Gender Segregation and Decision-Making in Undergraduate Course-Taking

Marissa E. Thompson,[a] Tobias Dalberg,[b] Elizabeth E. Bruch[c]

a) Columbia University; b) Uppsala University; c) University of Michigan and the Santa Fe Institute

Abstract: Gender segregation across fields of study is a persistent problem in higher education. Although a large body of literature has illustrated both gendered patterns in major choice as well as overall gender segregation across academic majors, comparatively less attention has been paid to an important building block for gender inequality: college courses. In this study, we examine the process of how students choose courses and the implications for gender segregation. Drawing on a unique data set that includes individual-level consideration and choice data from an entire cohort of university students choosing their first college courses, we examine both gender segregation at the college course level as well as the extent to which individual decision-making processes are themselves gendered. We find that course gender composition serves as a screener at the consideration stage, which suggests that gender segregation in decision-making emerges at the outset of the choice process. Once a subset of considered options has been established, final choices are much less influenced by course gender compositions. Furthermore, we find that courses are much more gender-segregated, on average, than majors themselves, illustrating that segregation is occurring at a more microlevel than commonly studied.

Reproducibility Package: Code for this study is available through the Open Science Framework: https://osf.io/ya3t8/. Due to the fact that the data includes potentially identifiable information, as well as to protect the anonymous case institution and students involved, the underlying data and the identity of the case university cannot be made public. Author access to the data was facilitated through the Pathways Network, which has an institutional relationship and data use agreement for access to the data. Questions about data access and requirements should be directed to Pathways Director, Professor Mitchell Stevens (stevens4@stanford.edu) at the Stanford University Graduate School of Education. Access to the data is at the discretion of the anonymous case university on a case-by-case basis, and data may not be available to external researchers. For more details on the specific course search platform leveraged in this study, see Chaturapruek et al. (2021).

I N spite of the fact that women now earn the majority of college degrees overall and earn higher college grades than men, fields of study have remained largely and stubbornly segregated by gender (Buchmann and DiPrete 2006; Conger and Long 2010; England and Li 2006). Segregation across academic majors carries non-trivial consequences for the gender wage gap, power structures, and the reification of gender stereotypes (Buchmann and DiPrete 2006; Charles and Grusky 2004; Weeden 1998). Such segregation persists despite the regular turnover of people in fields or occupations. Even as the overall gender compositions shift as more women enter new fields, future cohorts respond in ways that further entrench this segregation (England and Li 2006; England et al. 2007). In particular, studies have shown that as fields become increasingly occupied by women, there tend to be steep

declines in the number of men in future cohorts (England and Li 2006; England et al. 2007).

However, underneath these macrolevel patterns of shifting gender compositions, individuals are making decisions about which courses to take in college, which major to declare, and subsequently, which jobs to apply for and occupations to pursue (Alon and DiPrete 2015; Cech 2013; Morgan, Gelbgiser, and Weeden 2013; Quadlin 2020). Although major selection can be viewed as a single decision to declare a given major at a given time, prior studies suggest that it is better understood as a process that unfolds over the course of students' college years (Chambliss and Takacs 2014; Dalberg, Cortes, and Stevens 2024; Leu 2017). As many as one-third of students change their major (Denice 2021; Leu 2017), and students tend to make this choice very soon after their first set of course enrollments (Denice 2021). In addition, recent research has shown that students' first course enrollments predict their eventual choice of major (Lang et al. 2021), making decisions about first semester course enrollments highly consequential. However, very little is known about the process that might lead a student to choose one course over another, or, consequently, the process that might lead a female student to choose a different course than her male peer. As a result, we know little about the role of courses in overall segregation patterns.

Furthermore, if cumulative, aggregate patterns of gender segregation are driven by individual decision-making, it is important to understand how individuals make choices in context and when in the decision-making process we observe gender-specific choices made by men and women. However, studies on aggregate patterns of segregation—which are the cumulative result of individual decisions—do not always engage with theories of decision-making and the cognitive load associated with making a choice. Decision theorists have long shown that the cognitive demands of choosing from a moderate to large number of options results in predictable strategies of decision-making (Bruch and Feinberg 2017; Simon 1997). Although, at first glance, the process of choosing and enrolling in a course may seem straightforward and simple, it is actually a rather difficult and cognitively demanding task. Rather than considering all options at once, people tend to first screen for all options that they are willing to consider before choosing a final option from the set of winnowed-down choices. For many students, there could be thousands of course options functionally available to them (Chaturapruek et al. 2021). This allows different decision rules to be used at each stage, as the strategies needed to simplify choices may differ for considered and final options. At first, people tend to use simple, coarse screening rules that do not require a complete evaluation of each option to construct a consideration set (e.g., when choosing a course, one could decide first only to consider the social sciences). Once the set of options has been reduced to a manageable size, people then invoke more holistic and explicit evaluations of each option (i.e., reading reviews and considering the tradeoffs between specific options).

Although decision theorists have mapped the cognitive strategies that people use to reduce the burden of the decision process, the social world and cultural beliefs also provide people with cognitive shortcuts that may be deployed in decision-making processes (Alon and DiPrete 2015; Bruch and Feinberg 2017; DiMaggio

1997; Krysan and Crowder 2017; Ridgeway 1997; Vaisey and Valentino 2018; Weick 1995). For example, people are more likely to invoke gender stereotypes in low-information settings or where decisions are particularly cognitively demanding (Biernat and Kobrynowicz 1997; Botelho and Abraham 2017; Correll et al. 2020; Simcoe and Waguespack 2011), which suggests that gendered beliefs may be most pronounced early on, when individuals are constructing consideration sets. Along the same lines, during hiring processes, gendered status beliefs about competencies tend to disadvantage women more at the screening stage than at the evaluation stage (Botelho and Abraham 2017). However, this does not imply that final choices are free from stereotypes and cultural beliefs, as there is considerable evidence that gender shapes both supply- and demand-side choices (Alon and DiPrete 2015; England 2010; Hall and Sandler 1982; Quadlin 2018; Ridgeway and Correll 2004). And yet, in general, gender theories do not typically encompass a comprehensive assessment of the decision-making process, and decision theory does not typically engage the impact that culture has on choice, screening, and evaluation (Bruch and Feinberg 2017; Vaisey and Valentino 2018).

We focus on initial college course choice as a site for understanding the role of gendered decision-making processes using data from an entire cohort of first-year students at an admission-selective university ($n = 1,610$). Course choice is an ideal setting for studying decision-making in educational settings because courses—and the academic fields of study associated with them—carry persistent gender stereotypes (Riegle-Crumb 2006; Sanabria and Penner 2017). Data on course choice are also well-suited for the study of decision-making because, unlike with major or occupational selection, where a given individual is likely only choosing one major or profession at a time, students must select several courses in their first year from thousands of available options (Chaturapruek et al. 2021), allowing us to view the extent to which stages in the decision-making process are associated with historic gender compositions. Although course-taking decisions are lower stakes than major or occupational decisions, the large number of courses available to students implies a greater need for an initial screening process, which may encourage the use of cognitive shortcuts.

This study illustrates a previously understudied aspect of major segregation: that courses—even among first-year first-term college students—are highly segregated. In fact, on average, courses tend to be more segregated than academic majors themselves, with the bulk of course-level segregation occurring within rather than between subjects. Furthermore, decision-making processes are themselves gendered, such that many men and women are not even considering the same courses in the first place. If students do not have the same courses on their radars from the outset of the college choice process, there is little hope that eventual majors will not also be segregated by gender. Furthermore, we argue that gender composition serves as a screener at the consideration stage of the decision-making process, which suggests that a lack of information encourages the use of gendered heuristics that persist even when gender composition is not directly observed by decision makers. Understanding how and when gender composition enters decision-making frameworks has important implications for our understanding of how inequality is produced and becomes entrenched. In particular, the reduced set of options

that end up in an individual's consideration set plays an outsized role in shaping eventual choice. Even in cases where an individual may not hold strong preferences, small differences in the heuristics used to construct consideration sets are amplified in their impacts over subsequent choice stages (Bruch and Swait 2019). Our study demonstrates that gender composition is associated with propensities to consider some options over others, which suggests that individuals begin to reproduce gender segregation in the earliest stages of the college decision-making process.

Background

The Gendered Logics of Choice

Gender is a ubiquitous frame through which nearly all social relations are refracted and understood (Ridgeway 2011; Ridgeway and Correll 2004). Indeed, studies have shown that, when encountering a new individual, people immediately and unconsciously attempt to categorize them by (perceived) gender (Ito and Urland 2003; Ridgeway 1997; Zarate and Smith 1990), which then nearly instantaneously cues gender stereotypes (Banaji and Hardin 1996; Ridgeway 1997). Decisions about fields of study and occupations are particularly subject to the frame of gender given widespread persistent stereotypes and cultural beliefs about "fit" (Correll 2001, 2004; Morgan et al. 2013; Quadlin 2020; Weeden, Gelbgiser, and Morgan 2020), and the persistence of outright gender discrimination in many fields (England 2010; Hall and Sandler 1982; Quadlin 2018). There is also interplay between individuals' gendered preferences and broader societal forces (Thébaud and Charles 2018), such that increased discrimination in certain fields may lead fewer women to have preferences for entering these fields.

However, gender informs consequential decisions long before people enter the workforce. Math and science test scores in early and middle childhood tend to favor boys over girls (Penner and Paret 2008; Reardon et al. 2019), which contributes to stereotypes about fit and competence in these fields. By middle school, both boys and girls tend to view boys as more intelligent and gifted than girls (Musto 2019), in particular in subjects related to math and science. These widely held socially constructed ideas of who is (and is not) capable at gender-typed tasks influence students' self-conceptions of their own abilities and fit, which then influences preferences for courses, majors, and future occupations as they enter college (Correll 2004; Dalberg et al. 2024; Giebel et al. 2022; Morgan et al. 2013; Quadlin 2020; Sterling et al. 2020). Each of these key decisions leads students one step closer to a field of study or work, which may have either segregating or desegregating consequences more broadly.

In particular, choosing a first set of college courses is an important step toward eventual major declaration and occupational selection (Chambliss and Takacs 2014; Denice 2021; Kizilcec et al. 2023; Leu 2017). Decisions made early in college have consequences for a student's eventual major and occupation; this is particularly true in science and mathematics fields where there are large numbers of required courses, which effectively requires students to decide on these fields quite early in

their college careers (Seymour and Hewitt 1997; Thompson 2021). Even absent strict requirements, students create meaning out of their first course experiences and internalize feedback as important markers of their fit for a given field and potential for success (Chambliss and Takacs 2014; Harrison, Hernandez, and Stevens 2022; Sanabria and Penner 2017). Early college decisions are also highly gendered, as students' gender identities and preferences interact to shape the academic pathways they follow (Armstrong and Hamilton 2013; Cech 2013; Giebel et al. 2022; Mullen 2014; Sterling et al. 2020). Furthermore, gender segregation in college field of study explains about one-third of occupational segregation among college graduates, highlighting the importance of higher education in shaping broader patterns of gender segregation (Zheng and Weeden 2023).

In sum, gender segregation across fields of study and occupations are the result of a series of unconscious and conscious decisions that begin—in part—with the choice of which initial college courses to pursue. We focus on this key juncture in students' trajectories to examine both how the structure of course-taking decisions varies by gender as well as how different cultural dimensions associated with a given course might influence the decision-making process.

From Consideration to Choice

To understand choices as outcomes, we must first understand the process of how people make decisions. The task of whittling down the universe of available options to a smaller list of considered options, before finally choosing a set of choices from the considered subset, introduces considerable opportunity for sorting along gendered lines. This is in part due to the complexity of the task of decision-making. To construct a consideration set of options that one is willing to consider (and exclude anything that one is unaware of or unwilling to consider), people tend to use simple decision rules, often without fully engaging with the set of options (Bruch and Feinberg 2017). This step is vital because social and structural constraints shape who is aware of certain options (Baker and Orona 2020; Bruch and Swait 2019; Burdick-Will et al. 2020; Krysan and Crowder 2017), and consideration sets tend to be constructed using socially influenced information, such as input from a friend (Burdick-Will et al. 2020; Chaturapruek et al. 2021; Krysan and Crowder 2017). In the case of college course choice, where there are thousands of available options, this means that most students are considering fewer than 5 percent of courses functionally available to them and relying on friends, roommates, and older students to help them find potential options (Chaturapruek et al. 2021; Kizilcec et al. 2023). For example, prior work has shown that students make inferences about course content and characteristics using only minimal information, such as the course title (Spoor and Lehmiller 2014). Once a smaller and more reasonable set of options has been identified, a given individual can then look more carefully at the attributes of their options and make a more holistic evaluation. For example, a student might first decide only to consider sociology courses out of all of the available courses at a university and then might use more rigorous search criteria to land on a chosen course (such as only considering highly rated professors, avoiding courses held on Fridays, or preferring courses on the topic of gender inequality).

The stage at which different preferences and choices occur has meaningful implications for overall segregation patterns. For example, evidence from Bruch and Swait (2019) showed that, in the context of residential segregation, preferences for the same-race neighbors can shape both the consideration sets from which individuals make their final choices as well as their final choices once a subset of considered neighborhoods have been identified. Importantly, however, even moderate preferences for the demographic composition of one's neighbors (i.e., the dimensions affecting one's consideration set) have an amplified influence on macrolevel patterns of segregation. This is due to the fact that moderate preferences at the consideration stage keep individuals from even considering certain neighborhoods, which by construction also prevents them from choosing them (Bruch and Swait 2019). Likewise, Burdick-Will et al. (2020) showed that differences in structural constraints at the consideration stage meaningfully shaped school segregation among children. Furthermore, a related study by Alon and DiPrete (2015), which also used a multidimensional model of choice, evaluated how gender composition shaped women's first- and second-choice majors, finding that gender composition has a stronger association with first-choice majors than second-choice majors. In sum, the characteristics that drive decision-making at each of the stages of choice have critical implications for understanding the maintenance of segregation.

Finally, research on discrimination, evaluations, and status beliefs has found that status characteristics and stereotypes are more likely to shape screening stages than stages with comparably more information. When information is low (or cognitive loads are particularly high), individuals rely on status markers, such as gender, when deciding which options to consider more carefully (Biernat and Kobrynowicz 1997; Botelho and Abraham 2017; Correll et al. 2020; Simcoe and Waguespack 2011; Weick 1995). For example, Botelho and Abraham (2017), in a study of hiring patterns, found that there tend to be more double standards disadvantaging women at the screening stage rather than at the evaluation stage. Indeed, individuals tend to shift to relying on stereotypes in conditions of high cognitive demand (Biernat, Kobrynowicz, and Weber 2003; Spears et al. 1997). Likewise, evidence from political science on voting patterns shows that information search and consideration patterns are also influenced by gender stereotypes in low-information settings (Ditonto, Hamilton, and Redlawsk 2014). Together, prior literature suggests that gender beliefs shape the formation of a consideration set, particularly in settings where there is an overwhelming numbers of options and a high cognitive cost to gaining information on each of them. The influence of gender may happen unconsciously during this stage before people even fully realize they have begun the decision-making process.

Devaluation and Gender Segregation

The fraction of women in a field of study influences its perceived value, which in turn shapes likelihoods that both men and women will consider entrance into it. A devaluation perspective posits that, because fields associated with women have lower perceived status, increasing proportions of women can lead to a downgrade in the overall status of these fields (Busch 2018; England and Li 2006; England et

al. 2007; Valentino 2020). In previous work, these patterns have been shown to be driven by the link between increasing shares of women and gender stereotypes as well as cultural biases that tend to devalue women's work (Busch 2018). In addition, the devaluation of fields associated with women leads to asymmetric patterns of avoidance of gender-atypical fields, with men less likely to enter fields associated with women, while the same stigmas typically do not apply to women entering male-dominated fields (England and Li 2006; Mullen 2010).

Devaluation processes matter not only in the likelihoods of men and women entering a given field but also in how it is viewed and valued (Correll et al. 2020; Leslie et al. 2015; Valentino 2020). For example, evidence from Leslie et al. (2015) shows that fields with more women are less likely to be viewed as requiring an innate brilliance. Likewise, fields with high percentages of women have lower average salaries, which cannot be explained solely by human capital differences or occupational prestige (Tomaskovic-Devey 1993). There are also larger gender gaps in wages in science, technology, engineering or mathematics (STEM) fields with the lowest composition of women, which is not true in STEM fields with comparatively higher proportions of women (Michelmore and Sassler 2016). Large shares of women in applicant pools shape hiring patterns because large proportions of gender-atypical applicants can "gender" an entire pool (Leung and Koppman 2018). Together, prior theoretical and empirical evidence points toward the importance of rising fractions of women on decision-making processes on a macrolevel. This suggests that, as the proportion of women in a given course, major, or degree rises, future cohorts of men might be less likely to enter these fields. These dynamics are often asymmetrical (England and Li 2006), with men reacting more strongly (and negatively) than women to rising proportions of women in a given setting.

There are a number of reasons to suspect that the gender composition of a course might be associated with how an individual engages with the decision-making process. First, because the percent of women in a course or field of study affects its perceived value (England 1992; England et al. 1994; Valentino 2020), it is possible that men and women use different decision rules in evaluating whether or not to enroll. Likewise, status characteristics theory suggests that gender stereotypes are most likely to be applied and activated in contexts that are gendered, including the choice of a college major (Alon and DiPrete 2015; Quadlin 2020; Ridgeway 2009; Yavorsky 2019). By this logic, the composition of a course may serve as a signal to students about competence and fit of a given field for men or women, which might then influence who does (and does not) opt to consider it or subsequently enroll. Second, the gender composition of a course and subject may affect who is even aware of it in the first place. Because gender structures students' social networks (Riegle-Crumb, Farkas, and Muller 2006), it may also be the case that women are more aware of—and therefore more likely to consider and seek out—courses with higher percentages of women than men.

However, knowing that devaluation may exist on a macrolevel tells us little about if and how it enters into an individual's decision-making process. In particular, a decision-theoretic framework can help us to understand how gendered status beliefs are integrated into the process of choice. What is the process by which people construct consideration and choice sets, and where in that process is
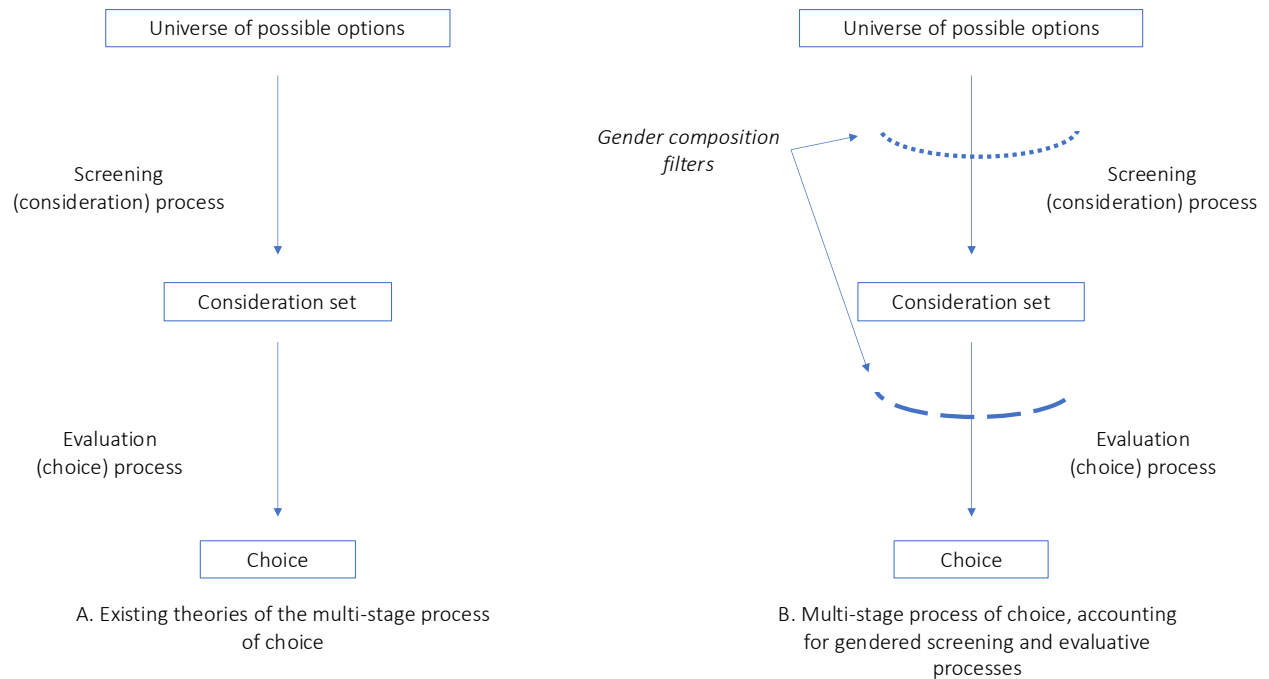
Figure 1: Map of conceptual framework.

gender composition the most consequential? Do students tend to choose courses that are gender segregated at the outset of the consideration process, or are these associations more influential in shaping final choices than consideration sets? In answering these questions, this study advances our understanding of how gender and choice dynamics may lead to gender segregation.

Figure 1 shows our conceptual framework. Panel A illustrates existing theories of multistage choice from decision theory (see also Bruch and Feinberg 2017; Bruch and Swait 2019; Chaturapruek et al. 2021). As individuals move from the universe of available options to a smaller set of considered options, they engage in a consideration or *screening process*. From this smaller set of considered options, they then embark upon a choice or *evaluative process* to winnow considered options down to their final choice(s). Panel B extends these existing theories to represent our theoretical contribution: the fact that options considered during either the screening or evaluative process (or both) may be associated with the gender composition of the course in question. In particular, we expect screening and evaluative processes to operate differently depending on the gender composition of a given course, which we represent in the conceptual model with a filter. The porosity of the filter is used to represent the fact that some options may be filtered out at the screening stage based on their gender composition, whereas others may be filtered out at the evaluation stage. We develop a model based on this framework that investigates both the screening and evaluative stages and the extent to which gender composition is associated with decision-making for men and women at these timepoints. This leads to four potential outcomes where gender composition may be associated with outcomes: (1) at both screening and evaluation stages, (2) in screening only, (3)

in evaluation only, or (4) there may be no association between gender composition and outcomes at either stage.

Data

To empirically examine the questions posed by our study, we focus on college course choice as a site for understanding decision-making in gendered contexts. As previously noted, course choice provides an ideal site for studying the role of gender (or lack thereof) in decision-making given that, unlike the choice of major or occupation (which often happens only a few times, if not only once), students must choose 4–5 courses each term from thousands of options. Moreover, courses provide a building block for eventual majors and occupations, so observing first course choice likely provides a meaningful window into early gender segregation in higher education contexts.

We leverage course search and enrollment data from an entire cohort of students at a single university, who began their studies in the fall of 2016 ($n = 1,610$).[1] We follow these students over the course of their first year using a course search platform that catalogs real-time data on student search behavior.[2] Using this online platform, students can search for available course offerings and browse course data. As a part of accessing the platform, all students consented to participate in research when using the course search platform. The course search platform allows us to view what students search for and which courses they view, which we also link to a data set of covariates associated with each student. In addition, we link students' search patterns to their course enrollment patterns, which connects their consideration behavior with their choices. We also include data collected after the conclusion of the study, including eventual major upon graduation.

Data in this study are from an admission-selective private university. More than 90 percent of students regularly used the course search platform to choose their courses in the 2016–2017 school year. The university academic year functions on a quarter system, during which students can choose courses for the fall, winter, and spring terms. Students enter the case university without a formally declared major and are free to take any course for which they satisfy the prerequisites.

Measures

Defining consideration and choice. In a course choice setting, the definition of choice is straightforward: enrollment. However, defining consideration is analytically more challenging because there is not a universally agreed-upon definition of having considered an option. In this study, we use viewing a course's profile on the university course search platform as a proxy for having actively considered that course. Unfortunately, not all types of consideration leaves data traces. For example, there may be options that individuals think about but never seek out on the course search platform. Although this is an important limitation to acknowledge, we also argue that consideration processes captured by options that are actively sought out by students are those that were most likely meaningfully considered. For example, if a student briefly considered a course on social stratification, but then subsequently

decided against it before searching for it and viewing its profile (an act that would be unobserved in our data), this likely did not indicate a meaningfully considered course (or, at the very least, suggests that it was a course that was less meaningfully considered than a different course that was searched for).[3]

Individual covariates. We leverage administrative data on student self-reported sex identification (as listed in the registrar), which is limited to a single binary report as either female or male (collected at the time of application to the university).[4] Unfortunately, we are not able to further disentangle this binary report to better understand the gender identities of students in the sample. Although administrative data include sex rather than gender identity, this study focuses on the social implications of gender differences between men and women, not any biological distinctions that may be related to sex assigned at birth. As such, we use the term "gender" throughout this article to refer to both students and broader processes of gender segregation. However, this is an important limitation to acknowledge, as students' identities may not be accurately captured by registrar data. In addition, per privacy agreements with the university and the concern for the potential to identify individual students, gender is the only demographic variable that we were able to use in this study. Unfortunately, this precludes us from developing models that accounted for student race/ethnicity, socioeconomic background, or other background measures that may meaningfully contribute to gendered patterns of decision-making.

In addition, our data include the eventual major(s) that students had declared upon graduation and their final grade point average (GPA). Finally, we pair these administrative data with student-specific interactions with the course search platform, including the number of days that a given student interacted with the course search platform per academic quarter. There is no missingness along these measures.

Gender composition of considered and chosen options. The key variable of interest is the historic gender composition of a given course. We operationalize this as the average share of women course enrollees in the prior three academic years (fall 2013 to summer 2016). In short, these are a lagged measure of gender compositions of the enrolled courses for students who were in their sophomore, junior, or senior year when our focal cohort entered their first year. In addition, we examine the association between the decision-making process and the gender composition of degree recipients in a given subject in the prior three academic years in the online supplement. Importantly, individuals do not observe course gender compositions on the platform directly, which is consistent with other prior work in this domain (Alon and DiPrete 2015; England and Li 2006). However, this information can be inferred from several sources, such as students' social networks, the content of course reviews, and course title, among others. The distribution of course gender compositions, by subject, is shown in the online supplement (Fig. A1).

Course covariates. Our data also include a number of course attributes derived from the course search platform itself, which we include as covariates. Unlike gender compositions, which students do not observe directly, these attributes are displayed to students on the course search platform. Although we focus on gender as our core attribute of interest, we also analyze the extent to which students' reliance on these attributes differs by gender and decision-making stage. More

specifically, we include the following characteristics for which we have course-level data: the average grades received by students in the course (course GPA), course enrollment, mean instructor rating (ranging from 1 to 5), average "intensity" hours reported by students per week for the course, the catalog number of the course (i.e., the catalog number for sociology 100 is 100), and the number of pre- and postrequisites. The number of prerequisites is defined as the number of courses that are listed as courses that should be taken before enrolling in a given course, whereas postrequisites (labeled in tables and figures as "prerequisites after") define courses that list the course as a prerequisite. Each course characteristics was standardized (with catalog number standardized within academic departments), and we include both linear and quadratic terms for each course characteristic. Finally, we also control for whether a course is a STEM course. Other potentially meaningful course attributes, such as faculty gender identity or department faculty gender compositions were not available. Our data set includes complete data for all course characteristics with the exception of the historic gender composition of a given degree program (missing from approximately a quarter of the courses in the data set); this is expected missingness, as there are courses offered in programs that do not award undergraduate degrees.

Descriptive statistics for the student and course sample are shown in the online supplement (Tables A1 and A2). Approximately half of the students in the sample self-identify as women, with an average GPA of around 3.62. Students spend on average 29 days per academic year logging into the platform, though students vary widely in their use of the search platform to consider and choose courses (SD = 23.8). Courses themselves also vary widely in their baseline characteristics.

Analytic Strategy

Our analytic strategy unfolds across several stages. First, we examine the extent to which decision pathways are multistage and can then be separated into a consideration and a choice stage. Assuming that these decision-making processes are indeed multistage, we then examine if and how these stages are themselves gendered. We examine the extent to which consideration and choice sets are segregated by gender using two commonly used measures of segregation: the dissimilarity index (D) and the Theil index (H) (Massey and Denton 1988). Next, we examine differences in the staged nature of decision-making between men and women. Finally, we examine our key outcome: the extent to which gender composition is associated with gendered decision-making at each stage.

To model staged decision-making and therefore determine the extent to which each stage of the decision-making process is related to gender composition (or gendered such that men and women engage with it differently), we begin by constructing a data set of all courses viewed by students in the cohort, including whether or not a given course was then enrolled in by a given student. Although the construction of a set of considered options is straightforward, it is less straightforward to determine—for each student—a defensible set of non-considered options that can be modeled as the choice alternatives in a decision theory framework. We first limit the sample of non-considered options to the subset of courses functionally

available to first-year students, which we define as any courses that have a first-year student enrolled. We then construct a randomly selected set of non-considered (i.e., non-viewed) courses at a ratio of 4:1 for each considered course, following prior work using this analytic approach (Bruch, Feinberg, and Lee 2016).

As previously noted, a multistage decision-theoretic framework choice encompasses two stages: one screening stage that is used to construct a subset of considered options, and an evaluation process where the final choice (or choices) is made from the subset of considered options. To determine the fit and efficacy of this framework, we compare estimates from multistage models to single-stage models, which model a scenario where one assumes that students consider all available courses and choose from this entire set (without first enacting screening rules that create a subset of considered options). In contrast, multistage models incorporate a sequential model of choice, which incorporates both consideration (course view) and choice (course enrollments, conditional on consideration). We compare models by generating fit statistics comparing the single and multistage models.

In the multistage model, we model each student's choice behavior as a sequence of consideration/screening and later choice. In the first stage (consideration), the probability that a student i will view a course j is operationally defined as a binary choice (logistic) model, as shown in the following equation:

$$p_{ij} = \frac{\exp(V_{ij})}{1 + \exp(V_{ij})} \tag{1}$$

where V_{ij} is a utility function based on course characteristics, including the course gender composition. We estimate an identical equation for choosing (i.e., enrolling in) a given course, conditional on consideration (i.e., viewing). To do so, we re-estimate equation 1 among all considered options. As with prior research extracting multistage screening rules from consideration and choice data (Bruch et al. 2016), we allow for separate sets of choice behavior coefficients at different stages, which we compare to single-stage models. In addition, models include student fixed effects.

We present results in terms of marginal effects for ease of interpretation. These coefficients indicate the average marginal effect[5] (AME) of a one standard deviation (SD) increase in a given course characteristic, which can be interpreted as the change in predicted probability of viewing or enrolling in a course given a one SD increase in the measure of interest. In multistage models, all AMEs predicting enrollment are conditional on first considering a course. All analyses in this study are descriptive and should be interpreted as associations between measures of interest, not the causal effect of gender composition on any of the outcomes.

Results

We begin our discussion of the results by examining the extent to which a multistage decision-theoretic framework of choice describes the process of course selection by comparing fit statistics and conclusions from a multistage model to a naive single-stage model. Further, we examine segregation across courses and majors.

Table 1: Course-level gender segregation by stage.

	Consideration	Choice
Course level		
Dissimilarity index (*D*)	0.23	0.27
Theil index (*H*)	0.07	0.11
Between subject	45%	36%
Within subject	56%	64%
Major level		
Dissimilarity index (*D*)	0.09	
Theil index (*H*)	0.07	

We then discuss how stages are gendered and the relationship between gender composition and staged choice for both men and women.

Single and Multistage Models of Choice

The 1,610 first-year students in our sample enrolled in more than 740 unique courses over the course of their first year at the case university. These course enrollments were the culmination of considering more than 2,300 unique courses, with each student considering, on average, approximately 30 of the options available to them.

Although the multistage model of decision-making is perhaps a more theoretically plausible model than a single-stage model, which implies that students consider all courses available to them (which is unlikely given the sheer number of options and the cognitive load associated with sorting through thousands of courses), it is also important to determine if it is a better statistical fit for our data based on conventional goodness-of-fit statistics. Fit statistics, including the Akaike information criterion (AIC) and the Bayesian information criterion (BIC), are shown in the online appendix (Table A3). Fit statistics are based on a simple model that includes course and degree share women and student fixed effects. In general, given the trend of smaller AIC and BIC values, these estimates suggest that the multistage model is a better statistical fit.

Segregation Across Consideration and Choice

We next describe the levels of gender segregation across these decision-making stages. Course enrollments represent moderate course-level segregation: the dissimilarity index for course enrollments is 0.27, which suggests that over one-fourth of students in the sample would need to change courses for gender parity in enrollments (see Table 1). As expected, the dissimilarity index for considered courses is slightly smaller (0.23) than chosen courses, suggesting that there is slightly more similarity by gender in the courses that students consider compared to the courses that students choose. This is expected given the staged nature of this choice; by construction, students did not choose any options that they did not first consider, so it is unlikely for there to be higher segregation at the consideration relative to the choice stage. Instead, the fraction of overall choice-stage segregation that stems

from consideration is a useful benchmark for understanding how much segregation of choices is explained by earlier consideration. When considering both the dissimilarity and Theil indices, we observe that gender segregation at the earlier consideration stage accounts for more than half of gender segregation at the choice stage, suggesting that the bulk of segregation in enrollments stems from differences in what students consider in the first place.

In addition, of the course enrollments, approximately 36 percent of overall segregation is due to between-subject segregation, whereas the remainder is due to within-subject segregation. Subject codes are the departments or programs that house a set of courses (i.e., history), whereas unique courses within a subject have their own number (i.e., 100 or 200). This suggests that, rather than mostly being segregated across subjects typed by gender, such as across math or English, most course-level segregation is within subjects but across distinct courses. This provides insight into the process of gender segregation: while much of the literature on gender segregation in higher education focuses on between-field differences that are gender typed, gender segregation is pervasive such that there exists within-field segregation that shapes how students end up in different courses within the same programs. In addition, we find that courses are more gender segregated, on average, than majors themselves, which further motivates the choice of course-level decision-making processes as the empirical setting for this study.

Gender Composition and Staged Choice

Having established the multistage nature of this choice and the extent of gender segregation in undergraduate courses, an important question is then the extent to which decisions at each stage (1) differ by individual student gender and (2) are differently associated with course gender compositions. Table 2 shows the AMEs of a one SD increase in course share of women on the predicted probability of considering or choosing a given course option. The first panel shows estimates from a single-stage model, whereas the second panel shows estimates from our preferred model, which is a multistage model of course choice. In addition, all models control for course attributes (including the degree gender composition) and include student-level fixed effects.

As shown in Table 2, conclusions drawn from the single-stage model differ meaningfully from those drawn from the multistage model. We display these single-stage results for comparison purposes only, as our preferred specification is the multistage model. In a scenario where one assumes that students use the same decision logics to choose final and considered courses, the coefficient on course composition is zero and is not statistically significant among male students in the cohort. For women, a 1 SD increase in the course fraction of women is associated with a 5 percentage point increase in course enrollment. However, as previously noted, a single-stage model fails to consider the process of how people make decisions and whittle down the universe of available options into manageable consideration sets. Thus, conclusions drawn from a model that does not account for gender differences not only in final choices but also in decision-making processes will likely fail to fully model the dynamics shaping choice. To illustrate this point,

Table 2: AMEs of course share of women on viewing and enrolling behavior by gender.

	AME Men		AME Women	
	View	Enroll	View	Enroll
Single-stage model				
Course share of women	0.00		0.05**	
	(0.00)		(0.00)	
Multistage model				
Course share of women	−0.03**	0.03*	0.05**	0.09**
	(0.00)	(0.01)	(0.00)	(0.01)

Note: Standard errors in parentheses.
*$p < 0.05$, **$p < 0.01$. All models additionally control for course attributes and include student fixed effects.

we compare single-stage estimates to a multistage model of decision-making that allows gender composition to have distinct associations with the consideration and choice stages.

Moving to the multistage model, a different story emerges. For men, a 1 SD increase in the share of women in a given course is associated with a 3 percentage point decrease in the likelihood of consideration. Among men, conditional on the considered options that a given student shortlists, a 1 SD increase in the share of women in a given course is associated with a 3 percentage point increase in the likelihood of enrollment. Among women, a 1 SD increase in the course share of women is associated with a 5 percentage point increase in the likelihood of consideration. This is in contrast to the same figures for male students, for whom increases in the course share of women are associated with decreases in the likelihood of course view. At the choice stage, a 1 SD increase in the course share of women is associated with a 9 percentage point increase in the likelihood of choice, conditional on consideration. For women, increases in the course share of women increase both the likelihood of considering a course at all as well as choosing it once it has been shortlisted.

From these results, an important pattern emerges: both men and women are responsive to historic gender compositions but in markedly different ways. First, the direction of associations at the consideration and choice stage differs by gender. On average, men are less likely to view a course with more women. Conditional on consideration, however, there is a small positive association between gender composition and enrollment among men. On the other hand, women are both more likely to view and to enroll in (conditional on having viewed) courses as the historic share of women in a course rises. Second, the magnitudes of the coefficients are larger for women, suggesting that they are more sensitive to the course's gender composition than men.

These models control for course characteristics as well as the historical degree gender composition. Additional models exploring degree gender composition as the focal measure are shown in the online supplement in Tables A4 and A5. In short, these models find that associations between course gender composition, consideration, and choice follow different patterns from that of historic patterns in degree gender composition. Although this may at first seem counterintuitive, it should be
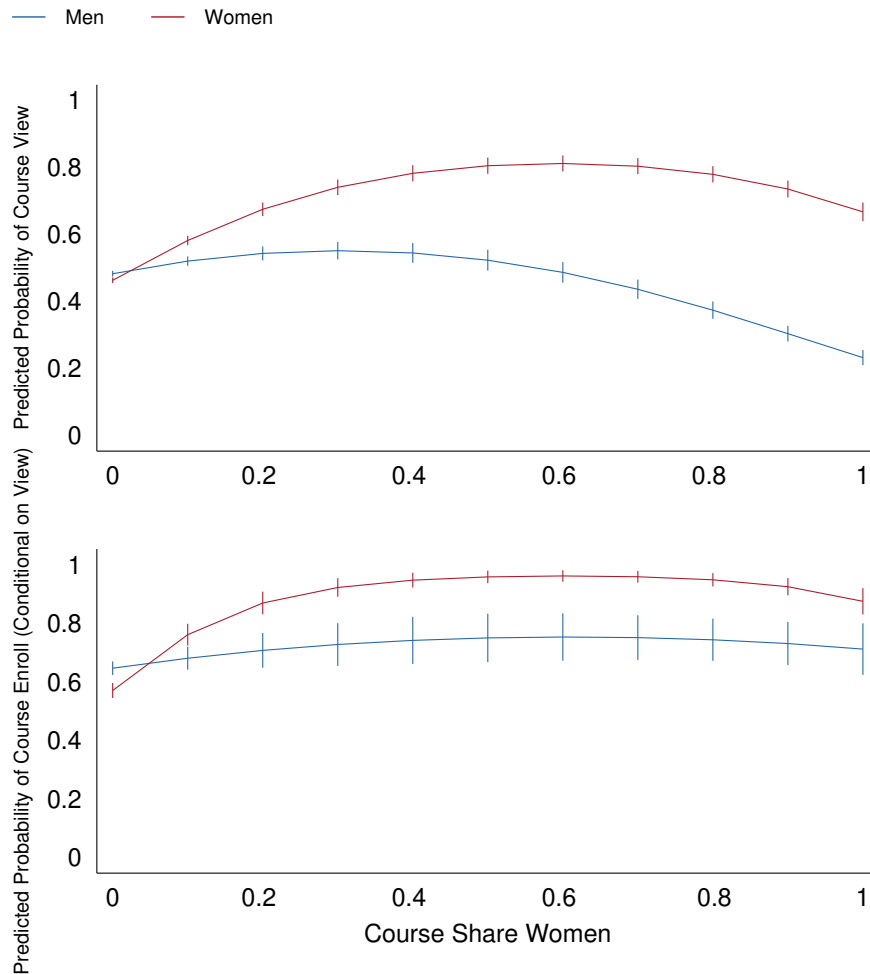
Figure 2: Predicted probability of consideration and choice for men and women by course share of women.

noted that the course gender composition does not necessarily map onto degree gender composition, particularly for introductory course sequences (which are the most common set of courses in our study). For example, at the case university where this study takes place, women are overrepresented in the introductory chemistry sequence but underrepresented as chemistry majors. Although it is not possible to disentangle the mechanisms underlying this pattern using the available data, it may be the case that women either enter the introductory chemistry course sequence intending to major in chemistry and subsequently change paths or they enter the chemistry sequence with intentions of majoring in a different non-chemistry field (e.g., premedical students are required to take introductory chemistry sequences).

The divergent patterns between men and women are also illustrated in Figure 2, which shows the predicted probability of course view associated with varying levels of course gender composition. Patterns predicting course view differ meaningfully by gender, whereas patterns predicting course enrollment, conditional on having viewed a course, are more similar by gender in both overall patterns and relative

peaks. The relationship between the historic fraction of women in a course and the predicted probability of course view follows a non-linear curve for both men and women. For men, this peaks at around 30 percent women, before decreasing as the fraction of women continues to rise. For women, the curve is similar in shape but shifted such that the peak is closer to 60 percent women. However, once students have selected a subset of courses to consider, there is more gender balance on probabilities of enrollment, as shown in the second panel of Figure 2. Notably, students follow gender divergent patterns at the consideration stage even within fields that are historically associated with women. For example, within the English department at the case university (which awards a higher share of degrees to women than men), there are a few courses where women make up between 40 percent and 50 percent of the course population rather than the majority. We find that, at the consideration stage, men choosing an English course are more likely to consider these male-dominated English courses and avoid courses with higher fractions of women; the same is not true for women. However, at the choice stage, patterns are roughly similar across gender. Figures illustrating the same relationships for degree gender composition rather than course gender composition are shown in the online supplement (Fig. A2). Furthermore, as a robustness check, we also include tables and figures illustrating the association between staged choice and course composition, but without controlling for degree composition and the indicator for whether a course is in an STEM field, which may partially explain away some of the relationship between course composition and consideration/choice. As shown in Table A6, Table A7, and Figure A3, our substantive conclusions on the role of course composition in shaping course consideration and choice remain consistent whether or not these controls are included.

In addition to considering the extent to which increases in course share of women are related to these patterns, it is useful to use cutoffs from Kanter (1977) to better understand the relationship between gender composition and the decision-making process in context. Following Kanter, occupations in which 85 percent (or more) of one gender represent a *skewed* field. Along these lines, Table 3 illustrates the average marginal difference in likelihood of consideration/choice for a course that is gender balanced (i.e., 50 percent men and 50 percent women) relative to one that is skewed (i.e., more than 85 percent men or more than 85 percent women). We include both the AMEs separately by gender as well as the second difference illustrating the difference between men and women. These estimates were generated using one model that included all course attributes as well as an indicator for student gender that was interacted with all course attributes. This was done to ensure that we could test the significance of the difference between the AME for men and women from one model (see column labeled "second difference").

The first row of Table 3 shows that, among men, there is no evidence of a statistically significant difference in the likelihood of considering a course that is 15 percent women relative to one that is 50 percent women. However, among women, relative to a course that is gender balanced, women are 11 percentage points less likely to view a course that is skewed toward men. The resulting difference between the two is 12 percentage points and it is statistically significant at the $p < 0.01$ level. Next, the second row of Table 3 shows the analogous patterns for

Table 3: AMEs at Kanter (1977) cutoffs.

	AME Men	*AME* Women	Second Difference
Course share of women			
Consideration stage			
50% women → 15% women	0.01	−0.11**	0.12**
	(0.01)	(0.00)	(0.01)
50% women → 85% women	−0.10**	−0.04**	−0.06**
	(0.01)	(0.01)	(0.01)
Choice stage			
50% women → 15% women	−0.07**	−0.18**	0.11**
	(0.01)	(0.01)	(0.02)
50% women → 85% women	−0.01	−0.07**	0.06
	(0.02)	(0.02)	(0.03)

Note: Standard errors in parentheses.
$^{*}p < 0.05$, $^{**}p < 0.01$. All models additionally control for course attributes. Second differences indicate the difference between the AME for men and the AME for women.

the difference associated with a course that is skewed toward women relative to one that is gender balanced, where both men and women avoid courses that are skewed toward women. Importantly, men and women display similar levels of avoidance toward considering courses that are skewed toward the opposite gender, relative to courses that are gender balanced. Next, the third and fourth rows of Table 3 show how gender composition is associated with choice, conditional on having considered a course. Among considered courses, men and women are less likely to choose a course that is skewed toward men relative to one that is gender balanced. Likewise, women are also less likely to choose a considered course that is skewed toward women relative to one that is gender balanced. However, we do not observe evidence of a statistically significant difference by gender in the difference in predicted probability of choice when comparing a gender-balanced option and one that is skewed toward women.

Together, results from Figure 2, Table 2, and Table 3 show that most gender-divergent patterns are occurring at the consideration stage. Although women's choices are more influenced by gender composition on average, we also observe that both men and women avoid considering courses that are heavily skewed toward the opposite gender. Still, on average, we find that women's predicted probability of viewing a course with few (or no) women is comparatively higher than men's predicted probability of viewing a course with few (or no) men (predicted probabilities = 0.46 and 0.23, respectively).

Gendered Decision-Making and Course Attributes

Finally, we broaden our discussion beyond only course gender composition to examine how other aspects of the decision-making process may (or may not) differ by gender. Our goal in this section is to examine how we can understand gender composition in context with other attributes that are also implicated in the consideration and choice processes of course selection. Although the previous sections have
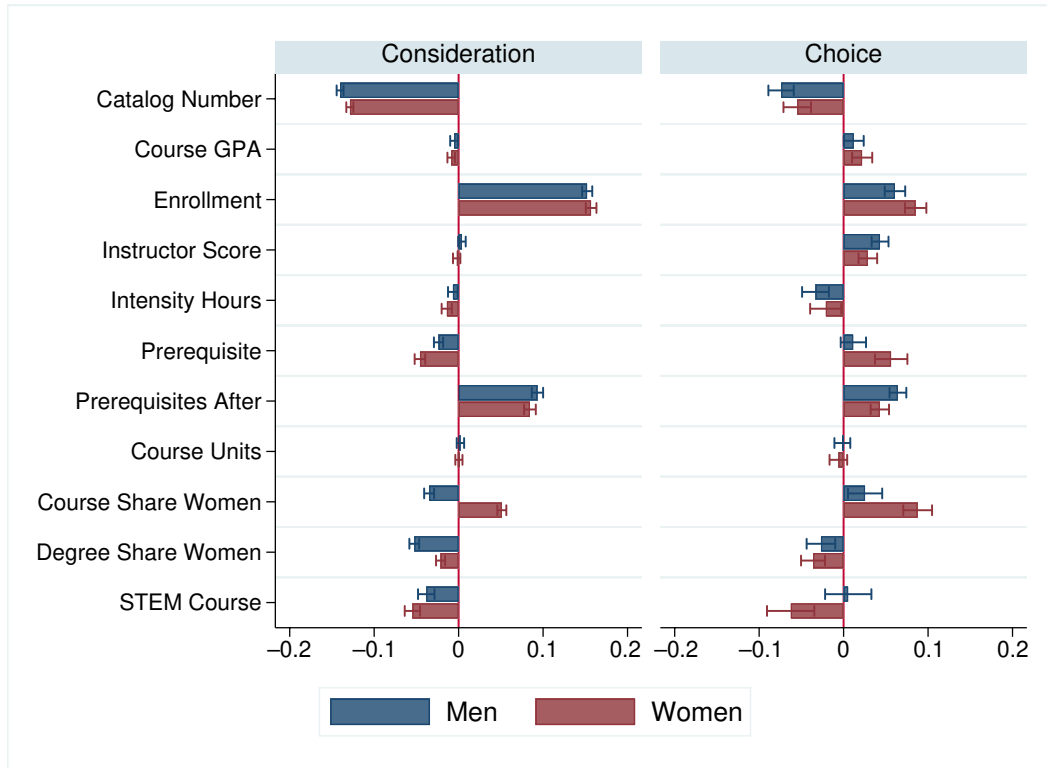
Figure 3: Associations between course characteristics and likelihoods of consideration and choice.

demonstrated the importance of gender in predicting consideration and choice sets, it may also be the case that these attributes are not as important as other course characteristics when it comes to decision-making in context. In addition, while the previous section illustrated how gendered dynamics differ with respect to gender composition, it is useful to understand in general how decision-making processes do (or do not) differ by gender, and at which stage the bulk of this divergence stems from.

Results illustrate the AMEs of increases across all attributes in the likelihood of consideration or choice, by gender. For example, for men, a 1 SD increase in the number of students enrolled in a course is associated with a nearly 15 percentage point increase in the likelihood of viewing a course, net other factors. In other words, male students are more likely to view courses with large enrollments. This is also true for women, with similar magnitudes for increases in enrollment, regardless of gender. In general, the course characteristics predicting increases in course views are similar across gender—with consistency in direction and approximate magnitude across all course characteristics with one exception: course gender composition. Indeed, we observe that course gender composition at the consideration stage is the *only* such characteristic where we observe statistically significant trends in the opposite direction by gender. Degree gender composition is similarly different in magnitude by gender, though in this case the directions of the coefficients are the same.

For the choice stage, rather than relying on a few key course characteristics for decision-making around choice, students appear to use a more balanced set of course characteristics to move courses from the view stage to the enrollment stage. These are shown in the second panel of Figure 3. These models predict the likelihood of enrolling in a course, conditional on having viewed it, so courses that were never considered for enrollment are not included in these models. Stated differently, these estimates answer the question of which course characteristics might lead students to choose one considered course over another. As in the viewing models, we include student-level fixed effects. In general, the course characteristics that predict likelihood of enrollment are more balanced both across course attributes (e.g., no one attribute plays an outsized role in shaping enrollment decisions) and across gender (e.g., men and women do not appear to have markedly different enrollment processes once consideration is taken into account) than in the consideration models.

Taken together, these models suggest that a few key characteristics predict likelihoods of course consideration, but a more balanced set of course attributes are associated with later choice. This is consistent with the theory that some attributes—including gender composition—serve as screeners, while the evaluation stage is a more balanced choice-making process. In most respects, the relationship between attributes and choice is relatively stable across gender, with the exception of historic course and degree gender composition. Importantly, the relative similarity by gender across other courses characteristics besides course and degree gender compositions suggests the primary nature of gender in these decisions (Ridgeway 2011; Ridgeway and Correll 2004).

Discussion

Decision-making processes contribute to gender segregation in part because men and women do not consider the same options at the beginning of the choice process and their responses to gender compositions follow gender-divergent trends early-on. In this study, we show how consideration set formation—and to a much lesser extent choice set formation—is associated with gender composition. We do so using granular course choice search data from an entire cohort of university students as they consider and enroll in their first-year courses, illustrating that not only are courses substantially segregated but also that even *considered* courses are segregated by gender.

Taken together, our models suggest that compositions of women are associated with decision-making both at the consideration and the choice stage, but that these patterns are most different by gender at the consideration stage. We find that men's avoidance of options skewed toward women is highest at the consideration stage, which is true for both course and degree gender composition patterns. On the other hand, women have much higher likelihoods of both viewing and enrolling in a course as the proportion of women in the course rises. Although women's choices appear to be more sensitive to gender composition overall, this is less true for courses that are heavily skewed by gender. For example, women are more likely than men to consider courses where they are significantly under-represented.

However, once considered courses are established, choices tend to be relatively balanced by gender. These results explain, in part, why men and women tend to end up in different first semester enrollments: they are likely not seriously considering the same initial options. If students are not considering similar sets of courses, there is little chance that their enrolled sets will involve much balance by gender. Furthermore, we find that academic majors are less segregated than courses. This study also builds upon prior work that showed that the multistage choices of women are shaped, in part, by gender composition (Alon and DiPrete 2015).

Furthermore, our study aligns with a growing analogous body of work on residential and school segregation, which suggests that meaningful differences in consideration processes have an outsized role in shaping segregation patterns (Bruch and Swait 2019; Burdick-Will et al. 2020; Krysan and Bader 2009). Because preferences—whether for same-gender or same-race peers, neighbors, or classmates—shape the options that one considers *at all*, segregation persists even when the characteristics used to weigh final choices may not differ meaningfully across groups (Bruch and Swait 2019). Given persistent stereotypes and segregated social networks, these patterns persist even when individuals do not directly observe the compositions of the options they are considering. Although gendered reactions to gender compositions are not the only characteristics shaping consideration and choice patterns, they have meaningful associations with the decision-making process.

Why do consideration and choice patterns for men and women seem to be differentially associated with the historic composition of women in a given course? Although our data do not allow us to adjudicate between competing perspectives on why students ultimately seek out or avoid these courses, our work is consistent with the theoretical perspective of devaluation of women's work, fields, and occupations, which is shaped by changing gender compositions (Busch 2018; England and Li 2006; Magnusson 2008). These theories help to explain both why students may use gender as a cognitive shortcut when making choices as well as why these patterns are asymmetric, such that men avoid fields with more women while women's choices are positively associated with the course fraction of women. This work is also consistent with a broader theme in gender inequality research that points toward the strong pull of precollege preferences and tastes on later enrollments (Morgan et al. 2013; Weeden et al. 2020). These preferences and tastes may also be exacerbated by gender-segregated social networks, which can reaffirm gendered choices (Alon and DiPrete 2015; Charles and Bradley 2009; Riegle-Crumb et al. 2006). Given that the students in our sample are making individual decisions in the context of strong and persistent gender stereotypes and status beliefs, it is perhaps not surprising that these forces have a pull both on the courses they consider as well as those they choose. Finally, our results are consistent with a growing body of research that suggests that gender, and the cultural and status beliefs associated with gender, may be used as a cognitive shortcut when information is low and cognitive load is high (Biernat and Kobrynowicz 1997; Biernat et al. 2003; Botelho and Abraham 2017; Correll et al. 2020; Ridgeway 2011; Simcoe and Waguespack 2011), which has implications for gender inequality across fields (Correll et al. 2020; Leslie et al. 2015; Nielsen et al. 2017; Ridgeway 2011). From this, it is perhaps not

surprising that gender compositions are most salient to the students in our sample at the earliest stages, when options exceed what most people can reasonably consider (Chaturapruek et al. 2021). This may explain why gender-divergent patterns appear most prominently at the consideration stage.

Our results suggest not only that students do not consider all options functionally available to them but also that the options they consider in the first place are gender segregated. As with other similar studies that have focused on school and residential segregation, a key implication of this study is the need to better understand the structural and social barriers that shape the options that men and women are aware of and willing to consider. To the extent that patterns early on in the decision-making process display gender divergent patterns, segregation will persist in course choice, major choice, and later occupations. Of course, we also acknowledge that though individual decisions structure these supply-side mechanisms, that is not to say that the onus is directly on women (or men) to simply change their behaviors and preferences in the name of lowering gender segregation. These decisions are made in the context of a complex social environment where there are persistent stereotypes and cultural associations about competence and fit for men and women in different fields (Cech 2013; Correll 2001). Moreover, men and women are differentially likely to take these cultural associations into account while making decisions (Correll 2004; Quadlin 2020). As such, changing the structure of gender segregation requires more than encouraging individual decision-makers to change their behaviors. Indeed, recent research has shown that there is a steep wage disparity between men and women that persists even when considering the within-firm, within-occupation differences (King et al. 2023).

We acknowledge that our study is only a first step in understanding the complex process of decision-making in gendered contexts and is limited in several ways that provide ample opportunity for future work. First, we do not have comprehensive data on the options that students are aware of, which limits our ability to distinguish between awareness and consideration sets in the data. Examinations that include differences in awareness and consideration sets may provide additional insights into the mechanisms that explain gender differences in decision-making processes. Furthermore, we are unable to disentangle whether choices follow a *considered options preference model*, as we have described here, or a *sequential preferences model*, where individuals first select a top choice and then select a second choice from the options that remain (see Alon and DiPrete 2015). In addition, we use page views on an online course search platform as a proxy for meaningful consideration, but we acknowledge that there may be other options that students considered without ever actively searching for them.

Importantly, it is also possible that students are reacting to attributes that are correlated with—but not necessarily driven by—gender compositions. Because our analyses are descriptive, we cannot examine the extent to which gender compositions have a causal effect on consideration and choice, particularly given that, in our study, students do not directly observe gender compositions when making choices. Although gender compositions are not directly observed in this study, prior work has suggested that students draw meaningful information about courses using only course titles, which drives their enrollment patterns (Spoor and Lehmiller 2014).

Nonetheless, future work on this topic should continue to investigate the extent to which there is a causal relationship between gender composition, consideration, and choice in higher education contexts and beyond. We also acknowledge that these data represent a cohort of students at a private admission-selective university, which is not generalizable to the wider population of undergraduate students nationwide in terms of the specifics of the relationship between certain course characteristics and choice. However, the university population at our case university is particularly suited for studying the dynamic choice process of university students because students do not enter with a declared major and are actively encouraged to explore the curriculum until they declare one.

In sum, this study demonstrates that the process of considering and choosing courses is itself gendered: men and women do not tend to consider the same initial set of college courses, and they browse course offerings in ways that are, in part, related to underlying gender compositions. This has broad implications for our understandings of gender segregation and decision-making.

Notes

1 The analytic sample in this study includes all of the students in the cohort who entered in the 2016–2017 school year and used the course search platform at any point to choose their courses. A total of 1,754 students entered the case university in 2016–2017, of whom 144 (8%) did not interact with the course search platform in any capacity and were therefore excluded from analyses. Although we cannot observe the courses that these students considered, there is reason to suspect that these students may not be traditional enrolled first-year students, as only four had graduated by the completion of the data selection period. Our data set has no missingness in the full $n = 1,754$ student sample (and therefore, by construction, of the analytic $n = 1,610$ sample) across key demographic measures, such as student gender.

2 For more details on the specific course search platform leveraged in this study, see Chaturapruek et al. (2021).

3 In addition, a fraction of courses at the case university were enrolled in without ever being viewed on the course platform. However, in investigating how these courses compare to courses that were viewed and then enrolled in, we find minimal evidence of selection bias or meaningful differences between these courses (see Chaturapruek et al., 2021).

4 Although this was the method of data collection used for the 2016–2017 cohort at the case university, more recent cohorts are asked to self-identify using a broader set of sex and gender questionnaires.

5 Note that the term "effect" in average marginal effect indicates a descriptive association not a causal effect.

References

Alon, Sigal and Thomas A. DiPrete. 2015. "Gender Differences in the Formation of a Field of Study Choice Set." *Sociological Science* 2:50–81. https://doi.org/10.15195/v2.a5

Armstrong, Elizabeth A., and Laura T. Hamilton. 2013. *Paying for the Party: How College Maintains Inequality*. Harvard University Press. https://doi.org/10.4159/harvard.9780674073517

Baker, Rachel and Gabe Avakian Orona. 2020. "Gender and Racial Differences in Awareness and Consideration of Curricular Programs: Exploring a Multistage Model of Major Choice." *AERA Open* 6(3). https://doi.org/10.1177/2332858420937023

Banaji, Mahzarin R. and Curtis D. Hardin. 1996. "Automatic Stereotyping." *Psychological Science* 7(3):136–41. https://doi.org/10.1111/j.1467-9280.1996.tb00346.x

Biernat, Monica and Diane Kobrynowicz. 1997. "Gender- and Race-Based Standards of Competence: Lower Minimum Standards but Higher Ability Standards for Devalued Groups." *Journal of Personality and Social Psychology* 72(3):544–57. https://doi.org/10.1037/0022-3514.72.3.544

Biernat, Monica, Diane Kobrynowicz, and Dara L. Weber. 2003. "Stereotypes and Shifting Standards: Some Paradoxical Effects of Cognitive Load." *Journal of Applied Social Psychology* 33(10):2060–79. https://doi.org/10.1111/j.1559-1816.2003.tb01875.x

Botelho, Tristan L. and Mabel Abraham. 2017. "Pursuing Quality: How Search Costs and Uncertainty Magnify Gender-Based Double Standards in a Multistage Evaluation Process." *Administrative Science Quarterly* 62(4):698–730. https://doi.org/10.1177/0001839217694358

Bruch, Elizabeth and Fred M. Feinberg. 2017. "Decision-Making Processes in Social Contexts." *Annual Review of Sociology* 43:207–27. https://doi.org/10.1146/annurev-soc-060116-053622

Bruch, Elizabeth and Joffre Swait. 2019. "Choice Set Formation in Residential Mobility and Its Implications for Segregation Dynamics." *Demography* 56(5):1665–92. https://doi.org/10.1007/s13524-019-00810-5

Bruch, Elizabeth, Fred Feinberg, and Kee Yeun Lee. 2016. "Extracting Multistage Screening Rules from Online Dating Activity Data." *Proceedings of the National Academy of Sciences* 113(38):10530–5. https://doi.org/10.1073/pnas.1522494113

Buchmann, Claudia and Thomas A. DiPrete. 2006. "The Growing Female Advantage in College Completion : The Role of Family Background and Academic Achievement." *American Sociological Review* 71:515–41. https://doi.org/10.1177/000312240607100401

Burdick-Will, Julia, Jeffrey A. Grigg, Kiara Millay Nerenberg, and Faith Connolly. 2020. "Socially-Structured Mobility Networks and School Segregation Dynamics: The Role of Emergent Consideration Sets." *American Sociological Review*. https://doi.org/10.1177/0003122420934739

Busch, Felix. 2018. "Occupational Devaluation Due to Feminization? Causal Mechanics, Effect Heterogeneity, and Evidence from the United States, 1960 to 2010." *Social Forces* 96(3):1351–76. https://doi.org/10.1093/sf/sox077

Cech, Erin. 2013. "The Self-Expressive Edge of Occupational Sex Segregation." *American Journal of Sociology* 119(3):747–89. https://doi.org/10.1086/673969

Chambliss, Daniel F. and Christopher G. Takacs. 2014. *How College Works*. Cambridge, MA: Harvard University Press.

Charles, Maria and Karen Bradley. 2009. "Indulging Our Gendered Selves? Sex Segregation by Field of Study in 44 Countries." *American Journal of Sociology* 114(4):924–76. https://doi.org/10.1086/595942

Charles, Maria and David B. Grusky. 2004. *Occupational Ghettos: The Worldwide Segregation of Women and Men*. Stanford, CA: Stanford Univ. Press. https://doi.org/10.1515/9781503618183

Chaturapruek, Sorathan, Tobias Dalberg, Marissa E. Thompson, Sonia Giebel, Monique H. Harrison, Ramesh Johari, Mitchell L. Stevens, and Rene F. Kizilcec. 2021. "Studying Undergraduate Course Consideration at Scale." *AERA Open* 7(1). https://doi.org/10.1177/2332858421991148

Conger, Dylan, and Mark C. Long. 2010. "Why Are Men Falling Behind? Gender Gaps in College Performance and Persistence." *The ANNALS of the American Academy of Political and Social Science* 627(1):184–214. https://doi.org/10.1177/0002716209348751

Correll, Shelley J. 2001. "Gender and the Career Choice Process: The Role of Biased Self-Assessments." *American Journal of Sociology* 106(6):1691–1730. https://doi.org/10.1086/321299.

Correll, Shelley J. 2004. "Constraints into Preferences: Gender, Status, and Emerging Career Aspirations." *American Sociological Review* 69(1):93–113. https://doi.org/10.1177/000312240406900106

Correll, Shelley J., Katherine R. Weisshaar, Alison T. Wynn, and JoAnne Delfino Wehner. 2020. "Inside the Black Box of Organizational Life: The Gendered Language of Performance Assessment." *American Sociological Review* 85(6):1022–50. https://doi.org/10.1177/0003122420962080

Dalberg, Tobias, Kalena E. Cortes, and Mitchell L. Stevens. 2024. "Major Selection as Iteration: Observing Gendered Patterns of Major Selection Under Elective Curriculums." *AERA Open* 10:23328584241249600. https://doi.org/10.1177/23328584241249600

Denice, Patrick A. 2021. "Choosing and Changing Course: Postsecondary Students and the Process of Selecting a Major Field of Study." *Sociological Perspectives* 64(1):82–108. https://doi.org/10.1177/0731121420921903

DiMaggio, Paul. 1997. "Culture and Cognition." *Annual Review of Sociology* 23(1):263–87. https://doi.org/10.1146/annurev.soc.23.1.263

Ditonto, Tessa M., Allison J. Hamilton, and David P. Redlawsk. 2014. "Gender Stereotypes, Information Search, and Voting Behavior in Political Campaigns." *Political Behavior* 36(2):335–58. https://doi.org/10.1007/s11109-013-9232-6

England, Paula. 1992. *Comparable Worth: Theories and Evidence*. Transaction Publishers.

England, Paula. 2010. "The Gender Revolution: Uneven and Stalled." *Gender & Society* 24(2):149–66. https://doi.org/10.1177/0891243210361475

England, Paula, and Su Li. 2006. "Desegregation Stalled: The Changing Gender Composition of College Majors, 1971-2002." *Gender & Society* 20(5):657–77. https://doi.org/10.1177/0891243206290753

England, Paula, Paul Allison, Su Li, Noah Mark, Jennifer Thompson, Michelle J. Budig, and Han Sun. 2007. "Why Are Some Academic Fields Tipping Toward Female? The Sex Composition of U.S. Fields of Doctoral Degree Receipt, 1971–2002." *Sociology of Education* 80:23–42. https://doi.org/10.1177/003804070708000102

England, Paula, Melissa S. Herbert, Barbara Stanek Kilbourne, Lori L. Reid, and Lori Mc-Creary Megal. 1994. "The Gendered Valuation of Occupations and Skills: Earnings in 1980 Census Occupations." *Social Forces* 73(1):65–100. https://doi.org/10.2307/2579918

Giebel, Sonia, Aj Alvero, Ben Gebre-Medhin, and Anthony Lising Antonio. 2022. "Signaled or Suppressed? How Gender Informs Women's Undergraduate Applications in Biology and Engineering." *Socius: Sociological Research for a Dynamic World* 8:237802312211275. https://doi.org/10.1177/23780231221127537

Hall, R. M., and B. R. Sandler. 1982. *The Classroom Climate: A Chilly One for Women?* Washington, DC: Association of American Colleges.

Harrison, Monique H., Philip A. Hernandez, and Mitchell L. Stevens. 2022. "Should I Start at MATH 101? Content Repetition as an Academic Strategy in Elective Curriculums." *Sociology of Education* 95(2):133–52. https://doi.org/10.1177/00380407221076490

Ito, Tiffany A. and Geoffrey R. Urland. 2003. "Race and Gender on the Brain: Electrocortical Measures of Attention to the Race and Gender of Multiply Categorizable Individuals." *Journal of Personality and Social Psychology* 85(4):616–26. https://doi.org/10.1037/0022-3514.85.4.616

Kanter, Rosabeth Moss. 1977. "Some Effects of Proportions on Group Life: Skewed Sex Ratios and Responses to Token Women." *American Journal of Sociology* 82(5):965–90. https://doi.org/10.1086/226425

King, Joseph, Matthew Mendoza, Andrew Penner, Anthony Rainey, and Donald Tomaskovic-Devey. 2023. "Estimating Firm-, Occupation-, and Job-Level Gender Pay Gaps with U.S. Linked Employer-Employee Population Data, 2005 to 2015." *Socius: Sociological Research for a Dynamic World* 9:237802312311576. https://doi.org/10.1177/23780231231157678

Kizilcec, René F., Rachel B. Baker, Elizabeth Bruch, Kalena E. Cortes, Laura T. Hamilton, David Nathan Lang, Zachary A. Pardos, Marissa E. Thompson, and Mitchell L. Stevens. 2023. "From Pipelines to Pathways in the Study of Academic Progress." *Science* 380(6643):344–47. https://doi.org/10.1126/science.adg5406

Krysan, Maria and Michael D. M. Bader. 2009. "Racial Blind Spots: Black-White-Latino Differences in Community Knowledge." *Social Problems* 56(4):677–701. https://doi.org/10.1525/sp.2009.56.4.677

Krysan, Maria and Kyle Crowder. 2017. *Cycle of Segregation: Social Processes and Residential Stratification*. New York: Russell Sage Foundation

Lang, David, Alex Wang, Nathan Dalal, Andreas Paepcke, and Mitchell Stevens. 2021. "Forecasting Undergraduate Majors Using Academic Transcript Data." *L@S 2021 - Proceedings of the 8th ACM Conference on Learning @ Scale* 243–46. https://doi.org/10.1145/3430895.3460149

Leslie, Sarah-Jane, Andrei Cimpian, Meredith Meyer, and Edward Freeland. 2015. "Expectations of Brilliance Underlie Gender Distributions across Academic Disciplines." *Science* 347(6219):23–34. https://doi.org/10.1081/E-EWS

Leu, Katherine. 2017. *Beginning College Students Who Change Their Majors within 3 Years of Enrollment*. National Center for Education Statistics.

Leung, Ming D. and Sharon Koppman. 2018. "Taking a Pass: How Proportional Prejudice and Decisions Not to Hire Reproduce Gender Segregation." *American Journal of Sociology* 124(3):762–813. https://doi.org/10.1086/700677

Magnusson, C. 2008. "Gender, Occupational Prestige, and Wages: A Test of Devaluation Theory." *European Sociological Review* 25(1):87–101. https://doi.org/10.1093/esr/jcn035

Massey, Douglas S., and Nancy A. Denton. 1988. "The Dimensions of Residential Segregation." *Social Forces* 67(2):281–315. https://doi.org/10.1093/sf/67.2.281

Michelmore, Katherine, and Sharon Sassler. 2016. "Explaining the Gender Wage Gap in STEM: Does Field Sex Composition Matter?" *Rsf* 2(4):194–215. https://doi.org/10.7758/rsf.2016.2.4.07

Morgan, Stephen L., Dafna Gelbgiser, and Kim A. Weeden. 2013. "Feeding the Pipeline: Gender, Occupational Plans, and College Major Selection." *Social Science Research* 42(4):989–1005. https://doi.org/10.1016/j.ssresearch.2013.03.008

Mullen, Ann L. 2010. *Degrees of Inequality: Culture, Class, and Gender in American Higher Education*. Baltimore, MD: Johns Hopkins University Press.

Mullen, Ann L. 2014. "Gender, Social Background, and the Choice of College Major in a Liberal Arts Context." *Gender & Society* 28(2):289–312. https://doi.org/10.1177/0891243213512721

Musto, Michela. 2019. "Brilliant or Bad: The Gendered Social Construction of Exceptionalism in Early Adolescence." *American Sociological Review* 84(3):369–93. https://doi.org/10.1177/0003122419837567

Nielsen, Mathias Wullum, Sharla Alegria, Love Börjeson, Henry Etzkowitz, Holly J. Falk-Krzesinski, Aparna Joshi, Erin Leahey, Laurel Smith-Doerr, Anita Williams Woolley, and Londa Schiebinger. 2017. "Gender Diversity Leads to Better Science." *Proceedings of the National Academy of Sciences* 114(8):1740–2. https://doi.org/10.1073/pnas.1700616114

Penner, Andrew M. and Marcel Paret. 2008. "Gender Differences in Mathematics Achievement: Exploring the Early Grades and the Extremes." *Social Science Research* 37(1):239–53. https://doi.org/10.1016/j.ssresearch.2007.06.012

Quadlin, Natasha. 2018. "The Mark of a Woman's Record: Gender and Academic Performance in Hiring." *American Sociological Review* 000312241876229. https://doi.org/10.1177/0003122418762291

Quadlin, Natasha. 2020. "From Major Preferences to Major Choices: Gender and Logics of Major Choice." *Sociology of Education* 93(2):91–109. https://doi.org/10.1177/0038040719887971

Reardon, Sean F., Erin M. Fahle, Demetra Kalogrides, Anne Podolsky, and Rosalía C. Zárate. 2019. "Gender Achievement Gaps in U.S. School Districts." *American Educational Research Journal* 56(6):2474–508. https://doi.org/10.3102/0002831219843824

Ridgeway, Cecilia L. 1997. "Interaction and the Conservation of Gender Inequality: Considering Employment." *American Sociological Review* 62(2):218–35. https://doi.org/10.2307/2657301

Ridgeway, Cecilia L. 2009. "Framed before We Know It: How Gender Shapes Social Relations." *Gender & Society* 23(2):145–60. https://doi.org/10.1177/0891243208330313

Ridgeway, Cecilia L. 2011. *Framed by Gender: How Gender Inequality Persists in the Modern World*. https://doi.org/10.1093/acprof:oso/9780199755776.001.0001

Ridgeway, Cecilia L. and Shelley J. Correll. 2004. "Unpacking the Gender System: A Theoretical Perspective on Gender Beliefs and Social Relations." *Gender & Society* 18(4):510–31. https://doi.org/10.1177/0891243204265269

Riegle-Crumb, Catherine. 2006. "The Path through Math: Course-Taking Trajectories and Student Performance at the Intersection of Gender and Race/Ethnicity." *American Journal of Education* 113(1):101–22. https://doi.org/10.1086/506495.

Riegle-Crumb, Catherine, George Farkas, and Chand Muller. 2006. "The Role of Gender and Friendship Course Taking Advanced Predicts." *Sociology of Education* 79(3):206–28. https://doi.org/10.1177/003804070607900302

Sanabria, Tanya and Andrew Penner. 2017. "Weeded Out? Gendered Responses to Failing Calculus." *Social Sciences* 6(2):47. https://doi.org/10.3390/socsci6020047

Seymour, Elaine and Nancy Hewitt. 1997. *Talking about Leaving: Why Undergraduates Leave the Sciences.* Boulder, CO: Westview Press.

Simcoe, Timothy S. and Dave M. Waguespack. 2011. "Status, Quality, and Attention: What's in a (Missing) Name?" *Management Science* 57(2):274–90. https://doi.org/10.1287/mnsc.1100.1270

Simon, Herbert A. 1997. *Models of Bounded Rationality: Empirically Grounded Economic Reason*. The MIT Press. https://doi.org/10.7551/mitpress/4711.001.0001

Spears, Russell, Penelope J. Oakes, Naomi Ellemers, and S. Alexander Haslam, eds. 1997. *The Social Psychology of Stereotyping and Group Life.* Malden: Blackwell Publishing.

Spoor, Jennifer R., and Justin J. Lehmiller. 2014. "The Impact of Course Title and Instructor Gender on Student Perceptions and Interest in a Women's and Gender Studies Course." *PLoS ONE* 9(9):e106286. https://doi.org/10.1371/journal.pone.0106286

Sterling, Adina D., Marissa E. Thompson, Shiya Wang, Abisola Kusimo, Shannon Gilmartin, and Sheri Sheppard. 2020. "The Confidence Gap Predicts the Gender Pay Gap among STEM Graduates." *Proceedings of the National Academy of Sciences of the United States of America*. https://doi.org/10.1073/pnas.2010269117

Thébaud, Sarah and Maria Charles. 2018. "Segregation, Stereotypes, and STEM." *Social Sciences* 7(7):111. https://doi.org/10.3390/socsci7070111

Thompson, Marissa E. 2021. "Grade Expectations: The Role of First-Year Grades in Predicting the Pursuit of STEM Majors for First- and Continuing-Generation Students." *The Journal of Higher Education* 92(6):961–985. https://doi.org/10.1080/00221546.2021.1907169

Tomaskovic-Devey, Donald. 1993. "The Gender and Race Composition of Jobs and the Male/Female, White/Black Pay Gaps." *Social Forces* 72(1):45–76.

Vaisey, Stephen and Lauren Valentino. 2018. "Culture and Choice: Toward Integrating Cultural Sociology with the Judgment and Decision-Making Sciences." *Poetics* 68:131–43. https://doi.org/10.1016/j.poetic.2018.03.002

Valentino, Lauren. 2020. "The Segregation Premium: How Gender Shapes the Symbolic Valuation Process of Occupational Prestige Judgments." *Social Forces* 99(1):31–58. https://doi.org/10.1093/sf/soz145

Weeden, Kim A. 1998. "Revisiting Occupational Sex Segregation in the United States, 1910-1990: Results from a Log-Linear Approach." *Demography* 35(4):475–87. https://doi.org/10.2307/3004015

Weeden, Kim A., Dafna Gelbgiser, and Stephen L. Morgan. 2020. "Pipeline Dreams: Occupational Plans and Gender Differences in STEM Major Persistence and Completion." *Sociology of Education* 93(4):297–314. https://doi.org/10.1177/0038040720928484

Weick, Karl E. 1995. *Sensemaking in Organizations*. Thousand Oaks: Sage Publications.

Yavorsky, Jill E. 2019. "Uneven Patterns of Inequality: An Audit Analysis of Hiring-Related Practices by Gendered and Classed Contexts." *Social Forces* 98(2):461–92. https://doi.org/10.1093/sf/soy123

Zarate, Michael A. and Eliot R. Smith. 1990. "Person Categorization and Stereotyping." *Social Cognition* 8(2):161–85. https://doi.org/10.1521/soco.1990.8.2.161

Zheng, Haowen and Kim A. Weeden. 2023. "How Gender Segregation in Higher Education Contributes to Gender Segregation in the U.S. Labor Market." *Demography* 60(3):761–84. https://doi.org/10.1215/00703370-10653728

Marissa E. Thompson: Department of Sociology, Columbia University.
E-mail: marissa.thompson@columbia.edu.
Tobias Dalberg: Department of Education, Uppsala University.
E-mail: tobias.dalberg@edu.uu.se.
Elizabeth E. Bruch: Department of Sociology, University of Michigan and the Santa Fe Institute. E-mail: ebruch@umich.edu.