Investigating the Impact of Role Models and Grade Sensitivity on Female Undergraduates' Chance of Pursuing an Economics Degree

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Abstract

The purpose of this research paper is to determine if a lack of role models and grade sensitivity impacts a women's probability of majoring or minoring in economics at the undergraduate level. Based on self-categorization and stereotype threat, previous research indicates that the lack of female role models leads females to major in areas other than economics. Previous research also shows that due to the theory of self-efficacy, women are more discouraged than men by lower grades. This study used data from the Lycoming College Registrar's Office to determine the presence and pervasiveness of these barriers within economics. Data from the areas of accounting and psychology are also analyzed for comparison. Based on the regression results, it is concluded that the presence of role models does not have an impact on whether a female student majors or minors in economics, which is consistent with results from the accounting and psychology data. It is also concluded that grade sensitivity only impacts women deciding to minor in economics.

Introduction

The underrepresentation of women within various areas of academia is not a new subject of conversation. Higher-paying areas of study tend to be male-dominated and severely lacking in female participation. Specifically, the gender gap in the field of economics has not wavered over the years and has drawn increasing attention. There is a larger fraction of female majors in STEM areas such as chemistry, mathematics, and statistics than in economics (Avilova and Goldin 2018). Over 50 percent of undergraduate students and bachelor's degree earners in the past two decades are women, but less than one third of undergraduate economics majors are women (Avilova and Goldin 2018; Dynan and Rouse 1997). This figure has seen little growth, indicating the progress of women in the field of economics has stalled. Women are even scarcer among higher levels of academia such as the masters and doctorate degree levels. This is referred to as a "leaky pipeline", because the number of women at each stage continually decreases (Buckles 2019). Researchers and economists share a growing concern about these statistics (Chevalier 2021). The gender composition of undergraduate economics students contains room for improvement and warrants further investigation into what prevents female students from pursuing economics.

Diversifying economics will increase the number of perspectives that contribute to classrooms, research, and policy. Women heavily contribute to the economy as both paid wage-earners and caregivers but are not adequately represented in the groups that make economic decisions and policies. Research shows that the inclusion of women enhances the quality of collaboration within teams and positively increases productivity. This is true not for groups with a few women, but rather groups with an equal gender ratio between male and female members (Bear and Woolley 2011). Men and women also have significant differences in their views on

important policies, meaning the inclusion of more women in these decisions can broaden policy choices (May, McGarvey, and Kucera 2018; May, McGarvey, and Whaples 2014). The lack of women within these areas is a pervasive problem that begins at the university level when students decide what field of study to pursue. There is a discrepancy between the number of men and women who choose to major in economics, along with other quantitative fields, which contributes to the lack of women in various careers. Therefore, universities need to be analyzed to determine what is creating this variation between the number of men and women who major in those fields.

The setting of this study is Lycoming College, a small and private liberal arts institution located in Williamsport, Pennsylvania. Lycoming's percentage of female students earning a bachelor's degree in economics is aligned with the national figures. This is shown through data obtained from the College's Registrar's Office and the Integrated Postsecondary Education Data System (IPEDS). As shown in Table 1 of the appendix, the percentage of women earning a bachelor's degree in economics from Lycoming College in 2021 was 30.8 percent, almost identical to the national value of 30 percent. However, the percentage of women earning all bachelor's degrees, both at Lycoming College and all institutions, was above 50 percent. The percentage of women at Lycoming College earning a bachelor's degree in economics has also greatly fluctuated over time with no sustained progress, ranging from 12.5 percent in 2014 to 50 percent in 2013. This fluctuation is also a function of the small number of students who choose to major in economics at Lycoming College.

Previous studies on this subject offer several reasons as to why progress in this area has not occurred. In a 1997 study, Dynan and Rouse found that a student's grade in an introductory level economics course had both a positive and significant impact on whether that student chose

to major in economics. Furthermore, a study by Avilova and Goldin in 2018 examined the impact of grades in a principles of economics course and discovered gendered differences in the responses to these grades, suggesting women are sensitive to grades received. Previous research has also found that a lack of female role models and mentors in the field contributes to the lack of female participation (Lundberg and Stearns 2019; Porter and Serra 2020). As a result, women are unaware of the various career possibilities, applications, and potential that comes with a degree in economics (Dynan and Rouse 1997). Prior research also identifies evidence that a role model effect (Carrell, Page, and West 2010; Fried and MacCleave 2009) and grade sensitivity (Kugler, Tinsley, and Ukhaneva 2017; Ost 2010) exists for women within the fields of math and science as well.

I analyzed data from the Lycoming College Registrar's Office to determine if these barriers exist within the economics program at a small-scale liberal arts school. This process will then be replicated to analyze similar data from the accounting and psychology departments at Lycoming College. Results from both analyses will be compared to determine if the barriers experienced by women within economics are unique to that field, or if these effects are a common feature of many academic majors. Most previously studied institutions consisted of large, selective universities. While Lycoming College's figures follow the national statistics regarding women in economics, it is not clear whether the same barriers exist at colleges with a smaller student body and lower faculty to student ratio. If grade sensitivity and the role model effect are prevalent in this setting, it will emphasize the pervasiveness of the lack of women in undergraduate economics. It will also signal the institution to implement strategies aimed at combatting these obstacles such as encouraging students with a grade above the course median to consider economics as a path, presenting role models, and providing information on careers in

economics. The broader goal of this study is to gain a better understanding of the barriers faced in order to increase participation among female undergraduate students and create a more diverse community within Lycoming's economics department, one that better represents the entire college community. The results and lessons learned within this study can also benefit other institutions who seek to increase the number of women that major within male-dominated fields.

Theoretical Framework and Literature Review

Several concepts and theories from psychology provide an understanding for the analysis in this research paper. The discrepancy between the low percentage of women receiving degrees in undergraduate economics compared to the higher percentage of men receiving degrees, potentially due to a lack of role models, can be examined through the self-categorization theory and stereotype threat.

The American Psychology Association's Dictionary of Psychology defines the self-categorization theory as, "an explanation of the cognitive processes that align people's self-conceptions with the groups to which they belong." In other words, individuals classify and sort themselves, along with others, into social categories and apply the stereotypes associated with the group in which they identify to themselves (Hogg, Terry, and White 1995). These social categories are referred to as the in-group and out-group. In the male-dominated field of economics, women are considered the out-group. This categorization is supported in a 2018 study conducted by Wu in which a negative culture was discovered using evidence from anonymous discussions on the Economic Jobs Market Rumors forum (EJMR). The EJMR shares information regarding job opportunities, interviews, and outcomes during hiring cycles while users post anonymously about any issue relating to economics or other subjects. The study

measured the gendered language in a sample of posts and identified the words most associated with men and women, which revealed a discrepancy in how each is portrayed. The study found that female words are usually about physical appearance, personal or family information, or gender issues and sexism, while male words related to academic or professional characteristics (Wu 2018). More specifically, the inclusion of the words "hot" and "attractive" increase the probability that a post is discussing a woman by approximately 27.1 percent and 24.5 percent (Wu 2019, 176). This reveals that women working within the field of economics can be objectified and face sexism. They are judged by unprofessional characteristics and treated as the out-group.

As shown above, out-groups are typically identified and labeled with undesirable characteristics. When an individual is aware of their status as the out-group and the labels they face, they become susceptible to stereotype threat. Stereotype threat is, "an individual's expectation that negative stereotypes about his or her member group will adversely influence others' judgements of his or her performance and that a poor performance will reflect badly on the member group. This expectation may undermine the individual's actual ability to perform well" (*American Psychological Association Dictionary of Psychology*). Individuals tend to underperform in situations where they are stereotyped. This creates uncertainty and causes a search for evidence confirming the stereotypes, which triggers negative thoughts that affect the individual's thinking, feelings, and actions (Schmader 2010). Women within economics, since it is a masculine and quantitative field, often face negative stereotypes. A 1997 study by Steele tested the existence of stereotype threat by using domain identification (process by which individuals form a relationship between themselves and a field or pursuit, e.g., the academic domain) to describe barriers that women in advanced quantitative fields face. Male and female

college sophomores who were good at math and strongly identified with their math skills were recruited to take a very difficult math test. The researchers tested the theory that for these academic domain-identified students, stereotype threat can interfere with a women's performance on the test, since quantitative fields such as mathematics are seen as masculine. The results revealed that women significantly underperformed on the test in comparison to men. These results were surprising and indicative of stereotype threat, because both men and women in the study identified and classified as high-achieving individuals in mathematics. This process was then replicated using an advanced literature test with individuals that identified with literature. These results showed no difference in performance between men and women and further confirms the presence of a stereotype effect among women in quantitative fields, such as economics (Steele 1997). These stereotypes discourage women from pursuing economics and push them to major in fields where they do not face negative labels.

Self-categorization and stereotype threat exist for women within economics because they are the minority gender. The lack of female participation leads to the out-group identification and negative stereotypes. A potential solution for removing both the stereotypes and low participation is female representation in the form of role models. Role models can provide an example that allows female students to disprove and reject the negative stereotypes. They represent success and an attainable career, which can increase an individual's belief in achieving success and motivate them towards it. Role models can also make a career in economics more attractive to women and draw them into the field. Women are less likely to identify as the out-group if the number of women in economics and their visibility increases. Based on this logic, female students who do not have a female professor, advisor, or mentor will be less likely to

choose to major or minor in economics, and those who do have a female role model for guidance will be more likely to continue.

Previous studies support the claim that a contributing factor to the lack of women in economics, and other quantitative fields, is the lack of female role models. In 2016, Bayer and Rouse studied previous literature to summarize and identify what elements were affecting the supply and demand of female and minority economics students. They discovered that recent studies point to the idea that a lack of role models dissuades these individuals from pursuing economics. This notion about role models is also supported by a national survey conducted by Haslehurst, Hopkins, and Thorpe (1996) on Australian economics students, which found representation was an important factor in the career decisions of both undergraduate and postgraduate students. When questioned about their importance, 40 percent of women agreed that a reason they would not consider academia as a career was due to a lack of role models in that area, but only 28 percent of men had this same response (Haslehurst, Hopkins, and Thorpe 1996). This indicates that female economics students are discouraged because of a lack of role models.

More recent studies show that the presence of a female role model disproves the stereotypes and out-group association surrounding women in these fields and increases their participation. Porter and Serra (2020) exposed a treatment group of introductory economics students at Southern Methodist University (SMU), a medium-sized private university, to successful female economics alumni. These women visited randomly selected classes and lead discussions outlining how they achieved success, what it took to get where they are, and how their economics degrees helped them in their careers. As a result, this simple and low-cost intervention significantly impacted female enrollment in economics when compared to the

control group. The treatment group increased their chances of choosing to major in economics by 100 percent from the previous year (Porter and Serra 2020). Furthermore, the chances of a women taking an intermediate economics course the year after principles increased by 11 percentage points, and their chances of taking any other economics course after principles at any point increased by 14 percentage points (Porter and Serra, 228). The large impact of a 15-minute conversation with a role model shows the effect they can have. It also illuminates how deprived female students are of this privilege. The women within this treatment group performed as well or better than those within the control group, so the interventions were not attracting inadequate candidates but rather intelligent women who were not previously considering economics for a major (Porter and Serra 2020). All these women needed was an example of who they could be and what they could achieve through economics.

Outside of the classroom, academic advisors can also act as role models and impact a female student's choice in major. Data on advisors and students enrolled at the American University of Beirut (AUB), a private college located in Lebanon, indicated that the gender of an economic advisor has a significant influence on women (Canaan and Mouganie 2021). At this university, first-year undergraduate economics majors are randomly assigned to an advisor. Female students paired with female academic advisors experienced a 4.1 percentage point decrease in first year dropout rate and a 7 percentage point increase in women graduating with an economics degree (Canaan and Mouganie 2021). Academic advisors are not a daily presence within a students' life. They mainly provide guidance when a student is making academic decisions and are only visited or contacted when needed. The influence of this limited contact from an academic advisor shows once again how impactful a role model can be.

In addition to academic advisors, a mentor is considered another type of role model. Mentors also provide guidance along with coaching and networking. In 2020, Ginther, Currie, Blau, and Croson published a study examining the impact of mentors. They focused on a program that was designed as a randomized control trial. For the program, junior female economists pursuing a Ph.D. and who were employed at institutions that heavily focus on research when determining promotions, participated in a two-day workshop with the purpose of connecting with mentors who worked in their area of expertise. Those who attended the workshop, which involved sharing how to be successful and building career relationships, increased their probability of having a tenured job by 10.7 percentage points at any institution and 16.3 percentage points at a top-100 rated institution (Ginther et al. 2020, 208). The introduction of a role model impacts the success of women at the graduate and doctorate levels in economics, just as it does at the undergraduate level. This form of representation matters in all stages of economics. These studies demonstrate that the effect of a role model within the major of economics, in varying capacities and on varying levels, disproves the stereotypes and out-group identification and increases the number of women within the major.

The lower probability that women pursue a degree in economics compared to men can also be investigated using the theory of self-efficacy regarding grade sensitivity. Self-efficacy is defined as, "a person's beliefs concerning his or her ability to successfully perform a given task or behavior" (Betz 2000). Belief in self and having confidence in one's own abilities are important characteristics for individuals to possess. If an individual has a low self-efficacy, it can lead to avoidance, poor performance, and often result in the individual "giving up" in the face of discouragement (Betz 2000). Previous research indicates that women are less confident than men and that they often infer a lack of capability from a poor performance, no matter the

circumstances (Shastry, Shurchkov, and Xia 2020). This perceived low efficacy and lack of confidence extends to academic outcomes. A 2012 study by Jakobsson surveyed Swedish university students, asking what grade each individual believed they would receive on a macroeconomics exam, one week prior to the exam. The results showed no significant evidence of overconfidence in men but did show that women were underconfident. Specifically, 23 percent of the women and 9 percent of the men thought they would fail, but only 15 percent of the women and 24 percent of the men actually failed. Four percent of the women and 13 percent of the men expected to get a high pass, but 23 percent of the women and 20 percent of the men actually got a high pass (Jakobsson 2012, 1058). The difference between the estimated grade and actual grade for women is statistically significant.

One of the sources that informs a person's self-efficacy is performance accomplishments, which are experiences that include successful completion of a task or behavior (Betz 2000). In academic settings, the grade an individual receives on an exam or for a course indicates success. The higher the grade, the more self-efficacy is perceived to be had. On the other end, individuals receiving lower grades, specifically women, will believe they have low efficacy. As shown through prior research, women already have low efficacy in the classroom by expecting to receive lower grades. If a woman taking an economics course receives a grade that she deems is poor, she is likely to give up regardless of how it compares to others. She will translate the grade as a lack of capability and low efficacy. Therefore, women who receive lower grades in principles and introductory economics courses will not major or minor in economics, and only those earning a high grade will choose to pursue economics.

Prior research indicates that grades are a strong signal for women in economics and impact their participation in the field. A 2010 study by Owen provides direct evidence of the

effect of grades earned in economic principles courses on the decision to major in economics. The sample for the study consisted of 1,800 students who took an introductory economics course at a highly selective university in the United States over the period of 2003-2006. This institution does not award half letter grades (pluses or minuses), which allowed the researchers to use a regression discontinuity design. Owen argues that this regression model provides a more valid case that grades cause student choices, due to the design of the regression. The variable for letter grade received was interacted with a dummy variable for gender to evaluate whether the treatment of receiving a particular letter grade varies in relation to men and women. The results showed female students receiving an A for their final grade in their first economics class experienced a positive and significant increase in the probability of majoring in economics. This held true after controlling for the numerical grade earned in the class as well (Owen 2010). An alternative example from a university that used half-letter grades, which increased the number of breakpoints within the regression, corroborated these results (Owen 2010). These results show how grades act as a strong signal for women in economics by indicating their capacity for success in the field. Since women are more sensitive to this signal than men, women require a higher grade to confirm their abilities.

In 2015, Goldin found that women who drop out of the economics major after taking a principles course are disproportionately those who did not receive a high grade in the class. This study focused on Adams College, a liberal arts school that is similar in selectivity to Ivy league schools. The results showed a drop-off of female students after taking the principles of economics course based on grade earned in the class. Specifically, 42 percent of women with A's in the class went on to major in economics and 40 percent of men with A's continued. However, only 27 percent of women receiving a B+ went on to major in economics while men had 41

percent with a B+ continue (Goldin 2015). Only a handful of students within a class earn an A. For men, not receiving an A does not discourage them in their pursuits. For women, receiving a grade below an A signals less ability and is not high enough for them to pursue economics. Because of this discrepancy and the fact that more students will receive B's in a course than A's, less women pursue the field compared to men.

Another study went even further to determine the impact of course grades on major persistence. McEwan, Rogers, and Weerapana (2021) studied longitudinal data from Wellesley College, a very selective women's-only liberal arts college, using a regression discontinuity design. They developed a system of "letter-grade cutoffs", which is the midpoint between two letter grades (A and A-, A- and B+, etc.), and determined the likelihood of that student continuing in economics based on where their grade fell. It was discovered that there was an 18 percentage point difference in the likelihood to major in economics between those just above the letter-grade cutoff and those right below it (McEwan, Rogers, and Weerapana 2021). In fact, there is a difference immediately after a score falls below or above the cutoff by any relative value. More specifically, 64 percent of women receiving an A majored in economics, while only 29 percent of those receiving a B chose to major (McEwan, Rogers, and Weerapana 2021). While this study examines a college that only admits female students, it is important in depicting how sensitive women are to the signal of an A versus a B. Based off both studies, it is very evident that the grade a woman receives in an introductory economics class heavily influences their decision on whether to pursue economics or explore other avenues.

Grade sensitivity also persists outside of economics in other STEM fields. While investigating trends of persistence within the sciences, Ost (2010) determined students are "pulled away" from science by high grades in non-science classes and "pushed out" of science

by low grades within their major classes. He goes on to explain that in the physical sciences, there is a 10 percent persistence gap between men and women, but no gap within the life sciences (Ost 2010). Physical sciences require more mathematical prowess and include a higher percentage of male students than the life sciences. This exemplifies the stereotype threat that women face in quantitative fields because they are perceived to be worse at math than men, which results in the unwillingness of women to pursue a physical sciences degree. Kugler, Tinsley, and Ukhaneva (2017) discover a similar pattern in their study by examining whether low grades in major-related classes explain gender differences in degrees awarded at a large private university on the East Coast. They find that women are significantly more likely to drop a male-dominated STEM major due to poor performance, but men and women are equally likely to drop a major due to low grades in gender equal STEM areas (Kugler, Tinsley, and Ukhaneva 2017). This reinforces the findings of the previous paper regarding women in the physical and life sciences. Most importantly, Kugler, Tinsley, and Ukhaneva (2017) describe how it takes multiple signals to persuade a woman to switch majors such as low grades, the gender composition of her class, and stereotyping and implicit biases.

These studies showcase the key factors that are preventing women from pursuing degrees and careers in the field of economics. Across levels of study (undergraduate, graduate, and doctorate), types of institutions, campuses, periods of time, and even fields of study, a lack of role models and grade sensitivity prevents women from realizing their potential and pursuing certain career paths. The research gathered in past studies demonstrates how many factors simultaneously influence a student's decision to major in a field, however the lack of role models and grade sensitivity of women are especially important. Therefore, two hypotheses will be tested in this study.

Hypotheses 1: Female students with a female professor in a principles of economics course are more likely to major or minor in economics than other students.

Based on the concepts of self-categorization and stereotype threat, women are discouraged from pursuing economics because a lack of role models allows negative stereotypes and the out-group association to persist. Thus, we expect that a female professor will disprove the negative stereotypes and associations, which encourages female students to continue in the field of economics.

Hypothesis 2: Female students with a higher relative grade and course grade are more likely to major or minor in economics compared to those with lower grades.

The theory of self-efficacy shows that the lower the grade a woman receives, especially in comparison to her other courses, the lower her confidence and the less ability she believes she has in that field. Women require a higher grade than men to consider pursuing economics, so it is expected that receiving a higher grade will influence a woman to pursue economics. This paper adds to the previous literature by analyzing these two factors side by side and comparing their effects across different fields of study in a small college setting.

Description of the Data

In order to determine the presence of a role model effect and grade sensitivity, an analysis was conducted with data pertaining to undergraduates who were enrolled in a principles of

microeconomics or principles of macroeconomics course at Lycoming College. A total of 24 semesters in which the principles courses were offered, occurring from Fall 2010 through Spring 2022, was examined. Sections were taught by a changing combination of 8 professors, only 1 of whom is female. The original sample population includes the 3,907 students who enrolled in a principles of economics course during the stated period.

Data was collected from the College's Registrar office regarding student and course characteristics. Students' sex, ethnicity, declared majors and minors, GPA at time of graduation or end of the most recent completed semester, and their grade level (freshmen, sophomore, junior, or senior) when taking the principles course was collected. Course characteristics such as the term, course name, instructor's sex, type of instructor (tenure track or other), and grade received by each individual were also included. This data was further used to determine if the student was currently enrolled at or graduated from Lycoming, if they left the college prior to graduating, the class composition of the course (percentage of female students in the class), and the student's grade in the course relative to their cumulative GPA (calculated by dividing the course grade by the cumulative GPA with that specific grade removed). For a full description of all variables included in the regressions, refer to Table 2 in the appendix. It is important to note several details about certain variables. First, sex in this study refers to the individual's biological identification at birth, not the gender the individual personally identifies as. Second, one of the categories of race and ethnicity in this study is international, which refers to a student who does not reside in the United States but rather a foreign country. While this is a broad category as international students come from a variety of places and backgrounds, this is how those individuals chose to identify from a list of races and ethnicities. Finally, cumulative GPA refers to a student's GPA at the time they exited the college (graduation or transfer) or for current

students, it refers to their GPA at the time data was collected. This can introduce noise with relation to the student relative grade variable because it is comparing the grade in an introductory course, which is presumably taken at the beginning of one's college career, to a student's GPA at the end of their college career.

The original sample of data was then narrowed down to conduct a more accurate analysis. When assessing the probability that a student majors in economics, the following adjustments were made: students who took the introductory course as a junior or senior are removed because a student must declare their major prior to the end of their sophomore year, and it is difficult to change majors later on in a college career; transfer students were removed due to the difficulty in determining whether the student transferred in or out of the college, which made it impossible to define a student's class year when taking the course; students who received a grade of P, W, X, or T in the course are removed due to the ambiguity of the value of that grade (for example, P represents passing a course and any grade above a D is considered passing); students who minored in the subject are removed since it is not possible to major in a subject that you minor in; finally, first year students who took the course within the two most recent semesters are removed since they are unlikely to have declared a major by the time data was collected. This resulted in the sample size decreasing to a total of 1,210 observations. The same variables and processes were replicated for the data regarding accounting and psychology, resulting in sample sizes of 650 and 1,325 respectively.

Similar adjustments were made to the sample data used to determine the probability that a student minors in economics. Students who transferred, received a grade of P, W, X, or T, and who took the course as a first-year student within the two most recent semesters (Fall 2021 and Spring 2022) were again removed. Only students who took the introductory course as seniors

were removed because it is possible to switch or declare a new minor as a junior, despite it being in the latter half of a students' college career. Furthermore, students who majored in the subject were removed since it is not possible to both minor and major in a subject. This resulted in a final sample size of 1,428 observations. Again, the same process was replicated for the subjects of accounting and psychology, resulting in sample sizes of 730 and 1,170 observations respectively.

The total number of observations for each set of sample data can also be found listed in Tables 3a and 3b of the appendix. These tables describe the categorical and dummy variables used within each set of data. Psychology had the highest number of female observations for both the major and minor regressions, followed by economics and then accounting. For all three subjects, the number of observations that took an introductory course and then went on to either major or minor in that field is small relative to the total number of observations. It is also true for all three fields that in both the major and minor regressions, the most frequent race of a student is white, and it is far more frequent than all other categories of race. For psychology, most students were taught by a female professor (85.1% within the major sample and 89.4% within the minor sample), whereas it is the opposite for economics and accounting. In the economics samples, 33.1% of the major observations and 32.9% of the minor observations included a female professor. In accounting, 34.3% of the major observations and 38.1% of the minor observations included a female professor. However, both samples within all three subjects included an overwhelming majority of classes taught by a tenured or tenured track professor.

In addition to these tables that describe the categorical and dummy variables within the samples, Tables 4a and 4b within the appendix show descriptive statistics for the continuous variables in each sample. Table 4a describes the continuous variables used within the samples for

the major regressions. Psychology had the highest average course grade (2.894), followed by economics (2.703), and then accounting (2.421). Therefore, the average introductory course grade for each subject was a B, B-, and C+ respectively. While accounting had the lowest average course grade, it had the highest standard deviation followed by economics and then psychology. The lower the average course grade, the larger the variance in the data. On the other hand, economics had the highest average cumulative GPA at 3.077, followed by accounting with 3.066, and then psychology with 3.045. However, there is not a large difference between these values. There is a large difference between the average class composition of each subject. On average, a psychology class is about 57% female, whereas an economics class is about 35% female and accounting classes are about 39% female on average. The average class composition for economics (about 35%) is similar to the national statistics in Table 1 of the Appendix for the total number of women receiving an undergraduate degree in economics. The average relative grade for each subject is also below one, meaning that on average a student's grade in these courses is below their cumulative GPA. The above assertions regarding course grade, class composition, and student relative grade can also be made for Table 4b, which describes the continuous variables used in the minor sample data sets.

Empirical Strategy

To test the various hypotheses mentioned in section III, probit models are estimated. This model conducts a regression using a binary outcome as the dependent variable. Compared to a limited probability model, a probit model has fewer limitations. Several studies mentioned in the previous sections of this paper utilized a probit model for similar investigations (Dynan and Rouse 1997; Fournier and Sass 2000; Rask and Tiefenthaler 2008). After conducting this

regression, average marginal probabilities are then executed to make the results easier to interpret. The coefficient of a probit model expresses the effect that a one-unit increase in the independent variable will have on the cumulative normal probability of the dependent variable as a z-score. The average marginal probability operation computes the average change in the dependent variable when the independent variable increases by one unit for each individual in the sample, and then computes the average of those changes.

Three methods were used to estimate the effects of role models and grade sensitivity on the chances of a student majoring or minoring in economics. The presence of a role model effect is estimated with the following equations:

Equation 1

$$MajorInEcon_i = \beta_0 + \beta_1 FemaleStu_i + \beta_2 FemaleProf_i + \beta_3 FemaleStu_i \times FemaleProf_i + \alpha_i X_i + \gamma_i \tau_i + u$$

Equation 2

$$MinorInEcon_i = \beta_0 + \beta_1 FemaleStu_i + \beta_2 FemaleProf_i + \beta_3 FemaleStu_i \times FemaleProf_i + \alpha_i X_i + \gamma_i \tau_i + u$$

The dependent variables $MajorInEcon_i$ and $MinorInEcon_i$ take the value of 1 if student i chooses to major in economics and 0 if they do not. $FemaleStu_i$ indicates whether student i is female. $FemaleProf_i$ indicates if student i's instructor is female. $FemaleStu_i \times FemaleProf_i$ represents an interaction term that measures the effect of only a female student with a female instructor on the outcome. χ represents variables that control for student characteristics and Υ includes variables that control for course characteristics. The interaction term β_3 is the coefficient of interest and is expected to be positive and significant.

To determine if grade sensitivity impacts the probability that a female student majors in economics, the following equations are estimated:

Equation 3

$$MajorInEcon_i = \delta_0 + \delta_1 FemaleStu_i + \delta_2 StuRelGrade_i + \delta_3 FemaleStu_i \times StuRelGrade_i + \delta_4 CourseGrade_i + \delta_5 FemaleStu_i \times CourseGrade_i + \alpha_i X_i + \gamma_i \tau_i + u$$

Equation 4

$$MinorInEcon_i = \delta_0 + \delta_1 FemaleStu_i + \delta_2 StuRelGrade_i + \delta_3 FemaleStu_i \times StuRelGrade_i + \delta_4 CourseGrade_i + \delta_5 FemaleStu_i \times CourseGrade_i + \alpha_i X_i + \gamma_i \tau_i + u$$

The dependent variables $MajorInEcon_i$ and $MinorInEcon_i$ take the value of 1 if student i chooses to major in economics and 0 if they do not. $FemaleStu_i$ indicates whether student i is female. $StuRelGrade_i$ indicates student i's grade relative to their cumulative GPA. $CourseGrade_i$ represents student i's grade in the course. $FemaleStu_i \times StuRelGrade_i$ measures the effect of a female student's relative grade on the outcomes. $FemaleStu_i \times CourseGrade_i$ measures the effect of a female student's course grade on the outcomes. The remaining terms in the equation represent the same variables as in the former equation. δ_3 and δ_4 are the coefficients of interest in this equation and are expected to be positive and significant.

Finally, the combined impact of the role model effect and grade sensitivity are estimated using the following equations:

Equation 5

$$MajorInEcon_i = \alpha_0 + \alpha_1 FemaleStu_i + \alpha_2 FemaleProf_i + \alpha_3 StuRelGrade_i + \alpha_4 CourseGrade_i + \alpha_5 FemaleStu_i \times StuRelGrade_i + \alpha_6 FemaleStu_i \times CourseGrade_i + \alpha_7 FemaleStu_i \times FemaleProf_i + \alpha_i X_i + \gamma_i \tau_i + u$$

Equation 6

$$MinorInEcon_i = \alpha_0 + \alpha_1 FemaleStu_i + \alpha_2 FemaleProf_i + \alpha_3 StuRelGrade_i + \alpha_4 CourseGrade_i + \alpha_5 FemaleStu_i \times StuRelGrade_i + \alpha_6 FemaleStu_i \times CourseGrade_i + \alpha_7 FemaleStu_i \times FemaleProf_i + \alpha_i X_i + \gamma_i \tau_i + u$$

All alpha variables have the same meaning as in the previous equations. In these equations α_5, α_6, and α_7 are the coefficients of interest. By including these interaction terms, we can determine if one factor is more powerful than the other. For example, if the coefficient for α_5 is larger in value than the coefficient for α_7, that indicates grade sensitivity has a larger impact on the probability that a female student majors in economics. If the inclusion of both interaction terms results in α_5 becoming insignificant and α_7 remaining significant, this indicates that the role model effect negates grade sensitivity in women. However, both coefficients are expected to be positive and significant in value.

Results and Discussion

The results of the probit regressions and average marginal probabilities estimating the impact of the role model effect, grade sensitivity, and a combination of both the role model effect and grade sensitivity on whether a student majors or minors in economics are presented in Tables 5a and 5b, 6a and 6b, and 7a and 7b in the Appendix. Three models were estimated for each subject in all tables: Model 1 included only the key independent variables in each equation, Model 2 added the variables that controlled for student characteristics in addition to the key independent variables, and Model 3 introduced the variables controlling for course characteristics. The third model is the model of interest since it includes all variables. This is also

true for the tables listed in the below sections, which compare the average marginal probabilities across all three subjects for each equation.

Role Model Effect

Table 8a displays the results regarding the presence of the role model effect and its impact on a student's decision to major in economics, accounting, or psychology. The interaction term FemaleStudentXFemaleProfessor in the table estimates the presence and significance of the role model effect. It is important to note that because it is not possible to calculate average marginal probabilities for interaction terms, the sign and significance of the binary probit results for each interaction term are listed instead. Hypothesis 1 states that based on previous research, the result of a female student taking a course taught by a female professor is expected to be positive and significant. However, the results for all three subjects were not statistically significant. Furthermore, the impact of a female professor on a female student's probability of majoring in that subject was only positive within psychology and was negative for both economics and accounting. Female student was negative for economics and accounting, positive for psychology, and statistically significant for all three subjects at the .05, .10, and .01 levels respectively. On average, a female student is 4.3 percentage points less likely than a male student to major in economics, 4.8 percentage points less likely in accounting, and 27.8 percentage points more likely in psychology. Psychology is a female-dominated field, so it is expected that women are more likely than men to major in this area. Female professor was positive for both economics and psychology and negative for accounting, but it was not statistically significant for any of the three subjects. Statistically significant control variables for economics included international (12.7 percentage points), current student (15.8 percentage points), and tenure professor (8.8 percentage points); accounting included cumulative GPA (-16.3 percentage points)

and course grade (25.1 percentage points); and psychology included cumulative GPA (20.6 percentage points), course grade (-21.0 percentage points), student relative grade (71.0 percentage points), and class composition (-32.1 percentage points).

Similarly, Table 8b presents the results regarding the presence of the role model effect and its impact on a student's decision to minor in one of the three areas. The interaction term FemaleStudentXFemaleProfessor is again not statistically significant for economics, accounting, nor psychology. It is statistically significant at the .10 level within Model 1 and Model 2 for accounting, but the inclusion of all variables in Model 3 removes the significance. This interaction term is still negative for accounting and positive for psychology but for economics it is now positive. Female student was negative for economics and accounting, positive for psychology, and only statistically significant for psychology at the .01 level. On average, a female student is 6.7 percentage points more likely than a male student to minor in psychology. Female professor was positive for economics and negative for accounting and psychology, but it was not statistically significant for any subject. Statistically significant control variables for economics included white (9.4 percentage points), international (14.0 percentage points), tenure professor (5.9 percentage points), and class composition (25.9 percentage points); accounting included white (8.8 percentage points), cumulative GPA (-16.1 percentage points), current student (16.7 percentage points), tenure professor (6.2 percentage points), and course grade (15.9 percentage points); and psychology included Black (-7.3 percentage points) and Hispanic/Latino (-6.8 percentage points). Overall, the results of both the major and minor regressions do not support Hypothesis 1 and the presence of a role model effect in economics, accounting, or psychology.

Table 8a

Average Marginal Probability Results: Major in Economics, Accounting, or Psychology - Role Model Effect

	Economics			Accounting			Psychology		
Variable	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Female Student	-0.015	-0.068***	-0.043**	-0.019	-0.062**	-0.048*	0.282***	0.280***	0.278***
	(0.024)	(0.022)	(0.021)	(0.027)	(0.026)	(0.025)	(0.023)	(0.023)	(0.023)
Female Professor	0.024	0.009	0.031	-0.006	-0.005	-0.012	0.017	0.017	0.070
	(0.025)	(0.024)	(0.027)	(0.028)	(0.032)	(0.037)	(0.034)	(0.034)	(0.045)
FemaleStudentXFemaleProfessor	Negative	Negative	Negative	Negative	Negative	Negative	Positive	Positive	Positive
White		0.041	0.002		0.070	0.057		0.036	0.039
		(0.039)	(0.040)		(0.048)	(0.043)		(0.044)	(0.045)
International		0.254***	0.127**		0.058	0.050		0.105	0.113
		(0.068)	(0.060)		(0.081)	(0.069)		(0.101)	(0.102)
Black		-0.012	-0.038		0.061	0.040		0.035	0.044
		(0.059)	(0.053)		(0.087)	(0.074)		(0.059)	(0.061)
Hispanic/Latino		0.071	0.011		0.165	0.137		0.053	0.073
		(0.065)	(0.056)		(0.108)	(0.090)		(0.059)	(0.062)
Cumulative GPA		0.143***	0.104		0.147***	-0.163*		0.007	0.206*
		(0.024)	(0.205)		(0.029)	(0.090)		(0.025)	(0.115)
Current Student		0.001	0.158**		0.034	0.083		-0.005	0.002
		(0.030)	(0.068)		(0.047)	(0.087)		(0.032)	(0.072)
Tenure Professor			0.088***			N/A			0.025
			(0.034)						(0.050)
Course Grade			-0.025			0.251***			-0.210*
			(0.200)			(0.088)			(0.114)
Student Relative Grade			0.674			-0.177			0.710**
			(0.542)			(0.237)			(0.306)
Class Composition			0.235			0.129			-0.321**
			(0.170)			(0.207)			(0.161)
Semester Included	No	No	Yes	No	No	Yes	No	No	Yes
Observations	1,210	1,210	1,210	650	650	632	1,325	1,325	1,325
Pseudo R^2	0.001	0.069	0.209	0.002	0.064	0.274	0.082	0.083	0.111

Significance levels are denoted by * $p \leq .10$; ** $p \leq .05$; *** $p \leq .01$

Note: Standard Errors listed in parentheses and the size and signifigance of the binary probit regression results for the interaction terms is listed

Table 8b

Average Marginal Probability Results: Minor in Economics, Accounting, or Psychology - Role Model Effect

	Economics			Accounting			Psychology		
Variable	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Female Student	-0.006	-0.032*	-0.024	-0.020	-0.024	-0.021	0.070***	0.064***	0.067***
	(0.018)	(0.018)	(0.018)	(0.018)	(0.019)	(0.019)	(0.019)	(0.020)	(0.019)
Female Professor	0.003	-0.006	0.009	0.004	0.003	-0.004	-0.007	-0.008	-0.002
	(0.019)	(0.018)	(0.023)	(0.019)	(0.022)	(0.027)	(0.028)	(0.027)	(0.040)
FemaleStudentXFemaleProfessor	Positive	Positive	Positive	Negative*	Negative*	Negative	Positive	Positive	Positive
White		0.095***	0.094***		0.089**	0.088**		-0.039	-0.042
		(0.029)	(0.027)		(0.043)	(0.043)		(0.034)	(0.034)
International		0.192***	0.140**		0.131	0.096		-0.042	-0.044
		(0.0746)	(0.066)		(0.119)	(0.105)		(0.055)	(0.053)
Black		-0.010	-0.008		0.134	0.134		-0.067**	-0.073**
		(0.055)	(0.054)		(0.112)	(0.104)		(0.031)	(0.029)
Hispanic/Latino		0.086	0.081		0.069	0.042		-0.063**	-0.068**
		(0.069)	(0.067)		(0.102)	(0.080)		(0.031)	(0.030)
Cumulative GPA		0.098***	-0.003		0.018	-0.161**		0.018	-0.062
		(0.017)	(0.077)		(0.018)	(0.075)		(0.019)	(0.082)
Current Student		-0.092***	-0.045		0.023	0.167**		0.008	-0.004
		(0.019)	(0.066)		(0.033)	(0.077)		(0.027)	(0.047)
Tenure Professor			0.059**			0.062**			0.067
			(0.027)			(0.028)			(0.030)
Course Grade			0.064			0.159**			0.077
			(0.079)			(0.076)			(0.081)
Student Relative Grade			0.097			-0.219			-0.116
			(0.217)			(0.199)			(0.208)
Class Composition			0.259*			0.004			-0.144
			(0.147)			(0.148)			(0.122)
Semester Included	No	No	Yes	No	No	Yes	No	No	Yes
Observations	1,428	1,428	1.394	730	730	667	1,170	1,170	1,170
Pseudo R^2	0.001	0.069	0.123	0.011	0.034	0.207	0.015	0.022	0.079

Significance levels are denoted by * $p \leq .10$; ** $p \leq .05$; *** $p \leq .01$

Note: Standard Errors listed in parentheses and the size and signifigance of the binary probit regression results for the interaction terms is listed

Grade Sensitivity

Table 9a displays the results regarding the effect of grade sensitivity and its impact on a student's decision to major in one of the three fields. Previous research indicates women are more sensitive towards grades than men, so Hypothesis 2 anticipates that women who receive higher grades in economics are more likely to pursue the field. In this regression, there are two interaction terms used to measure grade sensitivity for women. FemaleStudentXStudentRelative Grade measures the impact that the grade received in the introductory course has on a women's chances of majoring in the field, relative to that women's cumulative GPA. For all three subjects, this interaction term was positive, but it was not statistically significant. FemaleStudentXCourse Grade measures the impact of the grade received in the introductory course on a female students' chances of majoring. Again, this term was not significant for any of the three subjects, but it was negative rather than positive. This indicates that while it does not lead to a sizeable effect on major decisions, the higher the grade a women receives in one of these three areas, the more likely she is to major in another field. Female student was negative for economics and accounting, positive for psychology, and statistically significant for all three subjects at the .10, .10, and .01 levels respectively. On average, a female student is 3.8 percentage points less likely than a male student to major in economics, 4.3 percentage points less likely in accounting, and 27.6 percentage points more likely in psychology. Student relative grades were positive for both economics and psychology, negative for accounting, and only statistically significant for psychology. On average, a one-point increase in a student's relative grade contributes to a 64.7 percentage point increase in their chances of majoring in psychology. Therefore, whether an introductory psychology student's course grade is above or below their GPA is highly important in their decision to major. Course grade is negative for economics and psychology, positive for

accounting, and statistically significant for only accounting. A one-point increase in a student's course grade results in a 21-percentage point increase in their chances of majoring in accounting, on average. Statistically significant control variables for economics included international (12.7 percentage points) and current student (16.1 percentage points); accounting included no significant control variables; and psychology included class composition (-33.2 percentage points). It is important to note that within this table, no result is listed for tenure professors within the accounting section because all observations in this sample included a tenured professor.

Table 9b estimates grade sensitivity's impact on a student's decision to minor in economics, accounting, or psychology. FemaleStudentXStudentRelativeGrade is positive for all three subjects and statistically significant for economics at the .01 level. This result supports the hypothesized influence of grade sensitivity and indicates the better the grade received in economics, when compared to grades from other classes, the more likely it is for a woman to minor in economics. FemaleStudentXCourseGrade was negative for all three subjects and again statistically significant for economics. In contrast to the other interaction term, this result shows the higher the course grade received, the less likely a female is to minor in economics. This result could be due to the idea that women who perform proficiently in economics also perform proficiently in other difficult areas of study, and therefore choose to pursue another avenue. Female student was negative for economics and accounting, positive for psychology, and statistically significant for only psychology at the .01 level. On average, a female student is 6.7 percentage points more likely than a male student to minor in psychology. Student relative grade was positive for economics, negative for both accounting and psychology, and was not statistically significant for any of the fields. Course grade is positive for all areas and statistically

Table 9a

Average Marginal Probability Results: Major in Economics, Accounting, or Psychology - Grade Sensitivity

	Economics			Accounting			Psychology		
Variable	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Female Student	-0.042*	-0.045**	-0.038*	-0.033	-0.034	-0.043*	0.279***	0.277***	0.276***
	(0.023)	(0.022)	(0.022)	(0.026)	(0.026)	(0.026)	(0.024)	(0.023)	(0.024)
Student Relative Grade	0.304***	0.824*	0.798	0.215**	0.080	-0.043	0.151*	0.644**	0.647**
	(0.105)	(0.468)	(0.488)	(0.088)	(0.264)	(0.237)	(0.086)	(0.321)	(0.318)
FemaleStudentXStudentRelativeGrade	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive
Course Grade	0.099***	-0.094	-0.065	0.094***	0.147	0.210**	-0.009	-0.195*	-0.190
	(0.023)	(0.169)	(0.181)	(0.024)	(0.095)	(0.086)	(0.024)	(0.118)	(0.118)
FemaleStudentXCourseGrade	Positive	Negative	Negative	Negative	Positive	Negative	Negative	Negative	Negative
White		0.014	0.001		0.055	0.056		0.035	0.037
		(0.040)	(0.040)		(0.046)	(0.044)		(0.045)	(0.045)
International		0.153**	0.127**		0.020	0.049		0.098	0.111
		(0.061)	(0.060)		(0.068)	(0.069)		(0.099)	(0.101)
Black		-0.024	-0.036		0.044	0.045		0.047	0.043
		(0.055)	(0.053)		(0.079)	(0.074)		(0.061)	(0.062)
Hispanic/Latino		0.039	0.011		0.136	0.142		0.053	0.070
		(0.060)	(0.056)		(0.096)	(0.090)		(0.060)	(0.062)
Cumulative GPA		0.180	0.140		-0.056	-0.123		0.192	0.185
		(0.171)	(0.184)		(0.098)	(0.088)		(0.120)	(0.119)
Current Student		0.016	0.161**		-0.046	0.097		-0.007	0.003
		(0.031)	(0.070)		(0.029)	(0.092)		(0.032)	(0.073)
Female Professor			0.032			-0.012			0.071
			(0.027)			(0.037)			(0.044)
Tenure Professor			0.088			N/A			0.025
			(0.034)						(0.050)
Class Composition			0.242			0.122			-0.332**
			(0.171)			(0.208)			(0.161)
Semester Included	No	No	Yes	No	No	Yes	No	No	Yes
Observations	1,210	1,210	1,210	650	650	632	1,325	1,325	1,325
Pseudo R^2	0.156	0.170	0.210	0.209	0.219	0.275	0.089	0.090	0.113

Significance levels are denoted by * $p \leq .10$; ** $p \leq .05$; *** $p \leq .01$

Note: Standard Errors listed in parentheses and the size and signifigance of the binary probit regression results for the interaction terms is listed

Table 9b

Average Marginal Probability Results: Minor in Economics, Accounting, or Psychology - Grade Sensitivity

	Economics			Accounting			Psychology		
Variable	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Female Student	-0.016	-0.020	-0.019	-0.015	-0.013	-0.017	0.062***	0.061***	0.067***
	(0.019)	(0.018)	(0.019)	(0.020)	(0.020)	(0.021)	(0.020)	(0.020)	(0.019)
Student Relative Grade	0.058	0.118	0.163	0.164**	-0.206	-0.156	0.058	-0.019	-0.066
	(0.069)	(0.209)	(0.213)	(0.066)	(0.210)	(0.202)	(0.066)	(0.217)	(0.216)
FemaleStudentXStudentRelativeGrade	Positive***	Positive***	Positive***	Positive	Positive	Positive	Positive	Positive	Positive
Course Grade	0.075***	0.045	0.044	0.001	0.139*	0.138*	0.017	0.045	0.062
	(0.018)	(0.077)	(0.078)	(0.018)	(0.079)	(0.077)	(0.018)	(0.083)	(0.082)
FemaleStudentXCourseGrade	Negative***	Negative***	Negative***	Negative	Negative	Negative	Negative	Negative	Negative
White		0.088***	0.090***		0.081**	0.087**		-0.039	-0.042
		(0.029)	(0.028)		(0.041)	(0.044)		(0.034)	(0.034)
International		0.163**	0.138**		0.095	0.094		-0.042	-0.044
		(0.071)	(0.066)		(0.103)	(0.107)		(0.055)	(0.053)
Black		-0.006	-0.005		0.121	0.127		-0.065**	-0.073**
		(0.055)	(0.055)		(0.106)	(0.104)		(0.031)	(0.029)
Hispanic/Latino		0.071	0.070		0.040	0.040		-0.063**	-0.067**
		(0.065)	(0.065)		(0.085)	(0.079)		(0.031)	(0.030)
Cumulative GPA		0.015	0.010		-0.139*	-0.145*		-0.034	-0.047
		(0.073)	(0.075)		(0.077)	(0.075)		(0.084)	(0.084)
Current Student		-0.082***	-0.036		0.010	0.179**		0.008	-0.008
		(0.020)	(0.068)		(0.028)	(0.080)		(0.027)	(0.046)
Female Professor			0.011			-0.008			-0.005
			(0.023)			(0.027)			(0.040)
Tenure Professor			0.060**			0.063**			0.066
			(0.026)			(0.026)			(0.031)
Class Composition			0.227			-0.030			-0.146
			(0.144)			(0.153)			(0.123)
Semester Included	No	No	Yes	No	No	Yes	No	No	Yes
Observations	1,428	1,428	1,394	730	730	667	1,170	1,170	1,170
Pseudo R^2	0.079	0.103	0.130	0.075	0.102	0.203	0.024	0.028	0.08

Significance levels are denoted by * $p \leq .10$; ** $p \leq .05$; *** $p \leq .01$

Note: Standard Errors listed in parentheses and the size and signifigance of the binary probit regression results for the interaction terms is listed

significant for only accounting at the .10 level. On average, a one-point increase in a student's course grade results in a 13.8-percentage point increase in their chances of minoring in accounting. Statistically significant control variables for economics included white (9.0 percentage points), international (13.8 percentage points) and tenure professor (6.0 percentage points); accounting included white (8.7 percentage points), cumulative GPA (-14.5 percentage points), current student (17.9 percentage points), and tenure professor (6.3 percentage points); and psychology included Black (-7.3 percentage points) and Hispanic/Latino (-6.7 percentage points). Overall, Hypothesis 2 is only supported by the results of the minor in economics regression as all other equations showed no gendered impact for grade sensitivity.

Role Model Effect and Grade Sensitivity

Table 10a presents the regression results for equation 5, which includes all interaction terms. FemaleStudentXStudentRelativeGrade is positive and not statistically significant for all three fields of study. FemaleStudentXCourseGrade is negative and not statistically significant for all three fields of study. FemaleStudentXFemaleProfessor is negative for economics and accounting, positive for psychology, and not significant for all fields. Due to the lack of significance on all three interaction terms in each area, Hypothesis 1 and Hypothesis 2 are both not supported in this scenario. Female student is negative for economics and accounting, positive for psychology, and statistically significant for both economics and psychology at the .10 and .01 levels respectively. On average, a woman is 39 percentage points less likely than a man to major in economics, and a woman is also 27.6 percentage points more likely to major in psychology than a man. Student relative grade is positive for economics and psychology, negative for accounting, and statistically significant for psychology at the .05 level. A student is 64.6 percentage points more likely to major in psychology, on average, if their relative grade

increases by one-point. Course grade is negative for economics and psychology, positive for accounting, and statistically significant accounting at the .05 level. On average, a one-point increase in the course grade of an introductory accounting student increases their chances of majoring in accounting by 20.7 percentage points. Female professor is positive for economics and psychology, negative for accounting, and is not statistically significant for any of the fields. Statistically significant control variables include international (12.7 percentage points), current student (16.3 percentage points), and tenure professor (8.9 percentage points) for economics; there are no statistically significant control variables for accounting; and class composition (-33.2 percentage points) for psychology.

Table 10b presents the regression results for equation 6. FemaleStudentXStudentRelative Grade is positive for all three areas and statistically significant for economics. This result supports Hypothesis 2 and is concurrent with the results in Table 9b. FemaleStudentXCourse Grade is negative for all three fields and again statistically significant for economics. Like the above result, this also confirms the results from Table 9b. FemaleStudentXFemaleProfessor is positive for economics and psychology, negative for accounting, and not significant for all fields. Therefore, Hypothesis 1 is not supported in this scenario. Female student is negative for economics and accounting, positive for psychology, and statistically significant for psychology at the .01 level. On average, a woman is 6.7 percentage points more likely to minor in psychology than a man. Student relative grade is positive for economics, negative for accounting and psychology, and not statistically significant for all fields. Course grade is positive in all three fields and statistically significant in accounting at the .10 level. On average, a one-point increase in the course grade of an introductory accounting student increases their chances of minoring in

Table 10a

Average Marginal Probability Results: Major in Economics, Accounting, or Psychology - Grade Sensitivity and Role Model Effect

	Economics			Accounting			Psychology		
Variables	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Female Student	-0.038*	-0.041*	-0.39*	-0.032	-0.032	-0.041	0.278***	0.276***	0.276***
	(0.023)	(0.023)	(0.023)	(0.026)	(0.026)	(0.026)	(0.024)	(0.023)	(0.024)
Student Relative Grade	0.351***	0.733	0.771	0.262***	0.041	-0.032	0.158*	0.638**	0.646**
	(0.108)	(0.470)	(0.477)	(0.090)	(0.269)	(0.236)	(0.086)	(0.321)	(0.318)
FemaleStudentXStudentRelativeGrade	Negative	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive
Course Grade	0.093***	-0.052	-0.056	0.087***	0.166*	0.207**	-0.009	-0.190	-0.189
	(0.023)	(0.171)	(0.177)	(0.024)	(0.097)	(0.086)	(0.024)	(0.119)	(0.118)
FemaleStudentXCourseGrade	Positive	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative
Female Professor	0.080***	0.070***	0.031	-0.050**	-0.048*	-0.013	0.032	0.029	0.071
	(0.025)	(0.025)	(0.027)	(0.024)	(0.026)	(0.038)	(0.033)	(0.034)	(0.046)
FemaleStudentXFemaleProfessor	Negative	Negative	Negative	Negative	Negative	Negative	Positive	Positive	Positive
White		0.010	0.001		0.053	0.055		0.035	0.038
		(0.040)	(0.040)		(0.046)	(0.044)		(0.045)	(0.045)
International		0.139**	0.127**		0.022	0.050		0.095	0.110
		(0.060)	(0.060)		(0.068)	(0.068)		(0.099)	(0.101)
Black		-0.027	-0.038		0.048	0.042		0.047	0.043
		(0.054)	(0.053)		(0.079)	(0.073)		(0.061)	(0.062)
Hispanic/Latino		0.034	0.010		0.137	0.138		0.053	0.071
		(0.059)	(0.056)		(0.094)	(0.090)		(0.060)	(0.062)
Cumulative GPA		0.133	0.131		-0.079	-0.122		0.187	0.185
		(0.174)	(0.180)		(0.098)	(0.087)		(0.120)	(0.119)
Current Student		0.016	0.163**		-0.020	0.099		-0.009	0.003
		(0.030)	(0.069)		(0.035)	(0.092)		(0.032)	(0.073)
Tenure Professor			0.089***			N/A			0.025
			(0.034)						(0.050)
Class Composition			0.232			0.137			-0.332**
			(0.171)			(0.208)			(0.161)
Semester Included	No	No	Yes	No	No	Yes	No	No	Yes
Observations	1,210	1,210	1,210	650	650	632	1.325	1.325	1,325
Pseudo R^2	0.166	0.177	0.209	0.217	0.224	0.277	0.088	0.091	0.113

Significance levels are denoted by * $p \leq .10$; ** $p \leq .05$; *** $p \leq .01$

Note: Standard Errors listed in parentheses and the size and signifigance of the binary probit regression results for the interaction terms is listed

Table 10b

Average Marginal Probability Results: Minor in Economics, Accounting, or Psychology - Grade Sensitivity and Role Model Effect

	Economics			Accounting			Psychology		
Variables	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Female Student	-0.014	-0.018	-0.18	-0.015	-0.012	-0.016	0.062***	0.061***	0.067***
	(0.019)	(0.019)	(0.019)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.019)
Student Relative Grade	0.087	0.116	0.168	0.174***	-0.200	-0.170	0.055	-0.019	-0.067
	(0.071)	(0.210)	(0.213)	(0.067)	(0.211)	(0.204)	(0.067)	(0.218)	(0.215)
FemaleStudentXStudentRelativeGrade	Positive***	Positive***	Positive***	Positive	Positive	Positive	Positive	Positive	Positive
Course Grade	0.071***	0.051	0.043	-0.001	0.138*	0.144*	0.018	0.045	0.062
	(0.018)	(0.077)	(0.078)	(0.018)	(0.079)	(0.078)	(0.018)	(0.083)	(0.082)
FemaleStudentXCourseGrade	Negative***	Positive***	Negative***	Negative	Negative	Negative	Negative	Negative	Negative
Female Professor	0.034	0.025	0.010	-0.008	-0.012	-0.004	0.001	0.001	-0.002
	(0.020)	(0.020)	(0.023)	(0.019)	(0.020)	(0.027)	(0.027)	(0.027)	(0.040)
FemaleStudentXFemaleProfessor	Positive	Positive	Positive	Negative	Negative*	Negative	Positive	Positive	Positive
White		0.088***	0.090***		0.082**	0.087**		-0.038	-0.041
		(0.029)	(0.028)		(0.040)	(0.043)		(0.034)	(0.034)
International		0.156**	0.135**		0.095	0.096		-0.042	-0.045
		(0.071)	(0.066)		(0.101)	(0.105)		(0.055)	(0.053)
Black		-0.005	-0.007		0.121	0.127		-0.064**	-0.072**
		(0.055)	(0.054)		(0.104)	(0.101)		(0.031)	(0.029)
Hispanic/Latino		0.072	0.069		0.049	0.042		-0.062**	-0.066**
		(0.065)	(0.065)		(0.087)	(0.078)		(0.031)	(0.030)
Cumulative GPA		0.007	0.010		-0.139*	-0.150**		-0.033	-0.046
		(0.074)	(0.075)		(0.077)	(0.076)		(0.085)	(0.084)
Current Student		-0.081***	-0.036		0.016	0.174**		0.001	-0.007
		(0.020)	(0.069)		(0.031)	(0.079)		(0.027)	(0.046)
Tenure Professor			0.061**			0.063			0.064**
			(0.026)			(0.026)			(0.031)
Class Composition			0.232			0.000			-0.144
			(0.145)			(0.150)			(0.123)
Semester Included	No	No	Yes	No	No	Yes	No	No	Yes
Observations	1,428	1,428	1,394	730	750	667	1,170	1,170	1,170
Pseudo R^2	0.082	0.105	0.128	0.085	0.111	0.210	0.024	0.029	0.081

Significance levels are denoted by * $p \leq .10$; ** $p \leq .05$; *** $p \leq .01$

Note: Standard Errors listed in parentheses and the size and signifigance of the binary probit regression results for the interaction terms is listed

accounting by 14.4 percentage points. Female professor is positive for economics, negative for accounting and psychology, and is not statistically significant for any of the fields. Statistically significant control variables for economics include white (9.0 percentage points), international (13.5 percentage points), and tenure professor (6.1 percentage points); accounting includes white (8.7 percentage points), cumulative GPA (15.0 percentage points), and current student (17.4 percentage points; and psychology includes Black (-7.2 percentage points), Hispanic/Latino (-6.6 percentage points), and tenure professor (6.4 percentage points).

In summary, Hypothesis 1 is not supported in any of the regressions and Hypothesis 2 is only supported when examining equation 4. In other words, there is no evidence of a role model effect for women in any of the subjects and the only evidence of grade sensitivity occurs when estimating the chances that a woman minors in economics. This is not consistent with the previous literature discussed in this paper which found that women are impacted by the presence of role models and are more sensitive towards grades when deciding to major in economics. A separate set of regressions that removed the cumulative GPA variable were also estimated due to the similarity between the cumulative GPA and relative student grade variables. Removing cumulative GPA did not change the sign or significance of any of the interaction terms, indicating there is no sizeable difference in the results when GPA is included or excluded. It is also important to point out that the while the pseudo-R^2 values appear low for all regression equations used in this study, that is expected with individual-level data. There is a multitude of factors that can influence an individual in these scenarios, and those factors are also different between individuals. While previous research indicates that role models and grade sensitivity have a meaningful impact on a women's decision to pursue an economics degree, these R^2 values indicate that there are other important factors not being accounted for. This is true for not just

economics, but the other subjects of accounting and psychology as well. Psychology is a female-dominated field, but accounting is like economics in that it is a male-dominated area. This is an important realization because it reveals a gap in the previous research on this topic. While they are important issues to address, too much focus might be directed towards analyzing and combatting the lack of role models and grade sensitivity in economics, resulting in the overlook of other contributing factors.

This study also included several limitations regarding the data and interpretations. Within the economics data specifically, there is only one female professor throughout the entire data set. Therefore, it is not possible to disentangle the effects of being a female professor with the effects of that specific individual's teaching. Another important limitation is that it was not possible to separate classes of students who took the same course with the same professor in the same semester. Therefore, if a professor taught multiple sections of a course within the same semester, those sections were lumped together when calculating class composition. The availability and format of the data can also be seen as a limitation. The data used in this study was not collected for the purposes of this study, but rather it was documented for the purposes of the college's registrar's office. This constrained the types of variables and models that could be included and executed. For example, it would be important to include a variable that controls for when a student declared their major or minor and if the student entered the college with preferences for certain fields. Finally, the motivations behind why a student chooses to major in a specific field are different than the motivations behind why a student chooses to minor in a specific field. A student chooses their major based on their career and academic interests, whereas a minor might be chosen out of convenience and not preference. This difference in motivation leads to a

difference between the factors that influence each decision, which makes it more difficult to interpret and draw conclusions from the minor regression results.

Conclusion and Future Work

Statistics show that economics is a male-dominated field and women are less likely to major in economics at all levels of academia. Previous research indicates that two factors largely contribute to the lack of women in economics: the role model effect and grade sensitivity. There is a lack of female role models within the field of economics. Based on self-categorization and stereotype threat, the lack of role models allows negative stereotypes and the out-group association to discourage women from pursuing economics. The presence of a female role model disproves the negative stigmas surrounding women in economics and attracts them, as evidenced by previous research. It is also evident that women are more sensitive to the grades they receive when compared to men. The theory of self-efficacy helps us understand that grades are an important signal for women. If a woman receives a lower grade in a course, she interprets that as a lack of ability and little potential for success in the field. Therefore, women experience a greater sense of grade sensitivity than men, especially regarding economics courses.

This paper used data from a small liberal arts college to analyze the potential impact of the role model effect and grade sensitivity on a female student's probability of majoring or minoring in economics. Similar data from the majors of accounting and psychology were also used to decide if these barriers are unique to economics, or if they exist elsewhere. Accounting is quantitatively like economics and is a male-dominated field, whereas psychology represents a social science field, like economics, yet it is female-dominated. Results from the regression analysis did not support the presence of a role model effect for female students in all three

subjects and the impact of grade sensitivity was only supported regarding a female students' chances of minoring in economics. The results and data do further confirm that majors such as economics and accounting are male-dominated. These results emphasize the importance of analyzing the barriers that women face within various fields. Previous research indicated that grade sensitivity and role models had a significant impact on a female student's pursuit of economics, but this study discovered there could be other factors at play. Future research might investigate and identify what these other factors are. Another potential study might analyze the impact of role models and grade sensitivity through introducing interventions in a similar setting, which target those two factors. For example, a college might bring in female or minority economists as guest speakers to combat the role model effect. It also could expand the comparisons between economics and other fields by including more areas of study. Overall, the most accurate way to perform this experiment would be through a randomized control trial that follows a cohort of students throughout all years of their college experience, collecting data throughout that time.

Nonetheless, it is important to analyze the barriers that women face within all fields, especially those lacking women, because women can contribute new and diverse ideas when they are included by increasing the number and range of voices that are heard. To invite women into these conversations, they must be supported when entering new spaces and male-dominated areas of study. Undergraduate institutions are the first place in which the drop off of women occurs in various fields. Therefore, women at undergraduate institutions must be exposed to and encouraged to pursue such fields.

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APPENDIX

Table 1: Percentage of Females Earning Bachelor's Degree

Year	Economics Degrees		All Bachelor's Degrees	
	Lycoming College	All Bachelor Degree Granting Institutions	Lycoming College	All Bachelor Degree Granting Institutions
2010	44.4%	30.6%	55.1%	57.2%
2011	33.3%	30.6%	58.1%	57.2%
2012	40.0%	29.9%	54.7%	57.3%
2013	50.0%	30.7%	55.7%	57.2%
2014	12.5%	31.0%	66.3%	57.1%
2015	35.7%	31.1%	54.0%	57.1%
2016	23.1%	31.8%	55.4%	57.2%
2017	46.7%	31.8%	58.7%	57.3%
2018	44.4%	32.1%	55.8%	57.3%
2019	41.7%	n/a	55.1%	57.4%
2020	20.0%	n/a	51.9%	57.6%
2021	30.8%	n/a	51.1%	57.7%

Data obtained from the College's Registrar's Office and IPEDS.

Table 2: Variable Definitions

Variable Name	Definition	How Measured
Dependent:		
MajorInEcon	Student majors in economics	=1 if majored in econ at time of graduation; =0 if other
MinorInEcon	Students minors in economics	=1 if minored in econ at time of graduation; =0 if other
Student:		
FemaleStu	Indicates if student is female	1=Female; 0=other
White	Indicates if student's race is white	1=White; 0=other
International	Indicates if individual is an international student (not a US resident)	1=International; 0=other
Black	Indicates if student's race is black or African American	1=Black or African American; 0=other
HispanicLatino	Indicates if student's race is Hispanic or Latino	1=Hispanic or Latino; 0=other
CumGPA	Student's cumulative GPA	Measured on a 4.0 scale
CurrentStu	Indicates if student is currently enrolled at the college when data was collected	1=Current student; 0=graduated or other
Course:		
FemaleProf	Indicates if professor is female	1=Female; 0=other
TenureProf	Indicates if the professor is tenured or on the tenure track as opposed to a visiting or adjunct professor	1=Tenured/on tenure track; 0=other
CourseGrade	Grade received by student in the introductory course	Measured on a 4.0 scale
StuRelGrade	Compares a student's course grade to their overall GPA	Calculated by dividing student's course grade by their cumulative GPA with that course grade factored out
ClassComp	Sex composition of the class; ratio of female to male students	Calculated by dividing the number of female students in a class by the total number of students in that class
Term	Indicates the term in which the course was taken	1=Course taken during specified term; 0=other

Table 3a

Categorical Variable Totals: Major Regressions

Variable	Economics	Accounting	Psychology
Female Student	35.2%	40.2%	58.6%
Majors In Subject	20.5%	13.4%	29.9%
White	64.3%	65.5%	69.1%
International	10.3%	9.4%	2.0%
Black	8.1%	9.7%	10.6%
Hispanic/Latino	7.7%	6.5%	10.0%
Female Professor	33.1%	34.3%	85.1%
Tenure Professor	83.2%	98.9%	89.1%
Current Student	17.5%	14.5%	16.2%
Total Observations	1,210	650	1,325

Table 3b

Categorical Variable Totals: Minor Regressions

Variable	Economics	Accounting	Psychology
Female Student	37.5%	41.0%	50.4%
Minors In Subject	13.2%	6.8%	12.8%
White	68.6%	64.7%	68.9%
International	6.8%	8.2%	2.1%
Black	8.2%	10.3%	10.4%
Hispanic/Latino	7.0%	7.5%	9.2%
Female Professor	32.9%	38.1%	84.5%
Tenure Professor	83.1%	98.6%	89.4%
Current Student	14.8%	13.3%	16.0%
Total Observations	1,428	730	1,170

Table 4a

Summary Statistics for Continuous Variables: Major Regressions

	Mean			Standard Deviation			Minimum			Maximum		
Variable	Econ	Acct	Psych	Econ	Acct	Psych	Econ	Acct	Psych	Econ	Acct	Psych
Course Grade	2.703	2.421	2.894	0.996	1.085	0.893	0	0	0	4	4	4
Cumulative GPA	3.077	3.066	3.045	0.520	0.504	0.513	1.525	1.740	1.525	4	4	4
Class Composition	0.353	0.387	0.573	0.083	0.093	0.095	0.083	0.162	0.313	0.556	0.727	0.882
Student Relative Grade	0.860	0.770	0.943	0.266	0.312	0.250	0	0	0	1.66	1.784	1.791

Table 4b

Summary Statistics for Continuous Variables: Minor Regressions

	Mean			Standard Deviation			Minimum			Maximum		
Variable	Econ	Acct	Psych	Econ	Acct	Psych	Econ	Acct	Psych	Econ	Acct	Psych
Course Grade	2.631	2.328	2.898	0.964	1.080	0.919	0	0	0	4	4	4
Cumulative GPA	3.042	3.014	3.044	0.499	0.501	0.520	1.525	1.740	1.525	4	4	4
Class Composition	0.356	0.384	0.571	0.083	0.094	0.098	0.083	0.162	0.313	0.556	0.727	0.882
Student Relative Grade	0.847	0.752	0.943	0.259	0.317	0.252	0	0	0	1.651	1.784	1.801

Table 5a

Binary Probit Regression Results: Major in Economics - Role Model Effect

	Probit Coeff.			Avg. Marginal Probability		
Variables	(1)	(2)	(3)	(1)	(2)	(3)
Female Student	-0.019	-0.215**	-0.121	-0.015	-0.068***	-0.043**
	(0.105)	(0.11)	(0.116)	(0.024)	(0.022)	(0.021)
Female Professor	0.119	0.085	0.211	0.024	0.009	0.031
	(0.105)	(0.109)	(0.135)	(0.025)	(0.024)	(0.027)
FemaleStudentXFemaleProfessor	-0.100	-0.152	-0.219	N/A	N/A	N/A
	(0.184)	(0.188)	(0.205)			
White		0.159	0.007		0.041	0.002
		(0.157)	(0.176)		(0.039)	(0.040)
International		0.784***	0.498**		0.254***	0.127**
		(0.187)	(0.215)		(0.068)	(0.060)
Black		-0.047	-0.176		-0.012	-0.038
		(0.230)	0.258		(0.059)	(0.053)
Hispanic/Latino		0.251	0.050		0.071	0.011
		(0.214)	(0.242)		(0.065)	(0.056)
Cumulative GPA		0.541***	0.460		0.143***	0.104
		(0.094)	(0.901)		(0.024)	(0.205)
Current Student		0.005	0.633**		0.001	0.158**
		(0.115)	(0.258)		(0.030)	(0.068)
Tenure Professor			0.431**			0.088***
			(0.184)			(0.034)
Course Grade			-0.109			-0.025
			(0.887)			(0.200)
Student Relative Grade			2.986			0.674
			(2.368)			(0.542)
Class Composition			1.043			0.235
			(0.757)			(0.170)
Semester Included	No	No	Yes	No	No	Yes
Observations	1,210					
Pseudo R^2	0.001	0.069	0.209			

Significance levels are denoted by * $p \leq .10$; ** $p \leq .05$; *** $p \leq .01$

Note: Standard Errors listed in parentheses and number of observations is the same for each regression

Table 5b

Binary Probit Regression Results: Minor in Economics - Role Model Effect

	Probit Coeff.			Avg. Marginal Probability		
Variables	(1)	(2)	(3)	(1)	(2)	(3)
Female Student	-0.068	-0.190*	-0.164	-0.006	-0.032*	-0.024
	(0.106)	(0.112)	(0.118)	(0.018)	(0.018)	(0.018)
Female Professor	-0.035	-0.061	0.007	0.003	-0.006	0.009
	(0.112)	(0.117)	(0.143)	(0.019)	(0.018)	(0.023)
FemaleStudentXFemaleProfessor	0.125	0.078	0.110	N/A	N/A	N/A
	(0.184)	(0.192)	(0.200)			
White		0.544***	0.558***		0.095***	0.094***
		(0.189)	(0.185)		(0.029)	(0.027)
International		0.732***	0.593**		0.192***	0.140**
		(0.236)	(0.235)		(0.0746)	(0.066)
Black		-0.053	-0.043		-0.010	-0.008
		(0.292)	(0.295)		(0.055)	(0.054)
Hispanic/Latino		0.368	0.369		0.086	0.081
		(0.262)	(0.268)		(0.069)	(0.067)
Cumulative GPA		0.493***	-0.016		0.098***	-0.003
		(0.086)	(0.401)		(0.017)	(0.077)
Current Student		-0.594***	-0.258		-0.092***	-0.045
		(0.160)	(0.430)		(0.019)	(0.066)
Tenure Professor			0.341**			0.059**
			(0.173)			(0.027)
Course Grade			0.332			0.064
			(0.417)			(0.079)
Student Relative Grade			0.506			0.097
			(1.133)			(0.217)
Class Composition			1.354*			0.259*
			(0.766)			(0.147)
Semester Included	No	No	Yes	No	No	Yes
Observations	1,428	1,428	1,394	1,428	1,428	1.394
Pseudo R^2	0.001	0.069	0.123			

Significance levels are denoted by * $p \leq .10$; ** $p \leq .05$; *** $p \leq .01$

Note: Standard Errors listed in parentheses

Table 6a

Binary Probit Regression Results: Major in Economics - Grade Sensitivity

	Probit Coeff.			Avg. Marginal Probability		
Variables	(1)	(2)	(3)	(1)	(2)	(3)
Female Student	-0.345	-0.678	-0.548	-0.042*	-0.045**	-0.038*
	(0.821)	(0.687)	(0.691)	(0.023)	(0.022)	(0.022)
Student Relative Grade	1.249**	3.300*	3.225	0.304***	0.824*	0.798
	(0.424)	(1.980)	(2.182)	(0.105)	(0.468)	(0.488)
FemaleStudentXStudentRelativeGrade	0.033	0.526	0.895	N/A	N/A	N/A
	(1.089)	(0.989)	(1.002)			
Course Grade	0.397***	-0.393	-0.233	0.099***	-0.094	-0.065
	(0.111)	(0.706)	(0.794)	(0.023)	(0.169)	(0.181)
FemaleStudentXCourseGrade	0.042	-0.012	-0.158	N/A	N/A	N/A
	(0.210)	(0.216)	(0.219)			
White		0.059	0.003		0.014	0.001
		(0.172)	(0.176)		(0.040)	(0.040)
International		0.562**	0.497**		0.153**	0.127**
		(0.205)	(0.214)		(0.061)	(0.060)
Black		-0.103	-0.167		-0.024	-0.036
		(0.249)	(0.260)		(0.055)	(0.053)
Hispanic/Latino		0.159	0.050		0.039	0.011
		(0.235)	(0.242)		(0.060)	(0.056)
Cumulative GPA		0.762	0.620		0.180	0.140
		(0.716)	(0.808)		(0.171)	(0.184)
Current Student		0.068	0.647**		0.016	0.161**
		(0.126)	(0.263)		(0.031)	(0.070)
Female Professor			0.141			0.032
			(0.155)			(0.027)
Tenure Professor			0.430**			0.088
			(0.186)			(0.034)
Class Composition			1.070			0.242
			(0.758)			(0.171)
Semester Included	No	No	Yes	No	No	Yes
Observations	1,210					
Pseudo R^2	0.156	0.170	0.210			

Significance levels are denoted by * $p \leq .10$; ** $p \leq .05$; *** $p \leq .01$

Note: Standard Errors listed in parentheses and number of observations is the same for each regression

Table 6b

Binary Probit Regression Results: Minor in Economics - Grade Sensitivity

	Probit Coeff.			Avg. Marginal Probability		
Variables	(1)	(2)	(3)	(1)	(2)	(3)
Female Student	-0.471	-0.500	-0.466	-0.016	-0.020	-0.019
	(0.398)	(0.404)	(0.417)	(0.019)	(0.018)	(0.019)
Student Relative Grade	-0.595	-0.143	0.112	0.058	0.118	0.163
	(0.403)	(1.071)	(1.116)	(0.069)	(0.209)	(0.213)
FemaleStudentXStudentRelativeGrade	2.369***	2.004***	1.980***	N/A	N/A	N/A
	(0.755)	(0.762)	(0.771)			
Course Grade	0.609***	0.422	0.418	0.075***	0.045	0.044
	(0.109)	(0.398)	(0.415)	(0.018)	(0.077)	(0.078)
FemaleStudentXCourseGrade	-0.612***	-0.494***	-0.418***	N/A	N/A	N/A
	(0.188)	(0.192)	(0.192)			
White		0.516***	0.532***		0.088***	0.090***
		(0.192)	(0.186)		(0.029)	(0.028)
International		0.665***	0.587**		0.163**	0.138**
		(0.241)	(0.237)		(0.071)	(0.066)
Black		-0.033	-0.026		-0.006	-0.005
		(0.297)	(0.295)		(0.055)	(0.055)
Hispanic/Latino		0.325	0.324		0.071	0.070
		(0.266)	(0.269)		(0.065)	(0.065)
Cumulative GPA		0.080	0.053		0.015	0.010
		(0.380)	(0.394)		(0.073)	(0.075)
Current Student		-0.530***	-0.203		-0.082***	-0.036
		(0.165)	(0.421)		(0.020)	(0.068)
Female Professor			0.056			0.011
			(0.188)			(0.023)
Tenure Professor			0.350**			0.060**
			(0.174)			(0.026)
Class Composition			1.194			0.227
			(0.757)			(0.144)
Semester Included	No	No	Yes	No	No	Yes
Observations	1,428	1,428	1,394	1,428	1,428	1,394
Pseudo R^2	0.079	0.103	0.130			

Significance levels are denoted by * $p \leq .10$; ** $p \leq .05$; *** $p \leq .01$

Note: Standard Errors listed in parentheses

Table 7a

Binary Probit Regression Results: Major in Economics - Grade Sensitivity and Role Model Effect

	Probit Coeff.			Avg. Marginal Probability		
Variables	(1)	(2)	(3)	(1)	(2)	(3)
Female Student	-0.140	-0.388	-0.392	-0.038*	-0.041*	-0.39*
	(0.879)	(0.715)	(0.735)	(0.023)	(0.023)	(0.023)
Student Relative Grade	1.491***	3.005	3.162	0.351***	0.733	0.771
	(0.436)	(2.025)	(2.147)	(0.108)	(0.470)	(0.477)
FemaleStudentXStudentRelativeGrade	-0.053	0.339	0.732	N/A	N/A	N/A
	(1.146)	(1.025)	(1.036)			
Course Grade	0.381***	-0.216	-0.199	0.093***	-0.052	-0.056
	(0.111)	(0.726)	(0.779)	(0.023)	(0.171)	(0.177)
FemaleStudentXCourseGrade	0.031	-0.017	-0.139	N/A	N/A	N/A
	(0.212)	(0.218)	(0.220)			
Female Professor	0.399***	0.362***	0.201	0.080***	0.070***	0.031
	(0.121)	(0.123)	(0.136)	(0.025)	(0.025)	(0.027)
FemaleStudentXFemaleProfessor	-0.211	-0.217	-0.187	N/A	N/A	N/A
	(0.216)	(0.211)	(0.216)			
White		0.045	0.002		0.010	0.001
		(0.171)	(0.176)		(0.040)	(0.040)
International		0.519**	0.499**		0.139**	0.127**
		(0.206)	(0.215)		(0.060)	(0.060)
Black		-0.119	-0.176		-0.027	-0.038
		(0.245)	(0.259)		(0.054)	(0.053)
Hispanic/Latino		0.141	0.044		0.034	0.010
		(0.235)	(0.242)		(0.059)	(0.056)
Cumulative GPA		0.568	0.582		0.133	0.131
		(0.735)	(0.791)		(0.174)	(0.180)
Current Student		0.065	0.654**		0.016	0.163**
		(0.124)	(0.262)		(0.030)	(0.069)
Tenure Professor			0.435**			0.089***
			(0.185)			(0.034)
Class Composition			1.026			0.232
			(0.758)			(0.171)
Semester Included	No	No	Yes	No	No	Yes
Observations	1,210					
Pseudo R^2	0.166	0.177	0.209			

Significance levels are denoted by * $p \leq .10$; ** $p \leq .05$; *** $p \leq .01$

Note: Standard Errors listed in parentheses and number of observations is the same for each regression

Table 7b

Binary Probit Regression Results: Minor in Economics - Grade Sensitivity and Role Model Effect

	Probit Coeff.			Avg. Marginal Probability		
Variables	(1)	(2)	(3)	(1)	(2)	(3)
Female Student	-0.556	-0.578	-0.630	-0.014	-0.018	-0.18
	(0.445)	(0.450)	(0.464)	(0.019)	(0.019)	(0.019)
Student Relative Grade	-0.514	-0.213	0.066	0.087	0.116	0.168
	(0.414)	(1.079)	(1.115)	(0.071)	(0.210)	(0.213)
FemaleStudentXStudentRelativeGrade	2.551***	2.174***	2.171***	N/A	N/A	N/A
	(0.796)	(0.796)	(0.807)			
Course Grade	0.603***	0.465	0.420	0.071***	0.051	0.043
	(0.109)	(0.402)	(0.414)	(0.018)	(0.077)	(0.078)
FemaleStudentXCourseGrade	-0.652***	0.534***	-0.522***	N/A	N/A	N/A
	(0.192)	(0.194)	(0.195)			
Female Professor	0.118	0.078	-0.023	0.034	0.025	0.010
	(0.123)	(0.126)	(0.145)	(0.020)	(0.020)	(0.023)
FemaleStudentXFemaleProfessor	0.129	0.134	0.201	N/A	N/A	N/A
	(0.202)	(0.205)	(0.211)			
White		0.517***	0.534***		0.088***	0.090***
		(0.191)	(0.187)		(0.029)	(0.028)
International		0.642***	0.578**		0.156**	0.135**
		(0.243)	(0.237)		(0.071)	(0.066)
Black		-0.028	-0.036		-0.005	-0.007
		(0.296)	(0.295)		(0.055)	(0.054)
Hispanic/Latino		0.329	0.320		0.072	0.069
		(0.266)	(0.269)		(0.065)	(0.065)
Cumulative GPA		0.035	0.054		0.007	0.010
		(0.386)	(0.394)		(0.074)	(0.075)
Current Student		0.521***	-0.204		-0.081***	-0.036
		(0.165)	(0.428)		(0.020)	(0.069)
Tenure Professor			0.356**			0.061**
			(0.174)			(0.026)
Class Composition			1.22			0.232
			(0.762)			(0.145)
Semester Included	No	No	Yes	No	No	Yes
Observations	1,428	1,428	1,394	1,428	1,428	1,394
Pseudo R^2	0.082	0.105	0.128			

Significance levels are denoted by * $p \leq .10$; ** $p \leq .05$; *** $p \leq .01$

Note: Standard Errors listed in parentheses