Do Female Faculty Influence Female Students' Choice of College Major, and Why?*

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Abstract

The belief that female students avoid male-dominated majors due to gender biases, and that the presence of female faculty may mitigate these effects has prompted several North American universities to initiate programs to increase the number of female faculty in various fields, in particular Science and Engineering. However, existing evidence on the role of gender in major choice is surprisingly thin, sometimes contradictory, and usually based on small, localized samples. This paper studies whether the proportion of female faculty at a department has an influence on the proportion of female students in that field by using a nationally representative panel dataset, Computer Aided Science Policy Analysis and Research (CASPAR), over the years 1976-1987. Our panel data analysis reveals a statistically significant positive effect of the proportion of female faculty on female students only for the field of Engineering, the field with the lowest proportion of female faculty. In an alternate specification, we control for potentially confounding unobserved characteristics of colleges and students that might be correlated with the gender composition of faculty by using the idiosyncratic variation in female faculty in a field across time within the same college. This strategy also yields similar results.

Once we control for prevailing gender stereotypes across states by using a state-level gender-equality index, the positive influence of female faculty in Engineering disappears. This suggests that the channel through which female faculty influence the choices of female students are by serving as "role models" for female students, and by negating the "stereotype threat". Moreover, we do not find any effect of male faculty members on the choice of male students in female-dominated majors; this finding is consistent with the social psychology theories that females are more influenceable.

JEL Codes: I23; J16; J71

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1 Introduction

Males and females choose very different college majors: In 1999-2000, among recipients of bachelor's degrees in the United States, 13% of women majored in education compared to 4% of men, and only 2% of women majored in engineering compared to 12% of men (2001 Baccalaureate and Beyond Longitudinal Study; see also Turner and Bowen, 1999). Since there are large earnings differences across majors (Arcidiacono, 2004), the different choices of majors by males and females have significant economic and social impacts. Indeed, Paglin and Rufolo (1990) and Brown and Corcoran (1997) find that differences in major account for a substantial part of the gender gap in the earnings of individuals with several years of college education. Moreover, Xie and Shauman (2003) show that, controlling for major, the gap between men and women in their likelihood of pursuing graduate degrees and careers in science and engineering is smaller. The gender differences in choice of major have recently been at the center of hot debate on the reasons behind women's under-representation in science and engineering (Barres, 2006).

There are at least three plausible explanations for these differences. First, innately disparate abilities between males and females may predispose each group to choose different fields (Kimura, 1999). However, studies of mathematically gifted individuals reveal differences in choices across gender, even for very talented individuals. For example, the Study of Mathematically Precocious Youth shows that mathematically talented women preferred careers in law, medicine, and biology over careers in physical sciences and engineering (Lubinski and Benbow, 1992). Moreover, the gender gap in mathematics achievement and aptitude is small and declining (Goldin et al., 2006), and gender differences in mathematical achievement cannot explain the higher relative likelihood of majoring in sciences and engineering for males (Turner and Bowen, 1999; Xie and Shauman, 2003). These studies suggest gender differences in preferences as a second possible explanation for the gender gap in the choice of major. However, Zafar (2008) estimates a choice model of college majors and finds that gender differences in preferences cannot explain the underlying gender gap in majoring in science and engineering. Instead, most of it seems to be a consequence of gender differences in beliefs about enjoying the different fields. This suggests that social attitudes and gender stereotypes may be a reason for the gender gap in the choice of majors. This explanation has led to the belief that female students may avoid male-dominated majors due to gender biases, and that the presence of female faculty may mitigate these effects.

In the last two decades, this belief has prompted several North American universities to initiate programs to increase the number of female faculty in various fields, in particular science and engineering. For example, one of the recommendations in the 1999 MIT Report on the Committee of the Status of Women Faculty was to increase the number of women faculty "in order to make MIT more attractive to a larger pool of junior women faculty, and to encourage women students and postdocs to continue in academic science". Kimura (2007) mentions the origination of several targeting advantages like special scholarships and grants exclusively for females in disciplines that women are usually not drawn to. For example, in Canada, University Faculty Awards that used to be competitively open to both men and women in science for several years prior to 1989 are now available to women only. Similarly, in 2003, Princeton University created a $10 million fund to hire and promote women faculty in science and engineering (Wilson, 2003). While these policies are partly motivated by the desire to provide better and nondiscriminatory employment opportunities to women, the belief that female faculty may be instrumental in encouraging women to enter fields in which they are underrepresented has also been an underlying motivating factor. However, there is little empirical evidence on whether the presence of female faculty in a given major increases the likelihood of female students majoring in that field. This paper addresses this question.

Evidence on whether the proportion of female faculty at a college department affects women students' choice of major is mixed. Early studies used surveys that asked young women what factors determined their career choices. For example, Betz and Fitzgerald (1987), based on interviews of a group of college-bound women high school seniors, conclude that lack of awareness of successful women scientists discouraged them from majoring in sciences. However, Hackett et al. (1989) conclude from their survey of college women that role model influence is not a statistically significant explanatory variable for nontraditional and science-related college major choices. Using longitudinal data on the proportion of women faculty and majors in various fields at a private research university (Princeton), a public research university (Michigan), and a coeducational liberal arts college (Whittier), Canes and Rosen (1995) address the question of whether the presence of women faculty in traditionally male fields, i.e., science and engineering, induces women students to enter those fields. They find no evidence of a significant positive relationship between the change in the proportions of faculty who are women and the number of women majors. Conversely, Rask and Bailey (2002), using data from Colgate University, find evidence of female faculty members encouraging female students to select a major. Using longitudinal data from 12 public four-year colleges in Ohio of 1998 and 1999 entering students, Bettinger and Long (2005) find evidence that female faculty increase female students' interest in a subject as measured by course selection and major choice for a few majors in which women are underrepresented. More recently, using data of students from the United States Air Force Academy, Carrell et al. (2009) also find that female faculty have a strong influence on female students' performance in math and science classes, and on their likelihood of graduating with a degree in science, engineering, or math. One possible reason for why research on the role of gender in higher education has produced conflicting results is that studies are small in scale– they are either case studies, limited to a particular university, or to a state.

In this paper, we use longitudinal data from 1976-1987 on about 1500 colleges with nearly a million students each year from the Computer Aided Science Policy Analysis and Research (CASPAR). By focusing on this time period, we avoid the issue that estimates may be biased by university policies of preferential hiring by gender (both at faculty and student levels) that were mostly instituted starting in the 1990s. There is substantial variation in the fraction of female students and faculty across the various majors. For example, in 1976, less than 1% of Engineering faculty were female and about 3% of Engineering bachelor recipients were female. The corresponding proportions in 1987 were 3% and 13% respectively. Conversely, in Psychology, about 21% of the faculty and 53% of the students were female in 1976. The corresponding proportions in 1987 were 27% and 68%. We use the variation across universities and over time to estimate if female faculty influence the choice of major of female students.

We apply random effects models to test the relationship between the proportion of female faculty at the department and that of female students who decide to major in the discipline, controlling for an extensive set of relevant school and department characteristics. Our results may be biased if female students self-select into schools based on their own educational preferences, pro-femaleness of a college, or some other unobservables. In order to control for potentially confounding unobserved characteristics of colleges and students that might be correlated with the gender composition of faculty, we use an identification strategy developed by Hoxby (2000), and use the idiosyncratic variation in female faculty across time within the same college to test if female faculty influence the choice of female students. Both approaches yield very similar results. We find a statistically positive effect of female faculty on female students' choice for Engineering only– Engineering is the field with the lowest proportion of female faculty and students. Moreover, we don't find any evidence that male faculty influence the choice of male students, even for female-dominated fields.

Our nationally representative dataset also allows us to shed light on the underlying mechanisms that lead female faculty to influence the choice of female students. Understanding these mechanisms is important for relevant policy recommendations. Demographic matches of students and teachers may influence student outcomes either because of "Passive Teacher Effects" or "Active Teacher Effects". The former effects are triggered by the teacher's identity (gender, race, etc.). It includes the "role-model hypothesis", i.e., the mere presence of a demographically similar teacher affects student behavior, and the "Stereotype Threat", which is based on the assumption that academic identification is important for sustaining educational development (Steele, 1997). The second explanation, "Active Teacher Effects", refers to demographic-specific patterns of behavior among teachers; for example, teachers being more oriented towards students who share their race, gender, or ethnicity (Ferguson, 1998). The fact that we only find a statistically positive effect of female faculty in the choice of female students in the major with the lowest fraction of female faculty suggests that faculty serve as role models. Since we have substantial variation in our sample by states, we can directly control for prevailing gender stereotypes at the state-level using indices developed by Sugarman and Straus (1987) and Di Noia (2002).[1] Once we control for these gender stereotypes, we don't find a statistically significant effect of female faculty in any field. This seems to suggest that female faculty affect female students' choices by negating the stereotype threat. Therefore, the results in this paper can be explained by passive teacher effects.

One caveat of our study is that the analysis is conducted at the institution level. The ideal data set for this study would be student records linked with data sets of faculty, so that we could identify the number and nature (introductory or advanced) of courses within a field that a student took with a faculty member of the same gender. Unfortunately, such datasets are only available for a few institutions (see Bettinger and Long, 2005, and Carrell et al., 2009), which would not be very helpful for policy purposes. Moreover, our study does not control for whether the female faculty member is a professor, adjunct, or graduate student. Since more women are likely to teach as adjuncts or graduate students (Bettinger and Long, 2008), our results may be biased if adjuncts and graduate students have effects unrelated to gender. However, since we find that the underlying mechanisms through which female faculty influence the choice of female students are passive teacher effects (opposed to active teacher effects), this should not

[1] Pope and Sydnor (2008) use the index developed by Di Noia to study the gender gap in test scores across the U.S. They find that the equality index is negatively correlated with the male-female gap in test scores.

bias our results.

The paper is organized as follows: Section 2 describes the sources of data used in this study. Section 3 empirically investigates whether female (male) faculty influence the choice of major of female (male) students. Section 4 discusses the underlying mechanisms that could explain our results. Finally, Section 5 concludes.

2 Data

For the purposes of this study, we need a dataset that contains clear indicators of the gender composition of students and faculty at each department, together with other college and department covariates that influence the students' gender composition in a major. Further, to test the hypothesis fully, it would be ideal to have a large random sample of students enrolled in a wide variety of colleges and all ranges of major fields. The best data set available for our purpose are the Computer Aided Science Policy Analysis and Research (CASPAR) over the years 1976-1987.

CASPAR is a panel of selected variables from surveys of universities and colleges conducted by the NCES through its Higher Education General Information Survey (HEGIS) and the Integrated Postsecondary Education Data System (IPEDS, the successor to HEGIS from 1986 to the present), and from the National Research Council (NRC) Doctorate Records File. It is a National Science Foundation (NSF) database system designed to provide access to a wide range of statistical data focusing on U.S. universities and colleges and their science and engineering resources. Because of their focus on the science and engineering departments, their available data on the humanities departments are rather incomplete.

To account for the possible lag structure in the female faculty's influence on the female students' choice of majors, we merged the files of gender composition of students with that of gender composition of faculty that are two years, three years, and four years ahead. For example, information on female BA graduates of year 1976 was merged with information on female faculty of years 1972, 1973, and 1974. The extracted data set contains no faculty information of year 1979, and is therefore not used in this study. In order to ensure the condition of random assignment, the observations at the women's colleges and men's colleges were dropped. Colleges that have no female or male student records were also dropped. The final data set has each college of a particular year as a single observation. Each observation contains information on the college characteristics such as quality of faculty, tuition, fall enrollment, college status (public or private), research and development expenditure, and capital expenditures. It also includes information on the gender composition of student and faculty at each of the seven college departments (engineering, physics, geology, life sciences, psychology, mathematics and social sciences).[2] Since undergraduate years are a time of exploration, it is unlikely that a student would know exactly the specific type of engineering on which she would focus. Hence, it is reasonable to aggregate over all the subfields and obtain a general category for engineering. Our sample consists of about 1,500 colleges with nearly a million students in each year.

Figure 1 shows the mean proportion of female bachelor recipients over our sample period across the different majors. The proportion of females has been going up across all majors. More than half of the bachelor recipients were female by the end of our sample period. However, there is substantial heterogeneity in the proportion of females across the various majors. For our entire sample period, less than 15% of Engineering bachelor recipients were females. Life Sciences and Psychology are the two fields that have a majority of females. Figure 2 shows the mean proportion of female faculty members across the various fields over our sample period. One notable feature that stands out is that, though the proportion of female faculty has been going up across the fields, it reaches 30% at most. This figure exhibits similar relative patterns across fields as Figure 1: Engineering has the lowest proportion of female faculty (around 3%), while Life Sciences and Psychology are the two fields with the highest proportion of females.

Data on prevailing gender stereotypes at the state-level comes from the Gender Equality Index (GEI) developed by Sugarman and Straus (1987), and later updated by Di Noia (2002). This index reflects the economic, political, and legal climate in a state. It is based on variables such as the fraction of small business administration loans given to each gender, gender composition in state legislatures and the labor force, and domestic violence. Importantly, the index does not include measures of female faculty in colleges, which might reflect the college major differences that are the focus of this study. In fact, the first four columns of Table 1 show that the Spearman rank correlation coefficients between the Index and fraction of female students and female faculty is less than 0.05, and none are significant at the 5% level. The index is scaled from zero to 100, with zero meaning that women have attained none of the attributes included in the index, and 100 meaning that women have attained as much as men. The initial index constructed by Sugarman and Straus (1987) uses data that spans the period 1977-1983,

[2] We checked one entry with Harvard College data by calling different departments at Harvard, and confirmed that the original data were valid for the various natural and social sciences departments.

which overlaps with most of our sample period (we will denote the initial index as 1977 GEI). The index reveals large differences among states in terms of gender equality. The scores range from a low of 19.2 (Mississippi) to a high of only 59.9 (Oregon). Thus, even in a state with the highest score on the GEI, women have achieved only 60% parity with men. The updated index of Di Noia (2002) uses data from 1989-1996 (henceforth, 1989 GEI). Figure 3 shows how the Gender Equality Index has evolved over time. The figure shows that, over time, women have achieved greater equality with men. The figure also depicts the local linear polynomial estimates of the regression of the 1989 GEI on the 1977 GEI. The estimates suggest that, though the two indices are positively correlated, progress toward equality has slowed in states that were ranked as having a higher degree of gender equality in 1977. The most dramatic increases have occurred in states that were ranked below the median in 1977.

3 Empirical Strategy

The question that we want to empirically answer is whether, controlling for undergraduate institution characteristics, the percentage of female faculty of a department influences female students' decisions of majoring in that department. A good estimate of female students' decisions of majoring in a given field is the proportion of female students in the department divided by the proportion of female students in other departments at the college. We use proportions instead of the absolute number of female students in the numerator in order to account for possible departmental fixed effects that are relevant for students' enrollment (including male and female). The response variable is then divided by total proportion of female students in other fields at the college so as to capture any college and departmental pro-femaleness. A positive correlation between the probability of a female student's choice of major and the proportion of female faculty at the department could also be explained by the possibility that increases in both variables come from the same cause, that is, the pro-femaleness of the college or the department; use of percentage variables gets around this problem.

The main independent variable of female faculty was first constructed as a ratio of proportions for the same reason. However, we did not want to force the same coefficient on the two proportions, and decided to use two variables – log proportion of female faculty at each department i and log proportion of female faculty at each college j – instead of the ratios of two proportions as the response variable.

3.1 Baseline Estimates

The empirical test is on the relationship between the ratio of proportion of female students majoring at a department relative to that of the rest of the institution and the proportion of female faculty at the department of the same institution. The test is carried out for each of the major fields, which are engineering, physics, geology, life sciences, psychology, mathematics and social sciences. We estimate the model:

$$\begin{aligned} & \log\left(\frac{\text{\% of females in major i at college j at time } t}{\text{\% of females in college j at time } t \text{ in all majors EXCEPT major i}}\right) \qquad (1) \\ = \; & \alpha_j + \beta_1 \log(\text{\% female faculty in i at j at } t-2) + \beta_2 \log(\text{\% female faculty in j at } t-2) \\ & + \beta_3 \text{GEI}_{1977j} + (\text{college controls})_{t-2} + \text{time trend} \; + \; \epsilon_{ijt}, \end{aligned}$$

where α_j is a college random effect to account for random differences in estimates between colleges[3]; GEI_{1977j} is the 1977 Gender Equality Index of the state in which the college is located; college controls include college characteristics such as an index for average quality of faculty, average number of faculty with grants, tuition for undergraduates (for both in-state and out-of-state students), fall enrollment, college status (public or private), research and development expenditure, capital expenditures, and average number of graduate students; and time trend consists of year dummies. To account for the possible serial correlation of the residuals within a major in a college, whenever possible, standard errors are clustered by college throughout the paper.

The coefficient β_1 is the parameter of interest. A finding of $\beta_1 > 0$ would indicate that the fraction of female students in a major is increasing in the fraction of female faculty (with a two-year lag) in the major. On the other hand, $\beta_1 \approx 0$ would indicate that there is no evidence that female faculty influence the choice of majors of female students. Estimates of variants of equation 1 are in Table 2. The top panel of the table shows that β_1 is positive and statistically significant for five of the seven major categories. However, this specification does not include any controls. Inclusion of college controls in the second panel of Table 2 slightly decreases the estimate of β_1 but it remains positive and statistically significant for most majors. Inclusion of a time trend in the third panel further decreases the estimates of β_1. The last panel of Table 2 shows the estimates of equation 1 with a full set of controls. The coefficient β_1 is statistically

[3] Since some of the college characteristics don't change over time and we use the same Gender Equality Index for all of the sample years, the panel analysis in this section cannot include institution fixed effects. We instead incorporate random effects to account for random differences in estimates between colleges.

significant at the 1% level and positive only for engineering, the field with the lowest fraction of female students and female faculty. The estimate implies that a 10% increase in the proportion of female faculty in Engineering would increase the relative fraction of female students in that field by nearly 1.11%. Though estimates of β_1 are positive for all the other fields, they are not statistically significant at 95% confidence.

3.2 Robustness Checks

In equation 1, to account for the possible lag structure in the female faculty's influence on the female students' choice of majors, we investigate the relationship between the female composition of students in a field with that of the female composition of faculty that are two years ahead. Another reason for choosing a two-year lag was that our dataset includes both four-year colleges as well as two-years colleges. Unfortunately, we are unable to separate the two in our analysis. However, as a robustness check, we estimate the following model:

$$\begin{aligned}
& \log\left(\frac{\text{\% of females in major i at college j at time } t}{\text{\% of females in college j at time } t \text{ in all majors EXCEPT major i}}\right) \qquad (2)\\
= \; & \alpha_j + \beta_1 \log(\text{\% female faculty in i at j at } t-2) + \beta_2 \log(\text{\% female faculty in j at } t-2) \\
& + \beta_3 \log(\text{\% female faculty in i at college j at } t-3) + \beta_4 \log(\text{\% female faculty in j at } t-3) \\
& + \beta_5 \log(\text{\% female faculty in i at college j at } t-4) + \beta_6 \log(\text{\% female faculty in j at } t-4) \\
& + \beta_7 \text{GEI}_{1977j} + (\text{college controls})_{t-2} + \text{time trend} \; + \; \epsilon_{ijt}.
\end{aligned}$$

The estimates of equation 2 are shown in Table 3. As one moves down the table, more controls are added. The results show that, once the full set of controls is included, β_1 is statistically significant and positive for Engineering only. The coefficients on the lags, β_3 and β_4, are not statistically different from zero. These results are similar to the earlier findings in Table 2.

As mentioned earlier, we only have Gender Equality Indices at two points in time, 1977 and 1989. So far, we've used only the 1977 GEI in the specifications. Figure 3 shows that the two indices are positively correlated. However, states that were ranked below the median in 1977 show the most dramatic increases in gender equality. We test the sensitivity of our results by reestimating the model in equation 1 and replacing GEI_{1977j} with GEI_{jt}, where:

$$\text{GEI}_{jt} = \begin{cases} \text{GEI}_{j1977} \text{ if } t \leq 1980 \\ \text{GEI}_{j1989} \text{ if } t > 1980, \end{cases}$$

i.e, we use the 1977 GEI for the first five years (1976-1980) of our sample, and the 1989 GEI for the remaining seven years (1981-1987). Estimates of this model are shown in Table 4. The results are quantitatively similar to those in Table 2. The coefficient β_1 is statistically significant at the 1% level and positive only for engineering. As before, though estimates of β_1 are positive for all the other fields, they are not statistically significant at 95% confidence.

The analysis so far indicates that female faculty affect choices of female students only in the field of Engineering. There is weak evidence of female students being better represented in the various fields in states with more gender equality: The coefficient on the GEI, β_3, is positive (however, not statistically different from zero) for most fields.

3.3 Variation-over-time Estimates

Even though we include a fairly rich set of controls in the specification in section 3.1, our estimates would be biased if the variation in female students across schools over time is generated by selection. Female students could self-select into schools based on their own educational preferences, pro-femaleness of a college, or some other unobservables. In order to control for potentially confounding unobserved characteristics of colleges and students that might be correlated with the gender composition of faculty, we use the idiosyncratic variation in female faculty in a field across cohorts/ time within the same college to test if female faculty influence the choice of female students.[4]

Since the changes in every two consecutive years are not very big, we test the differences between the first (1976) and last year (1987) of the available data set instead. We estimate the

[4] This identification strategy was first used by Hoxby (2000) to estimate gender peer effects in elementary school, and has subsequently been used by other studies that examine peer effects including Lavy and Schlosser (2007).

following model:

$$\log\left(\frac{\text{\% females in i at college j in 1987}}{\text{\% females in j (excl major i) in '87}}\right) - \log\left(\frac{\text{\% females in i at college j in 1976}}{\text{\% females in j (excl major i) in '76}}\right) \quad (3)$$
$$= \beta_1[\log(\text{\% female faculty in i at j in 1985}) - \log(\text{\% female faculty in i at j in 1974})]$$
$$+\beta_2[\log(\text{\% female faculty in j in 1985}) - \log(\text{\% female faculty in j in 1974})]$$
$$+\text{controls(school type, tuition, college level stats etc)}_{1985-1974} + \epsilon_{ijt}.$$

As before, β_1 is the parameter of interest, and $\beta_1 > 0$ would suggest that female faculty influence the female students' choice of major. Results are presented in Panel A of Table 5. Similar to our earlier finding, the coefficient β_1 is statistically significant at the 5% level and positive only for the field with the lowest fraction of female students and faculty, i.e., engineering. The estimate implies that, on average, a 10% increase in the proportion of female faculty in Engineering between 1976 and 1987 would increase the relative fraction of female students in Engineering in those years by nearly 8.5%.

The estimates of β_1 are not statistically different from zero for the other fields. Somewhat surprisingly, the estimate of β_1 takes on negative values (though not statistically significant) in the case of Physics and Math, two fields that have traditionally been associated with having few females. This seems to suggest an alternative influence of female faculty on female students, opposite to that suggested by the role model hypothesis. While some female students are encouraged by female professors and decide to follow their footsteps, others may very well turn away from the department after realizing the challenges female professors face in the field. This scenario is described in the following comment in the booklet of WISHR by a Harvard student, Elizabeth Kelly, of 1996:[5] "I remember talking with a professor frosh year who told me flat out that for her, it was a choice: career or family. She knew she could not do both. I appreciated her honesty and took it to heart. I just made a different choice than she did." These two opposing channels of influence of female professors at a department may cancel out each other, and result in the insignificant net correlation.

As a robustness check, instead of focusing on the differences between the first and last year of the sample, we use the variation during a (roughly) 5-year period to estimate a variant of the model described in equation 3. In particular, we use the variation between years 1976 and

[5] WISHR stands for "Women in Science at Harvard and Radcliffe". It is an undergraduate student organization for women in science. The quote here is taken from their advice booklet to freshmen in year 1997, titled "Words of the Wise", pg. 22-23.

1982, and between 1982 and 1987 to test if female students are influenced by female faculty in the choice of major. This specification also allows us to include a linear time trend into the model.[6] Estimates of this model are shown in Table 6. The results are similar to those in Panel A of Table 5: Estimate of β_1 is only statistically positive and significant for Engineering. The estimate is also quantitatively similar to the earlier one: A 10% increase in the proportion of female faculty in Engineering during a 5-year period would increase the relative fraction of female students in Engineering by nearly 6%.

3.4 Do Male Faculty Affect Choices of Male Students?

Male students are underrepresented in certain fields, like Psychology and Life Sciences. We next ask the question of whether male faculty influence the choice of majors of male students. We estimate the male variant of equation 1. The estimates are shown in Table 7. In the specification without any controls, β_1 is positive and statistically significant (at the 5% level) only for Psychology. However, once we introduce controls, β_1 is not statistically different from zero. In Table 8, we present the estimates of the male variant of equations 3 and 4. β_1 continues to be statistically insignificant. These results suggest that male faculty do not influence the major choice of male students. These findings are consistent with the social psychology theories that females are more influenceable (Eagly, 1978), and that women have interdependent self-schemas while men have independent ones (Cross and Madson, 1997).

4 Interpreting the Results

We've found evidence that the presence of female faculty in Engineering increases the likelihood of female students majoring in that field. This evidence seems to be robust to the various alternate specifications that we've presented in the paper. But what is the channel through which a gender match between students and faculty influence the educational choices? Understanding the mechanism through which female faculty influences the major choice of female students is important for relevant policy recommendations. Existing but limited literature on why demographic matches of students and teachers may influence student outcomes suggests two reasons.

[6] More specifically, we estimate the model: $\Delta \log \left(\frac{\text{\% females in i at college j}}{\text{\% females in college j (exlc. major i)}} \right) = \beta_1 * \Delta \log (\text{\% female faculty in i at j}) + \beta_2 * \Delta \log (\text{\% female faculty in j}) + \delta_t + \epsilon_{ijt}$, where $\Delta \log(.)$ is the variation in the quantity between years 1982 and 1976, and 1987 and 1982, and δ_t is a linear time trend.

The first, "Passive Teacher Effects", are triggered by a teacher's identity (race, gender, ethnicity), and not by explicit teacher behavior. This would include the "role-model hypothesis", i.e., the mere presence of a demographically similar teacher affects student behavior. For example, the presence of female faculty in Engineering may cause incoming female undergraduates to update their prior beliefs about educational possibilities. A related effect is the "Stereotype Threat", which is based on the assumption that academic identification is important for sustaining educational development (Steele, 1997). It refers to situations where students perceive stereotypes (for example, males being better at Math than females), and causes them to experience apprehension that retards their academic identification and their performance. Good et al. (2008), in a field experiment, find that stereotype threat suppresses test performance even among the most highly qualified women in college mathematics. The second explanation, "Active Teacher Effects", refers to demographic-specific patterns of behavior among teachers. For example, it could be the case that when interacting with students, teachers are more oriented towards students who share their race, gender, or ethnicity. Experimental studies suggest that this indeed happens in the case of race (Ferguson, 1998).

In the case of gender dynamics, little is know about how female teachers affect educational outcomes of female students. Dee (2004) finds that gender dynamics between 8-th Grade students and teachers have large effects on teacher perceptions of student performances, but is unable to pin down the mechanism that drives these effects. Bettinger and Long (2005) interpret the finding that female faculty increase female students' interest in a subject (as measured by course selection and major choice) only in majors in which women are underrepresented as evidence of the role model hypothesis. In this paper, we find that female faculty influence the likelihood of female students majoring in the field with the lowest fraction of female faculty and female students (Engineering). This result supports the hypothesis that female faculty serve as role models.

Since we can directly control for prevailing gender stereotypes at the state-level using the Gender-Equality Index (GEI), we can further investigate the underlying mechanisms that lead female faculty to influence the decision of female students. Our main constraint is that we only have data on the GEI at two different points in time (1977 and 1989). These two points in time approximately overlap with the first (1976) and last year (1987) of the available data set.

Therefore, we undertake a variant of the model in equation 3, and estimate the model:

$$
\begin{aligned}
& \log\left(\frac{\text{\% females in major i at j in 1987}}{\text{\% females in j (excl. major i) in 1987}}\right) - \log\left(\frac{\text{\% females in major i at j in 1976}}{\text{\% females in j (excl. major i) in 1976}}\right) \quad (4) \\
= \; & \beta_1[\log(\text{\% female faculty in i at j in 1985}) - \log(\text{\% female faculty in i at j in 1974})] \\
& + \beta_2[\log(\text{\% female faculty in j in 1985}) - \log(\text{\% female faculty in j in 1974})] \\
& + \beta_3[\text{GEI}_{1987} - \text{GEI}_{1976}] + \text{controls(school type, tuition etc)}_{1985-1974} \; + \; \epsilon_{ijt}.
\end{aligned}
$$

$\beta_1 > 0$ would indicate that female faculty in a given field in fact influence the decision of female students to major in that field. Estimates of the model under the null that $\beta_3 = 0$ (i.e., the model in equation 3) were shown in Panel A of Table 5. We found that β_1 was statistically significant and positive for Engineering only. Next we estimate the model in equation 4. If β_1 continues to be significant after the inclusion of the GEIs, that would suggest that the mechanism through which female faculty affect the choice of female students is not by negating the stereotype threat. Estimates of the model in equation 4 are shown in Panel B of Table 5. As depicted in the Table, β_1 is not statistically different from zero for any of the fields.[7] On the other hand, β_3 is positive and statistically significant for four of the fields (Engineering, Physics, Life Sciences, Psychology), and negative for Math. These findings suggest that in fact one mechanism through which female faculty are affecting the choices of female students is by negating the stereotype threat.

The analysis in this section indicates that female faculty influence the choices of female students through passive teacher effects, and not active teacher effects. Moreover, the evidence supports both the role model hypothesis as well as the stereotype threat as possible explanations.

5 Conclusion

Gender biases and social attitudes have been offered as possible explanations for why males and females choose very different majors. The belief that female faculty may mitigate these effects has prompted universities to aggressively recruit female faculty. However, evidence that gender interactions between students and faculty matter is sparse, contradictory, and primarily

[7] β_1 could be insignificant if the change in GEI and the change in proportion of female faculty are highly correlated. This is, however, not the case: The last column of Table 1 shows that the Spearman rank correlation coefficient between ΔGEI and ΔFemale Faculty is less than 0.05 and not significant at 5%.

based on small, localized samples. In this study, using a nationally representative dataset of CASPAR from 1976 to 1987 (a time period where gender-based preferential hiring policies were not common), we investigate whether female faculty influence the choice of major of female students. We only find a significantly positive influence of female faculty in Engineering, a field which had the lowest proportion (less than 3%) of female faculty.

An important contribution of our study is that it provides evidence on the exact mechanisms by which female faculty influence female students. Since we have substantial variation in our sample by states, we control for prevailing gender stereotypes at the state-level using Gender-Equality Indices developed by Sugarman and Straus (1987) and Di Noia (2002). We don't find any significant effect of female faculty on choices of female students once we control for gender stereotypes. This suggests that female faculty affect female students' choices by negating the stereotype threat. Moreover, given that we only find an effect of female faculty for the field with the lowest proportion of female faculty, our results also support the notion that faculty serve as role models. In terms of policy recommendations, our results suggest that the role of female faculty as role models may only matter in instances where there are very few female faculty. A more useful policy would be to take measures to change social attitudes and remove stereotypes, such as females not being as good as males in Math (Good et al., 2008).

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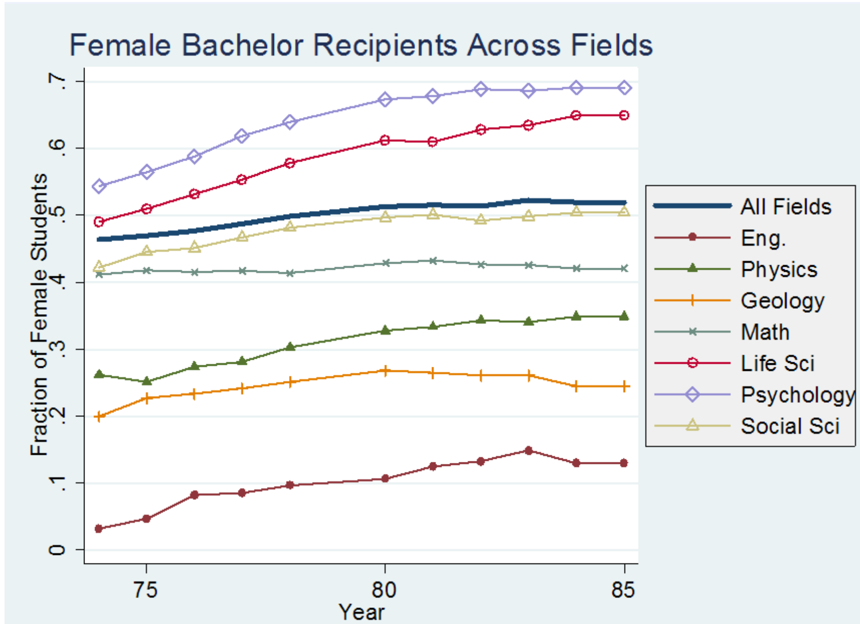

Figure 1: Fraction of female students in the various fields

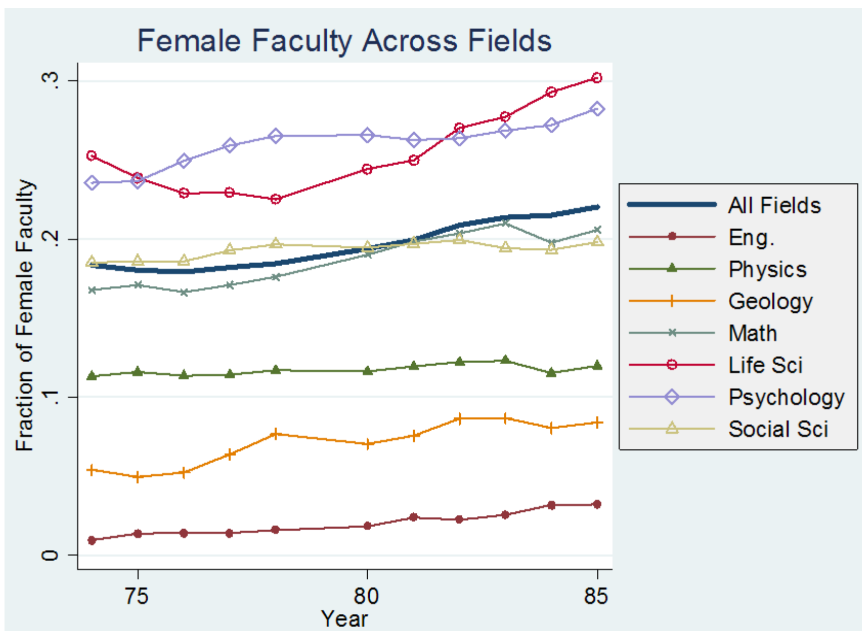

Figure 2: Fraction of female faculty in the various fields

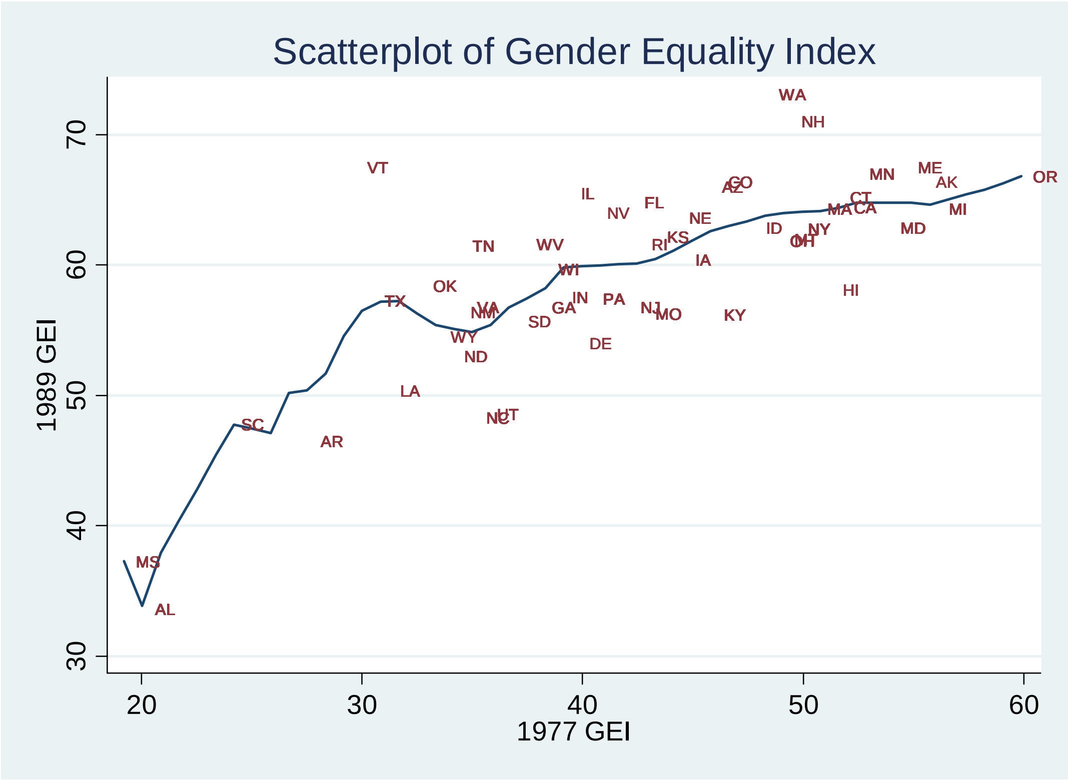

Figure 1: Figure 3: The Gender Equality Index (GEI) over time.

Table 1: GEI Correlations with the Fraction of Females in a Field

Correlations between:	1974 GEI		1985 GEI		Change in GEI	
	Students in 1974	Faculty in 1974	Students in 1985	Faculty in 1985	ΔStudents	ΔFaculty
Science & Eng	0.0004[a]	-0.0221	0.0348	0.0183	-0.0030	0.0429
Engineering	0.0393	0.0362	-0.0403	-0.0208	0.0392	0.0101
Physics	-0.0218	0.0359	-0.0542	0.1003	-0.0068	0.0456
Geology	0.0359	0.0297	0.0189	-0.0045	-0.0565	0.0556
Math	-0.0549*	-0.0278	-0.0563*	-0.0378	-0.0004	0.0385
Life Sciences	0.0119	0.0425*	0.0621**	0.0109	0.0281	-0.0347
Psychology	0.0527	0.0362	0.0013	0.0552	-0.0222	0.0518
Social Sciences	0.0250	0.0185	0.0144	0.0274	-0.0339	0.0373

[a] Each cell presents the Spearman rank correlation between the fraction of female students (faculty) in that year and the GEI
* correlation sig at 10%; ** sig at 5%; *** sig at 1%

Table 2: The Gender Hypothesis for Females

	Engineering	Physics	Geology	Math	Life Sci	Psychology	Social Sci
Log(Female Faculty in the field)[a]	0.381***	0.043	0.145**	0.098***	0.098***	0.094***	0.053
	(0.128)	(0.051)	(0.069)	(0.035)	(0.037)	(0.025)	(0.032)
Log(Female Faculty in institution)[b]	-0.128	0.217***	-0.292**	-0.033	-0.001	-0.166***	-0.014
	(0.107)	(0.065)	(0.129)	(0.054)	(0.059)	(0.039)	(0.045)
Gender Equality Index[c]	0.0006	0.0013**	0.002**	-0.00002	0.0016**	0.0005	0.0005
	(0.0007)	(0.0005)	(0.001)	(0.0006)	(0.0007)	(0.0005)	(0.0004)
Controls for Institution	No	No	No	No	No	No	No
Time Trend	No	No	No	No	No	No	No
Random Effect	No	No	No	No	No	No	No
Log(Female Faculty in the field)	0.358***	0.037	0.112	0.092***	0.076**	0.089***	0.054*
	(0.113)	(0.051)	(0.069)	(0.035)	(0.037)	(0.025)	(0.032)
Log(Female Faculty in institution)	-0.155	0.209***	-0.242*	-0.036	0.018	-0.159***	-0.019
	(0.100)	(0.065)	(0.124)	(0.055)	(0.060)	(0.038)	(0.045)
Gender Equality Index	-0.0001	0.0008	0.001	0.00003	0.0007	-0.0001	0.0004
	(0.0007)	(0.0006)	(0.001)	(0.0006)	(0.0007)	(0.0005)	(0.0005)
Controls for Institution	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Trend	No	No	No	No	No	No	No
Random Effect	No	No	No	No	No	No	No
Log(Female Faculty in the field)	0.243**	0.055	0.109	0.094***	0.074**	0.087***	0.054*
	(0.102)	(0.052)	(0.069)	(0.035)	(0.036)	(0.025)	(0.032)
Log(Female Faculty in institution)	-0.272***	0.149**	-0.281**	-0.033	-0.021	-0.184***	-0.031
	(0.096)	(0.067)	(0.136)	(0.055)	(0.060)	(0.039)	(0.046)
Gender Equality Index	0.0003	0.0013**	0.001	-0.00006	0.0013*	0.0001	0.0005
	(0.0008)	(0.0006)	(0.001)	(0.0007)	(0.0007)	(0.0005)	(0.0005)
Controls for Institution	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Random Effect	No	No	No	No	No	No	No
Log(Female Faculty in the field)	0.111**	0.038	0.071	0.064*	0.024	0.022	0.016
	(0.049)	(0.047)	(0.077)	(0.033)	(0.028)	(0.021)	(0.029)
Log(Female Faculty in institution)	-0.161**	0.118**	-0.168	0.0037	0.016	-0.050	0.025
	(0.071)	(0.057)	(0.115)	(0.051)	(0.051)	(0.036)	(0.041)
Gender Equality Index	0.0008	0.0013**	0.001	0.0001	0.0017**	0.0006	0.0001
	(0.0008)	(0.0006)	(0.001)	(0.0007)	(0.0007)	(0.0005)	(0.0006)
Controls for Institution	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Random Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	1618	7045	2419	7559	8101	6828	7603
Number of Institutions	261	877	350	941	949	863	944

Robust standard errors in parentheses. * sig at 10%; ** sig at 5%; *** sig at 1%

The dependent variable is $\log\left(\frac{\text{\% of females in major i at college j at time } t}{\text{\% of females in college j at time } t \text{ in all majors EXCEPT major i}}\right)$

a $\log(\%$ of female faculty in major i at college j at time $t-2)$

b $\log(\%$ of female faculty in college j at time $t-2)$

c The Gender Equality Index on a scale of 0-100 (for the years spanning 1977-1983)

Table 3: The Gender Hypothesis with lags

	Engineering	Physics	Geology	Math	Life Sci	Psychology	Social Sci
Log(Female Faculty)[a]	0.282**	0.035	0.081	0.073	0.110**	0.088***	-0.039
	(0.127)	(0.062)	(0.092)	(0.049)	(0.044)	(0.027)	(0.041)
Log(FemFaculty with one lag)[b]	-0.059	-0.0026	-0.049	-0.014	-0.014	-0.029	0.077**
	(0.136)	(0.074)	(0.112)	(0.056)	(0.045)	(0.029)	(0.038)
Log(Fem Faculty with two lags)[c]	0.215	-0.019	0.137	0.053	-0.0020	0.049*	0.051
	(0.219)	(0.062)	(0.110)	(0.051)	(0.045)	(0.028)	(0.042)
Gender Equality Index[d]	0.0006	0.0011**	0.0021*	0.00006	0.0018***	0.00007	0.0003
	(0.0008)	(0.0006)	(0.0011)	(0.0006)	(0.0007)	(0.0005)	(0.0005)
Controls for Institution	No	No	No	No	No	No	No
Time Trend	No	No	No	No	No	No	No
Random Effect	No	No	No	No	No	No	No
Log(Female Faculty in the field)	0.300**	0.026	0.060	0.069	0.091**	0.087***	-0.042
	(0.132)	(0.063)	(0.091)	(0.049)	(0.044)	(0.027)	(0.041)
Log(Fem Faculty with one lag)	-0.054	-0.0027	-0.079	-0.015	-0.021	-0.029	0.077**
	(0.138)	(0.074)	(0.112)	(0.056)	(0.046)	(0.029)	(0.038)
Log(Fem Faculty with two lags)	0.205	-0.017	0.121	0.049	-0.0105	0.044	0.055
	(0.243)	(0.062)	(0.110)	(0.051)	(0.045)	(0.028)	(0.042)
Gender Equality Index[d]	0.00014	0.0007	0.0014	0.00001	0.001	-0.0006	0.0004
	(0.0009)	(0.0006)	(0.0013)	(0.0007)	(0.0007)	(0.0005)	(0.0005)
Controls for Institution	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Trend	No	No	No	No	No	No	No
Random Effect	No	No	No	No	No	No	No
Log(Female Faculty in the field)	0.279**	0.039	0.053	0.070	0.080*	0.091***	-0.040
	(0.126)	(0.063)	(0.091)	(0.049)	(0.043)	(0.027)	(0.041)
Log(Fem Faculty with one lag)	-0.071	-0.0027	-0.078	-0.019	-0.025	-0.030	0.079**
	(0.137)	(0.074)	(0.110)	(0.056)	(0.045)	(0.029)	(0.039)
Log(Fem Faculty with two lags)	0.157	-0.0165	0.123	0.051	-0.0015	0.039	0.050
	(0.234)	(0.062)	(0.110)	(0.051)	(0.044)	(0.028)	(0.042)
Gender Equality Index[d]	0.00036	0.0007	0.0016	0.000007	0.0015**	-0.0005	0.0004
	(0.0009)	(0.0006)	(0.0014)	(0.0007)	(0.0007)	(0.0005)	(0.0005)
Controls for Institution	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Random Effect	No	No	No	No	No	No	No
Log(Female Faculty in the field)	0.145*	0.043	0.084	0.049	0.041	0.020	-0.0071
	(0.082)	(0.060)	(0.095)	(0.048)	(0.037)	(0.024)	(0.039)
Log(Fem Faculty with one lag)	-0.060	-0.026	-0.083	-0.015	-0.024	-0.037	0.063*
	(0.118)	(0.073)	(0.103)	(0.056)	(0.039)	(0.027)	(0.037)
Log(Fem Faculty with two lags)	0.241	-0.041	0.105	0.042	-0.031	0.0083	0.0092
	(0.258)	(0.062)	(0.104)	(0.050)	(0.042)	(0.025)	(0.039)
Gender Equality Index[d]	0.00028	0.0011*	0.0013	0.0003	0.0019**	0.00006	0.0003
	(0.0010)	(0.0006)	(0.0014)	(0.0008)	(0.0008)	(0.0005)	(0.0005)
Controls for Institution	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Random Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	1186	5451	1781	5828	6278	5098	5781
Number of Institutions	197	791	283	847	861	764	833

Robust standard errors in parentheses. * sig at 10%; ** sig at 5%; *** sig at 1%

The dependent variable is $\log\left(\frac{\text{\% of females in major i at college j at time } t}{\text{\% of females in college j at time } t \text{ in all majors EXCEPT major i}}\right)$

a $\log\left(\text{\% of female faculty in major i at college j at time } t-2\right)$; b $\log\left(\text{\% of female faculty in major i at college j at time } t-3\right)$

c $\log\left(\text{\% of female faculty in major i at college j at time } t-4\right)$

d The Gender Equality Index on a scale of 0-100 (for the years spanning 1977-1983)

Table 4: Robsutness Check: Gender Hypothesis for Females

	Engineering	Physics	Geology	Math	Life Sci	Psychology	Social Sci
Log(Female Faculty in the field)[a]	0.108***	0.038	0.073	0.062*	0.025	0.022	0.016
	(0.048)	(0.046)	(0.077)	(0.033)	(0.028)	(0.021)	(0.029)
Log(Female Faculty in institution)[b]	-0.164	0.118**	-0.153	0.0052	0.016	-0.049	0.025
	(0.072)	(0.057)	(0.115)	(0.051)	(0.051)	(0.036)	(0.041)
Gender Equality Index[c]	0.00008	0.0017	0.0007	-0.0010	0.0011	0.0003	0.0003
	(0.0007)	(0.0006)	(0.0010)	(0.0007)	(0.0007)	(0.0005)	(0.0005)
Controls for Institution	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Random Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	1618	7045	2419	7559	8101	6828	7603
Number of Institutions	261	877	350	941	949	863	944

Robust standard errors in parentheses. * sig at 10%; ** sig at 5%; *** sig at 1%

The dependent variable is $\log\left(\frac{\text{\% of females in major i at college j at time } t}{\text{\% of females in college j at time } t \text{ in all majors EXCEPT major i}}\right)$

a $\log(\%$ of female faculty in major i at college j at time $t-2)$

b $\log(\%$ of female faculty in college j at time $t-2)$

c The Gender Equality Index on a scale of 0-100 (I use the GEI for the years spanning 1977-1983 for the first five years (1976-1980) of the sample, and the GEI constucted using data from 1989-1996 for the last seven years of the sample (1981-1987)

Table 5: The Gender Hypothesis: Variation over Time

	Engineering	Physics	Geology	Math	Life Sci	Psychology	Social Sci
PANEL A							
ΔLog(Female Faculty)[a]	0.848**	-0.202	0.143	-0.123	0.126	0.094	0.100
	(0.353)	(0.156)	(0.246)	(0.106)	(0.092)	(0.074)	(0.084)
ΔLog(Female Faculty in the institution)[b]	0.881***	0.386**	0.336	0.190	0.286**	0.180*	0.175*
	(0.183)	(0.153)	(0.260)	(0.131)	(0.125)	(0.100)	(0.097)
Number of Observations	111	380	144	425	464	352	409
PANEL B							
ΔLog(Female Faculty in the field)	0.077	-0.0486	0.102	-0.088	0.122	0.0671	0.112
	(0.272)	(0.158)	(0.261)	(0.108)	(0.091)	(0.075)	(0.090)
ΔLog(Female Faculty in the institution)	0.059	0.012	0.303	0.237*	-0.0047	-0.0193	0.121
	(0.165)	(0.173)	(0.358)	(0.142)	(0.129)	(0.111)	(0.111)
ΔIndex[c]	0.008***	0.0048***	0.00061	-0.0023***	0.0053***	0.033***	0.0008
	(0.0009)	(0.0011)	(0.0017)	(0.0009)	(0.0007)	(0.0008)	(0.0007)
Number of Observations	103	351	136	395	427	313	373

Robust standard errors in parentheses. * sig at 10%; ** sig at 5%; *** sig at 1%

The dependent variable is $\log\left(\frac{\text{\% of females in major i at college j in 1987}}{\text{\% of females in college j at in 1987}}\right) - \log\left(\frac{\text{\% of females in major i at college j in 1976}}{\text{\% of females in college j at in 1976}}\right)$

a $\log(\text{\% of female faculty in major i at college j in 1985}) - \log(\text{\% of female faculty in major i at college j in 1974})$

b $\log(\text{\% of female faculty in college j in 1985}) - \log(\text{\% of female faculty in college j in 1974})$

c GEI in 1989 - GEI in 1977

Table 6: The Gender Hypothesis: Variation over Time

	Engineering	Physics	Geology	Math	Life Sci	Psychology	Social Sci
ΔLog(Female Faculty)[a]	0.623***	0.040	0.233	-0.0168	0.0095	0.031	0.042
	(0.185)	(0.107)	(0.211)	(0.0788)	(0.063)	(0.054)	(0.063)
ΔLog(Female Faculty in the institution)[b]	0.562***	-0.043	0.625*	-0.061	0.149	0.053	-0.0085
	(0.140)	(0.134)	(0.0365)	(0.137)	(0.128)	(0.089)	(0.098)
Linear Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	257	1074	349	1138	1283	1000	1164

Robust standard errors in parentheses. * sig at 10%; ** sig at 5%; *** sig at 1%

The dependent variable is $\log\left(\frac{\text{\% of females in major i at college j in year y}}{\text{\% of females in college j at in year y}}\right) - \log\left(\frac{\text{\% of females in major i at college j in year y-5}}{\text{\% of females in college j at in year y-5}}\right)$

a $\log$(% of female faculty in major i at college j in year y-2) $-$ $\log$(% of female faculty in major i at college j in year y-7)

b $\log$(% of female faculty in college j in year y-2) $-$ $\log$(% of female faculty in college j in year y-2)

c GEI in 1989 - GEI in 1977

Table 7: The Gender Hypothesis for Males

	Engineering	Physics	Geology	Math	Life Sci	Psychology	Social Sci
Log(Male Faculty in the field)[a]	0.234	-0.0013	0.110	0.063	-0.0050	0.0916**	0.117*
	(0.208)	(0.084)	(0.082)	(0.064)	(0.058)	(0.044)	(0.069)
Log(Male Faculty in institution)[b]	-1.078***	0.303**	-0.588***	-0.092	0.669***	0.081	-0.016
	(0.321)	(0.140)	(0.177)	(0.127)	(0.136)	(0.140)	(0.140)
Gender Equality Index[c]	-0.0013	-0.0010*	-0.0006	0.0005	-0.0020***	-0.0004	-0.0007
	(0.0013)	(0.0005)	(0.0008)	(0.0005)	(0.0007)	(0.0005)	(0.0006)
Controls for Institution	No	No	No	No	No	No	No
Time Trend	No	No	No	No	No	No	No
Random Effect	No	No	No	No	No	No	No
Log(Male Faculty in the field)	0.298	-0.016	0.066	0.045	-0.017	0.088**	0.117*
	(0.223)	(0.084)	(0.081)	(0.064)	(0.057)	(0.044)	(0.070)
Log(Male Faculty in institution)	-1.038***	0.310**	-0.480***	-0.088	0.695***	0.072	-0.028
	(0.245)	(0.143)	(0.172)	(0.129)	(0.134)	(0.140)	(0.140)
Gender Equality Index	-0.0016	-0.0009	-0.00004	0.00001	-0.0014*	0.0004	-0.0007
	(0.0015)	(0.0006)	(0.0008)	(0.0006)	(0.0008)	(0.0005)	(0.0006)
Controls for Institution	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Trend	No	No	No	No	No	No	No
Random Effect	No	No	No	No	No	No	No
Log(Male Faculty in the field)	0.241	-0.015	0.073	0.053	-0.024	0.085*	0.113
	(0.225)	(0.085)	(0.081)	(0.064)	(0.057)	(0.044)	(0.070)
Log(Male Faculty in institution)	-1.121***	0.306**	-0.049***	-0.047	0.665***	0.028	-0.019
	(0.251)	(0.148)	(0.169)	(0.131)	(0.137)	(0.143)	(0.143)
Gender Equality Index	-0.0019	-0.0009	-0.000006	0.0005	-0.0019**	-0.00008	-0.0007
	(0.0015)	(0.0006)	(0.0009)	(0.0006)	(0.0008)	(0.0005)	(0.0006)
Controls for Institution	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Random Effect	No	No	No	No	No	No	No
Log(Male Faculty in the field)	-0.116	-0.027	-0.0064	0.068	-0.006	0.037	-0.013
	(0.075)	(0.065)	(0.107)	(0.057)	(0.046)	(0.039)	(0.047)
Log(Male Faculty in institution)	-0.136*	0.246**	-0.252	-0.0048	0.193*	0.053	0.070
	(0.812)	(0.101)	(0.159)	(0.105)	(0.105)	(0.110)	(0.079)
Gender Equality Index	-0.0019	-0.0011*	0.0006	0.00027	-0.0025***	-0.0004	-0.0007
	(0.0016)	(0.0006)	(0.0012)	(0.0006)	(0.0008)	(0.0006)	(0.0007)
Controls for Institution	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Random Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	1621	7039	2419	7530	8032	6797	7559
Number of Institutions	261	875	350	939	948	862	943

Robust standard errors in parentheses. * sig at 10%; ** sig at 5%; *** sig at 1%

The dependent variable is $\log\left(\frac{\text{\% of males in major i at college j at time } t}{\text{\% of males in college j at time } t \text{ in all majors EXCEPT major i}}\right)$

a $\log\left(\text{\% of male faculty in major i at college j at time } t-2\right)$

b $\log\left(\text{\% of male faculty in college j at time } t-2\right)$

c The Gender Equality Index on a scale of 0-100 (for the years spanning 1977-1983)

Table 8: The Gender Hypothesis for Males: Variation over Time

	Engineering	Physics	Geology	Math	Life sciences	Psychology	Social Sci
PANEL A							
ΔLog(Male Faculty)[a]	-0.206	-0.280	0.080	0.0052	0.114	0.143	0.297
	(0.235)	(0.339)	(0.251)	(0.245)	(0.134)	(0.147)	(0.295)
ΔLog(Male Faculty in the institution)[b]	-0.236***	0.141	-0.062	0.167	0.545**	0.405***	0.179
	(0.073)	(0.162)	(0.24)	(0.260)	(0.236)	(0.154)	(0.132)
Number of Observations	118	377	145	423	452	344	402
PANEL B							
ΔLog(Male Faculty in the field)	-0.134	-0.088	0.062	0.033	0.122	0.087	0.442
	(0.229)	(0.327)	(0.269)	(0.252)	(0.130)	(0.158)	(0.331)
ΔLog(Male Faculty in the institution)	-0.234***	-0.072	0.174	0.506	0.161	0.080	0.009
	(0.083)	(0.182)	(0.307)	(0.335)	(0.268)	(0.197)	(0.165)
ΔIndex[c]	0.0003	-0.0015	0.001	0.007***	-0.0068***	-0.0053***	-0.0017
	(0.0005)	(0.001)	(0.001)	(0.0015)	(0.00097)	(0.0012)	(0.0011)
Number of Observations	110	349	137	392	416	316	367

Robust standard errors in parentheses. * sig at 10%; ** sig at 5%; *** sig at 1%

The dependent variable is $\log\left(\frac{\text{\% of males in major i at college j in 1987}}{\text{\% of males in college j at in 1987}}\right) - \log\left(\frac{\text{\% of males in major i at college j in 1976}}{\text{\% of males in college j at in 1976}}\right)$

a $\log$(% of male faculty in major i at college j in 1985) $-$ $\log$(% of male faculty in major i at college j in 1974)

b $\log$(% of male faculty in college j in 1985) $-$ $\log$(% of male faculty in college j in 1974)

c GEI in 1989 - GEI in 1977