Gender, Grade Sensitivity, and Major Choice*

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Abstract

It has been documented that the probability of women switching out of maledominated majors – like STEM and business – is more sensitive to their performance in relevant courses at the beginning of their college career relative to men. However, the reasons why women and men react differently to grades during college, and how this behavior impacts their major choices, are not well understood. Using a novel survey, I estimate students' sensitivity to grades and find that women value an extra GPA point about \$3,000 more than men. I find that anticipated labor market discrimination in male-dominated fields is important to understand the gender gap in grade sensitivity. I provide evidence of the gender differences in beliefs about labor market discrimination in different fields, and show that beliefs about gender discrimination in the labor market account for 43% of the gender gap in grade sensitivity.

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1 Introduction

It has been documented that women in STEM and other male-dominated fields such as Economics are more sensitive to grades than men, in the sense that the probability of women switching out of those fields is more strongly affected by their performance in introductory courses (Rask and Tiefenthaler, 2008; Ost, 2010; Goldin, 2015; Kugler et al., 2021). Although universities, governments, and policymakers are interested in closing the gender gap in these fields, designing effective policies that promote women's persistence in male-dominated fields has been challenging because the primary factors driving these gender differences in behavior remain poorly understood.¹ I investigate why women and men react differently to grades during college and how this behavior impacts their decision to remain in, or switch out of a given major. I provide evidence that anticipated labor market discrimination is important for understanding the gender gap in grade sensitivity.

Given that field of study is a key determinant of occupational choice and earnings (Gemici and Wiswall, 2014; Golan and Sanders, 2019; Patnaik et al., 2021) dropping out of STEM or business fields could have important implications for women's labor market outcomes and for the male-female earnings gap. This is because jobs in male-dominated fields such as STEM, Economics, and business pay higher wages than other areas (Altonji et al., 2012, 2014, 2016). Also, a higher rate of women dropping out of traditionally male majors is potentially consistent with a misallocation of talent and labor market inefficiencies (Hunt, 2016; Hammond et al., 2020). Therefore, understanding the reasons for women's propensity to drop out is essential to promote economic growth through an efficient allocation of talent across fields.

I document the grade sensitivity patterns among undergraduate students at Arizona State University (ASU), one of the largest public universities in the United States. I group majors into three broad categories: STEM, Business/Economics (BEC), and Social Sci-

¹For example, in October 2021, the White House released the National Strategy on Gender Equity and Equality which "seeks to close gender gaps in STEM fields so that women and girls can shape the workforce of the future."

ences/Humanities (SSH).² Using ASU's administrative data, I calculate the probability that first-year students remain in their first-year major, conditional on their first-year GPA. I find that the gender gap in the propensity to stay in STEM and BEC majors increases as GPA decreases, whereas such a relationship is not observed in the SSH majors. Women's stronger sensitivity to their first-year GPA in STEM/BEC majors suggests they care about their grades more than men do.

Concerns about selection due to unobserved preferences limit the ability of administrative data to uncover the underlying mechanisms driving these gender differences. To address this, I employ data from an original survey designed to quantify students' sensitivity to grades and to investigate potential factors contributing to such gender differences.

I use hypothetical choice scenarios to quantify the gender differences in grade sensitivity.³ This approach recovers students' preferences for key attributes of majors, such as average GPA at graduation, average weekly study time, and average post-graduation earnings at a full-time job. The survey includes 10 individual-specific scenarios. In each scenario, participants report the probability of choosing each major (SSH, BEC, STEM) based on the attributes in that scenario. This design generates a panel of probability choices, which allows me to estimate preferences at the individual level.

I find that on average, students prefer higher GPA at graduation, higher post-graduation earnings, and lower study time. Using the estimated GPA preferences, I calculate a willingnessto-pay (WTP) measure. This measure indicates the amount of annual earnings a participant is willing to forego for a one-point increase in the average GPA at graduation in a given major. I find that women are willing to pay \$3,026 more than men for an extra GPA point, which is an indication of the gender gap in grade sensitivity. The gender gap is concentrated among STEM students, for whom the gender difference in WTP for GPA reaches \$5,192.

²See Appendix B for the list of majors in each category.

³This methodology has been used in a wide variety of contexts, for example, to study preferences for reliable electricity services (Blass et al., 2010), political candidates (Delavande and Manski, 2015), workplace attributes including valuation of harassment risks at work (Wiswall and Zafar, 2018; Folke and Rickne, 2022), and neighborhood characteristics (Koşar et al., 2022) among others.

A number of factors could explain these differences in grade sensitivity including gender differences in risk aversion (Paola and Gioia, 2012), willingness to compete (Buser et al., 2014), gender composition of the peers (Kugler et al., 2021; Rask and Tiefenthaler, 2008; Griffith and Main, 2019; Zolitz and Feld, 2021), self-confidence (Ellis et al., 2016; Moakler and Kim, 2014), stereotype vulnerability (Ost, 2010), and misconceptions about academic performance in male-dominated majors (Owen, 2023).⁴ While the data allow me to test some of these hypotheses, a much less explored possibility and the primary focus of this paper is anticipated gender discrimination in the labor market (Steele et al., 2002; Alston, 2019).

There is evidence that women experience gender discrimination in the labor market and face higher standards in hiring and promotion, especially in male-dominated sectors.⁵ Therefore, it is reasonable that female college students anticipate this gender discrimination, particularly in fields like STEM and business. In the survey, I collect data on each respondent's perceived gender discrimination in each field. Participants report their predicted likelihood of experiencing difficulties finding a job because of their gender, and the likelihood of facing differential treatment by their boss or peers based on gender. Using their responses, I create an anticipated gender discrimination in the labor market than women, regardless of their major. Women believe they are more likely to face gender discrimination in the STEM and BEC labor markets than in SSH.

I also collect students' perceptions about the labor market standards. Specifically, students report their beliefs regarding the minimum GPA required to secure a full-time job in each major.⁶ Although women anticipate higher standards than men in all fields, they expect particularly elevated requirements in STEM. Perceived labor market standards and

⁴Stereotype vulnerability is a psychological concept that refers to "the tendency to expect, perceive, and be influenced by negative stereotypes about one's social category" (Aronson and Inzlicht, 2004, p. 1). It is closely related to stereotype threat (Steele, 1997; Thompson, 2017).

⁵See Foschi et al. (1994); Goldin and Rouse (2000); Quintero (2008); Williams et al. (2014); Funk and Parker (2018); Alam and Tapia (2020).

⁶College GPA is commonly used in the hiring process for entry-level positions (McKinney and Miles, 2009, Hansen et al., 2023a) and higher GPA is associated with higher chances of getting a job (McKinney et al., 2003; Quadlin, 2018; Kessler et al., 2019).

anticipated gender discrimination are positively related, especially among women.

I find that the beliefs about the labor market standards and anticipated gender discrimination reduce the gap in WTP for GPA by 49%, making it no longer statistically significant. This means that when men and women expect the same level of gender discrimination and similar hiring standards, on average there is no statistical difference in how much they value grades. These results highlight the importance of considering perceived labor market standards and gender discrimination to understand why women and men value grades differently, particularly in STEM and BEC majors.

This paper contributes to both the literature on grade sensitivity and gender discrimination in the labor market. However, its main contribution is to bridge these two branches of scholarly work. It demonstrates that anticipated gender discrimination in the labor market is important for understanding the gender gap in grade sensitivity. While anticipated discrimination may not be the only factor driving this gender difference, it suggests different policy implications than explanations based on inherent gender differences like risk aversion or self-confidence. If students' perceptions of gender bias match the reality of the labor market, policymakers should address this systematic discrimination. Conversely, information interventions could be a valuable tool if beliefs are inaccurate.

Most of the work on grade sensitivity remains agnostic about the mechanisms driving the gender differences in reaction to grades.⁷ Therefore, I also contribute to this literature by providing evidence that self-confidence and misconceptions about academic performance play a lesser role compared to anticipated discrimination in understanding the gender gap in grade sensitivity. Additionally, the administrative data results and the estimated gender gaps in WTP for GPA are consistent with the scholarly work that finds women are more responsive to grades than men, particularly in male-dominated majors (Rask and Tiefenthaler, 2008; Ost, 2010; Owen, 2010; Goldin, 2015; Kugler et al., 2021; Kaganovich et al., 2021; McEwan et al., 2021; Ahn et al., 2022; {Ugalde A.}, 2024). Some papers within this literature fail to identify

⁷One exception is Kaganovich et al. (2021) which finds that tastes for different majors are important to understand the gender differences in grade sensitivity.

any effect of grades on economics course-taking behavior or STEM graduation (Main and Ost, 2014; Bestenbostel, 2021), while others find significant effects that do not differ by gender (Astorne-Figari and Speer, 2019; Chizmar, 2000; Owen, 2021; Tan, 2023). The differences in results may arise because some studies estimate the causal effect of marginal changes in *letter* grades, while my study focuses on preferences for cumulative GPA. Additionally, some papers are purely correlational or rely on designs that assume selection on observable characteristics, potentially susceptible to omitted variable bias. In my case, identification comes from within-individual variation in stated preferences. This reduces concerns about selection and allows me to estimate the complete distribution of preferences.

Despite the considerable amount of research on gender discrimination, there is much less work on anticipated gender discrimination or its relationship with major choices.⁸ In the psychology literature, Steele et al. (2002) documents that female undergraduate students in mathematics, science, and engineering majors anticipate encountering more discrimination in their careers compared to women in the arts, humanities, and social sciences. In economics, Alston (2019) is one of the first papers to study anticipated discrimination as a potential explanation for women's underrepresentation in certain occupations by investigating its effect on applicants' decisions to apply for a stereotypically male job. In contrast, I analyze the effect of anticipated discrimination on major choice, which happens earlier in life and impacts occupation decisions. Therefore, my findings enhance our understanding of the impact of gender discrimination on human capital investment decisions.

The rest of the paper is organized as follows. Section 2 describes the administrative data and documents gender gaps in grade sensitivity among ASU students. Section 3 introduces the survey and describes the sample, and section 4 describes students beliefs about each major. Section 5 presents the hypothetical scenarios from the survey and estimates the preferences and WTP for GPA measures. In section 6, I focus on anticipated discrimination as a driver of the gender differences in WTP documented in the previous section, and I

⁸See Shen (2021) for a literature review on gender discrimination.

analyze the role of other factors. Finally, section 7 concludes.

2 Gender Gap in Grade Sensitivity: Administrative Data

In this section, I analyze anonymized transcript-level data for 180,000 first-time firstyear students at Arizona State University (ASU), one of the largest public universities in the United States. The data set, which extends back to the year 2000, traces students' trajectories through their college careers, including all field-of-study switches. The analysis aims to provide suggestive evidence that women are more sensitive to grades in STEM and Business majors with a methodology similar to that employed by Kaganovich et al. (2021). Majors are grouped into three broad categories: STEM, Business/Economics (BEC), and Humanities/Social Sciences (SSH).⁹

At ASU, students declare a major upon entering college. To assess the impact of grades on major retention, I calculate the probability that first-year students remain in their initial major conditional on their first-year GPA. This probability is estimated using a logit model, applied separately for each major category, as follows:¹⁰

$$\mathbb{1}(\operatorname{Stay})_{ikc} = \delta_0 + \delta_1 Female_i + \delta_2 GPA_{ik} + \delta_3 GPA_{i-k} + \mathbf{M}_i + \mathbf{N}_i + \gamma_c + \epsilon_{ikc}$$
(1)

where $k \in \{\text{SSH, BEC, STEM}\}$, $\mathbb{1}(\text{Stay})_{ikc}$ is an indicator variable that equals one if student *i* from cohort *c* remains in major *k* from their first to their sophomore year. *Female*_i equals one if student *i* is female. GPA_{ik} represents cumulative GPA for student *i* in major *k* at the end of their first year, while GPA_{i-k} is the of cumulative GPAs all other majors. To create

 $^{^9 {\}rm See}$ Appendix B for the list of majors in each category. The SSH category includes any majors that could not be classified as STEM or Business/Economics.

¹⁰The sample for this exercise consists of students that stay enrolled in college at least until the end of their sophomore year. In other words, it does not include people who drop out at the end of their first year. However, the gender differences in the probability of persisting in a given major are robust to including dropouts.

 GPA_{ik} and GPA_{i-k} , all courses were classified into one of the three major categories (SSH, BEC, STEM) and the respective GPA was calculated using only the courses that correspond to that major.¹¹ \mathbf{M}_i includes academic controls such as ACT/SAT scores, high school GPA, and indicators for honors and exploratory students.¹² \mathbf{N}_i includes controls for for minority status, income, in-state residency, and first-generation status. γ_c represents cohort fixed effects.

The results are summarized in Figure 1. The bars show the probability of remaining in the major indicated at the top of each panel, given first-year GPA on the horizontal axis. In panels (1c) and (1b), the probability of staying in STEM and BEC majors decreases as GPA drops, indicating that students with lower grades are more likely to switch out. This effect is more pronounced for women than men, illustrating that women are more responsive to grades in these majors.¹³ In contrast, panel (1a) shows no significant gender difference in the probability of staying in SSH majors, which remains constant across different GPA levels.

Additionally, Figure A1 suggests that the effect observed among STEM students is more concentrated in majors outside of life and medical sciences. This distinction is important because women are better represented in life and medical sciences compared to other STEM fields (Kahn and Ginther, 2017). The split between life sciences and other STEM disciplines suggests that differential grade sensitivity varies across STEM disciplines, with more significant gender gaps likely in fields where women are more underrepresented.

These results align with previous studies on grade sensitivity (Rask and Tiefenthaler, 2008; Ost, 2010; Goldin, 2015; Kugler et al., 2021; Kaganovich et al., 2021) and indicate that women care about grades more than men, especially in STEM and BEC majors. However,

¹¹The model includes indicator variables that equal one for cases where GPA_{i-k} cannot be calculated due to a lack of courses in other majors.

¹²Exploratory students, who did not declare a major in their first year, are enrolled in special programs allowing them to explore several majors, facilitating their classification into one of the three categories. The most common exploratory programs are health and life sciences; humanities, fine arts and design; mathematics, technology, engineering, and physics; and social and behavioral sciences.

 $^{^{13}}$ The difference between the blue and orange bars is statistically significant at the 1% level for all GPA levels.

due to selection issues and potential confounders like varying tastes for different majors, observational data alone cannot fully explain these patterns. While the administrative data can track when students change majors, it cannot reveal the specific reasons behind their decisions or the exact role grades play. To address this limitation, I designed a survey experiment to more precisely measure students' sensitivity to grades and to gain deeper insights into why men and women might value grades differently and how these differences impact their decisions to persist in or switch out of a major. The details of the survey are described in the next section.

3 Survey Data

3.1 Survey

The data come from an original online survey of undergraduate students at ASU. Students were invited to participate via email and through advertisements on the student portal, which is accessible only with an ASU ID and password. They were informed that the study was about how they chose their major and the relationship between study time and grades, with the incentive of entering a lottery for one of 350 \$20 eGift Cards. Data collection began on April 5th, 2021, and lasted for about two weeks.

The survey, programmed in Qualtrics, collected data on students' demographics, family background, major, academic performance, and study time. The survey instrument can be found here.

3.2 Sample

A total of 2,036 respondents completed the survey. Responses from the 3% of participants who identified as non-binary or chose not to disclose their gender were excluded from the analysis. Additionally, responses in the 1st and 99th percentiles of survey duration were excluded, resulting in a final sample size of 1,936. The median completion time was 23 minutes (43 minutes on average).

Women comprise 64% of the sample, which is higher than their representation in ASU's student population (51% female). However, there is no differential selection on observables across genders (see Table A1), suggesting that the sample reasonably represents ASU students in terms of gender differences in background characteristics.

For the survey, majors were grouped into the same three broad categories: STEM, Business/Economics (BEC), and Humanities/Social Sciences (SSH).¹⁴ I refer to these categories as majors. The last three rows in Table A1 show the proportions of women and men in each major. The sample includes fewer men in BEC and fewer students in SSH compared to ASU's student population. However, the gender gap in STEM is consistent between the survey sample and the ASU student body (20% gap).

4 Major Attributes

As discussed in section 2, students' grades are related to their persistence in specific majors. Consequently, in the survey, I asked participants to report their beliefs about key characteristics of these majors, including the average GPA. Specifically, they provided their beliefs about: average GPA at graduation, average weekly study time, and average earnings from a full-time job after graduation.

Table 1 presents the mean and standard deviation of participants' beliefs about each attribute by major and gender. Participants believe SSH has the highest average GPA at graduation compared to the other majors. On average, women perceive graduation GPAs in BEC and STEM as similar (p-value=0.497), whereas men see grades in STEM as lower than in BEC (p-value<0.01). Additionally, column (3) shows that women generally believe the GPA at graduation is higher than men do, regardless of the major.

Women believe that weekly study time is 1-2 hours higher than men's estimates. However, both genders agree on the pattern across majors: SSH requires the least study time, closely

¹⁴The SSH category includes any majors not classified as STEM or BEC.

followed by BEC, with STEM demanding the most study time, averaging 8-9 hours more per week than SSH.

Participants believe that average earnings are highest in STEM, at approximately \$64,000 - \$66,000, followed by BEC at \$54,000 - \$55,000, with SSH at the lowest, around \$40,000 - \$41,000. As shown in column (9) of Table 1, women's earnings estimates exceed men's by about \$1,500 - \$2,000 across all majors.

Table 2 provides further evidence of differences in beliefs about each attribute across majors. It shows the proportion of women and men who think each major has the highest value for that attribute. For example, 96% of men and 97% of women believe that STEM majors require more weekly study time than BEC and SSH. Only 2% of both genders think SSH requires the highest study time. This pattern suggests that, overall, students view STEM majors as more demanding.

Regarding average earnings, 87% of women and 89% of men believe that STEM jobs offer higher pay compared to SSH and BEC. In contrast, 12% of women and 11% of men think that BEC jobs provide higher wages than STEM and SSH. Only 1% of participants from each gender believe that SSH jobs offer higher earnings than the other two majors. These findings suggest that students anticipate significant earning disparities, especially between SSH and the other fields.

Beliefs about average GPA at graduation show less consensus. One-third of women think SSH has the highest average grades, while 41% favor STEM, and 26% think BEC has the highest grades. In contrast, 46% of men rank SSH highest, with 32% and 22% ranking STEM and BEC highest, respectively. Thus, while students exhibit a clear ranking of majors regarding effort and earnings, the ranking in terms of grades is less clear.

The evidence in this section highlights the variety of beliefs students hold about major attributes, particularly grades. Beliefs about average grades, study time, earnings, tastes for each major, and shocks influence students' decisions to persist or switch majors. The administrative data do not include information on these potential confounders, limiting their ability to explain the role of gender differences in grade sensitivity in these decisions. In the next section, I describe a survey experiment designed to quantify these gender differences more precisely by exogenously changing major attributes, particularly average GPA at graduation.

5 Valuation of Major Attributes

To quantify gender differences in grade sensitivity, I use an online survey presenting students with hypothetical major choice scenarios. This survey collects data to estimate students' preferences for various major attributes (Blass et al., 2010; Delavande and Manski, 2015; Wiswall and Zafar, 2018; Folke and Rickne, 2022; Koşar et al., 2022; Fuster and Zafar, 2023). Participants evaluate 10 scenarios, each featuring three potential majors: SSH, BEC, and STEM. Each scenario describes the majors based on three attributes: average GPA at graduation, average weekly study time, and average earnings after graduation. Scenarios are presented sequentially. Table 3 provides an example of a scenario.

In each scenario, I exogenously vary the attributes' magnitudes to identify students' preferences. To ensure realism, these magnitudes are based on perturbations of each participant's own beliefs about average GPA, study time, and full-time earnings for each major (see section 4). Consequently, each scenario is individual-specific, reflecting small deviations from personal beliefs.¹⁵

In each scenario, students report the probability of choosing each major based on the provided characteristics.¹⁶ Participants provide probabilities because the scenarios are incomplete or not fully specified, as majors can be characterized by more attributes beyond

¹⁵Perturbations range from $\pm 10\%$ to $\pm 100\%$ and vary across scenarios. Table A2 details the attribute ranges by major in the scenarios. At ASU, students need a minimum GPA of 2.0 to graduate, so average GPA ranges from 2.0 to 4.0. Weekly study time ranges from 3 to 40 hours, and earnings range from \$15,000 to \$200,000.

¹⁶The exact wording of the question was: Imagine a situation in which you have not chosen a major yet and each major category is characterized as in the table below... What is the percent chance (or chances out of 100) that you would choose to graduate from each category given these characteristics? For more details, see the survey instrument here.

the three included in the survey. This approach allowed participants to express uncertainty about their choices due to the scenarios' incomplete nature. Figure A2 presents the histogram of elicited probabilities for each major across the ten scenarios. As is common for probabilistic belief data (Manski, 2004), responses often round to multiples of 5 and 10, indicating minor rounding bias.¹⁷ The histograms show that responses spanned the entire range of possible values, not just 0, 50, or 100, indicating no issue with gross rounding (Manski, 2004). Moreover, 86% of participants provided interior probabilities (neither 0 nor 100) in all scenarios, highlighting the significance of allowing participants to express uncertainty.¹⁸

An important implicit assumption when eliciting choice probabilities is that stated choices reflect participants' real-life decisions. Growing evidence suggests that stated choices yield similar preference estimates to revealed preference approaches and that participants provide meaningful responses when scenarios are realistic and relevant to them (Fuster et al., 2021; Fuster and Zafar, 2023). In this context, major choice decisions are certainly relevant for college students. Additionally, the scenarios were tailored to each participant's beliefs to ensure realism. While I cannot directly test this assumption, the consistency between the hypothetical scenario results and the administrative data in Figure 1 suggests participants provided meaningful responses (See section 5.2).

This design produces a panel of 30 probability choices per participant, allowing the estimation of the preference distribution without imposing distributional assumptions. The following section details the estimation procedure and explains how these preferences are used to calculate willingness-to-pay (WTP).

5.1 Preferences for Major Attributes

Similar to Wiswall and Zafar (2018), I use a simple model of expected utility of major choices to recover measures of WTP for the various major attributes. In particular, the model intends to recover how the utility of choosing a given major varies with GPA.

¹⁷Section 5.1 discusses how this rounding bias is addressed.

¹⁸Only 3% indicated a 100% probability for one major in all scenarios.

Let U_{ijs} denote the utility that student *i* derives from major *j* in scenario *s*. This utility is defined as

$$U_{ijs} = X'_{ijs}\beta_i + \kappa_{ij} + \epsilon_{ijs} \tag{2}$$

where X_{ijs} is a vector of major attributes: average GPA, average weekly study time, and the natural logarithm of average earnings. The vector β_i represents student *i*'s preferences for these attributes, which are not specific to any major. The term κ_{ij} captures student *i*'s specific taste for major j.¹⁹ The term ϵ_{ijs} accounts for uncertainty about additional attributes not specified in the survey scenarios.²⁰ Following Blass et al. (2010) and Wiswall and Zafar (2018), ϵ_{ijs} represents resolvable uncertainty, which is expected to be clarified in an actual choice situation. The key identifying assumption is that, conditional on the major, $\{\epsilon_{ijs}\}_{j=1}^{J}$ captures idiosyncratic variation that is orthogonal to the major attributes $\{X_{ijs}\}_{j=1}^{J}$.

Then, student *i*'s reported probability of choosing major j in scenario s is

$$p_{ijs} = \int \mathbb{1} \{ U_{ijs} > U_{ij's} \quad \forall j' \neq j \} dH_i(\epsilon_{is})$$
(3)

where $H_i(\epsilon_{is})$ represents *i*'s belief about the distribution of $\{\epsilon_{i1s}, ..., \epsilon_{iJs}\}$. I assume these beliefs are i.i.d Type I extreme value distributions for all individuals. Thus, the probability of student *i* choosing major *j* in scenario *s* takes the following form:

$$p_{ijs} = \frac{exp(X'_{ijs}\beta_i + \kappa_{ij})}{\sum_{j'=1}^{J} exp(X'_{ij's}\beta_i + \kappa_{ij'})}$$
(4)

Applying the log-odds transformation to equation (4) results in the linear model in (5).

$$ln\left(\frac{p_{ijs}}{p_{ij's}}\right) = (X_{ijs} - X_{ij's})'\beta_i + (\kappa_{ij} - \kappa_{ij'})$$
(5)

 $^{^{19}\}mathrm{For}$ estimation purposes the constant for SSH major is normalized to zero, making other majors' tastes relative to SSH.

 $^{^{20}}$ As discussed in the previous section, the scenarios are incomplete.

In line with the literature (Blass et al., 2010; Wiswall and Zafar, 2018), I introduce measurement error to the model in (5) to address the minor rounding bias noted earlier. I assume that measurement error follows a linear-in-logs form, so the reported log-odds ratio is

$$ln\left(\frac{\tilde{p}_{ijs}}{\tilde{p}_{ij's}}\right) = (X_{ijs} - X_{ij's})'\beta_i + (\kappa_{ij} - \kappa_{ij'}) + \omega_{ijs}$$
(6)

where \tilde{p}_{ijs} represents the reported choice probability, which measures the true probability p_{ijs} with measurement error ω_{ijs} . The measurement error has a median of zero, conditional on X.

To estimate (6), I use the Least Absolute Deviations (LAD) estimator. To ensure the natural logarithm is defined, I adjust extreme probabilities like 0 or 100 by replacing 0 with 0.001 and 100 with 99.9. The LAD estimator is robust to these adjustments. Variation in major attributes and participant choice probabilities across the 30 observations per respondent allows me to identify the vector β_i for each student separately. This approach generates a non-parametric characterization of the preferences distribution. However, β_i is not major-specific due to only having 10 observations per participant per major, which is insufficient for identifying preferences at that level.

I estimate standard errors for the preference parameters using block bootstrap sampling of the hypothetical choice scenarios, where each block includes all responses from a single respondent, following Wiswall and Zafar (2018). The estimation is based on 1,000 bootstrap replicates.

5.1.1 Estimates of Preferences for Major Attributes

Table 4 reports the average β_i estimates from equation (6), with bootstrapped standard errors in parentheses. Seniors are not considered in this part of the analysis because their proximity to graduation may influence their preferences in the hypothetical scenarios. However, including seniors yields qualitatively similar results.²¹ The first column displays the average estimate for each attribute and tastes across all individual-level estimates. Columns 2 and 3 report the average estimates by gender.

The average estimates show the expected signs: GPA at graduation and earnings are positively valued, while study time is negatively valued. This indicates that, on average, students prefer majors with higher earnings and GPAs but lower study time. The estimates by gender reveal similar qualitative patterns to the overall averages. Additionally, all attributes are statistically significant. Regarding tastes, students generally prefer SSH over BEC and STEM majors (with estimates relative to SSH), though men's preferences for BEC and STEM are not statistically different from zero. Given the difficulty in interpreting the magnitudes of these estimates, I convert them into a willingness-to-pay (WTP) measure in the next sub-section. This change allows me to quantify the gender gap in grade sensitivity in an easily interpretable way.

5.2 Willingness-To-Pay Measures

In this section, I calculate willingness-to-pay (WTP) measures from the estimated preferences. These measures convert utility differences due to attribute variations into equivalent earnings, indicating the additional income needed for students to be indifferent between attribute levels.

To compute the WTP, consider a change in attribute X_k from x_k to $x_k + \Delta$ where $\Delta > 0$. With the linear utility function, the indifference condition in terms of earnings Y is:

$$x_k \beta_{ik} + \beta_{i1} ln\left(Y\right) = \beta_{ik} \left(x_k + \Delta\right) + \beta_{i1} ln\left(Y + WTP_{ik}\left(\Delta\right)\right) \tag{7}$$

 $^{^{21}}$ Additionally, I exclude outliers with WTP for study time or GPA greater (as defined in the next subsection) than \$100,000 or less than -\$100,000 (5.5% of the sample).

Solving (7) for WTP gives the following expression:

$$WTP_{ik}\left(\Delta\right) = \left[exp\left(\frac{-\beta_{ik}}{\beta_{i1}}\Delta\right) - 1\right] \times Y,\tag{8}$$

which represents individual *i*'s willingness to pay for a Δ increase in attribute *k*. This WTP measure depends on the ratio of preferences for attribute *k* (β_{ik}) to preferences for earnings (β_{i1}) and is affected by the earnings level *Y*. In this calculation, *Y* is set to the average earnings across all participants and scenarios (\$53,545) to ensure that any observed gender differences in WTP reflect differences in preferences, not in earnings. Note that the WTP measure is not major-specific as it relies on β_i , which is not major-specific.²²

Table 5 displays the average and median WTP measures for one additional unit of each attribute: one whole GPA point at graduation (e.g., from 2.3 to 3.3) and one extra hour of study time per week. All means and medians reported in Table 5 are statistically significant (p-value<0.01). Columns (1)-(3) show WTP measures in dollars, while the last three columns present WTP as a percentage of average earnings. The stars in the male columns (3) and (6) indicate the significance level of differences in means (or medians) by gender.

On average, students are willing to pay 16% of their annual earnings for a one-point increase in the average GPA at graduation for a major. In contrast, students require an additional 3% in annual earnings to study one more hour per week. Women are willing to pay 17% of their annual earnings for a one-point increase in GPA, while men are willing to pay only 13% (p-value<0.1). There is no significant gender difference in the average WTP for weekly study time.

I interpret the WTP for GPA as a measure of students' sensitivity to grades. To understand why women and men value grades differently and how this affects their major choices, I will focus on this measure henceforth. Table 6 shows the gender gap in WTP for GPA at

 $^{^{22}}$ As mentioned in section 5.1, 10 observations per participant per major are insufficient to identify preferences at that level.

graduation, conditional on background characteristics. Specifically, Table 6 reports α_1 from:

$$WTP_{GPAi} = \alpha_0 + \alpha_1 Female_i + \mathbf{C}_i + \xi_i \tag{9}$$

where the outcome variable is participant *i*'s WTP measure for GPA at graduation. *Female_i* is an indicator equal to one when the participant is female. C_i includes controls for family income, parents' education, minority status, SAT/ACT scores, school year, and indicators for honors students and majors.

Column (1) reports the overall conditional gender gap at \$3,191. This indicates that women are willing to forgo \$3,191 in average annual earnings more than men for an additional GPA point at graduation in a given major. I interpret this as the gender gap in grade sensitivity, since women are willing to "pay" more for the GPA increase. Columns (2)-(4) split the sample by major. This analysis shows that the overall gender gap is primarily driven by the STEM students, where the WTP difference for GPA at graduation between genders reaches \$5,326. Consistent with the results from the administrative data, this gender gap in WTP among STEM students is concentrated in fields outside of life and medical sciences (Table A3). In contrast, the gap is smaller and not statistically significant among SSH students.

In the BEC subsample, the point estimate for the gender gap is negative, however it is worth noting that the sample is considerably smaller in this field of study than in STEM and SSH and potentially not representative of its student body. In table A4, participants are weighted such that the distribution of men and women across the different majors in BEC is representative of the student population. Although not significant, the gender gap is positive and in between the point estimates for STEM and SSH at \$2,690. Additionally, as expected, the positive gender gap is concentrated in male dominated BEC majors like Business and Economics (Columns (2) and (3) in Table A4.) These results are consistent with the administrative data evidence in Figure 1 about STEM and SSH: women in STEM and BEC majors are more sensitive to grades than men.

As discussed in section 5.1, the preference parameters, β_i , and consequently the WTP measures, are not major-specific due the small number of observations per participant per major. To provide evidence of different WTP for GPA across majors, I calculate a pooled, major-specific WTP measure for each gender.²³ Men's WTP for GPA is similar across the three fields, ranging from \$6,437 in SSH to \$6,931 in STEM. In contrast, women's WTP for GPA shows greater heterogeneity, with estimates of \$7,921 in SSH, \$5,976 in BEC, and \$12,861 in STEM. These findings are consistent with Table 6 and the administrative data, and show that women respond more strongly to grades than men, particularly in STEM fields.

6 What could be driving the gap?

Several potential mechanisms could explain the gender differences in grade sensitivity documented earlier. This section focuses on a less explored possibility: anticipated gender discrimination in the labor market (Steele et al., 2002; Alston, 2019).

There is evidence that men favor male candidates for engineering positions even when a female candidate performs better (Foschi et al., 1994), women face gender bias in symphony orchestra hiring (Goldin and Rouse, 2000), and harsher treatment in government recruitment processes (Quintero, 2008). Additionally, 50% of women in STEM jobs in the US report having experienced gender discrimination (Funk and Parker, 2018), and 64% of female scientists feel they must provide more evidence of competence to their colleagues (Williams et al., 2014).

Thus, it is reasonable for female students to anticipate facing gender discrimination in the labor market. They likely expect more rigorous standards than men for getting hired, with these expectations varying by field. Beliefs about anticipated discrimination could influence their responses to grades and major choices, potentially explaining part of the gender gap

²³This provides a major-specific but not individual-specific measure.

in grade sensitivity observed earlier. For instance, women might feel the need to provide an excellent GPA to compete against men, especially in male-dominated fields. Consequently, low grades in introductory courses may seem inconsistent with the high standards they believe are required, leading them to switch out of the field.

Additional mechanisms may also influence the gender gap in sensitivity to grades. The survey data allow me to test some of these mechanisms. In this section, I examine self-confidence and stereotype vulnerability (Ellis et al., 2016; Moakler and Kim, 2014; Ost, 2010), and misconceptions about academic performance in male-dominated majors (Owen, 2023), as these factors show gender differences that could explain why women and men respond differently to grades. I conclude this section by providing evidence of the relative importance of anticipated gender discrimination compared to these other explanations.

Other examples include gender differences in risk aversion (Paola and Gioia, 2012), willingness to compete (Buser et al., 2014), and gender composition of the peers (Kugler et al., 2021; Rask and Tiefenthaler, 2008; Griffith and Main, 2019; Zolitz and Feld, 2021). While I do not collect data on risk preferences, recent evidence by Patnaik et al. (2022) indicates that gender differences in expectations about earnings, risk aversion, and patience do not explain gender gaps in major choice.

Being in the gender minority in STEM and other male-dominated fields can influence women's sense of belonging, potentially impacting their persistence in these areas (Hansen et al., 2023b). However, research on the effects of peer gender composition on major choice offers mixed findings. For instance, a higher proportion of women may decrease the likelihood of either gender majoring in economics (Rask and Tiefenthaler, 2008) but increase the likelihood of both genders majoring in engineering (Griffith and Main, 2019). Zolitz and Feld (2021) finds that men are more inclined to select male-dominated majors when they have more female peers, while women tend to avoid these majors as the proportion of female peers grows. Conversely, Kugler et al. (2021) finds no gender differences in persistence in response to the share of female peers. Although I do not collect data on preferences regarding the gender composition within each major, I ask students how important fitting in with other students is as a reason for their major choice. I find no significant gender differences, which suggests that a sense of belonging may have a limited effect on the gender gap in grade sensitivity.

6.1 Anticipated Gender Discrimination

In this section, I document gender differences in students' beliefs about gender discrimination and hiring standards in the labor market using the survey data, and present evidence of the importance of those beliefs to understand the gender differences in grade sensitivity.

To measure beliefs about anticipated gender discrimination in the labor market, participants rated on a 5-point Likert scale how likely it was that: (1) finding a job would be harder because of their gender, (2) their supervisor/boss would treat them differently because of their gender, and (3) their peers/coworkers would treat them differently because of their gender.²⁴ These questions, asked separately for each major, were combined using Principal Components Analysis (PCA) to create a major-specific index of anticipated gender discrimination.²⁵

Figure 2 shows the average gender discrimination index by major and gender. By construction, each index has a mean of zero (and standard deviation of one), therefore negative (positive) numbers imply anticipated gender discrimination that is lower (higher) than average. Men anticipate facing less discrimination due to their gender in all fields than the average participant. In contrast, women anticipate more discrimination across all fields, especially in STEM and BEC compared to SSH (p-value<0.01). This result is consistent with evidence of greater challenges for women in male-dominated fields (Foschi et al., 1994; Goldin and Rouse, 2000; Funk and Parker, 2018; Alam and Tapia, 2020).

College GPA is often used in hiring for entry-level positions, as it correlates with cognitive

 $^{^{24}}$ Given the leading nature of these questions they were asked at the end of the survey.

²⁵All results remain qualitatively consistent when major-specific indexes are constructed using a PCA algorithm that accounts for variable discreteness, or when considering only the difficulty of finding a job due to gender.

ability, job performance, and other traits valued by recruiters (McKinney and Miles, 2009, Hansen et al., 2023a). A higher GPA also increases job prospects (McKinney et al., 2003; Quadlin, 2018; Kessler et al., 2019). Discrimination may lead women to believe they need stronger evidence of competence than men to be hired, especially in male-dominated fields. Therefore, participants reported the minimum GPA they believe is required to secure a full-time job in each field.

Figure 3 shows the average GPA threshold for each major by gender. Participants believe they would need a higher GPA to secure a job in STEM than in BEC or SSH. Women, on average, think they need a GPA 0.23 points higher than in BEC and 0.18 points higher than in SSH (p-value < 0.01). Men believe they need 0.12 and 0.10 extra GPA points for STEM over BEC and SSH, respectively (p-value < 0.01). Overall, women think they need a higher GPA than men in any field. The gender gaps in perceived GPA requirements for SSH, BEC, and STEM are 0.075, 0.054, and 0.161, respectively (p-value < 0.01 for all).²⁶ In short, women believe they must provide a stronger signal of competence, particularly in STEM fields, to secure a job.

The binned scatter plot in Figure 4 illustrates the relationship between beliefs about anticipated gender discrimination and the GPA required to secure a job. There is a significant positive relationship (p-value < 0.01) for women between anticipated discrimination and the minimum GPA they believe is needed for a full-time job. This relationship is weaker for men, which is not surprising since men expect less gender discrimination.²⁷

Women believe they need to demonstrate greater competence in fields where they expect to face more discrimination. Female participants rated (on a 5-point scale) how much they agree that women need a higher GPA than men to be competitive in various fields. Figure 5 summarizes the responses. On average, represented by the dashed lines, the agreement is higher for STEM and BEC jobs compared to SSH jobs (p-value < 0.01). Nearly 77% and

 $^{^{26}}$ The gender gaps for BEC and SSH are not statistically different from each other (p-value=0.45), but they are statistically different from the gender gap in STEM (p-value<0.01).

²⁷However, a significant positive relationship exists for men when excluding eight outlier observations with high discrimination index but low labor market standards.

82% of women somewhat or strongly agree that a higher GPA is needed for BEC and STEM jobs, respectively, versus 42% for SSH jobs. These findings reinforce that women expect greater challenges in the STEM and BEC labor markets.

Table 7 examines how anticipated discrimination and GPA threshold beliefs contribute to the gender gap in grade sensitivity. Column (1) replicates the gender gap in WTP for GPA at graduation reported in Table 6 as \$3,191. Column (2) controls for beliefs about the required GPA to get a full-time job in each field, reducing the gap by 15% to \$2,699. This indicates that differing perceptions of labor market standards are crucial for understanding the gender differences in grade valuation.

Discrimination also contributes to the gender gap in WTP beyond its effects through labor market standards, as shown in column (3), which directly controls for anticipated discrimination indexes. Here, the gender gap becomes statistically insignificant, with a 34% decrease to \$2,093. Column (4), which controls for both discrimination indexes and GPA thresholds, shows a further decrease in the gap to \$1,643 (a 49% reduction) with no statistical significance. These results suggest the importance of anticipated discrimination in explaining the gender gap in grade sensitivity.²⁸

6.2 Self-Confidence

Research shows that women are less confident in their quantitative abilities than men. For instance, Ellis et al. (2016) finds that women in Calculus I report lower confidence in their math skills throughout the term. Similarly, Moakler and Kim (2014) reports that women's lower academic and math confidence is associated with a lower likelihood of choosing a STEM major. A possible explanation for these confidence patterns is stereotype vulnerability, a concept in social psychology that refers to the tendency to be influenced by negative stereotypes about one's social group. Individuals more susceptible to stereotype vulnerability are often more prone to overconfidence or underconfidence in their academic abilities, with

²⁸Results are directionally similar when seniors are included or when focusing only on first-year students.

self-confidence that can fluctuate over time (Aronson and Inzlicht, 2004).²⁹ Consequently, women may interpret lower grades in STEM and BEC majors as confirmation of gender stereotypes, reinforcing perceived inadequacies and ultimately leading some to switch out of these fields.

In the survey, participants rated their ability in each major on a 1-100 scale relative to their peers.³⁰ Figure 6 shows the average rank by gender and major. Women rated their ability 6.1 and 6.6 points higher in SSH than in BEC and STEM, respectively (p-value < 0.01 for both). There is no significant difference between their self-reported abilities in BEC and STEM (p-value = 0.58). On average, men reported higher abilities than women in all majors, with significant gender gaps in BEC and STEM (p-value < 0.01 for both).

Figure 7 shows the distribution of the difference between participants' perceived and actual rank in their major (Belief - True Rank). True rank is determined using administrative data from Spring 2021, where students in each major are ranked by cumulative GPA. This ranking assigns the true rank to survey participants based on their reported GPA. The difference (Belief - True Rank) represents the error in their self-assessment. A positive error indicates overconfidence, while a negative error indicates underconfidence.

In Figure 7, the vertical dashed lines represent the mean of the distribution by gender, indicating that participants generally underestimate their abilities, ranking themselves lower than their GPA-based rank. Women are more underconfident than men, shown by a lower mean (p-value < 0.01) and more mass below zero in the female histogram. The Kolmogorov-Smirnov test confirms that female and male distributions differ significantly (p-value < 0.01).³¹

Table 8 examines the impact of over/under confidence on gender differences in grade sensitivity. Column (1) replicates the conditional average gender gap in WTP for GPA at

²⁹In Aronson and Inzlicht (2004), the authors find that unstable self-confidence is associated with increased sensitivity to feedback, with students performing better in a test after positive feedback and worse after negative feedback. While I cannot measure self-confidence stability in this study, my focus is on examining the effect of feedback (grades) on major choices rather than on academic performance.

 $^{^{30}\}mathrm{The}$ higher the number the better the ability relative to peers.

 $^{^{31}\}mathrm{This}$ pattern holds when analyzing distributions by major. See Figure A3 in the Appendix.

graduation from Table 6, showing \$3,191. Column (2) controls for the error in beliefs about ability (belief - true rank). This adjustment reduces the gender gap by 5%, but it remains statistically significant. Although gender differences in self-confidence follow expected patterns, these results suggest that self-confidence may not be the primary factor driving the gender differences in sensitivity to grades.

6.3 Misconceptions about Academic Performance in Different Fields

Academic performance often drives major changes (Wright, 2018). However, students sometimes hold inaccurate beliefs about grade distributions across fields. For instance, Owen (2023) finds that men tend to underestimate the median grades in STEM majors, while women overestimate them. If women believe that grades in STEM majors are higher than they actually are, they may perceive their own grades as insufficient and switch out of these majors. Thus, misconceptions about grade distributions could explain the gender gap in grade sensitivity.

In the survey, participants report their beliefs about the average GPA of students graduating from each major. Table 9 shows these reported beliefs by gender in columns (2) and (3), with the fourth column displaying p-values from a difference in means test between genders. Women generally perceive the average GPA at graduation to be higher than men do, across all majors. Participants believe that STEM students have the lowest average GPA, while SSH students have the highest.

To assess the accuracy of these beliefs, I compare them to the actual GPA data for graduates from each major, using the administrative data detailed in section 2. Column (1) of Table 9 presents the average GPA for graduates in Spring 2019.³² Contrary to participants' beliefs, the average GPA for STEM graduates is slightly higher than for BEC or SSH graduates. Men generally underestimate the GPA for STEM and BEC majors compared to actual values (p-value < 0.01 for both), though their belief about SSH GPA is not significantly

 $^{^{32}}$ I chose Spring 2019 to avoid the impact of COVID-19 grading policies seen in Spring 2020 and 2021; however, results are qualitatively the same if any of those semesters is used instead.

different from the true average (p-value = 0.46). Conversely, women overestimate the GPA for SSH (p-value < 0.01) and STEM (p-value < 0.01) but have accurate beliefs about BEC (p-value = 0.89).

Figure 8 illustrates the distribution of the difference between participants' reported GPA beliefs and the actual average GPA at graduation for their major (Spring 2019). Negative (positive) values indicate underestimation (overestimation) of the GPA. The dashed lines mark the mean of each distribution.

On average, women in SSH majors tend to overestimate the GPA of their graduating peers (p-value < 0.01), while men in SSH have more accurate beliefs (p-value = 0.41). Female students in BEC majors hold accurate beliefs about their peers' GPA (p-value = 0.89), whereas men tend to underestimate it (p-value < 0.01). In STEM, both genders generally underestimate the graduating GPA, but women's estimates are closer to the actual GPA than men's (p-value < 0.01). Figure 8 shows that the distributions of these errors are statistically different between genders, as indicated by the Kolmogorov-Smirnov test. Overall, a higher proportion of women overestimate the GPA of their peers compared to men, as seen in the greater mass above zero in the female distributions.

Table 10 examines how overestimations or underestimations of the GPA at graduation influence the gender gap in grade sensitivity. Column (1) reproduces the first column of Table 6, reporting the conditional average gender gap in WTP for GPA, \$3,191. Column (2) incorporates errors in beliefs about the GPA at graduation (shown in Figure 8). As a result, the gender gap estimate decreases by approximately 8% to \$2,926. These findings suggest that while erroneous beliefs about GPA requirements have some impact, they may not be a significant driver of the gender differences in grade sensitivity.

6.4 Relative Importance of Anticipated Gender Discrimination

The previous results suggest that anticipated discrimination explains the gender gap in WTP for GPA better than self-confidence and misconceptions about grades. However, the analysis was conducted for each hypothesis independently. In this section, I provide suggestive evidence on the importance of anticipated gender discrimination relative to the other two explanations.

Table 11 examines the impact of the three hypothesis on the gender gap in grade sensitivity when considered together. Column (1) shows the overall conditional average gender gap in WTP for GPA at \$3,191. Column (2), which controls for self-confidence (section 6.2), reproduces column (2) in Table 8 and reduces the point estimate by about 5%. Column (3), controlling for errors in beliefs about the GPA at graduation (section 6.3), reduces the point estimate by about 8%, similar to when this hypothesis is considered separately. Column (4) includes controls for beliefs about anticipated gender discrimination, decreasing the estimated gender gap in WTP for GPA by about 47% relative to column (3), making the coefficient no longer statistically significant. Overall, the gender gap in WTP for GPA decreases by 54%, from \$3,191 to \$1,476, when including all controls.³³

The results in Table 11 suggest that anticipated gender discrimination plays a more significant role than the other two mechanisms, as its inclusion leads to the largest reduction in the estimated gender gap in WTP for GPA. This finding is further supported by an Oaxaca-Blinder decomposition.³⁴ According to this analysis, 43% of the observed gender gap in WTP for GPA can be attributed to gender differences in beliefs about anticipated gender discrimination, while 11% is due to differences in self-confidence and another 13% is related to misconceptions about GPA requirements across different majors.

7 Conclusion

This paper investigates the reasons behind the well-documented gender differences in grade sensitivity, particularly in male-dominated fields like STEM and business. Using novel

 $^{^{33}}$ See Table A5 in the Appendix for the coefficients of each mechanism.

³⁴The Oaxaca-Blinder decomposition helps determine the portion of the gender difference in WTP for GPA explained by group differences in observable explanatory variables, in this case for each of the three mechanisms considered (Rahimi and Nazari, 2021).

survey data, I find that women are willing to pay about \$3,000 more in annual earnings than men for a one-point increase in GPA, indicating greater sensitivity to grades. This gender gap is concentrated among students in STEM majors.

The key contribution is showing that anticipated gender discrimination in the labor market plays an important role in explaining these differences. I find that women believe that they are more likely to experience gender discrimination in the labor market than men, particularly in STEM and business fields. Additionally, women believe they will face a higher standard in the labor market regarding GPA to get a full-time job. I provide evidence that the beliefs about higher standards are related to beliefs about gender discrimination in the labor market. Furthermore, my results show that beliefs about gender discrimination in the labor market account for 49% of the gender gap in sensitivity to grades.

While this paper focuses on anticipated discrimination, other factors could contribute to explaining the gender differences in grade sensitivity. Nevertheless, anticipated discrimination represents an explanation often overlooked, and my results provide evidence of its importance in this context. Considering the role of such beliefs is crucial to designing policies that effectively encourage the participation of women in traditionally male-dominated fields. For example, if students' beliefs about gender discrimination accurately reflect the labor market, then policymakers should prioritize addressing these issues. Conversely, information interventions could be a valuable tool if their perceptions are erroneous. Therefore, assessing the accuracy of these beliefs represents an important avenue for future research.

Figures



Figure 1: Probability of Persisting in a Major by First Year GPA

(a) SSH



Notes: Bars represent the probability of staying in the major indicated at the top of each panel given the first-year GPA level on the horizontal axis, estimated from a logit model that regresses an indicator for staying in the same major as in the first year on a female indicator, the GPA in that major, and the GPA in the other majors. All regressions control for minority status, family income, first generation, in-state, honors and exploratory status, ACT/SAT, high school GPA, and cohort FE. Spikes represent 95% CI.



Figure 2: Gender Discrimination Index by Gender

Notes: Average gender discrimination index for each major by gender. The index calculated using PCA and the responses to how likely (on a 5-point Likert scale) it would be that: (1) it is harder to find a job because of their gender, (2) their supervisor/boss would treat them differently because of their gender, and (3) their peers/coworkers would treat them differently because of their gender. Spikes represent 95% CI.

Figure 3: Average Beliefs about Min. GPA Necessary for Full-Time Job in Given Field



Notes: Average belief about the minimum cumulative GPA at graduation required to secure a full-time job in each field by gender. Spikes represent 95% CI.



Figure 4: Discrimination and Thresholds Relationship

Notes: Markers are from a binned scatter plot between GPA thresholds to get a full-time job and the anticipated discrimination index. Lines are fitted values from a regression of the GPA threshold on the discrimination index separately by gender and standard errors are clustered at individual level. Coefficients at the bottom left corner are the slopes of each line. *Significant at 10%, **5%, ***1%.

Figure 5: Female Participants Agreement with "Women need a higher GPA to compete against similar man", by major



Notes: For each major, histogram of female participants responses to "How much you agree with: A woman competing for a job in this field would need a higher GPA than an otherwise similar man to be competitive." Dashed lines represent the average level of agreement by major.



Figure 6: Average Beliefs about Ability in Each Major

Notes: Average ability ranking in each major by gender. Rank is on a 1-100 scale where higher numbers represent higher ability. Spikes represent 95% CI.



Figure 7: Ability Over/Under Confidence, by Gender

Notes: Histogram, by gender, of the difference between participants' beliefs about their rank in their reported major and their "true" rank in that major based on reported cumulative GPA. Dashed lines represent the mean of each respective distribution. K-S p-val: p-value from a Kolmogorov-Smirnov test for the equality of the distributions.



Figure 8: Error in Beliefs about Av. GPA at Graduation, by Majors

Notes: Histogram, by gender, of the difference (error) between a participant's belief about the GPA at graduation for the major they report to be enrolled in and the corresponding average GPA at graduation from the administrative data (Spring 2019). Dashed lines represent the mean of each respective distribution. K-S p-val: p-value from a Kolmogorov-Smirnov test for the equality of the distributions.

Tables

| | Av. GPA | | | Av | Av. Study Time | | | Av. Earnings | | |
|------|---------|--------|---------|---------|----------------|---------|---------|--------------|---------|--|
| | Female | Male | P-value | Female | Male | P-value | Female | Male | P-value | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | |
| SSH | 3.47 | 3.38 | 0.000 | 14.60 | 12.68 | 0.000 | 41.60 | 40.01 | 0.005 | |
| | (0.27) | (0.30) | | (8.26) | (7.49) | | (12.56) | (10.74) | | |
| BEC | 3.37 | 3.29 | 0.000 | 14.06 | 13.20 | 0.024 | 55.02 | 53.57 | 0.067 | |
| | (0.31) | (0.31) | | (8.17) | (7.89) | | (17.66) | (14.80) | | |
| STEM | 3.37 | 3.21 | 0.000 | 22.72 | 21.23 | 0.002 | 66.47 | 64.16 | 0.020 | |
| | (0.33) | (0.32) | | (10.19) | (9.97) | | (22.57) | (17.88) | | |

Table 1: Beliefs about Major Attributes by Gender

Notes: Averages by gender for each major attribute. The p-value indicates the statistical significance of the gender gap. Earnings in thousands of dollars. Standard deviation reported in parentheses.

Table 2: Proportion of Participants that Rank a Major Highest for a Given Attribute, by Gender

| | Av. GPA | | Av. | Av. Study Time | | | Av. Earnings | | |
|------|---------|------|---------|----------------|------|---------|--------------|------|---------|
| | Female | Male | P-value | Female | Male | P-value | Female | Male | P-value |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| SSH | 0.33 | 0.46 | 0.005 | 0.02 | 0.02 | 0.995 | 0.01 | 0.01 | 0.443 |
| BEC | 0.26 | 0.22 | 0.397 | 0.01 | 0.03 | 0.058 | 0.12 | 0.11 | 0.235 |
| STEM | 0.41 | 0.32 | 0.042 | 0.97 | 0.96 | 0.180 | 0.87 | 0.89 | 0.174 |

Notes: For each attribute and by gender, the table reports the weighted proportion of participants that report each major having the highest level of the attribute (highest earnings, GPA or study time). For instance, 0.87 of women believe that earnings in STEM jobs are higher than in BEC and SSH, but only 0.01 believe that SSH jobs pay higher earnings than STEM and BEC. The p-value indicates the statistical significance of the gender gap.

| | Av. GPA | Av. Study Hours per week | Av. Earnings after Grad. (full-time job) |
|------|---------|-----------------------------|--|
| SSH | 3.47 | 8.0 | \$24,000 |
| BEC | 2.23 | 7.0 | \$49,000 |
| STEM | 2.00 | 22.0 | \$46,000 |

Table 3: Scenario Example

Table 4: Estimates of Preferences for Major Attributes

| | Overall | Female | Male |
|---------------------|-----------|-----------|---------------|
| | (1) | (2) | (3) |
| GPA at Grad. | 0.650*** | 0.689*** | 0.574^{***} |
| | (0.064) | (0.079) | (0.118) |
| Study time (h/week) | -0.070*** | -0.060*** | -0.090*** |
| | (0.007) | (0.009) | (0.014) |
| Log earnings | 4.569*** | 4.058*** | 5.558*** |
| | (0.154) | (0.182) | (0.291) |
| Taste for BEC | -0.430*** | -0.557*** | -0.184 |
| | (0.085) | (0.105) | (0.143) |
| Taste for STEM | -0.078 | -0.244** | 0.244 |
| | (0.096) | (0.113) | (0.175) |
| N | 1,192 | 786 | 406 |

Notes: Table reports the average of the coefficientes across the relevant sample. Tastes for BEC and STEM are relative to SSH. Asterisks denote estimates that are statistically different from zero based on bootstrapped standard errors. *Significant at 10%, **5%, ***1%

| | Dollars | | | % (| | | |
|--------------|----------|---------|-----------|----------|----------|---------|----------------------|
| | Overall | Female | Male | Overall | Female | Male | P-value ^a |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| GPA at Grad. | 8,344 | 9,128 | $6,\!828$ | 15.58 | 17.05 | 12.75 | 0.098 |
| | [6, 636] | [7,823] | [4,903] | [12.39] | [14.61] | [9.16] | 0.018 |
| | (652) | (811) | (1, 126) | (1.22) | (1.52) | (2.11) | |
| Study time | -1,486 | -1,434 | -1,585 | -2.77 | -2.68 | -2.96 | 0.724 |
| | [-641] | [-611] | [-717] | [-1.20] | [-1.14] | [-1.34] | 0.232 |
| | (196) | (241) | (355) | (0.37) | (0.45) | (0.67) | |
| N | 1,192 | 786 | 406 | | | | |

Table 5: WTP Estimates

Notes: Table reports WTP mean, median in squared brackets, and bootstrapped standard errors in parentheses in dollars and as percentage of average earnings. All means and medians are statistically different from zero at 1%. ^a P-value from a difference in means or medians test by gender.

| | Overall | SSH | BEC | STEM |
|--------|-----------|-----------|---------|---------------|
| | (1) | (2) | (3) | (4) |
| Female | 3,191** | 1,749 | -345 | $5,326^{***}$ |
| | (1,404) | (2,864) | (3,771) | (1,878) |
| Mean | 8,344 | $6,\!334$ | 9,971 | 9,249 |
| R2 | 0.02 | 0.02 | 0.04 | 0.03 |
| Ν | $1,\!192$ | 424 | 218 | 550 |

Table 6: Gender Gaps in WTP for GPA

Notes: Outcome variable is WTP for an extra point in av. GPA at graduation. All columns control for household income, parents education, SAT/ACT, school year, minority. Additionally, column (1) controls for major. Bootstrapped standard errors reported in parentheses. Columns (2)-(4) split sample by reported major of participants. *Significant at 10%, **5%, ***1%.

| | (1) | (2) | (3) | (4) |
|---------------------------------|-----------|-------------|-----------|-------------|
| Female | 3,191** | $2,\!699*$ | 2,093 | 1,643 |
| | (1,404) | (1,396) | (2,051) | (2,002) |
| Belief GPA Threshold SSH | | -131 | | -129 |
| | | (2,116) | | (2,189) |
| Belief GPA Threshold BEC | | $1,\!926$ | | $1,\!983$ |
| | | (2,387) | | (2,360) |
| Belief GPA Threshold STEM | | $3,\!451^*$ | | $3,\!386^*$ |
| | | (1,977) | | (1,971) |
| Anticipated Discrimination SSH | | | -222 | -237 |
| | | | (522) | (535) |
| Anticipated Discrimination BEC | | | 542 | 511 |
| | | | (895) | (898) |
| Anticipated Discrimination STEM | | | 73 | 93 |
| | | | (880) | (882) |
| Mean | 8,344 | 8,344 | 8,344 | 8,344 |
| R2 | 0.017 | 0.023 | 0.018 | 0.024 |
| Ν | $1,\!192$ | $1,\!192$ | $1,\!192$ | $1,\!192$ |

Table 7: Importance of Anticipated Discrimination and GPA Thresholds for the Gender Gaps in WTP for GPA

Notes: Outcome variable is WTP for an extra point in av. GPA at graduation. All columns control for household income, parents education, SAT/ACT, school year, minority, and major. Bootstrapped standard errors reported in parentheses. *Significant at 10%, **5%, ***1%.

| | (1) | (2) |
|--------------------------------|-----------|-----------|
| Female | 3,191** | 3,018** |
| | (1,404) | (1,418) |
| Error in Beliefs about Ability | | -19 |
| | | (20) |
| Mean | 8,344 | 8,344 |
| R2 | 0.017 | 0.018 |
| Ν | $1,\!192$ | $1,\!192$ |

Table 8: Importance of the Errors in Beliefs aboutAbility for the Gender Gaps in WTP for GPA

Notes: Outcome variable is WTP for an extra point in av. GPA at graduation. All columns control for household income, parents education, SAT/ACT, school year, minority, and major. Bootstrapped standard errors reported in parentheses. *Significant at 10%, **5%, ***1%.

| | Actual | | Beliefs | |
|------|--------|--------|---------|---------|
| | GPA | Female | Male | p-value |
| | (1) | (2) | (3) | (4) |
| SSH | 3.38 | 3.46 | 3.36 | 0.000 |
| BEC | 3.41 | 3.41 | 3.27 | 0.000 |
| STEM | 3.44 | 3.35 | 3.21 | 0.000 |

Table 9: Average Beliefs about GPA at Graduation, and Actual Average GPA at Graduation by Gender and Major

Notes: Column (4) is the p-value of a difference in means test across genders within major, columns (2) and (3).

Table 10: Importance of the Errors in Beliefs about GPA at Graduation for the Gender Gaps in WTP for GPA

| | (1) | (2) |
|--|-----------|-----------|
| Female | 3,191** | 2,926** |
| | (1,404) | (1,422) |
| Error in Beliefs about GPA at Graduation | | 1,929 |
| | | (2,478) |
| Mean | 8,344 | 8,344 |
| R2 | 0.017 | 0.018 |
| Ν | $1,\!192$ | $1,\!192$ |

Notes: Outcome variable is WTP for an extra point in av. GPA at graduation. All columns control for household income, parents education, SAT/ACT, school year, minority, and major. Bootstrapped standard errors reported in parentheses. *Significant at 10%, **5%, ***1%.

Table 11: Relationship between Gender Gaps in WTP for GPA and Pontential Mechanisms

| | (1) | (2) | (3) | (4) |
|--|-----------|--------------|--------------|--------------|
| Female | 3,191** | 3,018** | 2,774* | 1,476 |
| | (1,404) | (1,418) | (1,466) | (1,977) |
| Error in Beliefs about Own Ability | | \checkmark | \checkmark | \checkmark |
| Error in Beliefs about GPA at Graduation | | | \checkmark | \checkmark |
| Anticipanted Discrimination | | | | \checkmark |
| Mean | 8,344 | 8,344 | 8,344 | 8,344 |
| Ν | $1,\!192$ | $1,\!192$ | $1,\!192$ | $1,\!192$ |

Notes: Outcome variable is WTP for an extra point in av. GPA at graduation. All columns control for household income, parents education, SAT/ACT, school year, minority, and major. Bootstrapped standard errors reported in parentheses. *Significant at 10%, **5%, ***1%.

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(b) Other STEM

A Appendix

(a) Life and Medical Sciences



Figure A1: Probability of Persisting in a Major by First Year GPA

 First-Year GPA
 First-Year GPA

 Notes: Bars represent the probability of staying in the major indicated at the top of each panel given the first-year GPA level

Notes: Bars represent the probability of staying in the major indicated at the top of each panel given the first-year GPA level on the horizontal axis, estimated from a logit model that regresses an indicator for staying in the same major as in the first year on a female indicator, the GPA in that major, and the GPA in the other majors. All regressions control for minority status, family income, first generation, in-state, honors and exploratory status, ACT/SAT, high school GPA, and cohort FE. Spikes represent 95% CI.



Figure A2: Choice Probabilities by Major

Notes: Histograms of choice probabilities for each major pooled across all scenarios.



Figure A3: Ability Over/Under Confidence, by Majors

Notes: Histogram, by gender and major, of the difference between participants' beliefs about their rank in their reported major and their "true" rank in that major based on reported cumulative GPA. Dashed lines represent the mean of each respective distribution. K-S p-val: p-value from a Kolmogorov-Smirnov test for the equality of the distributions.

| | Survey | | | | | ASU | | P-value ^c |
|-------------------------------|--------|-------|-------|--|--------|------------|-------|----------------------|
| | Female | Male | Diff. | | Female | Male | Diff. | 1 Varue |
| | (1) | (2) | (3) | | (4) | (5) | (6) | (7) |
| Black | 0.05 | 0.03 | 0.02 | | 0.04 | 0.03 | 0.01 | 0.134 |
| White | 0.66 | 0.70 | -0.04 | | 0.46 | 0.48 | -0.02 | 0.498 |
| Hispanic | 0.23 | 0.18 | 0.05 | | 0.29 | 0.23 | 0.07 | 0.284 |
| First Generation ^a | 0.29 | 0.23 | 0.06 | | 0.31 | 0.23 | 0.08 | 0.263 |
| Family Income ^b | 102 | 109 | -7.1 | | 126 | 151 | -26 | 0.181 |
| Freshman | 0.22 | 0.20 | 0.02 | | 0.26 | 0.25 | 0.01 | 0.776 |
| Sophomore | 0.24 | 0.23 | 0.00 | | 0.26 | 0.25 | 0.01 | 0.853 |
| Junior | 0.30 | 0.30 | 0.01 | | 0.22 | 0.22 | 0.00 | 0.806 |
| Senior | 0.24 | 0.27 | -0.03 | | 0.26 | 0.28 | -0.02 | 0.742 |
| ACT | 27.71 | 28.56 | -0.85 | | 23.98 | 25.62 | -1.64 | 0.003 |
| | | | | | | | | |
| STEM | 0.38 | 0.58 | -0.20 | | 0.29 | 0.48 | -0.20 | 0.984 |
| BEC | 0.18 | 0.21 | -0.03 | | 0.17 | 0.26 | -0.09 | 0.001 |
| SSH | 0.44 | 0.22 | 0.22 | | 0.54 | 0.25 | 0.29 | 0.004 |
| Sample Size | 1,236 | 700 | | | 22,755 | $21,\!637$ | | $0.000^{\rm d}$ |

Table A1: Sample Compared to ASU Population

Notes: ASU data includes everyone taking at least one class for credit during the Spring semester of 2021 and attending ASU as their first full-time university. Income and first generation variables for the ASU data are constructed with the first year of available data, which it is not the freshman year all the sample. ^a Students with no parent with a college degree.

^b Family income in thousands of dollars.

^c P-value for whether the gender differences in the survey sample and the ASU population are different.

^d P-value for the difference in females proportion between the survey sample and ASU population.

| | Mean | Std. Dev. | Min. | Max. |
|----------------|-------|-----------|------|------|
| | (1) | (2) | (3) | (4) |
| SSH | | | | |
| Av. GPA | 3.38 | 0.43 | 4.00 | 2.00 |
| Av. Study Time | 15.53 | 9.44 | 40 | 3 |
| Av. Earnings | 43.46 | 16.29 | 190 | 15 |
| BEC | | | | |
| Av. GPA | 3.28 | 0.50 | 4.00 | 2.00 |
| Av. Study Time | 15.56 | 9.53 | 40 | 3 |
| Av. Earnings | 52.78 | 21.18 | 200 | 15 |
| STEM | | | | |
| Av. GPA | 3.28 | 0.46 | 4.00 | 2.00 |
| Av. Study Time | 20.72 | 10.34 | 40 | 3 |
| Av. Earnings | 62.77 | 24.38 | 200 | 15 |

Table A2:Variation in the Hypothetical MajorChoice Scenarios

Notes: Earnings in thousands of dollars. Study time in hours per week.

| | Life and Medical | Other STEM |
|--------|------------------|------------|
| | Sciences | Majors |
| | (1) | (2) |
| Female | 4,533 | 3,784* |
| | (3,497) | (2,173) |
| Mean | 12,380 | 6,965 |
| R2 | 0.07 | 0.05 |
| Ν | 232 | 318 |

Table A3: Gender Gaps in WTP for GPA: STEM

Notes: Outcome variable is WTP for an extra point in av. GPA at graduation. All columns control for household income, parents education, SAT/ACT, school year, minority. Sample includes participants enrolled in a STEM majors split between life and medical sciences and other STEM majors. Bootstrapped standard errors reported in parentheses. *Significant at 10%, **5%, ***1%.

| | Overall | Male Dominated | NOT | |
|--------|-----------|----------------|----------------|--|
| | Overall | male Dominated | Male Dominated | |
| | (1) | (2) | (3) | |
| Female | $2,\!690$ | $3,\!499$ | -9,512 | |
| | (4,399) | (4,825) | (9,245) | |
| Mean | 8,459 | $5,\!988$ | $17,\!586$ | |
| R2 | 0.06 | 0.13 | 0.18 | |
| Ν | 218 | 158 | 60 | |

Table A4: Gender Gaps in WTP for GPA: BEC

Notes: Outcome variable is WTP for an extra point in av. GPA at graduation. All columns control for household income, parents education, SAT/ACT, school year, minority. Sample includes participants enrolled in a BEC major. Columns(2)-(3) split sample based on how male dominated the majors are. Column(2) includes Business, Economics, Finance and Supply Chain Management. Column (3) includes Accountancy, Global Management, Management and Marketing. Observations are weighted to be representative of the distribution of women and men across each of the 8 major during the Spring 2021. Robust standard errors reported in parentheses. *Significant at 10%, **5%, ***1%.

| | (1) | (2) | (3) | (4) |
|--|-----------|-----------|-------------|-----------|
| Female | 3,191** | 3,018** | $2,774^{*}$ | 1,476 |
| | (1,404) | (1,418) | (1,466) | (1,977) |
| Error in Beliefs about Own Ability | | -19 | -18 | -16 |
| | | (20) | (20) | (20) |
| Error in Beliefs about GPA at Graduation | | | $1,\!820$ | 106 |
| | | | (2,471) | (2,518) |
| Anticipated Discrimination SSH | | | | -273 |
| | | | | (540) |
| Anticipated Discrimination BEC | | | | 518 |
| | | | | (897) |
| Anticipated Discrimination STEM | | | | 112 |
| | | | | (881) |
| Belief GPA Threshold SSH | | | | -124 |
| | | | | (2,189) |
| Belief GPA Threshold BEC | | | | $1,\!950$ |
| | | | | (2,358) |
| Belief GPA Threshold STEM | | | | $3,\!266$ |
| | | | | (2,019) |
| Mean | 8,344 | 8,344 | 8,344 | 8,344 |
| Ν | $1,\!192$ | $1,\!192$ | $1,\!192$ | $1,\!192$ |

Table A5: Relationship between Gender Gaps in WTP for GPA and Pontential Mechanisms

Notes: Outcome variable is WTP for an extra point in av. GPA at graduation. All columns control for household income, parents education, SAT/ACT, school year, minority, and major. Bootstrapped standard errors reported in parentheses. *Significant at 10%, **5%, ***1%.

B Appendix

ASU Majors in Each Broad Category

Humanities/Social Sciences (SSH)

African and African American Studies American Indian Studies Anthropology Applied Science Applied Science (Applied Leadership) Applied Science (Early Childhood Studies) Applied Science (Emergency Management) Applied Science (Food and Nutrition Entrepreneurship) Applied Science (Graphic Information Technology) Applied Science (Health Entrepreneurship and Innovation) Applied Science (Health Sciences) Applied Science (Medical Laboratory Science) Applied Science (Project Management) Applied Science (Technical Communication) Architectural Studies Art Asia Studies Asian Languages Asian Pacific American Studies Civic and Economic Thought and Leadership Communication Community Advocacy and Social Policy **Community Development** Community Health **Community Sports Management Conflict Resolution** Counseling and Applied Psychological Science Criminology and Criminal Justice Dance **Design Studies** Dietetics **Digital Audiences Digital** Culture **Digital Media Literacy Disability Studies** Early Childhood and Early Childhood Special Education **Educational Studies Elementary Education** English Environmental Design

Exercise and Wellness Family and Human Development Fashion Film Food and Nutrition Entrepreneurship French General Studies German Global Health **Global Studies** Graphic Design Health Care Compliance and Regulations Health Care Coordination Health Education and Health Promotion Health Entrepreneurship and Innovation Health Sciences Health Sciences (Health Policy) Health Sciences (Healthy Lifestyles and Fitness Science) Health Sciences (Pre-professional) History History of Science, Ideas and Innovation Industrial Design Innovation in Society Integrated Studies Integrative Health Integrative Social Science Interdisciplinary Arts and Performance Interdisciplinary Arts and Sciences Interdisciplinary Studies Interior Design International Letters and Cultures International Public Health Italian Jewish Studies Journalism and Mass Communication Justice Studies Landscape Architecture Latin American Studies Liberal Studies Mass Communication and Media Studies

Music Music Learning and Teaching Music Therapy Nonprofit Leadership and Management Nursing Nutrition Nutritional Sciences Organizational Leadership Parks and Recreation Management Performance Performance and Movement Philosophy Philosophy, Religion and Society **Political Science** Politics and the Economy Population Health Prelaw Psychology Public Health Public Service and Public Policy Recreation Therapy **Religious Studies** Russian Science of Health Care Delivery Science, Technology and Society Secondary Education Secondary Education (Biological Sciences) Secondary Education (Chemistry) Secondary Education (Earth and Space Sciences) Secondary Education (English) Secondary Education (German) Secondary Education (History) Secondary Education (Mathematics) Secondary Education (Physical Education) Secondary Education (Physics) Secondary Education (Political Science) Secondary Education (Spanish) Social and Behavioral Sciences Social and Cultural Analysis Social Justice and Human Rights Social Work Sociology Spanish Special Education Special Education and Elementary Education Speech and Hearing Science Sports Journalism Sports Science and Performance Programming Technical Communication Technological Leadership Theatre Theory and Composition Tourism and Recreation Management Tourism Development and Management Transborder Chicana/o and Latina/o Studies Urban and Metropolitan Studies Urban Planning Women and Gender Studies

Social Work Sociology Spanish Special Education Special Education and Elementary Education Speech and Hearing Science Sports Journalism Sports Science and Performance Programming Technical Communication Technological Leadership Theatre Theory and Composition Tourism and Recreation Management Tourism Development and Management Transborder Chicana/o and Latina/o Studies Urban and Metropolitan Studies Urban Planning Women and Gender Studies

Science/Technology/Engineering/Mathematics (STEM)

Actuarial Science Aeronautical Management Technology Aerospace Engineering **Applied Biological Sciences** Applied Computing **Applied Mathematics** Applied Mathematics for Life and Social Sciences Applied Physics Applied Quantitative Science Applied Science (Aviation) Applied Science (Internet and Web Development) Applied Science (Operations Management) Astronomical and Planetary Sciences Biochemistry **Biological Sciences** Biology **Biomedical Engineering Biomedical Informatics Biophysics** Biotechnology and Bioenterprise Chemical Engineering Chemistry Civil Engineering **Computational Forensics Computational Mathematical Sciences Computer Information Systems** Computer Science Computer Systems Engineering Construction Engineering Construction Management and Technology **Data Science** Earth and Environmental Studies Earth and Space Exploration Electrical Engineering Engineering **Engineering Management** Environmental and Resource Management Environmental Engineering Environmental Science Forensic Science

Geographic Information Science Geography Graphic Information Technology Human Systems Engineering Industrial Engineering Informatics Information Technology Kinesiology Manufacturing Engineering Materials Science and Engineering Mathematics Mechanical Engineering Medical Studies Microbiology Molecular Biosciences and Biotechnology Neuroscience Pharmacology and Toxicology Physics Software Engineering Statistics Sustainability Sustainable Food Systems Technological Entrepreneurship and Management

Business/Economics (BEC)

Accountancy Business Economics Economics (Politics and the Economy) Finance Food Industry Management Global Management International Trade Management Marketing Supply Chain Management