Student Evaluations of Teaching (Mostly) Do Not Measure Teaching Effectiveness

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The truth will set you free, but first it will piss you off.

Gloria Steinem

Abstract

We examine student evaluations of teaching (SETs) in two different contexts to determine whether they primarily measure actual teaching effectiveness, using nonparametric permutation tests. In the context of a natural experiment at a French university, we study relationships among SETs and the genders of students and instructors, final exam scores, and students' grade expectations for 23,001 SETs of 379 instructors by 4,423 students over five years in six different mandatory first year courses. In the context of an online randomized controlled experiment at a US university, we study the relationships among SETs, the gender of students, and the actual and perceived genders of instructors. We find significant associations between SETs and genders (perceived women instructors receive significantly lower SET scores), as well as between SETs and expected grades (higher expected grades are associated with higher SET scores). However, SETs are not significantly associated with an objective measure of teaching effectiveness (student performance on final exams). Our results suggest that SETs do not primarily measure the extent to which an instructor helps student learning, but depend on student biases to a large extent. Finally, we find that the extent and direction of gender biases vary depending on context, making it difficult for universities to correct for these biases, without performing an analysis of their own SETs.

1 Background

Student evaluations of teaching (SETs) are used widely in higher education as a measure of teaching quality. They figure in the hiring, promotion and firing of instructors, especially non-tenured faculty. Universities generally treat SETs as a measure of teaching effectiveness, rather than, e.g., a measure of student satisfaction. Because ascertaining teaching effectiveness is so difficult—for students, faculty and administrators alike—attempts to measure teaching effectiveness by surveying student opinion may suffer from conscious or unconscious biases. In this article, we adopt the definition by Centra and Gaubatz [2000], according to whom biases in SETs correspond to a situation in which "a teacher or course characteristic affects teacher evaluations, either positively or negatively, but is unrelated to criteria of good teaching, such as increased student learning" (p. 17).

Past research suggests that biases do pervade SETs. For instance, randomized experiments show that students confuse grades (or grade expectations) with long-term value (key recent studies are Carrell and West [2010], Braga et al. [2014]). These experiments show that SET scores are not associated with student performance in follow-on courses, suggesting that SETs do not measure actual teaching effectiveness nor effective learning. Instead, students may prefer exerting less effort in a course, choosing to reward an instructor who is an easy grader. Instructors who are easy graders or who teach to the test may therefore obtain high SET scores, despite the fact that they encourage shallow learning.

Gender biases may also explain how students rate instructors. In the context of a natural experiment at a French university, recent work by Boring [2015a] suggests that gender biases and stereotypes influence the way that students rate instructors. Her research shows that male first year undergraduate students tend to give higher

excellent scores to male instructors, despite male instructors being seemingly as efficient instructors as female instructors. Recent work by MacNell et al. [2014] has also demonstrated in a randomized, controlled experiment that, on average, students rate a given instructor lower on every aspect of teaching (including "objective" measures such as timeliness) when they think the instructor is female than when they think the instructor is male.

Here, we use the databases from Boring [2015a] and MacNell et al. [2014] to investigate hypotheses relating to whether the SET scores, including the overall satisfaction score, primarily measure teaching effectiveness or student biases. The two main potential biases we study are students' grade expectations and the gender of the instructor. We also determine whether there are systematic differences in how students rate courses in different disciplines using the data from Boring [2015a].

We use nonparametric permutation tests, which allow us to avoid counterfactual assumptions about generative models for the data, which regression-based methods (including ordinary linear regression, mixed effects models, logistic regression, etc.) and parametric methods such as t-tests and ANOVA, would require. The null hypotheses for our tests are simply that some characteristic—e.g., instructor gender—amounts to an arbitrary label and might as well have been assigned at random.

Our analysis is conducted at the level of courses, which matches how SETs are used in practice by institutions: typically, student responses in a given course are averaged, and those averages are compared across instances of the course, across courses in a department and across departments within a university. Some of the statistical issues in this reduction of SETs to averages are discussed by Stark and Freishtat [2014]

We find that SET scores primarily do not measure teaching effectiveness. Instead, our results confirm that gender biases and grade expectations can be strong

determinants of SET scores. While our analysis of the French data finds that male students tend to rate male instructors higher with no difference in ratings by female students, our analysis of the US data suggests that female students tend to rate female instructors lower with no difference in ratings by male students. In both cases, male instructors eventually receive higher SET scores, but the causes of these higher scores differ according to context. The French database also shows that differences in course types matter. Our results further suggest that students do confuse grade expectations with actual student learning when they rate their instructors. We therefore conclude that student biases in SETs exist, with the effects changing depending on context, and that it is impossible to control for these potential biases given the varying nature of contexts. However, the fact that gender biases exist in some contexts suggests that SETs are not a valid measure of teaching effectiveness.

2 Tests of Boring [2015a]

2.1 The data

We first use a remarkable census of SETs by first-year students at a French university, collected between 2008 and 2013, comprising 23,001 SETs by 4,423 students (57% women) of 1,177 sections, taught by 379 instructors (34% women). These data are discussed in detail by Boring [2015a]. The key aspects of the data are as follows:

- All first year students take the same six mandatory courses, in: history, macroeconomics, microeconomics, political institutions, political science and sociology. Each course has one main professor, who delivers the lectures (to groups of approximately 900 students). All main professors are men. Courses have many sections of 10–24 students. Those sections are taught by different instructors.

The instructors have considerable pedagogical freedom.

- Students enroll in "triads" of sections of these courses. The enrollment process does not allow students the freedom to select individual instructors. The assignment of students to sections is "as if" at random.

- Section instructors provide interim grades during the semester. Students know what their interim grades are when they complete their SETs, so interim grades are a good measure of grade expectations.

- Final exams are created by the main professor, and all students in a given course take the same final. Final exams are graded anonymously in all disciplines except political institutions (which we omit from analyses involving final exam scores). This feature makes performance on the final exam a reasonable measure of the value the section instructor adds: students of more effective instructors should do better on the final exam, on average.

- SETs are mandatory: the response rates are nearly perfect.

SETs include closed-ended and open-ended questions, but the question that attracts the most attention is the overall score, which is considered to be a summary of the scores on the other questions.

Our SET database includes students' individual evaluations of instructors in the sections for microeconomics, history, political institutions, and macroeconomics for the five academic years 2008–2013, and for sociology and political science courses for the three academic years 2010–2013 (these two courses were introduced in 2010). The SET scores are anonymous to the instructors, who only have access to them once all grades have been officially recorded on student transcripts, several weeks after final exams. Instructors and academic coordinators then have access to the

SETs. When scores are low, the academic coordinator discusses the SETs with the instructor and decides to maintain the instructor for the next semester or not.

Table 1: Descriptive statistics of instruction sections

	N. courses	N. instructors	% Female instructors
Overall	**1,194**	**379**	**33.8%**
History	230	72	30.6%
Political institutions	229	65	20.0%
Microeconomics	230	96	38.5%
Macroeconomics	230	93	34.4%
Political science	137	49	32.7%
Sociology	138	56	46.4%

Note: the data for one political institutions section were excluded as this section had an experimental online format. The political science and sociology courses were originally not included in the triad system, and students were randomly assigned by the administration to different sections.

While 34% of the 1,194 instruction sections are taught by women (Table 1), there is some variation by discipline. The political institutions sections are the ones more often taught by men (only 20% are taught by women). The sociology sections are almost equally divided between male and female instructors (46.4% are taught by women). The microeconomics and macroeconomics sections have a larger number of different instructors, because of a higher turnover of instructors.

2.2 Analysis of SET and grades

Teaching effectiveness is multidimensional (e.g. Marsh and Roche [1997]) and is therefore difficult to measure. But effective teaching should generate student learning, suggesting that effective instructors should lead their students to understand and learn more course material. Effective instructors should therefore cause their students to obtain higher grades on the final exams, on average.

We first test whether SET scores are correlated with higher grades on the final

exam, on average by instruction section (Table 2). The results suggest that SET scores do not always measure actual teaching effectiveness. Overall, final exam grades are not statistically correlated with SET scores (one-sided p-value of 0.70). The only two courses for which they are correlated are microeconomics and macroeconomics (p-values of 0.03 and 0.04). SET scores are uncorrelated with student achievement in the three other courses that are graded anonymously, i.e. history (p-value of 0.31), political science (p-value of 0.53) and sociology (p-value of 0.27).

Table 2: Correlation between average SET scores and final exam grades, by instruction section

	ρ	p-value
Overall	-0.02	0.70
History	0.03	0.31
Macroeconomics	0.12	0.04
Microeconomics	0.13	0.03
Political science	-0.01	0.53
Sociology	0.05	0.27

Note: one-sided p-values are reported, since we expect that higher SET scores are likely to be correlated with higher final exam grades.

2.3 The correlation between SET scores and gender

Although mostly uncorrelated with students' performance on the final exam, SETs appear to be much better predictors of gender. Overall, average SET scores and instructor gender are correlated, with male instructors obtaining significantly higher SET scores overall (p-value of 0.00). There are, however, strong variations by course type (Table 3). Male instructors of history, macroeconomics and political institutions courses receive (weakly) significantly higher overall satisfaction scores (p-values of 0.07, 0.08 and 0.10 respectively). The relationship is also positive between SET scores and instructor gender for microeconomics, political science and sociology

courses, although not significant (p-values of 0.58, 0.43 and 0.26 respectively).

Table 3: Analyzing the correlation between average SET score and instructor gender, by course

	ρ	p-value
Overall	0.10	0.00
History	0.12	0.07
Political institutions	0.11	0.10
Macroeconomics	0.11	0.08
Microeconomics	0.04	0.58
Political sciences	0.07	0.43
Sociology	0.10	0.26

Note: two-sided p-values are reported.

Do men receive higher SET scores overall because they are better instructors? If men were indeed better instructors, then their students should perform better on final exams, on average. This is not what we find (Table 4). Indeed, the correlation between student performance and instructor gender is negative, although statistically insignificant (p-value of 0.51 overall), suggesting that men are, at best, equally as effective instructors as women. If anything, the results suggest that women might be better instructors (although, again, the p-values are all statistically insignificant).

Table 4: Correlation between final exam average and instructor gender, by course

	ρ	p-value
Overall	-0.02	0.51
History	-0.06	0.39
Macroeconomics	0.00	0.97
Microeconomics	-0.03	0.63
Political sciences	0.02	0.79
Sociology	-0.00	0.97

Note: two-sided p-values are reported.

So why do male instructors receive higher SET scores? SET scores and instructor gender are correlated, because male students tend to give higher SET scores to

male instructors (Table 5). Our permutation tests confirm the results found by Boring [2015a]. Gender concordance is a statistically strong predictor of SET scores for men (p-value of 0.00 overall). Male students give higher SET scores to male instructors in all fields. The correlations are statistically significant in history (p-value of 0.00), macroeconomics (p-value of 0.04), political science (p-value of 0.06), political institutions (p-value of 0.07) and microeconomics (p-value of 0.10). The correlation is positive although statistically insignificant in sociology (p-value of 0.15).

Although gender concordance is correlated with overall satisfaction scores for male students, SET scores of female students are not statistically correlated with instructor gender (p-value of 0.49 overall). The correlation is negative in some fields (history, political institutions, macroeconomics and sociology) and positive in others (microeconomics and political science), but always statistically insignificant (p-values between 0.19 and 0.97).

Table 5: Correlation between SET scores and gender concordance

	Male student		Female student	
	ρ	p-value	ρ	p-value
Overall	0.15	0.00	0.02	0.49
History	0.18	0.00	-0.04	0.54
Political institutions	0.12	0.07	-0.09	0.19
Macroeconomics	0.14	0.04	-0.08	0.21
Microeconomics	0.11	0.10	0.03	0.67
Political sciences	0.16	0.06	0.00	0.97
Sociology	0.12	0.15	-0.05	0.53

Note: two-sided p-values are reported.

Do male instructors receive higher SET scores from male students because their teaching styles match male students' learning styles? If that were the case, then male students who had male instructors should perform better on the final exam. However, this is not what we find (Table 6). If anything, male students who had

male instructors appear to perform worse overall on the final exam (the correlation is negative but statistically insignificant, with a p-value of 0.76). In history, the negative correlation (-0.11) is weakly statistically significant (p-value of 0.10). In history, male students therefore give significantly higher SET scores, despite the fact that they appear to learn more from female instructors. These results further suggest that students are not measuring actual teaching effectiveness when they complete their SETs.

Table 6: Student performance and gender concordance

	Male student		Female student	
	ρ	p-value	ρ	p-value
Overall	-0.01	0.76	0.01	0.65
History	-0.11	0.10	0.01	0.86
Macroeconomics	0.02	0.76	-0.00	0.97
Microeconomics	-0.04	0.60	0.00	0.94
Political sciences	0.10	0.25	0.03	0.76
Sociology	0.02	0.85	-0.01	0.94

Note: two-sided p-values are reported.

2.4 The correlation between SET scores and grade expectations

Not only are SET scores correlated with gender, but they are also positively and significantly correlated with expected grades (Table 7). Political institutions is the only course for which the correlation between expected grades and SET scores is not significant (p-value of 0.19). The p-values in all other courses are close to 0. The correlation coefficients are especially high in history (0.32) and sociology (0.27). They are also high in macroeconomics (0.22), microeconomics (0.19) and political sciences (0.16).

Table 7: Analyzing the correlation between average evaluation score and interim grades, by course number

	ρ	p-value
Overall	0.10	0.00
History	0.32	0.00
Political institutions	0.06	0.19
Macroeconomics	0.22	0.00
Microeconomics	0.19	0.00
Political sciences	0.16	0.03
Sociology	0.27	0.00

Note: one-sided p-values are reported.

To summarize our results, the fact that SET scores are largely uncorrelated with student achievement measured by students' final exam grades suggests that (male) students may be expressing a gender bias in favor of men when rating instructors. Furthermore, students appear to reward instructors who give them higher interim grades. We conclude that gender and expected grades create biases in SET scores, which are unrelated to effective teaching.

3 Tests of MacNell et al. [2014]

While our analysis of the data in the previous section suggests that SET scores are largely unrelated to teaching effectiveness, the natural experimental setting of the French university data does not enable us to control for potential differences in teaching styles of men and women. We know of two experiments which were able to control for teaching styles: Arbuckle and Williams [2003] and MacNell et al. [2014]. These two experiments tend to confirm that students express gender biases in SET scores, rather than reward a teaching style that matches their learning style. In both experiments, students tend to give higher SET scores when they think that the

course is being taught by a man, regardless of whether the course is actually taught by a man or a woman. Hence, differences in teaching or learning styles do not seem to explain the differences in men and women's SET scores.

In the Arbuckle and Williams [2003] experiment, a group of 352 students watched "slides of an age- and gender-neutral stick figure and listened to a neutral voice presenting a lecture and then evaluated it on teacher evaluation forms that indicated 1 of 4 different age and gender conditions (male, female, "old," and "young")" [Arbuckle and Williams, 2003, p.507]. The goal of the experiment was to measure whether "students' perceptions of a professor's age and gender influence their perceptions of the professor's warmth and enthusiasm". Differences in evaluations could thus only be caused by students' subjective age and gender-biased judgments in evaluating the lecturer's competence. The researchers find that students rated the young male instructors higher than the other three combinations, especially on "enthusiasm", "showed interest in subject" and "using a meaningful voice tone".

The results of Arbuckle and Williams [2003] are reinforced by those of MacNell et al. [2014] who use a different set-up to control for differences in teaching styles. In their experiment, MacNell et al. [2014] used SET data collected from an online course in which 43 students were randomly assigned to four discussion groups for a course, each taught by one of two assistant instructors (one man and one woman). The two instructors each taught one course under their real identity, while they taught the other course under the other instructor's identity. In this set-up, one group of twelve students thought they had a female instructor when the instructor was actually male, and twelve other students thought they had the male instructor when the instructor was actually female. The two instructors worked together with the main professor of the course, to make sure that they gave similar types of feedback to students, graded papers in exactly the same time frame, etc., so as to limit differences in teaching

styles or grading to a strict minimum.

With this framework, potential gender biases can be tested by controlling for teaching styles. Biases in student ratings can be found by comparing how students rate their instructors as a function of the *actual* versus *perceived* gender of the instructor. MacNell et al. [2014] find that "the male identity received significantly higher scores on professionalism, promptness, fairness, respectfulness, enthusiasm, giving praise, and the student ratings index... [...] Students in the two groups that perceived their assistant instructor to be male rated their instructor significantly higher than did the students in the two groups that perceived their assistant instructor to be female, regardless of the actual gender of the assistant instructor."

In this section, we once again use permutation tests, this time to analyze the data provided by MacNell et al. [2014]. The use of permutation tests is especially appropriate in this case, given the small sample size. We develop their analysis to test for the male student-instructor bias we discussed in the previous section.

We first analyze the correlation between student ratings and the reported instructor gender (Table 8). A positive result signifies that the perceived male instructor received higher evaluations. We find a weak positive correlation between the perceived gender and overall satisfaction (p-value of 0.10). The statistical significance is stronger for several of the criteria which students rated: fairness (p-value of 0.00), giving praise (p-value of 0.01), caring and promptness (both criteria have p-values of 0.04), enthusiasm (p-value of 0.05), communication (p-value of 0.06), professionalism and respect (both criteria have p-values of 0.07), and being consistent and helpful (both criteria have p-values of 0.09). The criteria that were not statistically significant were feedback, responsiveness, being knowledgeable and clear. Our permutation tests confirm and extend the results found by MacNell et al. [2014].

We then analyze in more detail whether male or female students rated the in-

Table 8: Analyzing the correlation between ratings and reported instructor gender

	t-stat	p-value
Overall	1.82	0.10
Professional	1.93	0.07
Respectful	1.93	0.07
Caring	2.24	0.04
Enthusiastic	2.14	0.05
Communicate	2.06	0.06
Helpful	1.79	0.09
Feedback	1.63	0.14
Prompt	2.21	0.04
Consistent	1.65	0.09
Fair	2.96	0.00
Responsive	1.12	0.29
Praise	2.73	0.01
Knowledge	1.64	0.13
Clear	1.37	0.19

Note: two-sided p-values are reported.

structors differently according to perceived gender. While in the previous section we found that male students rated male instructors higher, we find in the MacNell et al. [2014] experiment that the perceived male instructor received significantly higher evaluation scores because female students rated the perceived female instructor significantly lower (Table 9). Male students rated the perceived male instructor significantly (though weakly) higher on only one criteria: being fair (p-value of 0.08). Female students, however, rated the perceived female instructor lower in terms of overall satisfaction (p-values of 0.08), along most teaching dimensions: giving praise (p-value of 0.01), enthusiasm (p-value of 0.03), caring and fairness (p-values of 0.04), being respectful and communication (p-values of 0.08), professionalism (p-value of 0.09) and feedback (p-value of 0.10). Although the results show a negative correlation between being a (perceived) female instructor and ratings on being helpful, promptness, consistency, responsiveness, knowledge and clarity, the results are not statistically significant.

Table 9: Analyzing the correlation between ratings and reported instructor gender, by gender concordance

	Both male		Both female	
	ρ	p-value	ρ	p-value
Overall	0.09	0.81	-0.36	0.08
Professional	0.22	0.42	-0.36	0.09
Respectful	0.22	0.35	-0.36	0.08
Caring	0.02	0.99	-0.46	0.04
Enthusiastic	0.09	0.81	-0.44	0.03
Communicate	0.12	0.65	-0.39	0.08
Helpful	0.21	0.36	-0.24	0.33
Feedback	0.04	0.93	-0.37	0.10
Prompt	0.38	0.14	-0.37	0.13
Consistent	0.07	0.83	-0.34	0.16
Fair	0.41	0.08	-0.43	0.04
Responsive	0.18	0.53	-0.03	0.96
Praise	0.29	0.24	-0.47	0.01
Knowledge	0.08	0.80	-0.29	0.20
Clear	0.06	0.78	-0.25	0.30

Note: two-sided p-values are reported.

Table 10: Analyzing the correlation between ratings and actual instructor gender, by gender concordance

	Both male		Both female	
	ρ	p-value	ρ	p-value
Overall	-0.07	0.72	0.13	0.56
Professional	0.08	0.74	0.04	0.95
Respectful	0.08	0.84	0.04	0.94
Caring	-0.11	0.59	0.03	0.98
Enthusiastic	-0.07	0.82	0.20	0.40
Communicate	-0.01	0.84	0.08	0.67
Helpful	0.01	0.96	-0.12	0.70
Feedback	-0.12	0.69	0.17	0.50
Prompt	-0.05	0.89	0.14	0.53
Consistent	0.05	0.85	0.17	0.49
Fair	-0.03	0.88	0.28	0.23
Responsive	-0.06	0.84	0.35	0.12
Praise	0.01	1.00	0.34	0.13
Knowledge	0.11	0.70	0.24	0.36
Clear	-0.12	0.65	0.35	0.12

Note: two-sided p-values are reported.

When we analyze how students rated the instructors according to their *actual* gender, we find no significant difference in evaluations (Table 10). We do find, however, that the students of the actual male instructor performed better in the course and obtained significantly higher grades (Table 11). There is no statistical difference between student performance and the perceived gender of the instructor.

Table 11: Correlation between grade and instructor gender

	t-stat	p-value
Perceived	0.21	0.83
Actual	2.65	0.01

Note: two-sided p-values are reported.

These results suggest that students did not rate the two instructors as a function of their actual teaching effectiveness (which in this experiment may be confounded with gender, i.e. the actual male instructor being a better instructor than the female instructor). Instead, students appear to have rated instructors largely as a function of the perceived gender of the instructor. Our analysis suggests that the female students were biased against the *perceived* female instructor, but were unable to tell the difference between the *actual* male and female instructor.

4 Code

Github repo. https://github.com/kellieotto/SET-and-Gender-Bias

5 Conclusions

Teaching effectiveness is a vague notion that even researchers of higher education have a hard time defining. There is a consensus that teaching effectiveness is

multidimensional (e.g. [Marsh and Roche, 1997]), and that universities must find incentives to encourage better teaching. The notion of teaching effectiveness implies that instructors have some control over the impact their teaching skills have on student-related outcomes. Measures of teaching effectiveness should therefore only reflect variables that are under the control of instructors.

In our analysis, we used a robust statistical test to develop the results by Boring [2015a] and MacNell et al. [2014], which suggest that gender biases prevent SETs from objectively measuring teaching effectiveness. Our results confirm that an instructor's perceived gender may be more important to students in the way they rate instructors, than student-related outcomes such as an instructor's ability to help student learning. Instructors appear to be rated to a larger extent on a variable that is out of their control (their gender), rather than their ability to positively impact student learning. We further find that the extent and direction of gender biases appear to depend on context. While the French university setting highlights a positive male student bias for male instructors, the experimental US setting suggests a negative female student bias against female instructors.

Instead of measuring teaching effectiveness, SETs appear to be a measure of student satisfaction regarding a course [Stark and Freishtat, 2014]. Students may be satisfied or dissatisfied with courses for reasons outside of the control of instructors. Gender may be one of these reasons, due to a given cultural context for example. We do find that the correlation between SET and performance isn't zero: it can be positive, albeit context dependent and not always statistically significant. While student satisfaction can be considered to be one dimension of teaching effectiveness, the larger point of our analysis is that SETs are better measures of student grade expectations and of instructor gender than they are of teaching effectiveness.

Gender and expected grades are not the only variables unrelated to teaching

effectiveness that other studies have shown to be predictors of SET scores. Given the many variables that are likely to bias SET scores and whose weight in SETs are likely to change from one learning environment to another, it would be impossible to control for all these variables to make SETs a valid measure of teaching effectiveness. Furthermore, the direction of biases appear to be context dependent.

Among the instructor characteristics alongside gender, race has also been shown to be correlated with SET scores. In studies conducted in the US, instructors of color appear to suffer from student biases similar to those that female instructors suffer from in our analysis. Minority instructors tend to receive significantly lower SET scores compared to white (male) instructors (e.g. Merritt [2008]).[1] Other instructor-related characteristics likely to be unrelated to teaching effectiveness have been shown to be predictors of SET scores, such as age [Arbuckle and Williams, 2003], charisma [Shevlin et al., 2000] and physical attractiveness (e.g. Riniolo et al. [2006] and Hamermesh and Parker [2005]).

Other factors still unrelated to factors that an instructor can control may be related to SET scores. Variables related to the teaching environment, class time, class size, mathematical content of the course, etc. may matter. For instance, Hill and Epps [2010] show that students' perceptions of classroom environment factors (such as seating characteristics or lighting) have an impact on student ratings of instructors. They find that differences in the physical characteristics of classrooms influence students' overall satisfaction with a course, and have an impact on student evaluations of criteria such as their perceptions of how organized their instructors are.

Hundreds of studies discuss and question the validity of SETs as a measure of

[1]French law does not allow for the use of race-related variables in data sets. We were thus unable to test for potential racial biases in SET scores in the context of our French university.

teaching effectiveness (e.g. for reviews Pounder [2007]). Some studies find results that are similar to ours, with male students expressing biases in favor of male instructors (e.g. Basow and Silberg [1987]; Kaschak [1978]). Other studies find that the gender and SETs is uncorrelated or that the relationship is weak (e.g. Bennett [1982]; Centra and Gaubatz [2000]; Elmore and LaPointe [1974]). While some studies tend to suggest that SETs are not a valid measure of teaching effectiveness e.g. Galbraith et al. [2012] and Carrell and West [2010]), others argue that SETs are valid and reliable measures of teaching effectiveness (e.g. Benton and Cashin [2012] and Centra [1977]). While there is no consensus among academics on the issue of validity, the fact that different studies show such a wide variety of results suggests that validity varies with contexts. This fact, in itself, shows that SETs are not universally valid and should be used by universities with great caution.

In the US, SETs have two purposes: 1) to help instructors improve their teaching skills, and 2) to help the administration decide on the hiring or promotion of instructors. We guard against the use of SETs for this second purpose, given the biases that may strongly influence students in the overall satisfaction scores. In fact, in France, the French Ministry of Higher Education and Research upheld in 2009 a 1997 decision of the French State Council which stated that public universities can only use SETs to help tenured instructors improve their pedagogy, but members of the administration are not allowed to use SETs as a tool for making decisions which might affect tenured instructors' careers (cf. Boring [2015b]).

Our results suggest that the existence of gender biases in SETs is context dependent. To test for the external validity of our results, we encourage the replication of our analysis in different settings. The results we find suggest that, in some contexts, female instructors may receive lower than average SET scores, despite being as effective instructors as men, only because of student biases in favor of male in-

structors. The use of SETs therefore unfairly penalizes women, and can have large consequences on their academic careers. Our results more generally emphasize that, at least in some contexts, instructors are being unfairly judged based on variables that are out of their control, potentially leading to negative consequences on their careers in academia. We encourage universities to study potential biases that may occur in their contexts, and to take appropriate measures so as to not penalize instructors for variables that are out of their control.

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