment dummies. This suggests that the average respondent's answer to one question did not affect their response to other questions.

In the control group, where the participants were asked the sensitive question directly, but under anonymity, the proportion of sensitive answer is sizable, as shown in Table 5. This yields our first result.

Result 1: *A significant proportion (p-value of difference from zero < 0.01) of students give sensitive answers to each of the five caste-based reservation questions in the direct-report measure. The results from questions 1 through 5 using the direct-report measure are as below.*

a) *41 percent participants report that caste-based reservation in admission at their institute is not justified.*
b) *46 percent participants believe that reserved category students have inferior academic ability relative to general category students.*
c) *21 percent participants are/were unwilling to include an inferior academic ability student in their study-group.*
d) *5 percent participants are/were unwilling to include a reserved category student in their study group.*
e) *13 percent participants report a lack of informal interaction between the general and reserved category students.*

A key aim of our paper is to ascertain whether the standard anonymous surveys are effective in eliciting truthful responses on issues related to caste-based reservation in higher education. We find significant under-reporting of the sensitive answer in the control group relative to the veiled treatment for two of the five questions in our survey; see the coefficients of the veiled treatment in Table 6.

In Question 3, the proportion of students who report that they are unwilling to include an inferior-academic-ability student in their study group increases from 21 percent in the control group to 64 percent in the veiled treatment. Thus, there is under-reporting of about 43 percentage points ($p < 0.01$) in the direct measure. In Question 4, we find that 5 percent of the control group participants state that they are unwilling to include a reserved-category student in their study group. This increases to 22 percent in the veiled treatment. Thus, there is under-reporting of about 17 percentage points ($p < 0.1$). On the other three questions, we find no evidence of the presence of social desirability concerns in direct anonymous reporting.

Table 6: Effect of the Veiled treatment on the report of sensitive answer

Dependent variables: Measure of the proportion stating the sensitive answer to each question.	(Q1) Is caste based reservation justified	(Q2) Do reserved category students have inferior academic ability	(Q3) Will you include an inferior academic ability student	(Q4) Will you include a reserved category student	(Q5) Is there sufficient informal interaction
Veiled Treatment	-0.01	-0.03	0.43***	0.17*	-0.12
	(0.13)	(0.14)	(0.16)	(0.09)	(0.15)
Robustness Dummy		-0.12	0.04	0.24**	
		(0.21)	(0.24)	(0.12)	
Treatment*Robustness		-0.41	-0.17	-0.32	
		(0.28)	(0.31)	(0.19)	
Demographic Controls	Yes	Yes	Yes	Yes	Yes
Observations	168	225	217	219	168
R^2	0.03	0.07	0.06	0.02	0.03

*Note: Each column corresponds to a separate regression and represents one of the 5 sensitive questions. The dependent variable for each regression is the number of noes out of 5 to that particular question set (for Q2 it is the number of yeses since the sensitive answer is yes). For control group participants the dependent variable is the sum of two measures: (i) 1 if the respondent reported the sensitive answer to the directly asked question and 0 otherwise, and (ii) the number of noes (yeses) to the block of 4 non-sensitive questions. In the treatment group the dependent variable is the number of noes (yeses) to the block of 5 questions; where the sensitive question is grouped with the 4 non-sensitive ones. The responses are coded in a way such that positive value of the veiled treatment reflects the increase in reporting of the sensitive answer under the veiled treatment compared to the control group. Heteroscedasticity Robust Standard errors are in parenthesis. *p<0.1; **p<0.05; ***p<0.01.*

Result 2: *There is significant underreporting about both, the tendency to exclude a reserved category student as well as the tendency to exclude an academically-inferior student from one's study group. The measure of the tendency to exclude a reserved category student increases from 5 percent in the direct measure to 22 percent in the veiled measure. The measure of the tendency to exclude an academically-inferior student increases from 21 percent in the direct measure to 64 percent in the veiled measure.*

The underreporting that we observe here has implications for studies that want to accurately measure and analyse the attitudes of students towards caste-based reservation and its beneficiaries. Elicitations under standard anonymous surveys may not reflect the true beliefs of students.

We have shown evidence for the presence of stigma associated with reporting of the sensitive answer, even under strict anonymity, regarding the existence and magnitude of discrimination in inclusion of reserved category students in study groups. We have also shown under-reporting of an important possible channel for this discrimination: participants under-report the fact that they don't want to include academically-inferior students. This is especially relevant given that more than 40 percent participants report that they consider reserved category students academically inferior (Result 1b).

Table 7: Correlation between direct responses and demographics

Demographic Characteristics of the Respondent	(Q1) Is reservation justified (No=1)	(Q2) Do reserved category students have inferior academic ability (Yes=1)	(Q5) Is there sufficient informal interaction (No=1)
Reservation category student	-0.27**	-0.33***	0.01
	(0.13)	(0.11)	(0.10)
Male	-0.05	0.19	-0.01
	(0.15)	(0.13)	(0.11)
Age	0.03	0.02	0.04
	(0.03)	(0.03)	(0.03)
Hometown Area-Urban	-0.05	0.14	-0.17
	(0.16)	(0.13)	(0.15)
Second year of the MBA program	0.05	0.11	-0.07
	(0.13)	(0.11)	(0.10)
Non-Hindu	-0.33	0.02	-0.22
	(0.27)	(0.19)	(0.09)
Robustness Dummy		-0.05	
		(0.13)	
Observation	70	96	70
R^2	0.09	0.13	0.08

*Note: Each column corresponds to a separate regression. We fit a linear probability model where the dependent variable equals one if respondent reported the sensitive answer ('No' for questions 1 & 5 and 'Yes' for question 2) and 0 otherwise. Except Age, each of the demographic characteristics are represented by a dummy variable. The reference category for each of the dummy variables is reported in the table. Heteroscedasticity Robust Standard errors are in parenthesis. *p<0.1; **p<0.05; ***p<0.01*

Finally, in questions where there is no significant under-reporting of the sensitive answer, we check for any correlation between the demographic variables and the reporting of the sensitive answer in the control group. Using the linear probability model, we find that reporting of the sensitive answer is significantly correlated with the reservation category of the respondent (see the coefficients of 'Reservation category student' in Table 7) while other demographics are uncorrelated. [5] Result 3 describes our findings on such correlations.

Result 3: *In the questions where we find no measurement bias in the direct measure, the following correlations are notable. Students belonging to the reserved category are 27 percentage points more likely (p-value < 0.05) to report that caste-based reservation is justified (question 1) compared to the general category students. Reserved category students are 33 percentage points less likely (p < 0.01) than general category students to report that reserved category students have inferior academic ability relative to general category students (question 2).*

5. Concluding remarks

The results show that around 41 percent of MBA students at a business school in India believe that reservation based on caste is not justified. 46 percent believe that reserved category students are academically inferior. We also find that general category students are more likely to report such beliefs compared to reserved category students.

More broadly, we show the presence of measurement biases due to social desirability concerns in answering sensitive questions related to caste and study-group formation, even under strict anonymity. In particular, when participants are asked under anonymity *and* a veil, we find that the inferred tendency to exclude a reserved category student from one's study group increases from 5 percent in the direct report (under only anonymity) to 22 percent in the veiled treatment (under both anonymity and veil).

One of the possible drivers of this tendency is also underreported in the direct report. We find that the tendency to exclude an academically-inferior student from one's study group increases from 21 percent in the direct report to 64 percent in the veiled measure. We can only conjecture that students are possibly affected by social desirability concerns (even in anonymous surveys) in revealing how much they care about grades.

Thus, we find that social-desirability concerns can bias measurements using anonymous surveys to investigate caste-related issues. Furthermore, our results reveal significant levels of sometimes hidden post-reservation discrimination against reserved category students in a higher educational institution. In our setting, this discrimination can have significant academic and economic ramifications since study groups affect grades and grades can affect placement outcomes (Chakravarty and Somanathan (2008)).

Certainly, using our data, we cannot say why there is a tendency to exclude reserved category students from study groups. The data only *suggests* a statistical discrimination channel (Phelps (1972), Arrow (1973)): 46 percent of participants believe reserved category students have inferior academic ability, and (using the veiled measure) 64 percent are unwilling to include academically-inferior students. But the anonymous direct reporting of the latter is found affected by social desirability bias. As such, it seems imprudent to conclude that it is this

[5] We get similar results under logit and probit specifications.

statistical channel that is causing the discrimination towards reserved category students in endogenous study-group formation. Moreover, our finding shows that it may require thorough robustness testing to study statistical discrimination using direct anonymous reporting.

Our findings have certain policy implications. The fact that 41 percent students believe that caste-based reservation is not justified seems to indicate a need for sensitization of general category students (where the "not justified" belief is more prevalent) about the need for such a policy. The fact that endogenous study-group formation may exclude reserved category students from certain study groups they may want to join, to improve their grades or to improve their learning, indicates that caste-based reservation in admission may need to be supported by nurturing policies post admission. More specifically, many business schools in India sort student exogenously in the first year of their MBA, but allow for endogenous sorting in the second year. [6] Our finding on caste-based discrimination in endogenous sorting suggests that exogenous sorting even in the second year is worth considering.

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[6] As a part of our study, we also wanted to check if exposure to reserved-category peers in the first-year study group (which is exogenously assigned by the business school) has any impact on the second-year study group choices or grades etc. We could not get the due approvals to obtain this data since caste is an extremely sensitive subject. Thus, we could not perform this analysis. Such an investigation could be an interesting area for further research.

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Appendix A: Proportion of sensitive answer in control group (Category wise)

Question 1: Do you believe that caste-based reservation while allocating seats at your institute is justified?

Table A1: Q1- Frequency of sensitive answer: Category Wise

	0 (Non-Sensitive answer)	1 (Sensitive answer)	Did Not respond
General	31	32	0
OBC	13	4	0
SC	7	1	0
ST	1	1	0
NA	8	5	2

Table A2: Q1- Proportion of sensitive answer: Category Wise

	0 (Non-Sensitive answer)	1 (Sensitive answer)	Did Not respond
General	49%	51%	0%
OBC	76%	24%	0%
SC	87%	13%	0%
ST	50%	50%	0%
NA	53%	33%	13%

Question 2: Do you believe that within your institute, reserved caste category students have inferior academic ability relative to general category students?

Table A3: Q2- Frequency of sensitive answer: Category Wise

	0 (Non-Sensitive answer)	1 (Sensitive answer)	Did Not respond
General	36	50	0
OBC	12	10	0
SC	9	0	0
ST	1	1	0
NA	17	5	1

Table A4: Q2- Proportion of sensitive answer: Category Wise

	0 (Non-Sensitive answer)	1 (Sensitive answer)	Did Not respond
General	42%	58%	0%
OBC	54%	46%	0%
SC	100%	0%	0%
ST	50%	50%	0%
NA	74%	22%	4%

Question 3: In the 2nd year are/were you willing to include a student of inferior academic ability than yours in your study group?

Table A5: Q3- Frequency of sensitive answer: Category Wise

	0 (Non-Sensitive answer)	1 (Sensitive answer)	Did Not respond
General	67	16	0
OBC	18	4	0
SC	10	1	0
ST	1	1	0
NA	11	7	1

Table A6: Q3- Proportion of sensitive answer: Category Wise

	0 (Non-Sensitive answer)	1 (Sensitive answer)	Did Not respond
General	81%	19%	0%
OBC	82%	18%	0%
SC	91%	9%	0%
ST	50%	50%	0%
NA	58%	37%	5%

Question 4: In the 2nd year are/were you willing to include a reserved-caste category student in your study group?

Table A7: Q4- Frequency of sensitive answer: Category Wise

	0 (Non-Sensitive answer)	1 (Sensitive answer)	Did Not respond
General	74	6	1
OBC	22	1	0
SC	11	0	0
ST	3	0	0
NA	20	0	1

Table A8: Q4- Proportion of sensitive answer: Category Wise

	0 (Non-Sensitive answer)	1 (Sensitive answer)	Did Not respond
General	91%	8%	1%
OBC	96%	4%	0%
SC	100%	0%	0%
ST	100%	0%	0%
NA	95%	0%	5%

Question 5: Do you believe that there is sufficient informal social interaction between general and reserved-caste category students within your institute?

Table A9: Q5- Frequency of sensitive answer: Category Wise

	0 (Non-Sensitive answer)	1 (Sensitive answer)	Did Not respond
General	55	8	0
OBC	15	2	0
SC	5	3	0
ST	2	0	0
NA	11	1	3

Table A10: Q5- Proportion of sensitive answer: Category Wise

	0 (Non-Sensitive answer)	1 (Sensitive answer)	Did Not respond
General	87%	13%	0%
OBC	88%	12%	0%
SC	63%	37%	0%
ST	100%	0%	0%
NA	73%	7%	20%

Appendix B: Survey documents

Introduction to the survey: This was identical for each control and treatment group participant.

This survey intends to study certain attitudes and behaviour of students currently enrolled in business/ management schools in India. This is being conducted by Prof. Jeevant Rampal (faculty, Economics area, IIM Ahmedabad) and Saif Ali Khan (Research Assistant at IIM Ahmedabad) for their research. We would like you to fill out a short survey which will not take more than 10 minutes. The data collected will be completely anonymous and will only be used for research purposes. You will not be asked to report your name, email id or any other information which can be used to identify the individual from their responses. The institute's name will also be kept anonymous in any disclosure of results.

Participation in this survey is voluntary. You can skip any question you do not wish to answer. At any time during the survey, if you wish to discontinue, you can do so. Some of the questions might cause discomfort to some of the participants and we advise the participants to use their discretion. We encourage the participants to not answer questions and/or discontinue the survey if they think that the questions or survey may cause them any discomfort. We also encourage the participants to contact any one of the principal investigators (Prof. Jeevant Rampal, Mr. Saif Ali Khan) in case of any issues faced while answering the survey.

If you agree with this, please proceed further and complete the survey. Otherwise, you can end the survey at this point. Proceeding further will be considered as consent provided for the study.

This study has been cleared by the IRB Committee, IIM Ahmedabad. The approval number is IIMA IRB 2022-20.

Survey document for a participant in the control group

General instructions: You will be presented with five sets of yes/no questions. Each set will have two components: (i) 4-questions marked (a)-(d), and (ii) two individual questions marked by bullet points. Within each set, for the questions marked (a)-(d) *don't provide individual answers*, instead *only provide the total number of the questions in (a)-(d) for which your answer is yes.* This number (0, 1, 2, 3, or 4) will be asked after questions (a)-(d). For the two subsequent individual questions marked by bullet points, please provide individual yes or no answers where indicated. Please note that anonymity will be maintained as specified in the preceding page.

Set 1

(Please don't provide yes/no answers for individual (a)-(d) questions; please only note the number of yeses.)

(a) Do you spend more than 6 hours in a day in front of a screen (mobile/computer) on an average?
(b) Have you ever received any type of phishing email (fraudulent message designed to trick victims into revealing sensitive information)?
(c) Have you ever taken any paid professional advice on financial matters?
(d) Have you had a traffic accident in the last 3 months?

Please circle the total number of questions from the list above for which your answer is yes.

0 1 2 3 4

(Please provide yes/no answers for individual questions in bullet points.)

- Do you believe that caste-based reservation while allocating student seats at your institute is justified?

  Yes No

- Have you ever lied or overstated your academic/professional achievements on any professional networking site (LinkedIn, etc.)?

  Yes No

Set 2

(Please don't provide yes/no answers for individual (a)-(d) questions; please only note the number of yeses.)

(a) Have you bought any type of health insurance plan for yourself?
(b) Have you used UPI as the payment option in the past 5 days?
(c) Have you been to a movie theatre at least once since the lockdown was lifted after the third COVID-19 wave?
(d) Do you take any vitamin or protein supplements regularly?

Please circle the total number of questions from the list above for which your answer is yes.

0 1 2 3 4

(Please provide yes/no answers for individual questions in bullet points.)

- Have you ever felt envious after seeing a friend's post on any social media platform (Instagram, Facebook, etc.)?

  Yes No

- Do you believe that within your institute, reserved-caste category students have inferior academic ability relative to general category students?

  Yes No

Set 3

(Please don't provide yes/no answers for individual (a)-(d) questions; please only note the number of yeses.)

(a) Have you ordered food online at least once in the past 5 days?
(b) Do you know the political party of the member of parliament from your hometown constituency?
(c) Will you stop buying products/services from a company if it is found guilty of unethical practices?
(d) Do you think that Gujarat should remain a dry state?

Please circle the total number of questions from the list above for which your answer is yes.

0 1 2 3 4

(Please provide yes/no answers for individual questions in bullet points.)

- In the 2nd year are/were you willing to include a student of inferior academic ability than yours in your study group?

  Yes No

- Have you ever lied about your personal information (e.g., age) or physical appearance in your online dating profile?

  Yes No

Set 4

(Please don't provide yes/no answers for individual (a)-(d) questions; please only note the number of yeses.)

(a) Do you feel you get as much exercise as you need?
(b) Do you get most of your news from electronic media compared to print media?
(c) Do you think that air pollution in India is a pressing issue that needs to be addressed immediately?
(d) Do you think that the Indian government should completely ban cryptocurrency in India?

Please circle the total number of questions from the list above for which your answer is yes.

0 1 2 3 4

(Please provide yes/no answers for individual questions in bullet points.)

- Are you more likely to share positive emotions and events than negative ones on social media platforms (Facebook, Twitter, etc.)?

  Yes No

- In the 2nd year are/were you willing to include a reserved-caste category student in your study group?

  Yes No

Set 5

(Please don't provide yes/no answers for individual (a)-(d) questions; please only note the number of yeses.)

(a) Do you think that climate change is something that is affecting you or is going to affect you, personally?
(b) Do you think that moving from 5-day to a 4-day workweek will reduce the weekly productivity of corporate employees?
(c) Were you aware of any type of cryptocurrency before 2017?
(d) Do you believe there is a lack of unbiased news reporting in India?

Please circle the total number of questions from the list above for which your answer is yes.

0 1 2 3 4

(Please provide yes/no answers for individual questions in bullet points.)

- Do you believe that there is sufficient informal social interaction between general category students and reserved-caste category students within your institute?

  Yes No

- Have you ever lied about the quality or the condition of a product while selling it online (OLX, Quikr.com etc.)?

  Yes No

Kindly fill in the following information. You are not being asked to report your name, email-id, etc., and you can skip any question that you do not wish to answer.

1. Age:
2. Gender:
3. Reservation Category (General, OBC, SC, ST):
4. Religion:
5. Hometown Area (Rural or Urban):
6. First-year student or second-year student:

Survey document for a participant in the treatment group

General instructions: You will be presented with five sets of yes/no questions. Each set will have 5-questions marked (a)-(e). Within each set, for the questions marked (a)-(e) *don't provide individual answers*, instead *only provide the total number of the questions in (a)-(e) for which your answer is yes.* This number (0, 1, 2, 3, 4 or 5) will be asked after questions (a)-(e). Please note that anonymity will be maintained as specified in the preceding page.

Set 1

(Please don't provide yes/no answers for individual (a)-(e) questions; please only note the number of yeses.)

(a) Do you spend more than 6 hours in a day in front of a screen (mobile/computer) on an average?
(b) Have you ever received any type of phishing email (fraudulent message designed to trick victims into revealing sensitive information)?
(c) Have you ever taken any paid professional advice on financial matters?
(d) Have you had a traffic accident in the last 3 months?
(e) Do you believe that caste-based reservation while allocating student seats at your institute is justified?

Please circle the total number of questions from the list above for which your answer is yes.

0 1 2 3 4 5

Set 2

(Please don't provide yes/no answers for individual (a)-(e) questions; please only note the number of yeses.)

(a) Have you bought any type of health insurance plan for yourself?
(b) Have you used UPI as the payment option in the past 5 days?
(c) Have you been to a movie theatre at least once since the lockdown was lifted after the third COVID-19 wave?
(d) Do you believe that within your institute, reserved-caste category students have inferior academic ability relative to general category students?

(e) Do you take any vitamin or protein supplements regularly?

Please circle the total number of questions from the list above for which your answer is yes.

0 1 2 3 4 5

Set 3

(Please don't provide yes/no answers for individual (a)-(e) questions; please only note the number of yeses.)

(a) Have you ordered food online at least once in the past 5 days?
(b) In the 2nd year are/were you willing to include a student of inferior academic ability than yours in your study group?
(c) Do you know the political party of the member of parliament from your hometown constituency?
(d) Will you stop buying products or services from a company if it is found guilty of unethical practices?
(e) Do you think that Gujarat should remain a dry state?

Please circle the total number of questions from the list above for which your answer is yes.

0 1 2 3 4 5

Set 4

(Please don't provide yes/no answers for individual (a)-(e) questions; please only note the number of yeses.)

(a) In the 2nd year are/were you willing to include a reserved-caste category student in your study group?
(b) Do you feel you get as much exercise as you need?
(c) Do you get most of your news from electronic media compared to print media?
(d) Do you think that air pollution in India is a pressing issue that need to be addressed immediately?
(e) Do you think that the Indian government should completely ban cryptocurrency in India?

Please circle the total number of questions from the list above for which your answer is yes.

0 1 2 3 4 5

Set 5

(Please don't provide yes/no answers for individual (a)-(e) questions; please only note the number of yeses.)

(a) Do you think that climate change is something that is affecting you or is going to affect you, personally?
(b) Do you believe that there is sufficient informal social interaction between general category students and reserved-caste category students within your institute?
(c) Do you think that moving from 5-day to a 4-day workweek will reduce the weekly productivity of corporate employees?
(d) Were you aware of any type of cryptocurrency before 2017?
(e) Do you believe there is a lack of unbiased news reporting in India?

Please circle the total number of questions from the list above for which your answer is yes.

0 1 2 3 4 5

Kindly fill in the following information. You are not being asked to report your name, email-id, etc., and you can skip any question that you do not wish to answer.

1. Age:
2. Gender:
3. Reservation Category (General, OBC, SC, ST):
4. Religion:
5. Hometown Area (Rural or Urban):
6. First-year student or second-year student:

Debriefing Statement: This was identical for each control and treatment group participant.

We would like to thank you for participating in our survey. Your participation is greatly appreciated.

In the consent form we informed you that the purpose of the survey is to study certain attitudes and behaviour of students currently enrolled in business schools. Specifically, the purpose of our study is to assess the students' attitude towards caste-based reservation, in particular how this attitude relates to study-group formation. We would like to reassure the participants that the data collected is completely anonymous and will be used for research purposes only. Not even the principal investigators can identify any individual from their responses. Your institute's name will also be kept anonymous in any disclosure of results. If you have any further questions or you feel any discomfort after completing the survey, please contact any one of the principal investigators (Prof. Jeevant Rampal, Mr. Saif Ali Khan).

We would like to apologize for not providing you with all the details prior to your participation. It was necessary in order to get an accurate measure of the respondents' attitude. Questions related to caste-based reservation are sensitive in nature and when asked directly, respondents can potentially alter their responses. To minimize this effect and get an accurate measure, we used the ***Item Count Technique (ICT)*** *or the veiled methodology.*

This methodology requires that we do not reveal the true purpose of the study at the start of the survey and divide the participants into two groups. Depending on whether you were in the control group or treatment group, each set of questions included a sensitive question (the focus of our study) which you were asked directly or grouped with other non-sensitive questions respectively. A comparison of the answers between the two groups will give us an accurate measure of the students' attitude. If you would like to learn more about the Item Count Technique, please see Coffman et al. (2017).

Please note that although the purpose of this study was not explicitly specified in the consent form, everything else has been clearly stated. This includes the ways in which we will keep your data confidential and anonymous. No personal information has been collected which can be used to identify any of the participant.

We request you to not disclose the true purpose of our study and the methodology used to anyone as this could affect the results of the future rounds of this study.

Thank you again for your participation.

Reference in the debriefing statement

Coffman, K.B., Coffman, L.C. & Ericson, K.M.M. (2017). The size of the LGBT population and the magnitude of anti-gay sentiment are substantially underestimated. Management Science, 63(10), 3168–3186.