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Field Interest and the Choice of College Major

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Abstract

We perform exploratory research to understand the importance of interest in the field of study as a determinant of college major choice and examine how the importance of interest varies by student demographic and socioeconomic characteristics. We show that women, White students, and students from advantaged socioeconomic backgrounds rate interest as a more important factor in driving the choice of college major relative to other students. The gender gap in the importance of interest is largest. Gaps by race/ethnicity and socioeconomic status are less pronounced but still large.

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1. Introduction

There is significant research and policy interest in understanding how students choose college majors, reflecting both micro- and macro-level concerns. At the micro level, a common concern is that some students make seemingly suboptimal choices. For example, gaps in labor market outcomes between workers in different fields have garnered attention on the grounds that some individuals—women and racial/ethnic minorities in particular—are overrepresented in traditionally lower-paying fields in college and the workforce (Carnevale *et al.*, 2015; Riegle-Crumb and King, 2010). At the macro level, there is concern about the broader distribution of human capital. For example, in the U.S. context, several recent high-profile publications argue that the share of degrees awarded in science and technology fields is too low and this is a threat to long-term economic prosperity (Committee on Prospering in the Global Economy of the 21st Century, 2007; National Science Board, 2015).

Research and policy efforts aimed at altering students' choices of college majors have devoted considerable attention to the potential for improved information about labor market outcomes to influence behavior. A prime example is the U.S. Department of Education's College Scorecard, on which post-graduation average earnings is among the core statistics reported for colleges and degree programs. The focus on labor-market information is motivated by the theory that students have inaccurate views about earnings differences across fields, and that if the inaccuracies are remedied, students will choose different (and presumably more lucrative) majors. This theory has been tested using information interventions, and studies have confirmed that students have inaccurate information and, moreover, that they are responsive to better information. However, despite large inaccuracies in student knowledge about labor market outcomes, the effects of information interventions on student decisions have been modest (Baker *et al.*, 2018; Beffy, Fougere and Maurel, 2012; Wiswall and Zafar, 2015; Zafar, 2013).

Another hypothesis is that academic skills prior to college entry drive the distribution of intended majors. However, Riegle-Crumb *et al.* (2012), who focus on the gender gap in STEM enrollment, show that pre-college achievement differences account for little of the gap. Moreover, despite large achievement differences between students who differ by race and social class prior to postsecondary entry, these authors show that students from disadvantaged backgrounds are not underrepresented at entry in STEM fields (also see Arcidiacono and Koedel, 2014). Porter and Umbach (2006) similarly find that academic preparation is not a key driver of initial major choice.

Over the course of establishing the modest influence of labor-market expectations and pre-entry academic qualifications over major choice, recent studies have found that students consistently put the most weight in their decisions on interest in the field of study and, relatedly, expected enjoyment in the career. Zafar (2013) and Wiswall and Zafar (2015) examine undergraduates at selective private universities (Northwestern University and New York University) and find that students place the most value on enjoyment of the material. Using a survey of students who attend a large, public research university, Weinberger (2004) aims to understand why women are underrepresented in technical fields and concludes the overwhelming majority of women rule out these majors because the courses are not interesting to them. Baker et al. (2018) report that course enjoyment and grades are the main determinants of major choice among community college students.

Motivated by the demonstrated importance of interest as a determinant of major choice (we use the terms "interest" and "enjoyment" synonymously), we perform exploratory research to understand heterogeneity in the link between interest and major choice between students who differ by demographic and socioeconomic characteristics. We find substantial heterogeneity.

Women, White students, and students of high socioeconomic status (SES) are more likely than other students to rate interest as the most important factor driving the choice of major. The gender gap in the importance of interest is by far the largest, although the racial/ethnic and SES gaps are still large. Alternatively, men, minorities, and low-SES students are much more likely to report choosing a major to improve expected earnings and employment outcomes, rather than because they are interested in the field of study.

2. Survey Instrument & Data

We collected survey data in 10 large-lecture, freshman-level courses taught at the University of Missouri-Columbia (MU) in fall 2017. We administered the survey in courses in the following fields, where the numbers in parenthesis indicate the number of separate lectures surveyed: Business Administration (1), Classical Humanities (1), Economics (2), Engineering (1), Mathematics (2), Political Science (1), and Psychology (2). The survey was conducted during the second week of the semester, except in mathematics, where it was conducted in week-4 at the request of the instructor (to accommodate the flow of the course).

The focal survey question asks students to rank five factors by their importance in determining their choice of major. The factors are:

(a) expected salary after graduation,
(b) stability of the expected career after graduation,
(c) fulfillment from expected work after graduation,
(d) inherent interest in the field of study, and
(e) perceived likelihood of success in coursework.

It has been shown in other contexts that the order in which the options are given for a rank-order question can affect respondents' answers (e.g., see Krosnick and Alwin, 1987), and with this in mind, we created four versions of the survey that use different, randomly-selected orderings.[1] In addition to the ranking exercise, students were asked to list their intended major, race/ethnicity, gender, level of education for their most-educated parent, residential status, and the first year they attended classes at MU (we use this variable to separate out students new to MU in a robustness test). An example survey is provided in Appendix A.[2]

Our dataset has several desirable features that improve upon and complement similar, previous survey-based efforts. First, our student sample is large—it includes over 2,200 students, which facilitates well-powered heterogeneity analyses. Second, we designed and implemented the survey with an explicit focus on attaining a high response rate in order to reduce concerns about nonresponse bias (in particular, we kept the survey short and anonymous and distributed it to students in-class). The result is that our survey data broadly reflect students in the classes we surveyed at MU: among those in attendance during a lecture we surveyed, our response rate is 94 percent (Appendix Table B.1). Moreover, given that the survey was administered early in the semester, attendance rates in the courses were high. Third, while MU is a selective institution, it serves a more academically and socioeconomically diverse population than the exceptionally

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[1] The survey versions are otherwise identical and were distributed to students at random during surveyed courses. See Appendix Table B.3 for tests consistent with the different versions of the survey being distributed randomly. Our preferred analytic models pool estimates across all survey versions. We also confirm that our findings are similar on a version-by-version basis in Appendix Tables B.9a-d.

[2] In addition to the items mentioned in this paragraph, we also asked students about their second-choice majors (i.e., the major they would choose if they were prevented from choosing the first major) and about the individuals who influenced their choices (options: parent(s), friend(s), teacher(s), high school counselor(s)). We do not use data from these questions in the present analysis.

selective universities at which many similar studies have been conducted to date (e.g., Barrea College (Stinebrickner and Stinebrickner, 2014); Duke University (Arcidiacono et al., 2012); Northwestern University (Zafar, 2013); New York University (Wiswall and Zafar, 2015)).[3]

Tables 1 and 2 provide summary statistics for our dataset. When available, we also report MU averages for the 2017 entering cohort based on administrative microdata from the Missouri Department of Higher Education. Men are overrepresented in our sample because we conducted the survey disproportionately in STEM and business/economics classes (see Table 2 below).[4] Our sample is also predominantly White, but this matches the racial composition of students who attend MU. Note that fewer than 5 percent of the students in our sample are Hispanic or "other race" and for this reason, in the racial/ethnic comparisons we focus on the contrasts between Asian, Black, and White students. By virtue of our targeting freshman-level classes, our sample is also disproportionately new to college—two-thirds of students were in their first semester at MU at the time of the survey, and only 11 percent were beyond their second year. This was by design as early-career major choices are consequential.

Table 1 also shows differences in average factor rankings and the likelihood that each factor is rated as most important by the students in our sample. Note that a factor with a lower average ranking is rated by students as most important on the 1-5 scale. The table reflects the empirical regularity that field interest is the highest-rated student factor. It has the lowest average factor ranking by a wide margin and is identified as the most important factor almost half the time. Career stability is the next highest-rated factor, followed by career salary and career fulfillment. Success in coursework is the least important factor on average.[5]

Next, Table 2 documents the share of surveys from classes in each field and the distribution of intended majors (intended majors are grouped into nine categories; a detailed list of majors under each category is in Appendix Table B.2). Again, we use the administrative microdata to document the MU distribution of intended majors for comparison. The high representation of business and economics courses among the 10 large lectures (in the top panel of Table 2) is reflected in the distribution of intended majors (in the bottom panel), although these majors are also the most popular at MU. Similarly, our emphasis on STEM in recruiting classes for the survey is reflected by the high share of students with intended STEM majors—specifically in engineering and computer science. That said, there is considerable major diversity in our data because many of the large-lecture classes we surveyed cover general graduation requirements.

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[3] MU is a mid-ranked flagship campus in the U.S.; specifically, as of 2017, it was ranked 29th out of the 50 flagship public campuses by *U.S. News and World Report* (where each state's highest-profile public campus is defined as the "flagship").

[4] The disproportionate representation of STEM and business/economics classes is partly due to convenience (business and economics both run multiple large-lecture classes and the faculty we contacted were all agreeable to the survey) and partly the result of a concerted effort on our part to increase the focus on STEM fields.

[5] This is somewhat surprising in light of evidence from Stinebrickner and Stinebricker (2014), who show that student performance in coursework is a key determinant of persistence in STEM majors after college entry. A potential explanation from Stinebrickner and Stinebricker (2014) is that students begin college overly optimistic about their ability to perform well academically. Given that our sample consists disproportionately of new entrants, it may be that concerns about academic performance have yet to manifest.

Table 1. Student Summary Statistics.

	Survey Sample Avg. (St Dev)	MU Avg., Fall-2017 Entering Cohort (St Dev)
Student Demographics and SES		
Female	0.46 (0.50)	0.53 (0.50)
Asian	0.06 (0.24)	0.02 (0.16)
Black	0.08 (0.27)	0.07 (0.26)
Hispanic	0.04 (0.19)	0.05 (0.21)
White	0.80 (0.27)	0.79 (0.41)
Other	0.03 (0.16)	0.07 (0.25)
Highest parental education < bachelor’s	0.27 (0.45)	--
Highest parental education = bachelor’s	0.38 (0.49)	--
Highest parental education = graduate degree	0.35 (0.48)	--
Other Student Characteristics		
First year on campus	0.67 (0.47)	1.0
Second year on campus	0.22 (0.41)	0.0
In-state student	0.66 (0.47)	0.68 (0.47)
Average Factor Rankings (Most to Least Influential)		
Field interest	2.21 (1.41)	--
Career Stability	2.84 (1.25)	--
Career Salary	3.16 (1.36)	--
Career fulfillment	3.20 (1.38)	--
Course success	3.61 (1.28)	--
Shares of Surveys Where Each Factor is Listed as Most Important		
Field interest	0.47 (0.50)	--
Career Stability	0.18 (0.38)	--
Career Salary	0.14 (0.35)	--
Career fulfillment	0.14 (0.34)	--
Course success	0.08 (0.27)	--
N	2240	5050

Notes: The gender and racial/ethnic shares reported in column (2) are taken from administrative microdata collected by the Missouri Department of Higher Education and are for all first-time MU students in fall 2017. An "--" indicates that information from the administrative data is unavailable.

Table 2. Sample Shares: Courses Surveyed and Intended Majors.

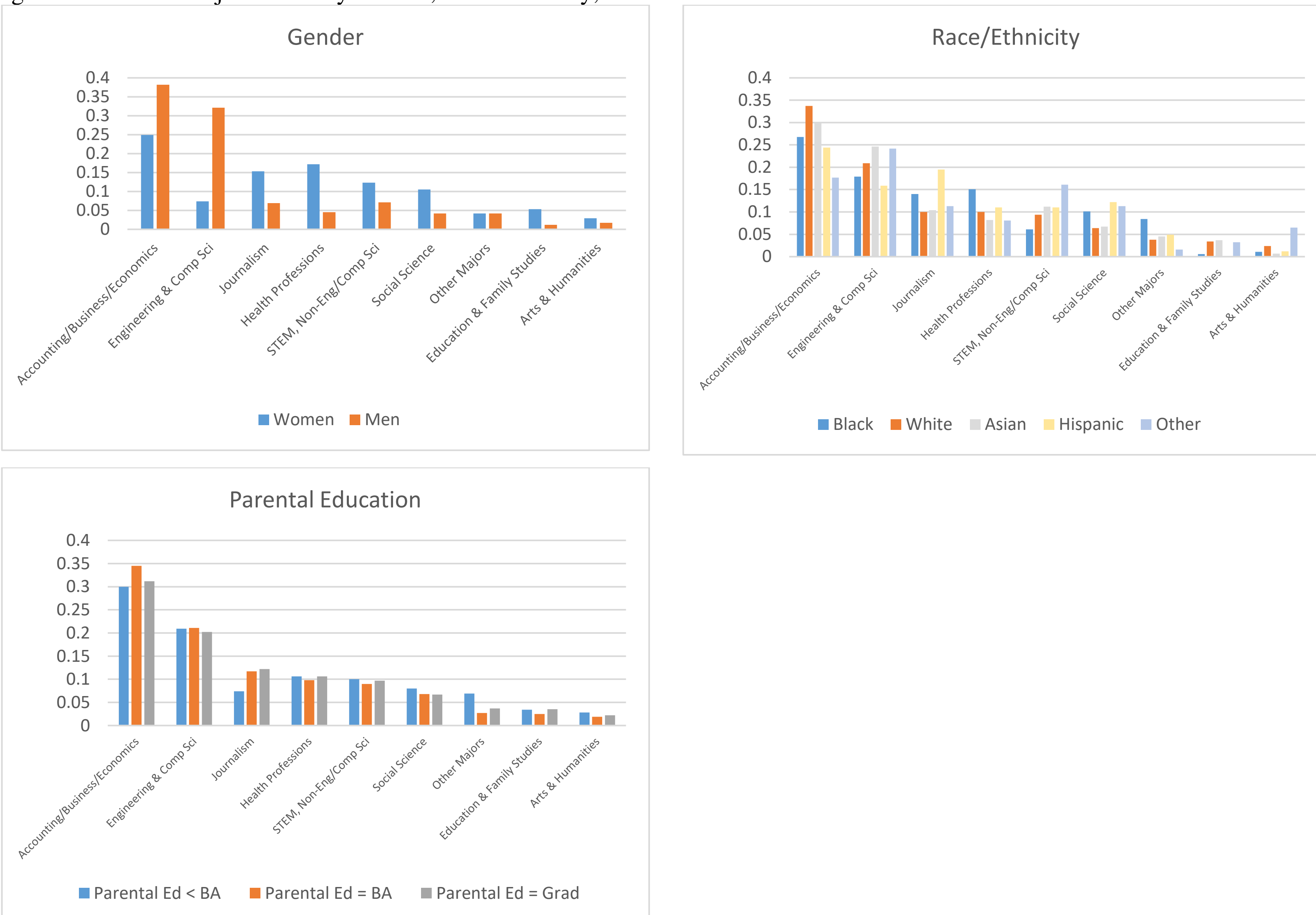
	Sample Shares	MU Shares Fall-2017 Entering Cohort
Course Type Surveyed (# of Sections Surveyed)		
Business Administration (1)	0.12	--
Classical Humanities (1)	0.15	--
Economics (2)	0.22	--
Engineering (1)	0.05	--
Mathematics (2)	0.09	--
Political Science (1)	0.15	--
Psychology (2)	0.21	--
Intended Major Groups		
Accounting, Business, & Economics	0.32	0.23
Engineering and Computer Science	0.21	0.12
Journalism	0.11	0.11
Health Professions	0.10	0.16
Non-engineering/computer science STEM	0.10	0.14
Social Science (excluding economics)	0.07	0.06
Other Majors	0.04	0.08
Education and Family Studies	0.03	0.05
Arts and Humanities	0.02	0.04
N	2240	5050

Notes: The intended-major shares reported in column (2) are taken from administrative microdata collected by the Missouri Department of Higher Education and are for all first-time MU students in fall 2017. An "--" indicates that information from the administrative data is unavailable (note that we do not have access to university-level transcript microdata to construct enrollment shares for individual courses).

Figure 1 compares intended majors for the students in our sample by gender, race/ethnicity, and SES, where we proxy for the latter using the level of parental education. The major groups in Figure 1 are ordered by the total enrollment shares in our sample (from Table 2). The key takeaways from the figure are (a) there are large gender differences in intended majors, (b) modest differences by race/ethnicity (particularly between Black and White students, who we can compare best given the demographics of MU), and (c) small differences by SES category.[6]

[6] These patterns of initial major choice are consistent with most studies in the literature (e.g., Arcidiacono and Koedel, 2014; Bowen, Chingos, and McPherson, 2009; Riegle-Crumb and King, 2010).

Figure 1. Intended Major Shares by Gender, Race/Ethnicity, and Parental Education.



Notes: The specific intended majors that belong to each category are reported in Appendix Table B.2.

3. Analysis Plan

The focal survey question asks students to rank the five factors by how much they influenced the intended major. Our goal is to provide descriptive comparisons of student rankings by gender, race/ethnicity, and SES. We use basic linear regression as a tool to make the comparisons. Specifically, we estimate regressions of the following form:

$$Y_{ik}^{j} = \delta_0 + G_i\delta_1^{j} + \mathbf{R_i}\boldsymbol{\delta}_\mathbf{2}^\mathbf{j} + \mathbf{P_i}\boldsymbol{\delta}_\mathbf{3}^\mathbf{j} + \gamma_k^{j} + \varepsilon_{ik}^{j} \tag{1}$$

In equation (1), Y_{ik}^{j} is the numeric rank of factor *j* (*j*=1,…,5 for the five factors) on a 1-5 scale, for student *i* who took version k of the survey. Per above, a lower-numbered value of Y_{ik}^{j} indicates the factor is more important in the decision. G_i is an indicator variable equal to one if student *i* is female and zero otherwise. $\mathbf{R_i}$ and $\mathbf{P_i}$ are vectors of indicator variables that capture student race/ethnicity and parental education, respectively. γ_k^{j} is a survey-version fixed effect to control for the survey version, and ε_{ik}^{j} is the error term (because the survey versions were distributed to students at random, including the survey-version fixed effects has no bearing on the findings, but we include them for completeness).

While we prefer the linear models due to the presentational simplicity of the output, a limitation is that the outcome variable is not on an interval scale. For instance, going from a ranking of 1 to 2 may not mean the same thing as going from a ranking of 2 to 3, and so on. To the extent the interval scale of the rankings is violated, our linear regressions are mis-specified. We probe the sensitivity of our findings to this issue in two ways. First, we estimate analogs to equation (1) but specify the models as ordered logistic regressions. These regressions permit inference about the attributes that predict each factor's ranking over the full 1-5 range and are robust to non-interval scaling. In all cases, the substantive interpretation of our findings is the same using the linear and ordered-logit regressions. Because the patterns of results are more difficult to see in the ordered-logit output, we present the linear-model results in the main text and report the ordered-logit results in Appendix Figure B.1.

Second, we estimate versions of the model shown in equation (1) where Y_{ik}^{j} is an indicator for whether factor *j* is ranked first, and zero otherwise. These models abstract from the interval-scale issue by focusing only on predicting the likelihood that a factor is ranked highest. We report results from these models, estimated as linear probability models, alongside results from the linear average-rank models. We also confirm that marginal effect estimates from binary logistic regressions are nearly identical to our estimates from the linear probability models in Appendix Figure B.2, which is expected (Angrist and Pischke, 2009).

One might wonder why we bother using a regression framework at all, when we could simply report mean differences across student groups. The reason is that the regressions facilitate comparisons between groups while simultaneously conditioning on student representation in all other groups. For example, the gender difference is estimated conditional on students' racial/ethnic and parental-education designations. This will matter if, for example, the composition of students is such that a particular group is over- or under-represented within a gender; e.g., the ratio of Black women to men typically exceeds the ratio of White women to men in college (and this is the case in our data as well). We report the conditional estimates from equation (1) for this reason.

4. Results

Figure 2 shows conditional differences in the factor rankings by gender, race/ethnicity, and SES, as estimated by equation (1). The omitted comparison groups are men, White students, and high-parental-education students (i.e., graduate degree). The figure isolates the group-by-group comparisons for presentational purposes, but all of the output is generated from the same regressions (see Appendix Table B.4 for full regression output).

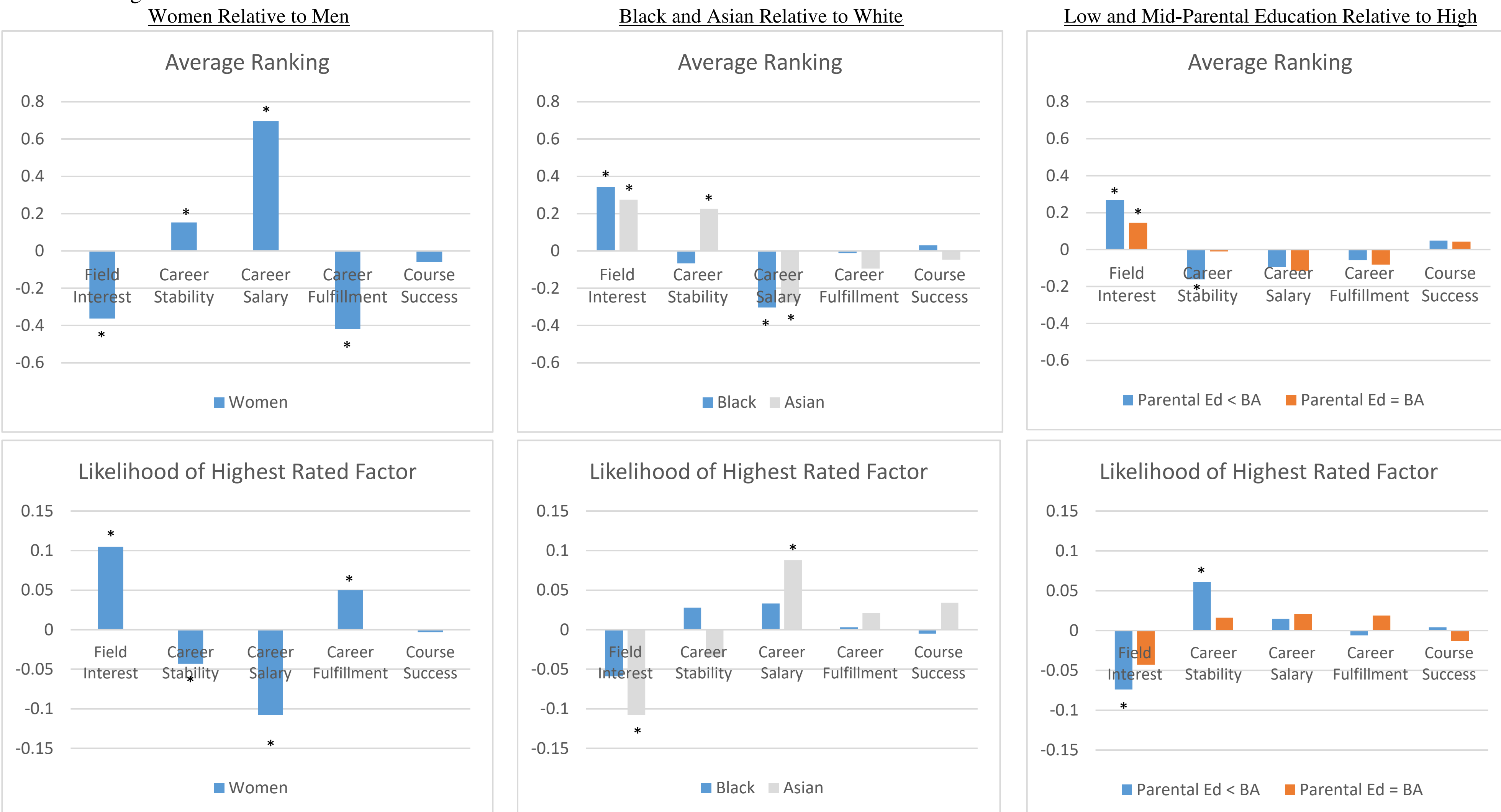
The graphs in the top row show results from regressions of average factor rankings, in which case a positive value indicates that students in the focal group rank the factor as *less important*, on average, than students in the omitted group. The bottom row of graphs show results from the linear probability models predicting the likelihood of ranking each factor first. In the bottom row, a positive estimate indicates the factor is *more important*—i.e., it is more likely to be ranked first among students in the focal group relative to the omitted group.

Starting with gender, there are clear gaps in the importance of the factors. Women are much more likely to rank field interest and career fulfillment highly and less likely to rank career salary and stability highly, relative to men (the gender gap for course success is small and not statistically significant). The gender gap in the rank of expected salary is particularly large: women on average rank expected salary 0.70 places lower than men on the 5-point scale and are 10.8 percentage points less likely to list salary as the most important factor. These results align broadly with evidence elsewhere in the literature (e.g., Zafar (2013) shows that non-pecuniary factors explain three-fourths of major choice behavior for women, but just half for men).

Next, we examine differences by race/ethnicity, focusing on comparisons between Asian and Black students relative to White students due to sample-size issues. Black students are less likely than White students to report interest as driving major choice and more likely to report emphasis on career goals, in particular expected salary. The Black-White gaps are smaller than the gender gaps, but not trivial. For example, Black students on average rank field interest 0.34 places lower on the 5-point scale, and they are almost 6 percentage points less likely than White students to rank field interest first, although this difference is not statistically significant. Asian students are similar to Black students, with a modest difference being that they put less weight on career stability than both Black and White students.

Finally, we turn to the comparison by parental education, which shows that interest is most influential in the choice of major for students with highly educated parents. Comparing extremes, students whose parents do not have a college degree rank interest over 0.20 places lower, on average, than students whose parents have a graduate-level education and are 7.4 percentage points less likely to rank interest as the most important factor. Students with lower parental education are more likely to make their choices based on expected career stability, career salary, and career fulfillment (although of these three, only the difference in emphasis on career stability is individually statistically significant). While the career fulfillment result is somewhat ambiguous given that it is conceptually similar to field interest, note that most of the differential weight on career outcomes falls on the other two career factors—expected salary and career stability—which are more distinct.

Figure 2. Factor Ranking Gaps by Gender, Race/Ethnicity, and Parental Education. Row 1: Average Ranking Gaps; Row 2: Gaps in Likelihood of Ranking Each Factor First.



Notes: In the average ranking models (row-1 graphs), a lower number indicates the factor is more important (i.e., it is ranked higher by students, on average); in the highest-rated-factor models (row-2 graphs), a higher number indicates the factor is more important (i.e., it is the highest rated factor more often, on average).
* Indicates the difference is statistically significant from the omitted group at the 5 percent level or better in the linear model (also see Appendix Table B.4).

5. Robustness & Sensitivity Tests

We consider the robustness and sensitivity of our findings to a variety of data and modeling adjustments. We briefly discuss the tests and findings here; the results are available in the appendix.

First, as noted above, we examine model sensitivity by re-estimating our models using ordered and binary logistic regressions. Appendix Figure B.1 shows marginal effects from the ordered logits, which are presented as conditional likelihoods for each possible rank (1-5) for each of the five factors and for each student group. Inference from the ordered-logit output is substantively similar to inference from our simple-average rank models in Figure 2 in all instances. Appendix Figure B.2 replicates results from our linear probability models using binary logits—the marginal effects from the binary logits are also very similar to the coefficients from our linear probability models reported in Figure 2.

Next, we test for heterogeneity in the comparisons based on students' confidence levels in their intended majors. Specifically, we re-estimate our models after splitting the sample into two groups based on student responses to the following statement (from Question 6 of the survey in Appendix A): "I am confident that my current major will be my final major." The first group is less confident in their current majors—they either strongly disagree, disagree, or are neutral about this statement (29.7 percent of the sample). The second group is more confident—they either agree or strongly agree (70.3 percent of the sample). Our findings are reported in Appendix Tables B.5a and B.5b. With regard to gender differences in ranking patterns, the results are very similar across groups. The differences by race-ethnicity and parental education are also broadly similar, with two modest exceptions: (1) Black-White differences are driven by students who are more confident in their current majors and (2) differences between students in the high and low parental-education groups are driven by students who are less confident in their current majors. A caveat to these differences is that some of our estimates in the split samples are underpowered, but they are at least suggestive.

Finally, we consider the sensitivity of our findings to various adjustments and restrictions to the data. First, we re-weight the survey data so the distribution of intended majors in our sample matches the distribution of intended majors for the incoming 2017 class at MU (as shown in Table 2). The practical implication is that students with intended majors in the fields of accounting, business, and economics, along with engineering and computer science, are down-weighted, while students majoring in other fields are either up-weighted or maintain their weights. Our findings are substantively unaffected by the re-weighting throughout (see Appendix Table B.6). We also estimate our results separately for students in their first semester on campus at the time of the survey (to isolate students at the point of entry into college), students who indicate belonging to a single racial/ethnic category (to address the potential for ambiguity created by multi-race/ethnicity students), and students who used each version of our survey (to test whether our findings are sensitive to the order in which the factors are listed on the survey). None of our findings are substantively affected by any of these restrictions (see Appendix Tables B.7, B.8, and B.9a-d).

6. Discussion & Conclusion

We report on exploratory research designed to improve our understanding how students choose college majors. Consistent with previous research, we show that field interest is by far the most important factor driving students' choices of majors. We further document substantial heterogeneity in the importance of interest by gender, race/ethnicity, and SES. Students who are female, White, and with highly-educated parents are more likely to report that interest is a key factor in the choice of major. The gender gap is larger than the gaps by race/ethnicity and SES.

The most obvious question raised by our findings is what drives these differences? Noting that career outcomes are the counterweight to interest in our study, the most straightforward explanation is that heterogeneity across groups in the perceived need for education to pay off as an investment is important. For example, the gender gap may be driven in part by expectations of traditional gender roles among some women, which will reduce the importance of high earnings for women on average (Davis and Greenstein, 2009). In contrast, students from disadvantaged racial/ethnic or SES backgrounds—who will have weaker safety nets on average should their college investments not pay off—would be expected to put more emphasis on earnings and career outcomes.

The significance of field interest as a determinant of student decisions, and the variability of its significance across student groups, highlights the importance of understanding what influences student interest in different fields prior to college entry. This line of inquiry has been pursued most vigorously with respect to gender gaps in STEM. Factors such as stereotype threat, individual competitiveness, and gender differences in the distribution of math achievement, among others, have been hypothesized and tested as factors that drive gender gaps in STEM interest and outcomes. Kahn and Ginther (2017) review the evidence on these possibilities. There is less research on the factors that drive interest for students who differ by race/ethnicity and SES, perhaps because the distributions of intended majors by race/ethnicity and SES are similar (Figure 1), despite the gap in the importance of interest we document here.

We conclude with an implication of our findings for future interventions aimed at altering students' choices of majors: there are efficiency and equity consequences for interventions designed to nudge students into particular majors depending on the source of the nudge. For example, the higher weight that men put on expected salary implies that when salary-based interventions are used to shift behavior, men are more likely to be affected. By the same logic, such interventions should be more effective in altering behavior among Black students and students from low-parental-education families relative to their more advantaged peers. In summary, efforts to influence major choice should acknowledge that different types of students may be driven by different factors in their decisions—tailoring an intervention for the types of students who will be targeted can improve efficacy.

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