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Are there sex differences in the utilization of educational capital among college-educated workers? ☆

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ABSTRACT

This paper introduces the concept of educational utilization as an overlooked part of the education-to-work transition and a potential mechanism by which occupational sex segregation is generated among the college-educated labor force. The paper begins with a critical discussion of the operationalization approaches that have been used in prior research that implicitly measures educational utilization. Multiple empirical measure of the concept are then developed using data from the O*NET and the *National Surveys of College Graduates*. The explanatory power of each measure is assessed using conditional logit models of occupational attainment. A combined measure is then used to assess sex differences in educational utilization using data from the 1993 and 2003 *National Surveys of College Graduates* for 2 cohorts of college graduates—those who earned their baccalaureate or post-baccalaureate degrees and entered the labor market in the years 1985–1993 and 1995–2003. The analysis identifies sex differences in educational utilization that vary across field, degree level and cohort and concludes with an examination of the implications of sex differences in educational utilization for occupational segregation.

1. Introduction

Despite the increasing post-secondary education rates among women (Bae et al., 2000; Jacobs, 1996; Spain and Bianchi, 1996; National Center for Education Statistics, 2005; Xie and Shauman, 2003) and the increasing integration of college majors (England and Li, 2006; Jacobs, 1995; Xie and Shauman, 2003), occupational segregation by sex persists in the U.S. labor force. The fact that occupational integration lags behind educational integration indicates that sex differences in occupational sorting occurs even among individuals with educational investments that are equal in both quantity, e.g., attainment of a college degree, and quality, e.g., the major field in which the degree was earned. For occupational segregation to persist, in the context of increasing educational integration, men and women who have made equal educational investments must differ in how they utilize their educational capital in the labor force. Identifying the extent, character and causes of population variation in the utilization of educational capital is therefore essential to our understanding of the processes by which segregation is perpetuated in the labor market.

In this paper I introduce the concept of educational utilization as an overlooked part of the education-to-work transition. I use data from the O*NET and the *National Surveys of College Graduates*, to develop multiple operationalizations of the links

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between occupations and college majors, and I use these to measure educational utilization. I then test the comparability of the multiple measures, assess their relative explanatory power using conditional logit models of occupational choice and use exploratory factor analysis to construct a single continuous measure of major-occupation connection. Finally, I use this measure of major-occupation connection with individual-level data for representative samples of U.S. college graduates from the 1993 and 2003 *National Surveys of College Graduates* to measure sex differences in the utilization of educational capital and to test if the observed gap varies across the major fields, levels of post-secondary educational attainment, and cohort.

2. Sex segregation in education and the labor force

The close correlation between the sex segregation of college majors and the sex segregation of occupations is well known (Davis, 1965; Jacobs, 1989, 1995; Peng and Jaffe, 1979; Polachek, 1978), as is the power of controlling for college major to explain sex differences in occupational attainment and earnings (Brown and Corcoran, 1997; Daymont and Andrisani, 1984; Gerhart, 1990; Shauman, 2006). Given the linkages between educational fields and occupational placement (Shauman, 2006), sex differences in educational specialization impose upper bounds on the degree of occupational integration that can be expected. But controlling for college major falls far short of explaining occupational segregation: labor force integration lags behind the integration of college majors to a significant degree. For example, although women earned 58.7% of all bachelor's degrees in the biological sciences in 2000, they accounted for only 40.7% of employees in biological science occupations. An integration gap of similar magnitude exists for the physical sciences, where 41.1% of 2000 bachelor's degrees went to women but 31.3% of employees were women, and in engineering, where the contrast was 20.4% versus 10.8%.[1] Although the slow pace of social change through the process of cohort replacement may explain some of this inertia in occupational sex segregation, the gap between the representation of women among degree-holders and the representation of women in related labor force sectors is significant even among the newest entrants to the labor force.

The lag between the integration of educational fields and the integration of occupational categories indicates that there may be significant sex differences in whether and how educational capital is utilized in the labor force. The differential between educational and occupational segregation is not a definitive symptom of sex differences in educational utilization, however, since occupational sex segregation exists if male and female college graduates are equally likely to utilize their education by gaining employment in occupations that are related to their education, but they enter mutually exclusive sets of "related" occupations. The extent to which occupational segregation is affected by the differential educational utilization of men and women is not yet know since there are few studies that investigate sex differences in individual education-to-work transitions. I begin to address this gap in the literature with the research presented in this paper.

3. The utilization of educational capital

Educational utilization can be conceptualized as a process that requires at least two steps. The first step is entering the labor force. The second step is gaining employment in an occupational setting that demands the substantive skills developed through one's educational pursuits. Sex differences in labor force participation are well-documented (Bianchi, 1995; Spain and Bianchi, 1996), so I bracket that aspect of sex differences in educational utilization, and I focus this analysis only on the members of recent cohorts of college graduates who are employed in the labor market. Thus, the focal concept of this analysis is employment in an occupation that is related to the major field in which each respondent attained his/her terminal degree (bachelor's or advanced degree), i.e., employment in an occupation where one's education is utilized.

Qualitative linkages between college majors and occupations are expected, given that college majors represent a type of self-selected treatment, involving the development of specialized knowledge and skills that may be recognized and valued in the labor market. This connection is the product of (1) the relative homogeneity of the population selecting a given major, (2) the homogenizing effect of the educational track, and (3) the demand for specific skills in particular occupations. Majoring in a particular field represents an affinity for the content of that field, the possession of prerequisite education, and aspirations for employment in a related field. The homogeneity of the students who select into majors is likely to intensify with the completion of the established sequence of coursework that comprises the core requirements of a major. Although the structure of most majors in post-secondary institutions in the U.S. allow students to tailor their coursework to their particular interests as they fulfill requirements, the courses that satisfy these requirements usually are predetermined, leading to significant commonality in the experience of students within a major. It is reasonable to assume, therefore, that the individuals attaining a degree in a given field are likely to have similar interests, occupational aspirations, and stocks of specific skills and content knowledge. On the demand-side, productivity in particular occupational settings requires specific skills, some of which may be associated with education in a particular field of study. So employers may use degrees in particular fields as a qualification for employment. Attaining a degree in a particular major should thus qualify an individual for, and facilitate entry into, a particular set of occupations. Conversely, without a degree in a select set of college majors entry into the related occupations may be difficult or impossible.

[1] Figures based on author's calculations. Female representation among baccalaureates by field are based on tabulated data presented by the NSF (2007). Female representation in science and engineering occupations based on analysis of 2000 U.S. Census data.

Therefore the qualitative major-occupation connections are a product of the substantive similarity of the education and the work: the degree to which the specialized education imparted by a major is utilized on the job. The strength and narrowness of the connections between college major and occupations will vary across fields according to the amount of variation in the three components specified above. That is, the majors with the strongest labor market linkages will be those with the most homogeneous entering populations (e.g., in terms of occupational aspirations), the most standardized educational requirements (e.g., relatively little variation across students in the courses completed), and consistent demand in specific occupational categories for the skills associated with the major. Relative heterogeneity in any of these three determinants will produce weaker or more diffuse links between majors and occupations in the labor market. The engineering fields are commonly assumed to set the standard for majors with strong occupational linkages, i.e., it is assumed that those majoring in engineering are very likely to utilize their education by gaining employment in engineering occupations. The humanities and social sciences are often pointed to as examples of majors with relatively weak links to the labor force, i.e., those majoring in these fields may be significantly less likely to utilize their education in the labor force. It is reasonable, therefore, to expect a significant amount of variation across major fields in the likelihood of educational utilization.

3.1. Operationalizing educational utilization

If the utilization of educational capital entails entering an occupation that requires the use of the specialized knowledge and skills developed through educational experiences, how should this concept be operationalized? Ideally, a researcher would simply compare measures of both the skills individuals developed through their course of study in college or any other educational program to the skills required in their job. Given the absence of such detailed measures of skills imparted and skills demanded, educational utilization can be operationalized as employment in an occupation that is related to one's education where that connection has at least two dimensions: (1) the *level* of education attained and that required for job attainment, and (2) the *substance* of the education and the substantive activities of the job.

3.1.1. Level of educational attainment

The level of education required for employment in a given job is a basic measure of educational utilization. Educational requirements can be assessed directly if information on degree or credential requirements is available for specific occupations. Such direct measures are relevant at very detailed job levels; when jobs are aggregated in occupational categories, an aggregate measure such as the modal, median or mean required level of education is more appropriate. Detailed information about job- or occupation-level degree requirements are not widely available, however, so proxy measures such as the average educational attainment of job incumbents are more often used (Hauser and Warren, 1997). For a college-educated worker, therefore, a first-level measure of educational utilization is the attainment of employment in an occupation where the required level of education is commensurate with his/her degree attainment.

3.1.2. Major-occupation connection: subjective operationalization

Prior research on the utilization of educational capital has focused almost exclusively on the utilization of education in science and engineering fields, and, more specifically, on sex differences in the utilization of science and engineering educational investments (Xie and Shauman, 2003). Such studies exclusively rely on a researcher-imposed operationalization of educational utilization. In this approach, researchers classify a set of occupations as those that comprise the science/engineering labor market, and employment in one of these occupations is defined as the utilization of science/engineering education. The researcher-imposed classification may be based on any combination of independent judgment, the conventions of prior research, or classification schemes used by benchmarking entities (NSF, 1999, 2004, 2007).

This approach may yield a reliable assessment of major-occupation connections when the occupational classification scheme parallels the organization of college majors, when occupational categories are internally homogenous, and when college majors have clearly defined occupational destinations. The researcher-defined operationalization relies on the judgment of the researcher, rather than on the assessment of the individuals whose education-work transition is being observed or on an empirical method of measuring the substantive consistency of a major-occupation pair. The limits of this approach become obvious when it is applied to majors such as English or sociology, which appear to have more diffused occupational linkages than do many of the science and engineering degree fields. The dichotomous nature of this operationalization is an additional deficiency. Since the "linked" occupations are identified only by a binary indicator variable, this operationalization cannot capture a critical dimension of the concept of major-occupation connection: the relative strength of major-occupation connections.

3.1.3. Major-occupation connection: empirical operationalizations

Empirical methods to identifying major-occupation linkages may address the limited applicability and lack of nuance that characterizes the researcher-imposed operationalization. Given the available data, there are three empirical strategies available for identifying the substantive connection between occupations and degree fields: a quantitative measure of the flow of workers from degree fields to occupations; a subjective assessment that relies on the reports of job incumbents to assess the degree to which occupations are related to degree fields; and a measure of the substantive educational demands in each occupation that relies on assessments of job-level requirements for education in specific fields.

The first empirical approach conceptualizes the transition from college to the labor market as a migration process where the size of the flow of "migrants" into occupations from college majors is the key indicator of the major-occupation linkages. The size of the flow from majors to occupations is a specific application of Kerckhoff's (1996) life course perspective concept of "frequently traveled pathways" between educational and occupational states and has been used to identify the normative pathways college graduates follow upon entry into the labor force (Shauman, 2006). Because some occupations require, either formally or informally, specialized educational attainment, the probability of employment in a given occupation will vary by degree level and major field. Of course, many occupations have no such demands for specialized education, and therefore draw workers from many different educational backgrounds. The relative volume of the flow of individuals between each major and occupation dyad is therefore a manifestation of the substantive major-occupation connection.

This operationalization can be applied to all college majors to yield a measure of the strength of the "link" between each major-occupation dyad. But, while this approach identifies the frequently traveled pathways from specific college majors to specific occupational categories, it is not an ideal method for identifying the substantively linked major-occupation dyads. The substantive similarity of major-occupation dyads cannot be inferred from the size of major-occupation flows since these flows are dependent on the idiosyncrasies of the occupational classification scheme. For example, very large occupational categories, such as "managers and administrators, not elsewhere classified," may receive substantial flows of college graduates from many majors, regardless of the substantive connectedness of the majors with the jobs aggregated into this occupational category.

A second empirical approach relies on individual survey respondent's subjective assessment of the degree to which their work is related to their education. Given a data source that solicits subjective assessments of major-occupation connection among a significant sample of labor force participants whose degree field and occupational situation are both identified, this approach would yield high content validity at the individual-level. Relying on individual-level response, however, would introduce a great deal of random noise and low levels of reliability across cases. Aggregating the individual assessments of education-work comparability within major-occupation pairings would provide a more reliable continuous measure of the "relatedness" of each occupation for each major field. The reliability of this operationalization would be limited by the size of the sample populating each cell of the major-occupation matrix. Also, the scope of the measure is limited by the occurrence of major-occupation "migration", for this measure of the substantive linkage between a particular major and a particular occupation requires that the occupation be entered by some minimal number of individuals who share that college major.

A third empirical approach would utilize occupation-specific descriptions of the skill and/or knowledge requirements in specific subject areas that can be linked to particular degree fields. Data on the knowledge demands of occupations would satisfying the occupational side of the ideal measure of educational utilization described above and could be used to identify the set of occupations that have a substantive relationship to a degree field. Such data are not common, and the available data often lacks sufficient detail to be useful. Also, this operationalization approach is not purely empirical since it requires that researchers use individual judgment to link the knowledge-domains identified in any data source to specific degree fields.

I use these empirical approaches to operationalization three measures of major-occupation connection:

1. *Flow*—A continuous measure of the size of the flow of graduates from majors into occupations. For all majors, I use the size of the flow of graduates into occupations from each major field as a continuous measure of the popularity of major-occupation linkages.
2. *Subjective*—A continuous measure of the strength of the substantive connection between majors and occupations that is operationalized as the aggregation of the individual subjective assessments of education-work relatedness for each major-occupation dyad.
3. *Substantive*—A continuous measure of the substantive connection between occupations and major fields that is constructed from information about the knowledge requirements of jobs within occupational categories.

I use these measures of major-occupation connection in conjunction with a measure of occupation-specific requirements for level of educational attainment to model the prevalence of educational utilization among college-educated workers.

4. Data and methods

4.1. Data for the operationalization of educational attainment requirement and major-occupation links

Operationalization of the empirical measures of educational requirement and education-occupation linkage requires four types of occupation-specific data: (1) information on the required level of education, (2) a measure of the flow of individuals to specific occupations from specific degrees and majors, (3) individual-level assessments of degree-occupation relatedness by incumbents within all possible parings of detailed classifications of degree majors and occupations, and (4) information on the knowledge requirements in specific subject areas that can be linked to college majors.

The second and third of these data demands are satisfied by the 1993 and 2003 waves of the *National Surveys of College Graduates* (NSCG93 and NSCG03). The NSCG93 and NSCG03 provide nationally representative survey data for college-edu-

cated individuals identified in the 1990 (for the NSCG93) and 2000 (for the NSCG03) Censuses. The NSCG93 sample included 215,000 individuals under age 75 working in all occupational fields and holding a bachelor's degree or higher in all fields of study, although those working in science and engineering fields were oversampled (NSF, 1997). The NSCG03 sample consists of 170,797 individuals under age 75 drawn from the 2000 Decennial Census long form respondents who indicated they had a baccalaureate degree or higher in any field of study, again with an oversample of those working in science and engineering fields. Two important aspects of the NSCG surveys recommend it for this study. First, these studies include detailed information about the employment characteristics, degree attainment, and field of post-secondary study for college graduates. Second, both data cohorts include a self-report measure of the relatedness of the respondents' occupations to the major field of their most recent degree. This survey item supports the *subjective* operationalization of major-occupation connection.

For the operationalization of major-occupation linkages, I extracted samples from the NSCG93 and NSCG03 that include all respondents who are U.S. citizens, aged 25–50 years, who had attained a bachelor's, master's, professional or doctoral degree 10–24 years prior to the survey date, who reported being employed at the time of the survey and who provided valid information about their college major, their occupation, and a valid response to a survey item soliciting their subjective assessment of the extent to which their major and job are related. The sample drawn from the NSCG93 using these selection criteria consists of 44,348 individuals who earned their degrees in the years 1970–1984. Applying these conditions to the NSCG03 data yields a sample of 28,253 individuals who earned their degrees in the years 1980 to 1994.

The first and fourth data requirement for the multiple operationalizations of major-occupation linkages are satisfied by the *O∗NET Occupational Information Network 12.0 Database* (O∗NET). The O∗NET is the online successor to the *Dictionary of Occupational Titles*. The database contains detailed information about the characteristics, requirements and activities of a broad range of occupational and worker attributes for jobs classified according to the 2000 Standard Occupational Classification (SOC) system (Boese et al., 2001). While early versions of the O∗NET relied on job analyst ratings, the most recent versions of the O∗NET gather information on job and worker attributes from representative surveys of job incumbents. The O∗NET provides a job-specific measure of the educational requirements and requirements for knowledge in 33 subject areas that correspond to commonly-identified degree fields. This data supports the operationalization of the *substantive* measure of major-occupation connection.

4.2. Data for modeling educational utilization and testing for sex differences

The NSCG93 and NSCG03 data also provide the analytical sample I use to both assess the explanatory power of the multiple measures of major-occupation linkages and to measure sex differences in the utilization of educational capital at the transition to the labor market. The analytical samples include individuals aged 23–35 who were employed in the civilian labor force at the time of the 1993 or 2003 survey, and who had attained a bachelor's, master's, professional or doctoral degree within the 9 years preceding the survey—i.e., degrees earned in the years 1985 through 1993 for the NSCG93 and in the years 1995 through 2003 for the NSCG03. All analyses are estimated using an analytical data file that pools the two cohorts and respondents at all degree levels. After excluding respondents with incomplete information on occupation, sex, type of degree and degree major, the NSCG93 sample includes 22,676 individuals, and the NSCG03 sample includes 9958 individuals. I note that these NSCG93 and NSCG03 analytical samples are exclusive of the samples of degree-holders used for the operationalization, so the subjective assessments of major-occupation connections provided by the respondents included in the operationalization samples are exogenous to the behavior of the survey respondents included in the analytic sample.

While the selection criteria I impose limit the generalizability of the findings, they are justified on empirical grounds. Focusing on the experiences of new entrants to the labor force, i.e., young people who had recently earned a degree (within 9 years of the survey), controls the influence of two factors that confound the measurement of sex differences in educational utilization: (1) cohort differences in characteristics such as human capital investments, labor market experiences and orientations toward work, and (2) the sorting influences of the labor market. Excluding older cohorts of degree recipients therefore limits the potential for upwardly biased estimates of sex differences in educational utilization since men and women in younger cohorts are likely to be more homogeneous than those in older cohorts with respect in their educational investments and work orientations. In addition, assessing sex differences among young workers parses the influence of labor market sorting mechanisms that intensify sex segregation over the life course (Jacobs, 1989) and allows a focused investigation of the sex differences that occur as people make the transition from degree attainment to the labor force.

The inclusion of part-time workers can potentially introduce bias into the analysis because occupational placement may be endogenous to labor force attachment since the possibility of working part-time is not evenly distributed across all occupations. Furthermore, since part-time work is associated with sex, including all workers introduces an influence that may confound the measurement of sex differences in occupational placement. To test for this potential bias, I conduct all analyses separately for the full sample of workers and for the subsample of full-time workers that excludes any NSCG respondent who reports working part-time.[2] Restricting the analysis to full-time workers does not affect the analytical results, so I present only the result for the sample that includes both full- and part-time workers.[3]

[2] The NSCG indicator of full- or part-time worker status is self-reported and coded as a discrete categorical variable that does not reference a specific number of hours worked threshold.

[3] The results based on the subsample that includes only full-time workers are available upon request from the author.

4.3. Individual-level variables

Table 1 presents the distribution of the analytical sample by sex, degree level and degree major. Appendix Table 1 presents the same distribution for the operationalization sample.

4.3.1. Sex

Sex is represented by the dichotomous variable SEX, which is coded 1 for females and zero otherwise. Women account for 51.03% of the analytical sample of recent graduates who are employed full-time in the labor force. Women are slightly overrepresented (51.87%) among the NSCG respondents who have attained only a bachelor's degree, and they are slightly underrepresented among post-baccalaureate degree-holders (47.88%).

4.3.2. Degree level

The variable DEGREE identifies college graduates whose highest degree is a bachelor's degree and those who had earned a post-baccalaureate degree—master's, professional or doctoral. I distinguish these two levels of degree attainment for both the operationalization of the occupation-level measures of major-occupation connection and for the analysis of sex differences in educational utilization. For the analytical sample of new labor force entrants, 79.04% of the recent graduates had earned a bachelor's degree and 20.96 had earned a post-graduate degree (see Table 1). Women are slightly overrepresented among the baccalaureates and underrepresented among those graduates earning master's, professional or doctoral degrees.

4.3.3. Degree field

The major field in which each respondent earned his/her degree (MAJOR) is coded according to a 24-category classification that collapses the detailed coding scheme of major fields available in the NSCG data. Appendix A lists the 24 major field categories used for this analysis along with the detailed NSCG93 and NSCG03 codes collapsed into each.

Table 1 presents the distribution of NSCG respondents across the 24 major fields separately for males and females and by degree level. Among the two cohorts of recent college graduates whose early occupational attainment is the focus of this study, the most common majors are in business, which accounts for almost a quarter of the pooled NSCG sample (23.45%), education (11.52%), health/medical (8.53%), and engineering (7.46%). There is a significant amount of sex segregation across the 24 major fields. The index of dissimilarity for the pooled NSCG sample is 0.296, indicating that 30% of men or women would have to change their major to attain a proportionate distribution of college graduates major field. The degree of major field sex segregation as is measured by the index of dissimilarity does not vary by degree level or cohort. The index values are 0.294 for the NSCG respondents whose terminal degree is a baccalaureate and 0.314 for those who have earned a post-graduated degree. The cohort-specific values of the index are 0.294 and 0.297, respectively, for the 1993 and 2003 NSCG cohorts.

Attaining degrees in education and health/medical majors, in contrast, is much more common among women than among men: education majors account for 17.11% of women compared to only 5.70% of men; the comparable percentages are 11.62 and 5.31 for the health and medical majors. The converse is true of engineering, which is much more popular among men than women: 12.89% of all male graduates earned their degree in an engineering field compared to only 2.24% of female graduates. The uneven distribution of men and women across major fields is reflected in the variation of the percent female. This statistic varies from a low of 15.31 (engineering) to a high of 75.78 (education). Taking 70% or more female as an indication that a field is female-dominated and 30% or less as an indication that a field is male-dominated, three of the major categories can be considered female-dominated—education, psychology, and social work—and five can be labeled male-dominated—architecture and environmental design, computer and information sciences, engineering, philosophy and religious studies, and the physical sciences.

With a few exceptions, the patterns in the distribution of degree fields are characteristic of both levels of degree attainment. Among individuals who hold only a bachelor's degree, the most common majors are business, education, engineering and health/medical and the female- and male-dominated majors are the same as those identified as such for the pooled sample. Among those graduates who hold a post-baccalaureate degree, the most common fields are business, education, health/medical and law. Undergraduate degrees in business majors are about equally common for men and women, accounting for 27.38% and 21.60% of bachelor's degrees respectively, whereas men are much more likely to attain an advanced degree in business than are women (25.24% for men versus 14.17% women). At both degree levels, women are much more likely to major in education, but the magnitude of difference is much greater at the post-baccalaureate level. And while the health/medical field is clearly a female-dominated at the undergraduate level, the representation of men and women is more equal among those earning health/medical post-baccalaureate degrees (13.09% of men and 15.34% of women). Finally, in the cohorts of recent graduates that I examine, men are more likely than women to earn law degrees (11.74% of men versus 8.30% of women).

4.3.4. Occupational attainment

The occupational attainment (OCC) of each NSCG sample respondent is measured using the NSCG occupation codes harmonized between the 1993 and 2003 surveys and collapsed to 67 separate occupational categories. These categories are listed in Appendix Table 2, which presents the distribution of the analytical and operationalization samples by occupational category. For this analysis, the full set of 67 occupations defines the choice set for each individual in the analytical sample, since every occupation was entered by at least one NSCG respondent.

Table 1
Percent distribution of analytical sample by degree level, labor force attachment, and degree field, separately by sex.

	Full sample				Baccalaureate degree-holders				Post-baccalaureate degree-holders			
	Total	Males	Females	%Female	Total	Males	Females	%Female	Total	Males	Females	%Female
Sample size (n)	32,634	15,980	16,654	51.03	22,510	10,834	11,676	51.87	10,124	5,277	4847	47.88
Degree level												
Bachelor's	79.04	77.69	80.33***	51.87								
Master's, professional or doctoral	20.96	22.31	19.67***	47.88								
Labor force attachment												
Full-time	91.19	95.67	86.89***	48.63	91.73	96.39	87.40***	49.42	89.14	93.13	84.80***	45.55
Part-time	8.81	4.33	13.11***	75.91	8.27	3.61	12.60***	79.01	10.86	6.87	15.20***	67.01
Degree field												
Agriculture, natural resources and forestry	1.26	1.65	0.88***	35.76	1.27	1.74	0.84***	34.37	1.20	1.35	1.04	41.34
Architecture and environmental design	0.80	1.14	0.46***	29.75	0.78	1.19	0.41***	27.27	0.84	0.99	0.67	38.55
Business and marketing	23.45	26.90	20.14***	43.82	24.38	27.38	21.60***	45.94	19.94	25.24	14.17***	34.03
Journalism and communications	4.43	3.87	4.98***	57.28	5.29	4.71	5.83***	57.16	1.19	0.93	1.48*	59.36
Computer and information sciences	3.40	4.92	1.95***	29.18	3.77	5.57	2.10***	28.84	2.02	2.65	1.33***	31.61
Education	11.52	5.70	17.11***	75.78	9.86	4.93	14.44***	75.95	17.78	8.39	28.01***	75.41
Engineering	7.46	12.89	2.24***	15.31	7.83	13.78	2.31***	15.30	6.04	9.81	1.94***	15.35
Foreign languages	0.78	0.55	1.01***	65.54	0.85	0.60	1.09***	66.11	0.53	0.38	0.68*	62.02
Health and medical	8.53	5.31	11.62***	69.51	7.04	3.08	10.71***	78.95	14.17	13.09	15.34**	51.84
Law	2.39	2.95	1.85***	39.50	0.34	0.43	0.27*	40.46	10.09	11.74	8.30***	39.38
English	2.94	2.19	3.66***	63.54	3.32	2.49	4.08***	63.86	1.52	1.14	1.94**	60.90
Biology	4.68	4.41	4.94*	53.83	5.16	4.81	5.48*	55.11	2.89	3.03	2.73	45.26
Math	1.28	1.40	1.16	46.27	1.33	1.41	1.26	48.93	1.08	1.37	0.76**	33.84
Philosophy, religious studies	1.36	2.20	0.57***	21.16	1.06	1.73	0.45***	21.76	2.50	3.83	1.06***	20.20
Physical sciences	2.08	3.05	1.14***	28.08	1.96	2.88	1.10***	29.21	2.55	3.68	1.32***	24.79
Psychology	4.59	2.70	6.42***	71.26	4.69	2.66	6.57***	72.72	4.25	2.84	5.79***	65.22
Protective services	1.23	1.43	1.03**	42.90	1.50	1.80	1.22***	42.10	0.21	0.14	0.28	64.65
Social work, public administration	2.23	1.27	3.14***	72.00	1.85	1.03	2.62***	73.32	3.64	2.13	5.29***	69.47
Economics	1.47	2.01	0.95***	32.87	1.69	2.32	1.11***	33.92	0.62	0.93	0.29***	22.11
History	1.87	2.57	1.20***	32.73	2.20	3.08	1.39***	32.65	0.61	0.78	0.43*	33.81
Sociology	1.79	1.36	2.21***	62.81	2.16	1.70	2.60***	62.26	0.40	0.20	0.61***	74.10
Other social sciences	4.08	4.08	4.09	51.06	4.74	4.79	4.69	51.30	1.61	1.59	1.63	48.47
Commercial art, visual and performing arts	4.18	3.53	4.81***	58.68	4.64	3.87	5.37***	59.94	2.42	2.34	2.51	49.57
Other fields	2.19	1.90	2.47***	57.50	2.27	2.04	2.48	56.76	1.90	1.43	2.42***	60.82

*$p \leqslant 0.05$, **$p \leqslant 0.01$, ***$p \leqslant 0.001$, for two-tailed test of sex differences.

Appendix Table 1
Percent distribution of operational sample file by degree level, labor force attachment, and degree field, separately by sex.

	Full sample				Baccalaureate degree-holders				Post-baccalaureate degree-holders			
	Total	Males	Females	%Female	Total	Males	Females	%Female	Total	Males	Females	%Female
Sample size (n)	80,455	43,895	36,560	45.44	61,532	32,926	28,606	46.49	18,923	11,352	7571	40.01
Degree level												
Bachelor's	83.81	82.20	85.75***	46.49								
Master's, professional or doctoral	16.19	17.80	14.25***	40.01								
Labor force attachment												
Full-time	89.10	97.50	79.01***	40.30	88.50	97.41	78.24***	41.10	92.19	97.90	83.63***	36.30
Part-time	10.90	2.50	20.99***	87.48	11.50	2.59	21.76***	87.96	7.81	2.10	16.37***	83.86
Degree field												
Agriculture, natural resources and forestry	1.50	1.99	0.91***	27.67	1.59	2.13	0.96***	28.06	1.06	1.33	0.65***	24.57
Architecture and environmental design	0.94	1.32	0.48***	23.31	0.96	1.35	0.50***	24.46	0.84	1.17	0.35***	16.57
Business and marketing	23.09	27.59	17.70***	34.82	25.13	30.00	19.52***	36.12	12.56	16.45	6.71***	21.39
Journalism and communications	3.94	3.48	4.49***	51.76	4.47	4.01	5.01***	52.04	1.18	1.06	1.37	46.29
Computer and information sciences	2.53	3.24	1.69***	30.22	2.78	3.59	1.84***	30.81	1.26	1.61	0.74***	23.45
Education	13.41	6.96	21.15***	71.67	11.39	5.40	18.29***	74.65	23.89	14.20	38.41***	64.34
Engineering	8.23	13.37	2.05***	11.34	8.82	14.57	2.21***	11.64	5.16	7.85	1.13***	8.73
Foreign languages	0.97	0.54	1.48***	69.50	0.97	0.53	1.48***	71.00	0.96	0.62	1.49***	61.68
Health and medical	7.47	4.35	11.22***	68.25	6.52	2.40	11.27***	80.30	12.40	13.35	10.97***	35.40
Law	1.86	2.49	1.10***	26.89	0.32	0.29	0.36	52.01	9.82	12.67	5.55***	22.61
English	2.77	2.05	3.63***	59.65	2.91	2.16	3.78***	60.37	2.00	1.53	2.72***	54.23
Biology	4.36	4.54	4.16**	43.30	4.57	4.75	4.37*	44.46	3.28	3.56	2.86**	34.89
Math	1.57	1.80	1.29***	37.45	1.60	1.85	1.32	38.35	1.37	1.55	1.09**	31.97
Philosophy, religious studies	1.36	1.96	0.65***	21.75	1.05	1.48	0.56***	24.84	2.97	4.16	1.19***	16.08
Physical sciences	2.24	3.10	1.22***	24.77	2.16	2.96	1.25***	26.78	2.66	3.71	1.08***	16.30
Psychology	4.06	2.84	5.52***	61.78	3.94	2.66	5.41***	63.81	4.67	3.67	6.18***	52.92
Protective services	1.08	1.26	0.87**	36.54	1.21	1.41	0.97***	37.36	0.41	0.52	0.24**	23.95
Social work, public administration	1.99	1.26	2.87***	65.53	1.68	0.94	2.52***	70.04	3.61	2.73	4.93***	54.67
Economics	1.75	2.41	0.95***	24.72	1.96	2.75	1.05***	25.02	0.66	0.88	0.33***	20.18
History	1.98	2.41	1.46***	33.50	2.14	2.65	1.56***	33.85	1.13	1.32	0.85**	30.01
Sociology	1.80	1.45	2.23***	56.14	2.03	1.64	2.48***	56.82	0.63	0.58	0.71	44.89
Other social sciences	4.42	4.36	4.48	46.12	4.88	4.88	4.88	46.52	2.03	1.99	2.09	41.16
Commercial art, visual and performing arts	4.20	3.40	5.16***	55.86	4.49	3.64	5.46***	56.56	2.71	2.26	3.38***	49.92
Other fields	2.47	1.84	3.23***	59.39	2.42	1.97	2.93*	56.47	2.74	1.25	4.99***	72.72

*$p \leqslant 0.05$, **$p \leqslant 0.01$, ***$p \leqslant 0.001$, for two-tailed test of sex differences.

The value of the index of dissimilarity for occupational segregation for the pooled sample is 0.344, indicating that occupational sex segregation is more intense than is the segregation of college majors. The occupational attainment of workers who hold a post-baccalaureate degree is more segregated by sex, with an index value of 0.369, than is the occupational attainment of baccalaureates, for whom the segregation index is 0.342. Also, the cohort-specific segregation indices show a slight intensification of occupational segregation: for the cohort of workers surveyed in 1993 the segregation index is 0.339; the value increased to 0.357 for the cohort interviewed in 2003.

4.4. Occupation-level variables

The central hypothesis underlying this exploratory analysis of educational utilization is that the each college graduate's likelihood of employment in any one of the 67 occupational categories depends on the degree of affinity between the occupation and the individual's educational background. To test this hypothesis, I generate measures of education-occupation connection, based on the empirical approaches to operationalization described above and the NSCG operationalization sample and O∗NET data sources, for each possible major-occupation dyad. When possible, the measures of major-occupation connection are specific to degree level and/or to cohort as well.

4.4.1. Educational requirement

I measure the level of education requirement, EDREQ, of each of the 67 occupational categories that the new labor force entrants may enter with worker-reported data from the O∗NET. Surveyed workers identified the level of education, from a list that distinguishes 12 levels of certification or degree attainment, "that is required to perform their job" (Boese et al.,

Appendix Table 2
Percent distribution of analytical sample by occupational category, separately by sex and degree field.

	Analytical sample				Operationalization sample				Baccalaureate degree-holders				Post-baccalaureate degree-holders			
	Total	Males	Females	%Female	Total	Males	Females	%Female	Total	Males	Females	%Female	Total	Males	Females	%Female
Sample size (n)	29,945	15,383	14,562	48.63	80,455	43,895	36,560	45.44	20,847	10,544	10,303	49.42	9098	4954	4144	45.55
Occupation																
Computer and information scientists, researchers	5.67	8.30	3.15	28.32	5.57	7.33	3.47	28.28	6.25	9.30	3.42	28.40	3.50	4.85	2.03	27.79
Mathematicians	0.27	0.32	0.22	42.26	0.21	0.19	0.23	50.92	0.16	0.18	0.14	44.55	0.68	0.79	0.58	40.24
Agricultural and food scientists	0.20	0.26	0.14	35.33	0.18	0.24	0.12	29.28	0.16	0.22	0.10	33.63	0.33	0.39	0.27	38.43
Biochemists and biophysicists	0.91	0.95	0.86	48.59	0.54	0.58	0.50	41.62	0.70	0.67	0.73	53.93	1.68	1.92	1.41	40.15
Medical scientists, except practitioners	0.53	0.56	0.51	48.93	0.43	0.41	0.46	48.39	0.43	0.39	0.46	56.08	0.93	1.13	0.71	36.46
Forestry and conservation scientists	0.11	0.18	0.04	20.19	0.11	0.18	0.03	10.41	0.10	0.18	0.02	10.67	0.18	0.20	0.15	39.63
Chemists, except biochemists	0.58	0.68	0.47	41.94	0.38	0.48	0.25	30.45	0.53	0.59	0.48	46.77	0.75	1.02	0.45	29.04
Atmospheric and space scientists	0.10	0.12	0.07	36.89	0.06	0.08	0.04	27.22	0.07	0.07	0.07	51.86	0.18	0.30	0.05	13.87
Geologists	0.20	0.29	0.10	27.04	0.19	0.30	0.06	15.26	0.13	0.20	0.07	26.28	0.43	0.60	0.25	27.93
Astronomers	0.16	0.29	0.05	14.61	0.09	0.14	0.03	15.97	0.05	0.10	0.01	9.61	0.58	0.93	0.20	16.35
Other physical and related scientists	0.14	0.14	0.13	49.22	0.10	0.13	0.06	26.21	0.12	0.12	0.13	55.25	0.18	0.23	0.13	33.82
Economists	0.18	0.28	0.09	25.12	0.13	0.16	0.09	32.05	0.11	0.15	0.07	33.28	0.47	0.74	0.18	18.23
Psychologists	0.78	0.49	1.06	69.50	0.60	0.41	0.82	62.47	0.33	0.18	0.47	73.48	2.47	1.54	3.48	67.50
Sociologists	0.09	0.06	0.12	67.88	0.06	0.04	0.08	58.62	0.07	0.05	0.10	68.10	0.15	0.09	0.21	67.47
Other social scientists	0.67	0.61	0.73	55.56	0.35	0.37	0.33	42.80	0.56	0.45	0.67	61.35	1.09	1.17	1.01	44.27
Aerospace, aeronautical or astronautical engineers	0.30	0.51	0.08	14.64	0.28	0.46	0.08	11.97	0.24	0.41	0.07	15.16	0.52	0.86	0.15	13.75
Chemical engineers	0.32	0.45	0.20	32.02	0.24	0.37	0.08	14.90	0.31	0.43	0.20	32.91	0.39	0.52	0.24	29.35
Civil, architectural or sanitary engineers	0.79	1.29	0.31	20.07	0.69	1.12	0.17	11.10	0.87	1.42	0.36	21.29	0.50	0.84	0.13	12.03
Electrical and electronics engineers	1.12	2.04	0.23	10.49	1.00	1.70	0.17	7.64	1.08	1.99	0.23	10.93	1.27	2.22	0.24	9.09
Industrial engineers	0.32	0.55	0.10	15.80	0.26	0.41	0.07	12.99	0.33	0.57	0.10	15.62	0.30	0.48	0.10	16.53
Mechanical engineers	1.01	1.86	0.20	10.07	0.85	1.47	0.11	5.86	1.04	1.97	0.18	8.95	0.91	1.49	0.28	14.88
Materials and metallurgical engineers	0.23	0.40	0.07	15.16	0.18	0.28	0.05	13.44	0.21	0.37	0.06	13.96	0.33	0.52	0.12	18.01
Petroleum engineers	0.03	0.07	0.00	5.63	0.06	0.11	0.01	10.40	0.03	0.05	0.00	8.69	0.06	0.11	0.00	0.00
Sales engineers	0.18	0.32	0.05	14.01	0.29	0.50	0.05	7.89	0.20	0.35	0.06	15.43	0.12	0.22	0.01	5.34
Other engineers	1.05	1.67	0.45	22.16	0.97	1.52	0.31	14.37	0.97	1.62	0.37	19.61	1.35	1.84	0.82	29.04
Diagnosing and treating health practitioners	2.79	3.69	1.92	35.22	2.89	3.79	1.81	28.43	1.26	1.58	0.96	39.47	8.56	11.03	5.87	32.86
Registered nurses, pharmacists, dieticians	5.40	1.68	8.97	84.75	4.74	1.38	8.78	84.11	5.71	1.83	9.32	84.57	4.22	1.16	7.56	85.68
Health technologists and technicians	1.07	0.53	1.59	75.73	0.96	0.46	1.57	73.92	1.28	0.64	1.88	76.08	0.27	0.16	0.39	69.40
Other health occupations	1.06	0.56	1.54	73.97	0.81	0.53	1.16	64.63	1.14	0.63	1.61	73.44	0.77	0.34	1.24	76.92
Technologists/technicians in the biological/life sciences	0.26	0.24	0.28	54.64	0.14	0.10	0.19	60.84	0.29	0.26	0.32	56.90	0.13	0.16	0.10	35.60
Computer programmers	1.30	1.88	0.74	29.07	0.92	1.12	0.67	33.35	1.43	2.11	0.80	28.96	0.81	1.10	0.51	29.80
EE, Indus, mech technologists/technicians	0.24	0.43	0.06	12.04	0.25	0.42	0.05	9.73	0.27	0.49	0.07	13.38	0.11	0.22	0.00	0.00
Drafting occupations	0.12	0.18	0.07	27.31	0.12	0.13	0.11	42.36	0.15	0.22	0.08	27.26	0.04	0.05	0.02	28.20
Surveying/mapping engineers technicians	0.07	0.12	0.02	14.28	0.08	0.13	0.02	9.21	0.08	0.15	0.02	11.85	0.02	0.01	0.02	57.02
Other engineers technologists/technicians	0.31	0.42	0.21	33.67	0.32	0.42	0.20	28.28	0.34	0.47	0.21	32.92	0.22	0.26	0.17	37.96
Architects	0.64	0.95	0.35	27.49	0.53	0.75	0.26	22.34	0.66	1.02	0.33	26.00	0.55	0.70	0.40	34.26
Actuaries	0.11	0.13	0.09	40.71	0.08	0.09	0.06	36.64	0.13	0.16	0.11	42.42	0.03	0.05	0.01	12.43
Top-level managers, executives, administrators	4.66	6.42	2.97	32.57	8.61	11.93	4.62	24.38	3.56	5.11	2.13	31.05	8.80	10.99	6.41	34.90
Other mid-level managers	5.04	5.79	4.32	43.75	6.38	7.14	5.48	39.01	5.54	6.58	4.58	42.85	3.17	3.06	3.29	49.68
Accountants, auditors, other financial services	7.64	8.14	7.15	47.81	6.73	6.92	6.50	43.89	8.31	8.67	7.97	49.76	5.10	6.28	3.81	35.78
Personnel, training and labor relations	1.78	0.94	2.59	74.23	1.53	1.14	2.01	59.38	1.96	1.12	2.73	72.47	1.12	0.31	2.01	85.81
Teachers—pre-K and kindergarten	1.08	0.06	2.07	97.27	1.35	0.04	2.92	98.48	1.17	0.08	2.18	96.80	0.76	0.00	1.59	100.00
Teachers—elementary school	5.16	1.44	8.73	86.31	4.73	1.10	9.09	87.27	5.04	1.57	8.27	85.05	5.61	1.02	10.62	90.55
Teachers—secondary, other subjects	4.38	4.06	4.68	54.55	4.47	3.64	5.46	55.52	4.30	3.99	4.58	55.31	4.67	4.31	5.06	51.91

(*continued on next page*)

Appendix Table 2 (*continued*)

	Analytical sample				Operationalization sample				Baccalaureate degree-holders				Post-baccalaureate degree-holders			
	Total	Males	Females	%Female	Total	Males	Females	%Female	Total	Males	Females	%Female	Total	Males	Females	%Female
Teachers—special education	1.65	0.49	2.76	85.46	1.49	0.42	2.77	84.58	1.36	0.39	2.25	86.24	2.75	0.84	4.83	84.01
Teachers—other precollegiate education	0.24	0.14	0.33	71.08	0.31	0.12	0.52	77.65	0.25	0.16	0.33	69.00	0.21	0.08	0.35	80.40
Post-sec teachers—other non-S&E	1.77	1.50	2.03	58.42	1.65	1.28	2.11	57.94	1.16	0.91	1.39	62.20	4.06	3.56	4.61	54.34
Clergy and other religious workers	0.88	1.45	0.32	18.67	0.83	1.23	0.36	19.57	0.67	1.11	0.26	20.29	1.65	2.66	0.56	16.21
Counselors, educational and vocational	1.19	0.61	1.74	74.73	0.97	0.48	1.55	72.80	1.03	0.57	1.46	73.35	1.77	0.75	2.87	77.78
Social workers	2.18	0.85	3.45	80.83	1.59	0.76	2.60	74.07	2.06	0.81	3.23	81.14	2.63	1.01	4.38	79.90
Sales/mrkt.—insurance, securities, real estates	3.15	3.84	2.49	40.35	3.47	4.42	2.34	30.57	3.67	4.51	2.90	40.90	1.17	1.49	0.83	33.78
Sales occupations—retail	7.92	8.47	7.40	47.67	8.02	9.34	6.44	36.49	9.15	9.74	8.59	48.73	3.30	4.02	2.52	36.53
Artists, editors, entertainers, public relations	3.59	3.78	3.40	48.34	3.68	3.15	4.31	53.24	3.95	4.28	3.65	47.92	2.22	2.08	2.37	51.21
Accounting clerks and bookkeepers	0.82	0.48	1.14	71.37	0.90	0.24	1.70	85.76	1.00	0.61	1.36	70.54	0.13	0.01	0.26	95.33
Secretaries, receptionists and typists	1.44	0.35	2.48	88.19	1.20	0.10	2.52	95.48	1.69	0.40	2.89	88.56	0.48	0.15	0.84	83.29
Other administrative	3.24	2.34	4.11	64.71	2.99	1.99	4.20	63.74	3.86	2.83	4.83	64.81	0.91	0.64	1.19	63.09
Farmers, foresters and fishermen	0.29	0.48	0.11	19.37	0.43	0.66	0.16	16.34	0.33	0.54	0.13	20.62	0.15	0.26	0.03	8.99
Lawyers and judges	3.39	3.93	2.88	43.28	3.26	4.12	2.23	31.06	1.60	1.66	1.54	50.07	10.14	11.82	8.31	39.25
Librarians, archivists and curators	0.40	0.29	0.50	64.73	0.57	0.26	0.93	74.63	0.31	0.24	0.37	62.64	0.73	0.45	1.04	68.07
Food preparation and service workers	0.83	0.75	0.90	55.62	0.72	0.64	0.81	51.22	0.98	0.90	1.06	56.06	0.25	0.25	0.26	49.10
Protective service workers	1.39	2.29	0.52	19.28	1.33	2.03	0.49	16.75	1.64	2.78	0.59	18.66	0.42	0.58	0.25	28.38
Other service occupations, except health	1.82	1.41	2.22	62.15	1.52	1.14	1.97	58.93	2.14	1.67	2.58	62.49	0.61	0.50	0.73	57.61
Construction trades, miners and well-drillers	0.63	1.15	0.13	10.62	0.91	1.59	0.10	4.75	0.75	1.38	0.16	11.32	0.18	0.35	0.00	0.00
Mechanics and repairers	0.31	0.59	0.05	7.56	0.62	1.01	0.14	10.42	0.40	0.76	0.06	7.62	0.01	0.02	0.00	0.00
Precision production occupations	0.81	1.12	0.52	32.48	1.08	1.44	0.64	26.85	0.98	1.36	0.62	32.98	0.18	0.27	0.09	22.50
Transportation and material-moving occupations	0.64	1.09	0.22	17.14	0.97	1.55	0.28	13.08	0.79	1.35	0.26	17.02	0.10	0.16	0.04	20.47
Other occupations	2.36	2.22	2.50	54.00	1.99	1.80	2.22	50.76	2.56	2.33	2.78	56.23	1.60	1.83	1.36	40.56

2001). I recode the categorical classification scheme into the equivalent years of educational attainment and calculate EDREQ as the mean years of required education reported among surveyed workers in each occupational category.[4] The value of EDREQ varies by occupation only. The minimum value of EDREQ is 11.67 and the maximum is 20.03; the mean is 15.48 with a standard deviation of 2.12.

4.4.2. Flow

I operationalize the size of the flow of college graduates from each major to each occupation using the NSCG operationalization data. For every possible major-occupation dyad, FLOW is the percent of all incumbents on the occupation who earned their degree in the particular major. This variable is operationalized separately by cohort and degree level and is linked to the individual-level data by cohort, degree level and major. It therefore measures a characteristic of each occupation that is particular to the degree level, major field, and contemporary time period of each individual in the analytical sample.

4.4.3. Subjective

The subjective assessments of major-occupation connections are supplied by responses to a survey item that was included in both the 1993 and 2003 NSCG surveys. This survey item read, "To what extent was your work on your principal job held during the week of (survey reference date) related to your highest degree?" Responses were coded as "Closely related," "Somewhat related," or "Not related." The variable SUBJECTIVE is operationalized as the percent of respondents, identified by each possible combination of the 24-category MAJOR classification and the 67-category OCC classification, degree level, and cohort, who report that their occupation is "Closely related" to their college major. All data are weighted prior to aggregation to account for the sampling design of the NSCG93 and NSCG03. The values of SUBJECTIVE can ranges between 0 and 100, and since small cell sizes can produce highly variable estimates with low reliability, SUBJECTIVE is coded to 0 for combinations of DEGREE, MAJOR and OCC that are experienced by fewer than 5 individuals within each cohort. This variable is linked to the individual-level data by COHORT, DEGREE and MAJOR. It therefore provides a measure of education-occupation affinity that is particular to the degree level and major field of each individual in the analytical sample.

4.4.4. Substantive

The substantive assessments of major-occupation association are attained from the O*NET. The O*NET provides a 2-dimensional measure of job-level requirements for worker knowledge in 33 domains that are listed in Appendix B. The first dimension is a worker report of the LEVEL of education required for job performance that is collected via the survey question, "What level of knowledge in (particular knowledge domain) is needed to perform your current job?" Responses to this question are coded using a 7-point scale. The second dimension is an incumbent-worker rating, using a 5-point scale, of the job-related IMPORTANCE of knowledge in each area. This variable is collected using the survey question, "How important is knowledge (in a particular domain) to the performance of your current job?" I combine the two dimensions into a single quantitative measure, SUBSTANTIVE, for each domain area, k, by rescaling the LEVEL measure to a 0–100 scale and the IMPORTANCE measure to a 0–1 range and then weighting the rescaled LEVEL value by the rescaled value of IMPORTANCE.[5] This calculation yields a set of 33 variables for each occupation, each with a potential range of 0–100, which indicate the level of job-specific demand for knowledge in a specific domain, scaled by the importance of that knowledge for job completion. A score of 0 thus indicates that a job requires not more than the most basic level of knowledge in a particular domain and that the knowledge is not important for job completion. A score of 100 indicates that the highest level of knowledge is required and that the knowledge is essential for job completion.

The O*NET data are measured at the detailed occupation level using the SOC occupational codes. I collapse this information to be consistent with the 67-category NSCG occupational coding scheme and use the mean of the knowledge variables within the aggregated categories as the measure of occupational demand for knowledge in each of the general domains.[6] I then equate each SUBSTANTIVE_k variable with one of the 24 degree fields distinguished by MAJOR based on the assumption that completing a degree in a given field imparts the specific knowledge that is the identified by the SUBSTANTIVE_k variable. A one-to-one correspondence between a SUBSTANTIVE_k and a category of MAJOR is obvious for 20 of the major fields. For the remaining 4 fields, a linear combination (mean) of 2 or 3 knowledge variables seemed the most appropriate measure of the knowledge imparted through study in the major. The equivalence of major fields and knowledge variables is specified in Appendix B. These variables are then linked to the individual-level data by major and occupation, such that for each individual in the analytical data file, each occupation is linked to the SUBSTANTIVE_k variable that corresponds to the individual's major. This linkage yields a value of SUBSTANTIVE for each occupation that is specific to the major of each individual.

[4] The categories are recoded to years of education using the following equivalents: 1 "Less than high school" = 10; 2 "High school diploma" = 12; 3 "Post-secondary certificate" = 13; 4 "Some college courses" = 13; 5 "associates degree" = 14; 6 "Bachelor's degree" = 16; 7 "Post-baccalaureate certificate" = 17; 8 "Masters degree" = 18; 9 "Post-masters degree" = 19; 10 "First professional degree" = 19; 11 "Doctoral degree" = 20; 12 "Post-doctoral degree" = 22.

[5] More formally, the scale variables for each domain area, k, SUBSTANTIVE_k is created using the following formula: $\text{SUBSTANTIVE}_k = ((\text{LEVEL}_k \div 7) * 100) * (\text{IMPORTANCE}_k \div 5)$.

[6] Information about the SOC codes collapsed to each of the 67 occupational categories used for this analysis is available from the author.

4.5. Methods: multivariate method for estimating educational utilization

This analysis of sex differences in educational utilization proceeds in two parts. I first compare the explanatory power of the three empirical operationalizations of major-occupation connection to assess educational utilization and to test the possibility that the multiple measures can be combined to produce a single scale of the strength of major-occupation linkages. In the second part of the analysis, I use the combined measure of major-occupation connection, in conjunction with the measure of occupation-specific requirements for level of educational attainment, to test if there are sex differences in educational utilization at the transition to the labor market after degree completion. I also test for variation in the observed sex differences across two levels of degree attainment and two cohorts of recent college graduates.

Since I conceptualize educational utilization as the attainment of employment in an occupation that is related to one's education, I analyze educational utilization using a conditional logit model that estimates the degree to which occupational attainment is associated with each of the measures of major-occupation connection (Hoffman and Duncan, 1988; Long, 1997; McFadden, 1974; Powers and Xie, 2000). Let P_{ik} denote the probability that the ith individual enters the kth occupation, with $i = 1, 2, N$, and $k = 1, 2, \ldots J$, where N is the sample size, and J is the set of 67 available occupations. Let x_{ij} denote a vector of explanatory variables that are specific to each individual and each occupational outcome. The choice probability is specified as:

$$P_{ik} = \frac{\exp(x'_{ik}\beta)}{\sum_{j=1}^{J}\exp(x'_{ij}\beta)}. \tag{1}$$

I test the relative power of the occupation-specific measure of educational requirements and each of the operationalizations of major-occupation connection to explain variation in occupational attainment by estimating reduced-form models that include each of the measures of major-occupation connection separately, as well as a series of hierarchical models that incorporate all measures. In addition to the measures of major-occupation linkage, all models are estimated with EDREQ, the occupation-specific measure of educational requirement, and a set of occupation-specific dummy variables to control for the marginal distribution of the new labor force entrants across occupational categories. Including the set of occupational dummies controls for the biasing effect that the disproportionate representation of workers in a few very large occupational categories would have on the estimated association between the measures of education-occupation connection and occupational attainment. In the absence of these controls, the estimated coefficients would be weighted heavily by the occupational characteristics associated with the large categories regardless of whether the predominance of employment in those categories is due to the occupational demand for specialized skills and knowledge or is a simple artifact of the occupational classification scheme. The complete set of occupational dummy variables numbers 57 (of which 56 are included in the models): one for each of the occupations into which 50 or more NSCG respondents gains employment, and one that represents the remaining 11 occupational categories that receive less than 50 of the NSCG new labor force entrants.[7]

5. Descriptive results

5.1. Degree-field differences in major-occupation connection

Table 2 presents the descriptive statistics for the 6432-cell matrix of the measures of major-occupation connection that are specific to each degree field (24 categories), occupation (67 categories), cohort (1993 and 2003), and degree level (bachelor's and post-baccalaureate).[8] These statistics describe only the *potential* for educational utilization, i.e., they indicate the existence of occupational outlets that are related to particular educational fields.

Relatively large mean values of FLOW indicate that there are some occupations that receive a significant inflow of graduates from that particular major. Six majors have above average values of FLOW, indicating that they that have particularly strong major-occupation associations. These include business, education, engineering, health and medical fields, the physical sciences, and biology. The standard deviation of FLOW is also high for each of these degree fields. This indicates that these majors may have particularly strong connections to a particular set of occupational outlets. In contrast, majors in architectural and environmental design, computer and information sciences, the foreign languages, law, philosophy, protective services, social work, economics, and history have particularly low levels of education-occupation connection according to this measure. It is notable that among these fields, the standard deviation of flow is relatively high for architectural and environmental design and law, indicating that, while these majors do not appear to have very many strong labor market connections, they may have very strong connections to a few occupations. In contrast, there is little variation about the low mean values of FLOW for foreign languages and history, indicating that these degree fields have particularly weak connections to all parts of the labor market.

There is a great deal of variability in the distribution of SUBJECTIVE, both within and across the major fields. The across-field variation, however, coincides with that for the variable FLOW: the degree fields with higher than average values of SUB-

[7] I use the full analytical sample, pooled across cohort and degree level, to identify the occupation-specific sample sizes used for identification of the occupational dummy variables.

[8] As is specified in the data description, only some occupation-level measures vary on all four dimensions. Specifically, EDREQ varies by occupation only. FLOW and SUBJECTIVE vary by major, occupation, cohort and degree level. SUBSTANTIVE varies by major and occupation.

Table 2
Descriptive statistics for occupation-level measures of major-occupation connection by degree field.

	FLOW		SUBJECTIVE		SUBSTANTIVE	
	Mean	(st. dev.)	Mean	(st. dev.)	Mean	(st. dev.)
Full sample of occupations	2.08	(7.03)	12.13	(25.66)	18.26	(18.24)
Degree field						
Agriculture, natural resources and forestry	1.88	(6.03)	12.66	(25.90)	4.01	(8.23)
Architecture and environmental design	0.82	(5.22)	6.15	(19.59)	14.45	(15.88)
Business and marketing	6.08	(10.36)	20.01	(26.39)	23.05	(11.01)
Journalism and communications	1.05	(2.30)	8.81	(20.55)	19.08	(8.91)
Computer and information sciences	0.83	(3.08)	8.02	(21.54)	37.09	(14.78)
Education	4.91	(9.83)	21.40	(33.05)	35.34	(16.03)
Engineering	8.70	(18.77)	24.10	(31.23)	25.82	(26.46)
Foreign languages	0.37	(0.68)	6.49	(20.12)	5.28	(3.93)
Health and medical	2.51	(9.09)	18.43	(32.46)	8.73	(13.61)
Law	0.49	(5.10)	3.43	(14.93)	22.22	(11.92)
English	1.01	(1.90)	10.04	(24.20)	46.63	(13.21)
Biology	3.65	(8.49)	19.07	(30.09)	13.47	(18.19)
Math	1.61	(6.58)	8.34	(21.75)	41.84	(17.70)
Philosophy, religious studies	0.79	(3.62)	6.74	(21.20)	9.20	(9.77)
Physical sciences	3.85	(10.27)	20.14	(30.76)	16.35	(14.84)
Psychology	2.07	(5.47)	15.46	(28.19)	22.86	(17.70)
Protective services	0.48	(2.13)	4.08	(15.16)	19.95	(8.89)
Social work, public administration	0.94	(2.81)	11.87	(26.70)	11.75	(17.23)
Economics	0.97	(4.03)	6.14	(19.15)	14.56	(11.62)
History	0.79	(1.37)	8.28	(21.93)	8.13	(10.77)
Sociology	1.21	(4.01)	8.86	(22.74)	14.14	(16.20)
Other social sciences	2.14	(4.15)	15.49	(27.65)	20.47	(12.53)
Commercial art, visual and performing arts	1.55	(3.18)	12.13	(25.22)	3.79	(5.73)
Other fields	1.28	(3.22)	15.04	(27.95)	0.00	(0.00)
p-value for *F*-test of equality of means	0.000		0.000		0.000	
Pairwise correlations of the measures of major-occupation connection						
FLOW	1.00					
SUBJECTIVE	0.47***		1.00			
SUBSTANTIVE	0.35***		0.33***		1.00	

Note: Statistics based on the 6432-observation dataset of occupation-level measures that vary by occupation (67 categories), cohort (1993 and 2003), degree level (bachelor's and post-baccalaureate), and major field (24 majors).
*$p \leqslant 0.05$.
**$p \leqslant 0.01$.
***$p \leqslant 0.001$.

JECTIVE are business, education, engineering, health and medical fields, the physical sciences, and biology. This measure of major-occupation connection also identifies architectural and environmental design, the foreign languages, law, philosophy, protective services, social work, and history as the major fields with relatively few strong connections to particular occupational outlets. The standard deviations for SUBJECTIVE are fairly large for all degree fields, however, indicating that this measure of major-occupation connection identifies relatively strong labor market linkages for most all of the degree fields.

The distribution of SUBSTANTIVE varies significantly as well, but this variable identifies relatively strong potential education-occupation linkages that are not indicated by the other measures of major-occupation connection. The degree fields with the highest average values of SUBSTANTIVE are english, math, computer science, and education, although business, engineering, psychology and law also have relatively high mean values of this measure. The lowest average values of SUBSTANTIVE are found for the arts, agriculture, foreign languages, and History. According to these results, there are relatively low levels of demand for the knowledge that is associated with these majors across all of the occupational categories.

The pair-wise correlation coefficients for the three measures of major-occupation connection are presented at the bottom of Table 2. These moderately strong correlations indicate that there is some consistency between the three measures of education-occupation connection. Comparing the descriptive results, six degree fields are identified as having noticeably strong education-occupation connections by at least 2 of the 3 measures: business and marketing, education, engineering, health and medical fields, biology, and the Physical sciences. Comparatively more degree fields are consistently identified by at least two measures as lacking strong connections to the occupational structure: architecture and environmental design, foreign languages, philosophy and religious studies, protective services, economics, and history.

5.2. Degree-field and sex differences in the experience of educational utilization

Table 3 presents descriptive statistics based on the analytical sample for the measures of education-occupation connection by degree field and sex. The mean values of EDREQ, FLOW, SUBJECTIVE, and SUBSTANTIVE presented in this table reflect

Table 3
Descriptive statistics for measures of education-occupation relatedness by degree field and sex for the analytical sample of NSCG new entrants to the labor market.

	EDREQ		FLOW		SUBJECTIVE		SUBSTANTIVE	
	Mean	(st. dev.)	Mean	(st. dev.)	Mean	(st. dev.)	Mean	(st. dev.)
Full sample	15.11	(1.96)	21.90	(23.42)	52.37	(33.77)	38.59	(25.40)
Sex								
Males	15.10	(2.02)	22.24	(24.52)	50.21	(32.39)	39.17	(26.30)
Females	15.12	(1.90)	21.58	(22.32)	54.44	(34.92)	38.04	(24.50)
p-value for *t*-test of equal means	0.399		0.012		0.000		0.000	
Degree field								
Agriculture, natural resources and forestry	14.59	(2.27)	9.32	(14.96)	36.97	(30.07)	10.91	(15.64)
Architecture and environmental design	15.43	(1.40)	27.40	(23.88)	71.52	(33.59)	51.69	(29.74)
Business and marketing	14.38	(1.43)	28.60	(19.74)	45.45	(23.79)	34.71	(13.45)
Journalism and communications	14.08	(1.51)	6.97	(7.30)	33.60	(26.68)	22.35	(10.61)
Computer and information sciences	14.78	(0.89)	13.89	(8.58)	72.92	(28.22)	63.69	(17.55)
Education	15.74	(1.39)	28.64	(14.63)	75.17	(30.26)	60.14	(17.70)
Engineering	15.30	(1.31)	35.45	(27.72)	56.91	(20.89)	55.29	(29.80)
Foreign languages	15.27	(2.46)	1.14	(0.91)	26.73	(37.26)	6.27	(3.82)
Health and medical	16.31	(2.27)	44.12	(30.28)	83.48	(25.72)	46.12	(24.54)
Law	17.70	(1.99)	64.98	(34.42)	79.59	(35.16)	67.87	(24.36)
English	14.92	(2.18)	3.28	(2.13)	32.29	(32.54)	50.06	(14.75)
Biology	15.97	(2.47)	11.74	(14.00)	57.25	(33.83)	34.44	(30.01)
Math	15.53	(1.82)	9.06	(14.33)	39.11	(35.60)	48.98	(20.45)
Philosophy, religious studies	15.05	(1.97)	13.15	(18.49)	45.71	(44.92)	21.77	(15.03)
Physical sciences	16.15	(1.95)	16.63	(20.89)	48.14	(32.04)	26.17	(16.56)
Psychology	15.64	(2.41)	8.55	(14.31)	41.40	(33.24)	42.94	(27.39)
Protective services	13.66	(1.66)	9.36	(10.55)	46.25	(30.39)	35.91	(20.15)
Social work, public administration	14.93	(1.73)	8.60	(9.72)	53.21	(36.11)	33.19	(25.44)
Economics	14.25	(1.80)	3.05	(8.27)	14.26	(23.35)	25.92	(16.30)
History	15.01	(2.17)	1.99	(1.09)	27.70	(32.64)	9.47	(11.51)
Sociology	14.69	(1.99)	4.93	(5.84)	32.51	(31.43)	21.92	(20.52)
Other social sciences	14.86	(2.09)	3.99	(5.79)	28.88	(31.18)	21.11	(12.03)
Commercial art, visual and performing arts	14.14	(1.60)	8.96	(8.47)	43.55	(32.21)	13.58	(14.19)
Other fields	14.51	(1.76)	5.36	(9.16)	38.65	(29.65)	0.00	(0.00)
p-value for *F*-test of equal means	0.000		0.000		0.000		0.000	

the degree-field and sex differences in the *experience* of educational utilization, i.e., the experience of gaining employment in an occupation that is related to one's educational investment, for the two cohorts of college graduates who entered the labor force in the years 1985–1993 and 1995–2003.

The NSCG respondents gain employment in occupations that require a relatively high level of education: the mean value of EDREQ for the full sample is 15.11, indicating that the occupations in which the NSCG graduates gain employment require, on average, 3 years of post-secondary education. The likelihood of gaining employment in occupations which require high educational attainment varies somewhat by the degree field of the college graduates but not by sex. Recent graduates who hold a degree in the fields of law, health and medical, and the physical sciences gain employment in occupations that require an average of 16 or more years of education. In contrast, the mean value of EDREQ is 13.66 for recent graduates with protective services degrees, indicating that they are employed in occupations characterized by relatively low educational requirements. The lack of significant sex differences in the mean of EDREQ shows that males and females are equally likely, on average, to gain employment in occupations which require post-secondary education. There are no significant sex differences, therefore, in the ability of recent graduates to attain employment that is roughly commensurate with their level of educational investment.

The average values of FLOW indicate the degree to which recent graduates experience normative major-occupation transitions, i.e., follow the predominating streams of graduates from major fields to occupations. Variation in the mean value of this variable across major fields therefore reflects both the availability of "frequently-travelled" major-occupation pathways as well as the likelihood that they are followed. On average, the NSCG respondents gain employment in occupations that draw 21.9% of incumbent employees from the respondents' own degree fields and this experience of being part of sizeable major-occupation flows is slightly more common for males than for females. Based on the descriptive results presented in Table 3, the likelihood of following normative major-occupation flows is by far the greatest for those graduates who earned Law degrees. This finding reflects both the overrepresentation of professional school graduates in this degree field, since law is not a major that is widely available at the undergraduate level, as well as its strong connection to particular occupational categories. Following frequently-travelled major-occupation flows is also very common among new labor force entrants who hold degrees in health/medical fields, engineering, education, architecture and environmental design, and business. In contrast, the major-occupation paths followed by graduates holding degrees in foreign languages, english, economics, history, sociology, and other social sciences, are significantly more diffuse: the occupations entered by these graduates on average draw less than 5% of their workers from any one of these majors.

The descriptive results for the SUBJECTIVE measure of major-occupation connection indicate that recent graduates experience a relatively strong substantive connection between their education and their occupational attainment. On average, the NSCG respondents gain employment in occupations for which 52.37% of incumbents feel that their job is "closely related" to their degree field. According to this measure, the likelihood of experiencing a substantive major-occupation connection is significantly greater for females than for males, and it is most common among graduates who have majored in health/medical fields, law, education, computer science, and in architecture and environmental design. Also, according to this measure, new entrants to the labor market who majored in economics, sociology, history, other social sciences, journalism and communications, and foreign languages are the least likely to utilize their education by gaining employment in occupations that have a close substantive relationship with their degree field.

Variation in the average value of SUBSTANTIVE reflects differences in the likelihood that graduates enter occupations that require the specific type of knowledge they had acquired during their post-secondary course of study. There are significant sex differences in this measure of major-occupation connection indicating that women are less likely than men to gain employment in occupations that utilize their educational investment. There is also significant variation in the mean of SUBSTANTIVE by major. The fields from which graduates have the greatest likelihood of employment in occupations that use their educational investments include law, computer science, education, engineering, architecture and education. In contrast, graduates who earned degrees in foreign languages, history, agriculture, and Art fields seem to be the least likely to attain employment where their knowledge is utilized on the job.

6. Multivariate results

6.1. Modeling educational utilization

The first aim of this analysis is to assess the degree to which the occupational attainment of recent baccalaureate and post-baccalaureate graduates is influenced by education-occupation connections, i.e., to estimate the prevalence of educational utilization. To accomplish this, I estimate reduced-form conditional logit models of occupational attainment that include each of the measures of education-occupation connection separately, along with the measure of educational requirement and the set of occupation dummy variables that control for the marginal occupational distribution of recent graduates.[9] Panel A of Table 4 presents model goodness-of-fit statistics for these conditional logit models of occupational attainment. If recent graduates are most likely to gain employment in an occupation that is related to the level and the substance of their educational investment, the inclusion of these variables in the model will explain a significant amount of variance in occupational attainment. Model-comparison statistics are presented in the last two columns of Table 4. To compare the explanatory power of various model specifications I rely on the relatively conservative Akaike's information criterion (AIC).[10] The model with the lowest value of AIC is the preferred model.

Both the model fit statistics for the reduced-form models and the model-comparison statistics show that each of the measures of education-occupation connection accounts for a significant amount of variance in the occupational attainment of college-educated workers. The baseline model, Model 0, that fits only the marginal occupational distribution (i.e., it includes only the set of 57 occupational dummy variables), accounts for 14.1% of the variance in occupational attainment. Controlling for occupational requirements for degree/certification attainment by adding EDREQ in Model A1 does not increase the proportion of variance explained, but the addition of each of the measures of major-occupation connection more than doubles the value of R^2. The significant explanatory power of the measures of major-occupation connection is reflected by the model-comparison statistics: Compared to AIC for the baseline model, the value of AIC declines significantly with the inclusion of FLOW, SUBJECTIVE and SUBSTANTIVE in Models A2 through A4.

The second goal of this analysis is to compare the independent explanatory power of each measure of education-occupation connection as a test of whether they can be combined into a single measure of major-occupation connection. To accomplish this, I fit the series of hierarchical multivariate models of occupational attainment presented in Panel B of Table 4. The first three models in the series build upon Model A1 which includes EDREQ (in addition to the set of occupational dummies) and test the independent explanatory power of each measure of major-occupation connection in the context of controls for one other measure. The model fit and model-comparison statistics from Models B1, B2 and B3 provide strong evidence that FLOW, SUBSTANTIVE and SUBJECTIVE each capture some aspect of major-occupation connection that is predictive of occupational attainment controlling for EDREQ and one other operationalization of major-occupation connection. Model B4 completes the series by including EDREQ and all three measures of major-occupation connection. In comparison with other model specifications, this model tests the independent explanatory power of each operationalization of major-occupation connection. Comparing Model B4 to Model A1 provides overwhelming evidence of the degree to which occupational attainment is associated with the measures of major-occupation connection: the AIC decreases by 14,830,862 for 3 degrees of

[9] For this discussion I use the term "reduced-form" to distinguish models that include only one of the measures of education-occupation connection, even when the single education-occupation measure is interacted with major and sex.

[10] Since the AIC is a measure of model fit that is particularly sensitive to the numbers of model parameters, it is the most appropriate model comparison statistic for this analysis. To test for within-major sex differences requires the addition of a large number of parameters, and the AIC penalizes the use of excessive numbers of parameters. The statistic is defined as $AIC = 2k - 2\ln(L)$, where k is the number of parameters in the statistical model, and L is the model likelihood function.

Table 4
Goodness-of-fit statistics for conditional logit models of occupational attainment.

Model specification		Model fit				Model-comparison	
		Pseudo R^2	ln(L)	k	AIC	Model contrast	AAIC
Panel 0: baseline model: estimating the marginal probability of occupational attainment							
0	OCC2 − OCC57	0.141	−32,358,344	56	64,716,800		
Panel A: reduced-form models of educational utilization estimating the average effect of each education-occupation connection							
A1	(0) + EDREQ	0.141	−32,357,332	57	64,714,778	A1 vs. 0	−2022
A2	(A1) + FLOW	0.303	−26,259,188	58	52,518,492	A2 vs. A1	−12,196,286
A3	(A1) + SUBJECTIVE	0.275	−27,314,367	58	54,628,850	A3 vs. A1	−10,085,928
A4	(A1) + SUBSTANTIVE	0.289	−26,767,137	58	53,534,390	A4 vs. A1	−11,180,388
Panel B: hierarchical multivariate models estimating independent explanatory power of each major-occupation connection							
B1	(A1) + FLOW + SUBJECTIVE	0.328	−25,299,857	59	50,599,832	B1 vs. A2	−1,918,660
B2	(A1) + FLOW + SUBSTANTIVE	0.326	−25,388,436	59	50,776,990	B2 vs. A2	−1,741,502
B3	(A1) + SUBJECTIVE + SUBSTANTIVE	0.316	−25,777,925	59	51,555,968	B3 vs. A3	−3,072,882
						B3 vs. A4	−1,978,422
B4	(A1) + FLOW + SUBJECTIVE + SUBSTANTIVE	0.338	−24,941,898	60	49,883,916	B4 vs. A1	−14,830,862
						B4 vs. B1	−715,916
						B4 vs. B2	−893,074
						B4 vs. B3	−1,672,052
Panel C: reduced-form model estimating the explanatory power of the combined measure of major-occupation connection							
C1	(A1) + MAJOCC	0.335	−25,057,438	58	50,114,992	C1 vs. A1	−14,599,786
Panel D: multivariate models estimating degree-field differences in educational utilization							
D1	(0) + EDREQ * MAJOR	0.163	−31,516,221	80	63,032,602	D1 vs. 0	−1,684,198
D2	(D1) + MAJOCC * MAJOR	0.340	−24,856,055	104	49,712,318	D2 vs. D1	−13,320,284
Panel E: multivariate models estimating sex differences in educational utilization within degree field							
E1	(D2) + EDREQ * MAJOR * SEX	0.341	−24,825,950	128	49,652,156	E1 vs. D2	−60,162
E2	(E1) + MAJOCC * MAJOR * SEX	0.342	−24,770,108	152	49,540,520	E2 vs. E1	−111,636

Note: AIC is Akaike's information criterion: AIC = $2k - 2\ln(L)$, where k is the number of parameters in the statistical model, and L is the likelihood function.

freedom and the R^2 increases from 0.141 to 0.338. The model-comparison statistics for this model in contrast to models B1, B2 and B3 confirm that each operationalization of major-occupation connection has significant independent power to explain occupational attainment net of the influence of EDREQ and all other measures: the inclusion of each, in the context of controls for the other education-occupation variables and occupational category dummies, is associated with significant reductions in the value of AIC. The declines in AIC that might be attributed to a single variable, however, are small relative to that associated with the full set of three measures. This disparity indicates that, while the measures may distinguish unique aspects of major-occupation connections, they largely represent a single dimension of major-occupation connectedness.

The results of an exploratory factor analysis corroborate the conclusion that the three measures of major-occupation connection—FLOW, SUBSTANTIVE and SUBJECTIVE—reflect a single underlying factor and can therefore be reduced to a single measure. The factor analysis identified a single factor model as most compatible with the data.[11] The Eigenvalue for the one-factor model is 1.19 and this factor accounts for 0.99 of the variance explained. To construct a factor scale that combines the three measures of major-occupation connection, I use the regression estimates method separately by cohort and degree level. For each major-occupation dyad within cohort and degree level, I generated MAJOCC by summing the values of FLOW, SUBSTANTIVE and SUBJECTIVE weighted by the regression scoring coefficients generated by the factor analysis post-estimation. The scoring coefficients are presented in Appendix Table 3. The resulting scale variable MAJOCC has a mean of 9.07 and standard deviation of 13.26 across all cohort- and degree-specific major-occupation dyads. Appendix C lists the 10 occupations with the highest values of MAJOCC for each major and by degree level.

The fit statistics for Model C1, which are presented in Panel C of Table 4, show that only a very small amount of explanatory power is lost in this data reduction. Model C1 replaces FLOW, SUBSTANTIVE and SUBJECTIVE with MAJOCC in the model of occupational attainment that controls for EDREQ and the 57 occupational dummies. The model fit and model-comparison statistics for the two models are practically identical: the substitution reduces the R^2 by only .003 and the change in AIC by only 231,076. Since replacing the three measures with one measure of major-occupation connection has only a minimal cost in terms of explanatory power but will mean much more parsimonious models of differences in educational utilization by major and sex, Model C1 is the preferred model of educational utilization. This model states that occupational attainment among college-educated individuals is strongly associated with occupational demands for educational attainment as well as the occupational demand for graduates for particular degree fields.

[11] The factor analysis of the variables FLOW, SUBSTANTIVE and SUBJECTIVE is based on the 6432-cell matrix of the measures of major-occupation connection that are specific to each degree field (24 categories), occupation (67 categories), cohort (1993 and 2003), and degree level (bachelor's and post-baccalaureate). See Table 2 for descriptive statistics for these data.

Appendix Table 3
Regression scoring coefficients used to construct the scale variable MAJOCC separately by cohort and degree level.

	Regression coring coefficients (weights)		
	Flow	Subjective	Substantive
1993 Cohort			
Bachelor's degree	0.446	0.219	0.384
Post-baccalaureate degree	0.479	0.216	0.360
2003 Cohort			
Bachelor's degree	0.459	0.299	0.299
Post-baccalaureate degree	0.455	0.161	0.431

6.2. Degree-field differences in educational utilization

Models D1 and D2 test for degree-field differences in educational utilization. Model D1 adds MAJOR-specific terms for EDREQ to the baseline model. According to the model fit statistics, the model of occupational attainment is significantly improved by allowing for major-field differences in the influence of occupation-level educational requirements. The addition of 24 interaction terms for MAJOR and MAJOCC in Model D2 increases the model R^2 to 0.34 and cuts the AIC by 13,964,274. These results strongly support the conclusion that educational utilization varies significantly across degree fields.

6.3. Within-major sex differences in educational utilization

The ultimate motivation for this analysis, and the reason for the data analysis reported above, is to test for sex differences in educational utilization within major fields. To accomplish this, I estimate a final set of nested models that include both two-way and three-way interactions between MAJOR and SEX and each occupational measure—EDREQ and MAJOCC. These models are presented in Panel E of Table 4. Comparing the model goodness-of-fit statistics confirms that the fit of the model of occupational attainment is significantly improved by the inclusion of the 3-way sex interaction terms. Adding EDREQ∗MAJOR∗SEX to Model E1 increases the value of R^2 to 0.341 and reduces AIC by 60,162. The addition of MAJOCC∗MAJOR∗SEX further increases R^2 to 0.342 and brings the AIC to its lowest value, down by 111,636 compared to Model E1. These results indicate that the best-fitting model of occupational attainment is the Model E2, i.e., the model that reflects both significant major-field differences and within-major sex differences in the likelihood of educational utilization among recent college graduates.

Table 5 presents the major-specific main effect and SEX-interaction coefficients for EDREQ and MAJOCC from Model E2. The coefficients represent the estimated sex-specific effect of each occupational characteristic on the likelihood of attaining employment in a specific occupation. The sign of the coefficient indicates whether relative differences in the value of the occupational variable between two occupational categories has a positive or a negative influence on the likelihood of employment in one versus the other, and the magnitude of the coefficient indicates the strength of that association. Specifically, the exponential of a coefficient yields the change in the estimated odds of employment in a given occupation, relative to all other occupations, given a one unit difference in the occupational characteristic. A significant estimated SEX-interaction coefficient represents a significant sex disparity in the association between the measure of education-occupation connection and the odds of employment, net of the marginal occupational distribution and the sex-specific effects of the other included occupational measure. For example, the estimated coefficient for the EDREQ∗SEX interaction for the degree field business, marketing and distribution represents the sex gap in the association between occupational attainment and the average educational attainment required in the occupation among graduates with degrees in business fields. Likewise, the coefficients for the MAJOCC∗SEX interaction represent within-major sex differences in the odds of attaining employment in an occupation which is substantively connected to a graduate's degree field. Taken together, the estimated SEX-interaction coefficients represent sex difference in the likelihood of attaining an occupational placement that utilizes one's education.

The estimated coefficients for EDREQ (either the main effect or the interaction with SEX) are found to be significant for 14 of the 24 major fields and in general the significant coefficients are negative in value. These negative values reflect both the heterogeneity of the occupational categories, i.e., that they encompass jobs with varying educational requirements, as well as the negative association between high educational requirements and the odds of employment. There are 11 fields in which a significant coefficient for the EDREQ∗SEX interaction indicates sex differences in the likelihood of gaining employment in occupations requiring high levels of education. Whether these sex differences advantage male or female graduates depends upon the degree field. Among graduates with degrees in Engineering, Math, Philosophy and religious studies, Economics, and the Commercial, visual and performing arts, women are more likely than men to enter "high education" occupations. In five other major fields the significantly negative value of $b_{\text{EDREQ}*\text{SEX}}$ reflects a female disadvantage in occupational attainment, i.e., that the occupational categories they enter have lesser educational requirements. These majors include Business, Computer science, Education, Health and medical fields, Biology, and Psychology.

Since the magnitude of the field-specific estimated coefficients for b_{EDREQ} and $b_{\text{EDREQ}*\text{SEX}}$ indicate the relative odds of capitalizing on one's degree attainment in the employment process, relatively large negative or positive values indicate very low

Table 5
Estimated conditional logit coefficients from Model E2.

Major	EDREQ				MAJOCC			
	Main effect		∗SEX		Main effect		∗SEX	
	b	se (*b*)	*b*	se (*b*)	*b*	se (*b*)	*b*	se (*b*)
Agriculture, natural resources and forestry	−0.064	(0.062)	0.081	(0.076)	0.092	(0.005)***	−0.028	(0.008)***
Architecture and environmental design	0.046	(0.105)	0.063	(0.141)	0.100	(0.005)***	−0.013	(0.007)
Business, marketing and distribution	−0.037	(0.046)	−0.050	(0.023)*	0.058	(0.002)***	0.002	(0.002)
Journalism, communications	−0.199	(0.057)***	0.022	(0.057)	0.068	(0.005)***	−0.009	(0.006)
Computer and information sciences	0.130	(0.071)	−0.227	(0.092)*	0.092	(0.004)***	−0.014	(0.007)*
Education	−0.029	(0.054)	−0.270	(0.039)***	0.071	(0.003)***	0.027	(0.003)***
Engineering	−0.006	(0.047)	0.133	(0.041)***	0.069	(0.001)***	−0.008	(0.002)***
Foreign languages	0.074	(0.098)	−0.010	(0.109)	0.063	(0.012)***	0.005	(0.015)
Health and medical	0.110	(0.056)	−0.350	(0.042)***	0.082	(0.003)***	0.013	(0.003)***
Law	−0.050	(0.100)	0.056	(0.134)	0.078	(0.005)***	0.000	(0.008)
English	−0.147	(0.082)	0.008	(0.085)	0.072	(0.008)***	−0.004	(0.009)
Biology	0.003	(0.055)	−0.109	(0.046)*	0.078	(0.003)***	0.001	(0.004)
Math	−0.050	(0.072)	0.171	(0.081)*	0.081	(0.005)***	−0.016	(0.008)*
Philosophy and religious studies	−0.245	(0.095)**	0.253	(0.129)*	0.093	(0.005)***	−0.011	(0.009)
Physical sciences	0.166	(0.054)**	−0.010	(0.059)	0.071	(0.003)***	0.008	(0.006)
Psychology	−0.026	(0.060)	−0.135	(0.056)*	0.060	(0.005)***	0.019	(0.006)**
Protective services	−0.136	(0.078)	0.016	(0.107)	0.100	(0.007)***	−0.027	(0.009)**
Social work and public administration	−0.137	(0.067)*	−0.128	(0.070)	0.058	(0.006)***	0.037	(0.007)***
Economics	−0.296	(0.074)***	0.228	(0.090)*	0.099	(0.008)***	−0.035	(0.016)*
History	−0.035	(0.076)	−0.013	(0.091)	0.050	(0.008)***	0.016	(0.011)
Sociology	−0.161	(0.107)	−0.048	(0.109)	0.062	(0.011)***	0.024	(0.013)
Other social sciences	−0.034	(0.055)	−0.046	(0.049)	0.045	(0.005)***	0.012	(0.007)
Commercial, visual and performing arts	−0.269	(0.065)***	0.134	(0.066)*	0.076	(0.005)***	−0.011	(0.006)
Other fields	−0.078	(0.064)	0.039	(0.056)	0.047	(0.008)	0.020	(0.011)

Note: Model includes 56 dummy variables that control for the marginal distribution of NSCG respondents across the 67 occupational categories included in the choice set.

* $p \leqslant 0.05$.
** $p \leqslant 0.01$.
*** $p \leqslant 0.001$.

or very great odds of educational utilization. A few of the estimated values of b_{EDREQ} and $b_{\text{EDREQ}*\text{SEX}}$ are notable in this regard. The estimated effect of EDREQ is particularly large in magnitude and negative in sign for women who have earned degrees in Computer and information science, education and health/medical fields. It seems that women who have degrees in these fields are particularly unlikely to gain employment in occupations that require high levels of education. This finding could be a reflection of the systematic under-employment of women in these fields, or it may be an artifact of heterogeneity by degree level among the sample of graduates from these degree fields. In two fields the estimated EDREQ∗SEX coefficients are significantly positive and large in magnitude—philosophy and economics—but these interactions simply offset the large negative main effect of EDREQ, indicating that men with degrees in these fields are disadvantaged on this dimension of educational utilization, but women do not experience any notable advantage.

The estimated coefficients for MAJOCC and MAJOCC∗SEX for each degree field are presented in the last two columns of Table 5. For all of the degree fields, the estimated coefficients for the main effect of MAJOCC are uniformly positive, statistically significant, and of magnitudes that greatly exceed the value of any estimated $b_{\text{MAJOCC}*\text{MAJOR}*\text{SEX}}$. This indicates that for both male and female college graduates, the odds of employment in a given occupation are significantly enhanced if the occupation is linked or connected to their major field. There are significant sex differences in this aspect of educational utilization in 10 degree fields. Among graduates with degrees in education, health/medical, psychology and social work, women are significantly more likely than men to enter occupations that are substantively related to their major, i.e., where they are more likely to utilize the knowledge gained through study in their degree field. It is notable that these majors are among the most female dominated of all of the degree fields distinguished in this analysis. Since these fields are closely associated with female-dominated occupational categories, this gendered pattern of educational utilization may not be surprising. In contrast, women who earned degrees in agriculture, natural resources and forestry, computer and information sciences, engineering, math, protective services, and economics are significantly less likely than similarly-educated men to enter occupations that are substantively related to their degree. As a consequence of the sex differences, the fields with the greatest likelihood of educational utilization are somewhat different for men and women. For men, the fields in which occupational attainment is strongly associated with major include agriculture, natural resources and forestry, architecture and environmental design, computer and information sciences, philosophy and religious studies, protective services, and economics. For women, the fields with the greatest likelihood of educational utilization include architecture and environmental design, education, health/medical majors, philosophy and religious studies, social work and public administration, and sociology.

6.3.1. Sex differences in educational utilization by degree level

There are many reasons to expect that the patterns of educational utilization may vary by degree level. For example, we might expect the probability of educational utilization to be greater among those with post-baccalaureate education, since, compared to the attainment of a bachelor's degree, the attainment of a post-baccalaureate degree represents a greater stock of specific educational capital that might be required for employment in related occupations and/or interpreted by employers as greater qualification for such jobs. Also, since the homogenizing effects of self-selection into and the experience of degree-field specialization will be far greater at the post-baccalaureate than at the bachelor's level, we would expect less variation in the occupational transitions of graduates with post-baccalaureate degrees. I therefore expect that there are fewer sex differences in educational utilization at the post-baccalaureate than at the baccalaureate level of degree attainment.

To examine if sex differences in educational utilization varies by degree level, I estimate the best-fitting conditional logit model of educational attainment separately for the NSCG respondents who had attained only a bachelor's degree and for those who had attained a master's, professional or doctoral degree. The estimated major-specific coefficients for the EDREQ∗SEX and MAJOCC∗SEX interactions from these models are presented in Table 6. As expected, there are fewer significant sex differences among the post-baccalaureate sample: sex differences in the educational utilization are found in only six degree fields among the post-baccalaureate sample, compared to 14 fields for the baccalaureate sample. There are some notable consistencies between the degree levels. First, sex differences in the likelihood of utilization of education degrees do not vary by degree level: women are significantly less likely than men to gain employment in occupations that require many years of education but they are significantly more likely to attain employment in occupations that are strongly linked to the field of education. Also, at both the baccalaureate and the post-baccalaureate levels, women are significantly more likely than men to utilize their degree in social work or public administration by gaining employment in a related occupation.

Other sex differences in educational utilization are specific to degree level. For example, since law degrees are overwhelmingly post-baccalaureate, sex disparities in the utilization of law degrees are apparent only at this degree level. Among law school graduates, women are more likely than men to attain employment in occupations with relatively high educational requirements, but they are less likely than men to attain employment in occupations that are related to their law degrees. Sex differences in the utilization of degrees in the health/medical fields, biology and sociology are also specific to degree level. At the undergraduate level, women are more likely than men to utilize their medical/health field degree by gaining employment in a substantively related field. This female advantage disappears at the graduate level, however, and instead women with post-baccalaureate health/medical degrees are significantly more likely than men to be *under-*

Table 6
Conditional logit coefficients estimating within-major sex differences in the influence of EDREQ and MAJOCC, separately by degree level.

Major	Baccalaureate				Post-baccalaureate			
	EDREQ∗SEX		MAJOCC∗SEX		EDREQ∗SEX		MAJOCC∗SEX	
	b	se (*b*)	*b*	se (*b*)	*b*	se (*b*)	*b*	se (*b*)
Agriculture, natural resourcesand forestry	0.041	(0.090)	−0.036	(0.011)**	0.221	(0.298)	−0.030	(0.023)
Architecture and environmental design	−0.093	(0.179)	−0.008	(0.007)	0.409	(0.227)	−0.036	(0.024)
Business, marketing and distribution	−0.036	(0.028)	0.005	(0.003)	−0.022	(0.039)	−0.011	(0.006)
Journalism, communications	0.020	(0.060)	−0.009	(0.006)	0.079	(0.127)	−0.015	(0.021)
Computer and information sciences	−0.253	(0.110)*	−0.013	(0.007)	−0.101	(0.134)	−0.011	(0.012)
Education	−0.304	(0.067)***	0.029	(0.004)***	−0.297	(0.054)***	0.025	(0.005)***
Engineering	0.151	(0.050)**	−0.009	(0.003)***	0.157	(0.092)	−0.009	(0.009)
Foreign languages	0.032	(0.125)	0.008	(0.019)	−0.290	(0.243)	0.011	(0.022)
Health and medical	−0.145	(0.074)	0.026	(0.005)***	−0.425	(0.075)***	−0.003	(0.005)
Law	−0.416	(0.235)	0.040	(0.034)	0.486	(0.156)**	−0.020	(0.007)**
English	0.070	(0.101)	−0.010	(0.012)	−0.312	(0.179)	0.022	(0.020)
Biology	−0.114	(0.049)*	0.005	(0.004)	−0.040	(0.104)	−0.017	(0.008)*
Math	0.201	(0.086)*	−0.016	(0.010)	0.157	(0.240)	−0.010	(0.015)
Philosophy and religious studies	0.383	(0.203)	−0.027	(0.021)	0.181	(0.159)	0.000	(0.008)
Physical sciences	0.009	(0.063)	0.016	(0.007)*	0.035	(0.117)	−0.014	(0.010)
Psychology	−0.127	(0.068)	0.025	(0.008)**	−0.117	(0.083)	0.012	(0.007)
Protective services	0.012	(0.110)	−0.029	(0.009)***	−0.004	(0.437)	−0.006	(0.031)
Social work and public administration	−0.089	(0.100)	0.040	(0.011)***	−0.134	(0.083)	0.029	(0.007)***
Economics	0.201	(0.094)*	−0.027	(0.019)	0.681	(0.405)	−0.047	(0.026)
History	−0.014	(0.097)	0.020	(0.012)	−0.162	(0.299)	−0.009	(0.028)
Sociology	−0.034	(0.115)	0.023	(0.015)	−0.600	(0.261)*	0.036	(0.016)*
Other social sciences	−0.069	(0.052)	0.021	(0.009)*	0.035	(0.170)	−0.022	(0.016)
Commercial, visual and performing arts	0.157	(0.076)*	−0.010	(0.007)	0.077	(0.104)	−0.013	(0.011)
Other fields	0.083	(0.068)	0.024	(0.013)	−0.107	(0.093)	0.011	(0.015)

Note: Model includes 56 dummy variables that control for the marginal distribution of NSCG respondents across the 67 occupational categories included in the choice set. The model also includes estimates for the major-specific main effects of EDREQ and MAJOCC.

* $p \leqslant 0.05$.
** $p \leqslant 0.01$.
*** $p \leqslant 0.001$.

employed, i.e., employed in occupations that require relatively low levels of educational attainment. Among graduates in the biological sciences, at the baccalaureate level female graduates are significantly more likely than males to be under-employed, and at the post-baccalaureate level they are significantly less likely to utilize their education by entering occupations that are related to biology. In sociology, sex differences in educational utilization emerge only at the post-baccalaureate level: women are less likely than men to enter "high education" occupations, but they are more likely to enter occupations where they are likely to use their education in sociology.

6.3.2. Sex differences in educational utilization by cohort

Given the increasing representation, and at some levels overrepresentation, of women in higher education, and the increasing integration of college majors, we might also expect the patterns of sex differences in educational utilization to have changed over time. To test for change over time, I estimate the best-fitting model of occupational attainment separately for the two NSCG cohorts. The estimated major-specific coefficients for the EDREQ∗SEX and MAJOCC∗SEX interactions from the cohort-specific models are presented in Table 7.

In general, the cohort-specific results reflect persistent sex differences, although there is some evidence of increasing gender equity in educational utilization. Comparing the cohort-specific model estimates, significant sex differences are detected in fewer degree fields for the more recent cohort. For the 1993 cohort, significant sex differences in educational utilization are found for graduates from 14 degree fields. The prevalence of sex differences narrows to only 9 fields for the 2003 cohort. Furthermore, most of the sex differences that do not persist across the cohorts are ones that disadvantaged women. For example, among the 1993 cohort, women with degrees in agriculture, architecture, business, and computer science were less likely than similarly-educated men to utilize their education in the labor market. Among the 2003 cohort, there are no sex differences among the graduates from these fields. Another sign of improvement is the cohort change in the direction of sex differences in educational utilization among graduates with degrees in the health and medical fields. Among the 1993 cohort of graduates from these fields, women were significantly less likely than men to gain employment in health-related occupation, but this sex difference is reversed into a significant female advantage among the 2003 cohort.

Despite this evidence of increasing sex equity, the cohort-specific models reflect significant consistency in the observed sex differences in educational utilization. Specifically, the direction and magnitude of sex differences in the utilization of degrees in the fields of education, engineering, protective services and social work all declined very little or remained unchanged between the 1993 and 2003 cohorts. Additionally, in the field of math, a female advantage in educational utilization among the 1993 cohort was replaced by a female disadvantage among the more recent cohort of college graduates.

Table 7
Estimated conditional logit coefficients indicating within-major sex differences in the influence of EDREQ and MAJOCC separately by cohort.

Major	1993 Cohort				2003 Cohort			
	EDREQ∗SEX		MAJOCC∗SEX		EDREQ∗SEX		MAJOCC∗SEX	
	b	se (*b*)	*b*	se (*b*)	*b*	se (*b*)	*b*	se (*b*)
Agriculture, natural and forestry	0.055	(0.084)	−0.022	(0.008)**	0.102	(0.137)	−0.045	(0.023)
Architecture and environmental design	0.208	(0.194)	−0.024	(0.011)*	−0.029	(0.210)	−0.006	(0.009)
Business, marketing and distribution	−0.096	(0.023)***	−0.001	(0.002)	0.014	(0.042)	0.009	(0.005)
Journalism, communications	−0.021	(0.061)	−0.003	(0.005)	0.068	(0.087)	−0.017	(0.012)
Computer and information sciences	−0.212	(0.093)*	−0.009	(0.007)	−0.269	(0.170)	−0.019	(0.010)
Education	−0.370	(0.044)***	0.035	(0.004)***	−0.204	(0.078)**	0.023	(0.005)***
Engineering	0.164	(0.049)***	−0.008	(0.003)**	0.131	(0.065)*	−0.007	(0.003)*
Foreign languages	−0.131	(0.174)	0.010	(0.021)	0.039	(0.137)	0.004	(0.028)
Health and medical	−0.225	(0.051)***	−0.009	(0.004)*	−0.267	(0.065)***	0.028	(0.006)***
Law	0.201	(0.145)	−0.009	(0.009)	−0.080	(0.258)	0.014	(0.030)
English	−0.134	(0.092)	0.009	(0.010)	0.111	(0.127)	−0.016	(0.015)
Biology	−0.153	(0.065)*	0.004	(0.005)	−0.101	(0.060)	0.002	(0.005)
Math	−0.308	(0.132)*	0.026	(0.010)**	0.409	(0.092)***	−0.040	(0.011)***
Philosophy and religious studies	0.126	(0.114)	−0.003	(0.007)	0.481	(0.276)	−0.034	(0.033)
Physical sciences	0.016	(0.088)	−0.008	(0.007)	−0.012	(0.071)	0.020	(0.009)*
Psychology	−0.107	(0.062)	0.009	(0.006)	−0.162	(0.091)	0.031	(0.010)**
Protective services	−0.135	(0.131)	−0.023	(0.009)*	0.099	(0.145)	−0.031	(0.014)*
Social work and public administration	−0.108	(0.074)	0.034	(0.007)***	−0.111	(0.109)	0.040	(0.012)**
Economics	0.296	(0.148)*	−0.050	(0.019)**	0.220	(0.119)	−0.025	(0.022)
History	−0.175	(0.144)	0.005	(0.014)	0.039	(0.115)	0.020	(0.015)
Sociology	−0.238	(0.136)	0.017	(0.014)	−0.023	(0.137)	0.030	(0.018)
Other social sciences	−0.145	(0.065)*	0.009	(0.008)	−0.020	(0.070)	0.014	(0.013)
Commercial, visual and performing arts	0.000	(0.061)	−0.009	(0.005)	0.231	(0.104)*	−0.011	(0.010)
Other fields	0.022	(0.062)	0.023	(0.011)*	0.090	(0.107)	−0.006	(0.027)

Note: Model includes 56 dummy variables that control for the marginal distribution of NSCG respondents across the 67 occupational categories included in the choice set. The model also includes estimates for the major-specific main effects of EDREQ and MAJOCC.

* $p \leqslant 0.05$.
** $p \leqslant 0.01$.
*** $p \leqslant 0.001$.

Table 8
Observed index of dissimilarity and that predicted under the assumption of sex parity in educational utilization, by degree level and cohort.

Duncan's index of dissimilarity	Full sample	Degree level		Cohort	
		Baccalaureate	Post-baccalaureate	1993	2003
Observed	0.344	0.342	0.369	0.339	0.357
Predicted	0.158	0.149	0.193	0.167	0.149

Note: The predicted dissimilarity index is calculated based on the predicted occupation distribution of the NSCG respondents given the counterfactual assumption that males and females are equally likely to utilize their college degree.

6.3.3. The implications of sex differences in educational utilization

To summarize the implications of the sex differences in educational utilization that have been identified in this analysis, I estimate how much occupation sex segregation is explained by sex differences in educational utilization using the approach presented by DeLeire and Levy (2004). I compare the value of the index of dissimilarity for the observed occupational distribution of the NSCG respondents to a "predicted dissimilarity index," i.e., the dissimilarity index calculated based on the occupation distribution of the NSCG respondents that is predicted under the counterfactual assumption that males and females are equally likely to utilize their education.[12] Table 8 presents the observed and predicted dissimilarity indices, *D*, for the full sample, and separately by degree level and cohort. As reported earlier, the observed values of *D* indicate that about 35% of women would have to change their occupational category in order to achieve an equitable occupational distribution of men and women. If there were no sex differences in the way that college graduates utilize their educational capital upon entering the labor market, occupational sex segregation would decline 15.8. Sex differences in educational utilization therefore explain about 54% of sex differences in occupational attainment. Sex differences in educational utilization appear to be a more significant influence on occupational sex segregation among baccalaureates than among graduates with post-baccalaureate degrees: imposing sex equity in educational utilization among recent bachelor's degree recipients would result in a decline of 56.4% in the occupational segregation index.

7. Discussion

In this paper I introduced the concept of educational utilization as an overlooked part of the education-to-work transition and a potential mechanism by which occupational sex segregation is generated among the college-educated labor force. I propose a series of empirical measures of the education-occupation connection that can be used to test for the prevalence of educational utilization in the occupational structure. The measures of education-occupation connection represent different conceptual dimensions of the concept and I operationalize these measures using data from nationally representative samples of employed, college-educated workers in the U.S. and from the O*NET occupational database. The measures of education-occupation connection that I propose can be used to assess differences in the likelihood of educational utilization. They prove to have significant predictive power in the conditional logit models of occupational attainment, both individually and as a combined scale measure of major-occupation connection. The compound measure, MAJOCC, may be useful for the study of disparities in education-to-work transitions among and between important demographic groups.

The multivariate results show that occupational placement at the transition to the labor force is associated with (1) occupational demands for educational attainment and (2) the substantive connection between majors and occupations. Occupational attainment, therefore, is related to both the quantity and quality of education attained by a recent graduate and that a significant amount of education-occupation matching drives the process of occupational attainment among college-educated workers. The significant variation across major fields, however, indicates that the efficiency of this matching process varies across major fields.

The results also reveal significant sex differences in the likelihood of educational utilization. These sex differences are conditional on degree field and they do not consistently favor one sex over the other; in some fields women appear to be more likely than men to gain employment in occupations that are closely related to their educational investments, while in others they seem less likely than men to utilize their educational investments in this way. Although the within-major sex differences vary somewhat by degree field and cohort, on the whole, the observed sex differences in educational utilization reflect a gendered pattern of occupational sorting. Sex differences in educational utilization therefore contribute to occupational sex segregation: among graduates from female-dominated college majors, men are significantly less likely to utilize their education by entering a related occupation, whereas among graduates in male-dominated fields the disparity in educational utilization disadvantages women. Further analyses are necessary to assess the causes of the observed sex differences in educational utilization and their consequences for other labor market outcomes such as occupational prestige and pay.

[12] The predicted occupational distribution is generated from the best-fitting conditional logit model. The counterfactual condition of sex equity in educational utilization is imposed by constraining all of the estimated coefficients for SEX*MAJOR*EDREQ and SEX*MAJOR*MAJOCC to zero. That is, occupational attainment is predicted for the NSCG sample (full sample and sub-samples defined by degree level and cohort) assuming all respondents experience the male-specific estimated effects of EDREQ and MAJOCC on occupational attainment.

Appendix A. Recode of NSCG93 and NSC03 codes.

Combined major field codes	NSCG93 major field codes		NSCG03 major field codes	
1. Agriculture, natural resources and forestry				
	601	Agriculture, economics	216050	Animal sciences
	602	Other, agricultural business and production	216060	Food sciences and technology
	605	Animal sciences	216070	Plant sciences
	606	Food sciences and technology	216080	Other, agricultural sciences
	607	Plant sciences	766820	Other, natural resources and conservation
	608	Other, agricultural sciences		
	680	Environmental science studies		
	681	Forestry sciences		
	682	Other, conservation/renewable natural resources		
2. Architecture and environmental design				
	610	Architecture/environmental design	646100	Architecture/environmental design
3. Business and marketing				
	651	Accounting	716020	Other, agricultural business and production
	652	Actuarial science	716510	Accounting
	653	Business administration and management	716530	Business administration and management
	654	Business, general	716540	Business, general
	655	Business/managerial economics	716550	Business and managerial economics
	656	Business marketing/marketing mgmt.	716570	Financial management
	657	Financial management	716590	Other, business management/administrative
	658	Marketing research	746560	Business marketing/marketing management
	659	Other, business management/admin. services	746580	Marketing research
4. Journalism and communications				
	661	Communications, general	766610	Communications, general
	662	Journalism	766620	Journalism
	663	Other, communications	766630	Other, communications
5. Computer and information sciences				
	671	Computer/information sciences, general	116710	Computer and information sciences
	672	Computer programming	116730	Computer science
	673	Computer science	116740	Computer systems analysis
	674	Computer systems analysis	116760	Information services and systems
	675	Data processing technology	116770	Other, computer and information sciences
	676	Information services and systems	636720	Computer programming
	677	Other, computer and information sciences	636750	Data processing
6. Education				
	701	Administration	627020	Computer teacher education
	702	Computer teacher education	627060	Mathematics teacher education
	703	Counselor education/guidance services	627090	Science teacher education
	704	Educational psychology	627120	Social science teacher education
	705	Elementary teacher education	727010	Education administration
	706	Mathematics teacher education	727030	Counselor education and guidance service
	707	Physical education/coaching	727050	Elementary teacher education
	708	Pre-elementary teacher education	727070	Physical education and coaching
	709	Science teacher education	727080	Pre-school/kindergarten/early childhood
	710	Secondary teacher education	727100	Secondary teacher education
	711	Special education	727110	Special education
	712	Social science teacher education	727130	Other, education
	713	Other, education		
7. Engineering				
	721	Aerospace, aeronautical, astronautical engineering	517210	Aerospace, aeronautical and astronautical
	722	Agricultural engineering	527250	Chemical engineering
	723	Architectural engineering	537230	Architectural engineering
	724	Bioengineering and biomedical engineering	537260	Civil engineering
	725	Chemical engineering	547270	Computer and systems engineering
	726	Civil engineering	547280	Electrical, electronics and communication
	727	Computer/systems engineering	557330	Industrial and manufacturing engineering
	728	Electrical, electronics, communications engineering	567350	Mechanical engineering
	729	Engineering sciences, mechanics, physics	577220	Agricultural engineering
	730	Environmental engineering	577240	Bioengineering and biomedical engineering

Appendix A. (*continued*)

Combined major field codes	NSCG93 major field codes		NSCG03 major field codes	
	731	General engineering	577290	Engineering sciences, mechanics and physical
	732	Geophysical engineering	577300	Environmental engineering
	733	Industrial engineering	577310	Engineering, general
	734	Materials engineering, including ceramics and textiles	577320	Geophysical and geological engineering
	735	Mechanical engineering	577340	Materials engineering, including ceramic
	736	Metallurgical engineering	577360	Metallurgical engineering
	737	Mining and minerals engineering	577370	Mining and minerals engineering
	738	Naval architecture and marine engineering	577380	Naval architecture and marine engineering
	739	Nuclear engineering	577390	Nuclear engineering
	740	Petroleum engineering	577400	Petroleum engineering
	741	Other, engineering	577410	Other, engineering
	751	Electrical and electronic technologies	637510	Electrical and electronic technologies
	752	Industrial production technologies	637520	Industrial production technologies
	753	Mechanical engineering-related technologies	637530	Mechanical engineering-related technology
	754	Other, engineering-related technologies	637540	Other, engineering-related technologies
	991	Other Science and Engineering field		
8. Foreign languages				
	771	Linguistics	757720	Other, foreign languages and literature
	772	Other, foreign languages and literature		
9. Health and medical				
	781	Audiology and speech pathology	617810	Audiology and speech pathology
	782	Health services administration	617820	Health services administration
	783	Health/medical assistants	617830	Health/medical assistants
	784	Health/medical technologies	617840	Health/medical technologies
	785	Medical preparatory programs (e.g., pre-dentistry, pre-medical, pre-veterinary)	617850	Medical preparatory programs
	786	Medicine (e.g., dentistry, optometry, osteopathic, podiatry, veterinary)	617860	Medicine (dentistry, optometry, osteopathy)
	787	Nursing (4 years or longer program)	617870	Nursing (4 years or longer program)
	788	Pharmacy	617880	Pharmacy
	789	Physical therapy and other rehabilitation/therapeutic services	617890	Physical therapy and other rehabilitation
	790	Public health (including environmental health and epidemiology)	617900	Public health (including environmental health and epidemiology)
	791	Other, health/medical sciences	617910	Other, health/medical sciences
10. Law				
	810	Law/prelaw/legal/studies	768100	Law/prelaw/legal studies
11. English				
	760	English language and literature/Letters	757600	English language, literature and letters
12. Biology				
	631	Biochemistry and biophysics	226310	Biochemistry and biophysics
	632	Biology, general	226320	Biology, general
	633	Botany	226330	Botany
	634	Cell and molecular biology	226340	Cell and molecular biology
	635	Ecology	226350	Ecology
	636	Genetics, animal and plant	226360	Genetics, animal and plant
	637	Microbiology	226370	Microbiological sciences and immunology
	638	Nutritional sciences	226380	Nutritional sciences
	639	Pharmacology, human and animal	226390	Pharmacology, human and animal
	640	Physiology, human and animal	226400	Physiology and pathology, human and animal
	641	Zoology, general	226410	Zoology, general
	642	Other, biological sciences	226420	Other, biological sciences
			236800	Environmental science or studies
			236810	Forestry sciences
13. Math				
	841	Applied mathematics (also see 843, 652)	128410	Applied mathematics
	842	Mathematics, general	128420	Mathematics, general
	843	Mathematics operations research	128430	Operations research
	844	Statistics	128440	Statistics

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Appendix A. (*continued*)

Combined major field codes	NSCG93 major field codes		NSCG03 major field codes	
	845	Other, mathematics	128450	Other, mathematics
			646520	Actuarial science
14. Philosophy, religious studies				
	861	Philosophy of science	458610	Philosophy of science
	862	Other, philosophy, religion, theology	738620	Other, philosophy, religion, theology
15. Physical sciences				
	871	Astronomy and astrophysics	318730	Chemistry, except biochemistry
	872	Atmospheric sciences and meteorology	328720	Atmospheric sciences and meteorology
	631	Biochemistry	328740	Earth sciences
	873	Chemistry	328750	Geology
	874	Earth sciences	328760	Geological sciences, other
	680	Environmental science studies	328770	Oceanography
	875	Geology	338710	Astronomy and astrophysics
	876	Geological sciences, other	338780	Physics
	877	Oceanography	348790	Other, physical sciences
	878	Physics	349910	Science, unclassified
	879	Other, physical sciences		
16. Psychology				
	891	Clinical psychology	437040	Educational psychology
	892	Counseling psychology	438910	Clinical psychology
	704	Educational psychology	438920	Counseling psychology
	893	Experimental psychology	438930	Experimental psychology
	894	General psychology	438940	General psychology
	895	Industrial/Organizational psychology	438950	Industrial/Organizational psychology
	896	Social psychology	438960	Social psychology
	897	Other, psychology	438970	Other, psychology
17. Protective services				
	690	Criminal justice/protective services	767600	Criminal justice/protective services
18. Social work, public administration				
	901	Public administration	429020	Public policy studies
	902	Public policy studies	739100	Social work
	903	Other, public affairs	768500	Parks, recreation, leisure, and fitness studies
	910	Social work	769010	Public administration
			769030	Other, public affairs
19. Economics				
	923	Economics	416010	Agricultural economics
			419230	Economics
20. History				
	925	History of science	459250	History of science
	926	History, other	759260	History, other
21. Sociology				
	922	Criminology	449220	Criminology
	929	Sociology	449290	Sociology
22. Other social sciences				
	620	Area/ethnic studies	429270	International relations
	921	Anthropology and archeology	429280	Political science and government
	924	Geography	449210	Anthropology and archeology
	927	International relations	456200	Area and ethnic studies
	928	Political science and government	457710	Linguistics
	930	Other, social sciences	459240	Geography
			459300	Other, social sciences
			768000	Home Economics
23. Commercial art, visual and performing arts				
	941	Dramatic arts	759410	Dramatic arts
	942	Fine arts, all fields	759420	Fine arts, all fields
	943	Music, all fields	759430	Music, all fields

Appendix A. (*continued*)

Combined major field codes	NSCG93 major field codes		NSCG03 major field codes	
	944	Other, visual and performing arts	759440	Other, visual and performing arts
24. Other fields				
	800	Home economics	758200	Liberal arts/general studies
	820	Liberal arts/general studies	768300	Library science
	830	Library science	769950	Other fields (not listed)
	850	Parks, recreation, leisure, and fitness studies		
	995	Other fields (not listed)		

Appendix B. Connection between degree fields and O∗NET knowledge domains used to create SUBSTANTIVE.

	$SUBSTANTIVE_k$	
Degree field	O∗NET domain variable	Description[a]
Agriculture, natural resources and forestry	Food production	Knowledge of techniques and equipment for planting, growing, and harvesting food products (both plant and animal) for consumption, including storage/handling techniques.
Architecture and environmental design	Design	Knowledge of design techniques, tools, and principles involved in production of precision technical plans, blueprints, drawings, and models.
	Building and construction	Knowledge of materials, methods, and the tools involved in the construction or repair of houses, buildings, or other structures such as highways and roads.
Business, marketing/ distribution	Sales and marketing	Knowledge of principles and methods for showing, promoting, and selling products or services. This includes marketing strategy and tactics, product demonstration, sales techniques, and sales control systems.
	Administration and management	Knowledge of business and management principles involved in strategic planning, resource allocation, human resources modeling, leadership technique, production methods, and coordination of people and resources.
Journalism, communications	Communications and media	Knowledge of media production, communication, and dissemination techniques and methods. This includes alternative ways to inform and entertain via written, oral, and visual media.
Computer and information sciences	Computers and electronics	Knowledge of circuit boards, processors, chips, electronic equipment, and computer hardware and software, including applications and programming.
Education	Education and training	Knowledge of principles and methods for curriculum and training design, teaching and instruction for individuals and groups, and the measurement of training effects.
Engineering	Engineering and technology	Knowledge of the practical application of engineering science and technology. This includes applying principles, techniques, procedures, and equipment to the design and production of various goods and services.
Foreign languages	Foreign language	Knowledge of the structure and content of a foreign (non-English) language including the meaning and spelling of words, rules of composition and grammar, and pronunciation.
Health and medical	Medicine and dentistry	Knowledge of the information and techniques needed to diagnose and treat human injuries, diseases, and deformities. This includes symptoms, treatment alternatives, drug properties and interactions, and preventive health-care measures.
Law	Law and government	Knowledge of laws, legal codes, court procedures, precedents, government regulations, executive orders, agency rules, and the democratic political process.
English	English language	Knowledge of the structure and content of the English language including the meaning and spelling of words, rules of composition, and grammar.
Biology	Biology	Knowledge of plant and animal organisms, their tissues, cells, functions, interdependencies, and interactions with each other and the environment.
Math	Mathematics	Knowledge of arithmetic, algebra, geometry, calculus, statistics, and their applications.
Philosophy, religious studies	Philosophy and theology	Knowledge of different philosophical systems and religions. This includes their basic principles, values, ethics, ways of thinking, customs, practices, and their impact on human culture.

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Appendix B. (*continued*)

	$SUBSTANTIVE_k$	
Degree field	O*NET domain variable	Description[a]
Physical sciences	Physics	Knowledge and prediction of physical principles, laws, their interrelationships, and applications to understanding fluid, material, and atmospheric dynamics, and mechanical, electrical, atomic and sub-atomic structures and processes.
	Chemistry	Knowledge of the chemical composition, structure, and properties of substances and of the chemical processes and transformations that they undergo. This includes uses of chemicals and their interactions, danger signs, production techniques, and disposal methods.
Psychology	Psychology	Knowledge of human behavior and performance; individual differences in ability, personality, and interests; learning and motivation; psychological research methods; and the assessment and treatment of behavioral and affective disorders.
Protective services	Public safety and security	Knowledge of relevant equipment, policies, procedures, and strategies to promote effective local, state, or national security operations for the protection of people, data, property, and institutions.
Social work and public administration	Therapy and counseling	Knowledge of principles, methods, and procedures for diagnosis, treatment, and rehabilitation of physical and mental dysfunctions, and for career counseling and guidance.
Economics	Economics and accounting	Knowledge of economic and accounting principles and practices, the financial markets, banking and the analysis and reporting of financial data.
History	History and archeology	Knowledge of historical events and their causes, indicators, and effects on civilizations and cultures.
Sociology	Sociology and anthropology	Knowledge of group behavior and dynamics, societal trends and influences, human migrations, ethnicity, cultures and their history and origins.
Other social sciences	Psychology	Knowledge of human behavior and performance; individual differences in ability, personality, and interests; learning and motivation; psychological research methods; and the assessment and treatment of behavioral and affective disorders.
	Sociology and anthropology	Knowledge of group behavior and dynamics, societal trends and influences, human migrations, ethnicity, cultures and their history and origins.
	Geography	Knowledge of principles and methods for describing the features of land, sea, and air masses, including their physical characteristics, locations, interrelationships, and distribution of plant, animal, and human life.
Commercial art, visual and performing arts	Fine arts	Knowledge of the theory and techniques required to compose, produce, and perform works of music, dance, visual arts, drama, and sculpture.
Other fields	NA	NA
Knowledge domain variables not linked to degree fields		
	Clerical	Knowledge of administrative and clerical procedures and systems such as word processing, managing files and records, stenography and transcription, designing forms, and other office procedures and terminology.
	Customer and personal service	Knowledge of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction.
	Personnel and human resources	Knowledge of principles and procedures for personnel recruitment, selection, training, compensation and benefits, labor relations and negotiation, and personnel information systems.
	Telecommunications	Knowledge of transmission, broadcasting, switching, control, and operation of telecommunications systems.
	Transportation	Knowledge of principles and methods for moving people or goods by air, rail, sea, or road, including the relative costs and benefits.
	Production and processing	Knowledge of raw materials, production processes, quality control, costs, and other techniques for maximizing the effective manufacture and distribution of goods.
	Mechanical	Knowledge of machines and tools, including their designs, uses, repair, and maintenance.

[a] Descriptions are presented in the O*NET Content Model Reference Guide.

Appendix C. For each major, the ten occupations with the strongest major-occupation association according to the MAJOCC measure.

Degree Field	All			Bachelor's degrees			Post-baccalaureate degrees		
	Occupations		MAJOCC	Occupations		MAJOCC	Occupations		MAJOCC
1. Agriculture, natural resources and forestry									
	210210	Agricultural and food scientists	54.34	210210	Agricultural and food scientists	58.07	210210	Agricultural and food scientists	50.62
	230240	Forestry and conservation scientists	34.98	230240	Forestry and conservation scientists	50.51	220220	Biochemists and biophysicists	37.14
	220220	Biochemists and biophysicists	33.45	781100	Farmers, foresters and fishermen	46.91	412320	Economists	19.91
	781100	Farmers, foresters and fishermen	26.43	220220	Biochemists and biophysicists	29.75	230240	Forestry and conservation scientists	19.44
	570990	Other engineers	20.30	640260	Technologists/ technicians in the life sciences	28.29	570990	Other engineers	18.03
	341980	Other physical and related scientists	20.27	732550	Teachers—secondary, other subjects	28.10	611110	Diagnosing and treating health practitioners	16.88
	732550	Teachers—secondary, other subjects	18.52	611120	Registered nurses, pharmacists, dieticians	27.34	341980	Other physical and related scientists	15.17
	611110	Diagnosing and treating health practitioners	16.91	341980	Other physical and related scientists	25.38	321940	Geologists	13.84
	640260	Technologists/ technicians in the life sciences	15.18	570990	Other engineers	22.58	711410	Top-level managers, executives, administrators	12.22
	611120	Registered nurses, pharmacists, dieticians	14.54	785000	Other occupations	19.13	732550	Teachers—secondary, other subjects	8.94
2. Architecture and environmental design									
	650810	Architects	56.84	650810	Architects	77.74	650810	Architects	35.94
	530860	Civil, architectural or sanitary engineers	38.26	530860	Civil, architectural or sanitary engineers	45.43	530860	Civil, architectural or sanitary engineers	31.09
	711470	Other mid-level managers	19.71	784010	Construction trades, miners and well-drillers	31.35	711470	Other mid-level managers	17.17
	784010	Construction trades, miners and well-drillers	19.40	570990	Other engineers	24.40	785000	Other occupations	16.32
	711410	Top-level managers, executives, administrators	18.62	711470	Other mid-level managers	22.24	711410	Top-level managers, executives, administrators	15.77
	570990	Other engineers	17.04	711410	Top-level managers, executives, administrators	21.46	641010	Drafting occupations	11.15
	785000	Other occupations	15.90	641010	Drafting occupations	20.60	570990	Other engineers	9.69
	641010	Drafting occupations	15.87	452380	Other social scientists	18.47	641020	Surveying/mapping engineers technicians	8.59
	452380	Other social scientists	10.57	785000	Other occupations	15.48	784010	Construction trades, miners and well-drillers	7.45
	641020	Surveying/mapping engineers technicians	10.33	110510	Computer and information scientists	13.70	550910	Industrial engineers	7.06
3. Business, marketing/distribution									
	721510	Accountants, auditors, other financial services	50.96	721510	Accountants, auditors, other financial services	64.28	711410	Top-level managers, executives, administrators	43.91
	711410	Top-level managers, executives, administrators	45.51	711410	Top-level managers, executives, administrators	47.11	742990	Post-secondary teachers—other non-S&E	43.05
	781200	Lawyers and judges	38.61	762000	Sales/mrkt.—insurance, securities, real estate	42.76	781200	Lawyers and judges	40.78
	711470	Other mid-level managers	34.30	762020	Sales occupations—retail	40.42	721510	Accountants, auditors, other financial services	37.64
	742990	Post-secondary teachers—other non-S&E	33.89	721520	Personnel, training and labor relations	36.77	711470	Other mid-level managers	32.13
	762000	Sales/mrkt.—insurance, securities, real estate	30.88	570980	Sales engineers	36.55	110510	Computer and information scientists	28.77

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Appendix C. (*continued*)

Degree Field	All			Bachelor's degrees			Post-baccalaureate degrees		
	Occupations		MAJOCC	Occupations		MAJOCC	Occupations		MAJOCC
	762020	Sales occupations—retail	29.81	711470	Other mid-level managers	36.46	412320	Economists	27.08
	570980	Sales engineers	28.95	781200	Lawyers and judges	36.43	611110	Diagnosing and treating health practitioners	23.10
	721520	Personnel, training and labor relations	26.66	780310	Accounting clerks and bookkeepers	36.00	570980	Sales engineers	21.35
	412320	Economists	26.52	732550	Teachers—secondary, other subjects	31.30	762020	Sales occupations—retail	19.20
4. Journalism, communications									
	770100	Artists, editors, entertainers, public relations	34.31	770100	Artists, editors, entertainers, public relations	46.52	742990	Post-secondary teachers—other non-S&E	42.29
	742990	Post-secondary teachers—other non-S&E	33.18	732550	Teachers—secondary, other subjects	31.95	452380	Other social scientists	26.89
	732550	Teachers—secondary, other subjects	25.08	732520	Teachers—elementary school	28.77	770100	Artists, editors, entertainers, public relations	22.10
	452380	Other social scientists	22.21	611120	Registered nurses, pharmacists, dieticians	27.13	732550	Teachers—secondary, other subjects	18.22
	711410	Top-level managers, executives, administrators	17.76	742990	Post-secondary teachers—other non-S&E	24.07	711470	Other mid-level managers	17.20
	711470	Other mid-level managers	17.02	781200	Lawyers and judges	21.42	711410	Top-level managers, executives, administrators	15.19
	732520	Teachers—elementary school	16.83	711410	Top-level managers, executives, administrators	20.32	762020	Sales occupations—retail	14.91
	611120	Registered nurses, pharmacists, dieticians	15.35	762000	Sales/mrkt.—insurance, securities, real estate	20.24	721520	Personnel, training and labor relations	11.92
	762020	Sales occupations—retail	15.11	750700	Counselor, educational and vocational	19.81	220250	Medical scientists, except practitioners	9.12
	721520	Personnel, training and labor relations	13.66	782220	Protective service workers	19.80	412320	Economists	6.75
5. Computer and information sciences									
	110510	Computer and information scientists	52.34	640520	Computer programmers	61.92	110510	Computer and information scientists	46.51
	640520	Computer programmers	46.33	110510	Computer and information scientists	58.18	640520	Computer programmers	30.74
	540890	Electrical and electronics engineers	29.39	540890	Electrical and electronics engineers	44.73	711410	Top-level managers, executives, administrators	19.63
	711410	Top-level managers, executives, administrators	24.50	570990	Other engineers	35.83	711470	Other mid-level managers	17.63
	570990	Other engineers	23.30	711410	Top-level managers, executives, administrators	29.37	540890	Electrical and electronics engineers	14.05
	711470	Other mid-level managers	22.98	711470	Other mid-level managers	28.32	121720	Mathematicians	12.19
	570980	Sales engineers	18.98	570980	Sales engineers	26.90	331910	Astronomers	11.75
	721510	Accountants, auditors, other financial services	17.05	721510	Accountants, auditors, other financial services	26.86	510820	Aerospace, aeronautical or astronautical	11.60
	762020	Sales occupations—retail	16.88	762000	Sales/mrkt.—insurance, securities, real estate	22.84	762020	Sales occupations—retail	11.56
	762000	Sales/mrkt.—insurance, securities, real estate	13.87	611110	Diagnosing and treating health practitioners	22.34	321920	Atmospheric and space scientists	11.19
6. Education									
	732560	Teachers—special education	63.89	732520	Teachers—elementary school	74.39	750700	Counselor, educational and vocational	62.23

Appendix C. (*continued*)

Degree Field	All			Bachelor's degrees			Post-baccalaureate degrees		
	Occupations		MAJOCC	Occupations		MAJOCC	Occupations		MAJOCC
	732520	Teachers—elementary school	63.37	732510	Teachers—pre-K and kindergarten	71.12	432360	Psychologists	57.65
	732550	Teachers—secondary, other subjects	60.79	732560	Teachers—special education	70.59	742990	Post-secondary teachers—other non-S&E	57.49
	750700	Counselor, educational and vocational	54.42	732550	Teachers—secondary, other subjects	65.80	732560	Teachers—special education	57.20
	742990	Post-secondary teachers—other non-S&E	52.54	732570	Teachers—other precollegiate education	61.89	732550	Teachers—secondary, other subjects	55.78
	732570	Teachers—other precollegiate education	52.54	742990	Post-secondary teachers—other non-S&E	47.60	732520	Teachers—elementary school	52.35
	732510	Teachers—pre-K and kindergarten	51.46	750700	Counselor, educational and vocational	46.61	452380	Other social scientists	46.58
	432360	Psychologists	43.29	781300	Librarians, archivists and curators	41.83	711410	Top-level managers, executives, administrators	45.02
	711410	Top-level managers, executives, administrators	33.14	750400	Clergy and other religious workers	35.58	732570	Teachers—other precollegiate education	43.19
	781300	Librarians, archivists and curators	32.93	611120	Registered nurses, pharmacists, dieticians	35.19	781200	Lawyers and judges	42.42
7. Engineering									
	530860	Civil, architectural or sanitary engineers	69.70	530860	Civil, architectural or sanitary engineers	86.77	510820	Aerospace, aeronautical or astronautical	56.53
	510820	Aerospace, aeronautical or astronautical	68.35	540890	Electrical and electronics engineers	81.71	530860	Civil, architectural or sanitary engineers	52.63
	540890	Electrical and electronics engineers	66.59	570970	Petroleum engineers	81.60	520850	Chemical engineers	52.47
	520850	Chemical engineers	64.51	510820	Aerospace, aeronautical or astronautical	80.17	570990	Other engineers	51.50
	560940	Mechanical engineers	61.77	560940	Mechanical engineers	79.29	540890	Electrical and electronics engineers	51.48
	570930	Materials and metallurgical engineers	59.66	520850	Chemical engineers	76.55	570930	Materials and metallurgical engineers	48.31
	570990	Other engineers	56.84	570930	Materials and metallurgical engineers	71.01	560940	Mechanical engineers	44.24
	570970	Petroleum engineers	50.31	550910	Industrial engineers	67.90	611110	Diagnosing and treating health practitioners	42.39
	550910	Industrial engineers	46.77	570990	Other engineers	62.19	331910	Astronomers	34.77
	650810	Architects	37.33	570980	Sales engineers	53.91	110510	Computer and information scientists	30.29
8. Foreign languages									
	742990	Post-secondary teachers—other non-S&E	33.98	732550	Teachers—secondary, other subjects	36.40	742990	Post-secondary teachers—other non-S&E	41.75
	732550	Teachers—secondary, other subjects	26.87	732520	Teachers—elementary school	32.38	732520	Teachers—elementary school	19.94
	732520	Teachers—elementary school	26.16	742990	Post-secondary teachers—other non-S&E	26.22	732550	Teachers—secondary, other subjects	17.34
	770100	Artists, editors, entertainers, public relations	12.45	770100	Artists, editors, entertainers, public relations	18.19	711410	Top-level managers, executives, administrators	11.81
	781200	Lawyers and judges	8.34	781200	Lawyers and judges	16.17	770100	Artists, editors, entertainers, public relations	6.70
	711410	Top-level managers, executives, administrators	8.27	721520	Personnel, training and labor relations	14.46	452380	Other social scientists	5.32
	721520	Personnel, training and labor relations	8.14	750400	Clergy and other religious workers	14.41	341980	Other physical and related scientists	2.37

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Appendix C. (*continued*)

Degree Field	All			Bachelor's degrees			Post-baccalaureate degrees		
	Occupations		MAJOCC	Occupations		MAJOCC	Occupations		MAJOCC
	611110	Diagnosing and treating health practitioners	7.87	611110	Diagnosing and treating health practitioners	14.30	210210	Agricultural and food scientists	2.20
	750400	Clergy and other religious workers	7.64	782230	Other service occupations, except health	11.90	442370	Sociologists	2.03
	782230	Other service occupations, except health	6.28	721510	Accountants, auditors, other financial services	9.89	750700	Counselor, educational and vocational	1.97
9. Health and medical									
	611110	Diagnosing and treating health practitioners	68.13	611120	Registered nurses, pharmacists, dieticians	71.68	611110	Diagnosing and treating health practitioners	76.48
	611120	Registered nurses, pharmacists, dieticians	60.02	611110	Diagnosing and treating health practitioners	59.78	220250	Medical scientists, except practitioners	60.11
	220250	Medical scientists, except practitioners	53.72	611130	Health technologists and technicians	56.35	611120	Registered nurses, pharmacists, dieticians	48.35
	611130	Health technologists and technicians	38.91	220250	Medical scientists, except practitioners	47.32	611140	Other health occupations	36.10
	611140	Other health occupations	38.87	611140	Other health occupations	41.63	220220	Biochemists and biophysicists	34.59
	220220	Biochemists and biophysicists	30.04	640260	Technologists/ technicians in the life sciences	38.18	711470	Other mid-level managers	30.44
	732560	Teachers—special education	28.07	742990	Post-secondary teachers—other non-S&E	35.33	732560	Teachers—special education	21.66
	742990	Post-secondary teachers—other non-S&E	27.61	732560	Teachers—special education	34.48	611130	Health technologists and technicians	21.47
	711470	Other mid-level managers	26.28	711410	Top-level managers, executives, administrators	29.63	781200	Lawyers and judges	20.84
	711410	Top-level managers, executives, administrators	24.19	732550	Teachers—secondary, other subjects	29.16	432360	Psychologists	20.51
10. Law									
	781200	Lawyers and judges	54.29	781200	Lawyers and judges	35.86	781200	Lawyers and judges	72.71
	785000	Other occupations	16.56	785000	Other occupations	23.82	742990	Post-secondary teachers—other non-S&E	21.82
	782220	Protective service workers	14.96	782220	Protective service workers	19.70	721510	Accountants, auditors, other financial services	16.99
	742990	Post-secondary teachers—other non-S&E	14.10	752400	Social workers	18.29	711410	Top-level managers, executives, administrators	14.87
	711470	Other mid-level managers	12.94	711470	Other mid-level managers	15.47	721520	Personnel, training and labor relations	11.19
	711410	Top-level managers, executives, administrators	12.72	711410	Top-level managers, executives, administrators	10.57	711470	Other mid-level managers	10.40
	721510	Accountants, auditors, other financial services	12.46	650810	Architects	10.34	762000	Sales/mrkt.—insurance, securities, real estate	10.33
	752400	Social workers	12.37	220220	Biochemists and biophysicists	8.89	782220	Protective service workers	10.22
	721520	Personnel, training and labor relations	9.31	651710	Actuaries	8.66	785000	Other occupations	9.30
	650810	Architects	9.20	341980	Other physical and related scientists	8.49	650810	Architects	8.05
11. English									
	742990	Post-secondary teachers—other non-S&E	49.15	732520	Teachers—elementary school	51.67	742990	Post-secondary teachers—other non-S&E	54.09

Appendix C. (*continued*)

Degree Field	All			Bachelor's degrees			Post-baccalaureate degrees		
	Occupations		MAJOCC	Occupations		MAJOCC	Occupations		MAJOCC
	732550	Teachers—secondary, other subjects	39.10	732550	Teachers—secondary, other subjects	48.91	711470	Other mid-level managers	36.13
	732520	Teachers—elementary school	37.86	742990	Post-secondary teachers—other non-S&E	44.20	732550	Teachers—secondary, other subjects	29.28
	781200	Lawyers and judges	30.67	781300	Librarians, archivists and curators	41.05	781200	Lawyers and judges	27.98
	711470	Other mid-level managers	28.70	781200	Lawyers and judges	33.37	750700	Counselor, educational and vocational	24.28
	750700	Counselor, educational and vocational	27.22	732570	Teachers—other precollegiate education	31.10	732520	Teachers—elementary school	24.05
	781300	Librarians, archivists and curators	26.17	770100	Artists, editors, entertainers, public relations	31.05	770100	Artists, editors, entertainers, public relations	17.51
	770100	Artists, editors, entertainers, public relations	24.28	750700	Counselor, educational and vocational	30.16	711410	Top-level managers, executives, administrators	17.03
	732570	Teachers—other precollegiate education	20.58	611110	Diagnosing and treating health practitioners	28.85	442370	Sociologists	14.60
	711410	Top-level managers, executives, administrators	20.50	732560	Teachers—special education	25.74	452380	Other social scientists	13.95
12. Biology									
	220220	Biochemists and biophysicists	65.36	220220	Biochemists and biophysicists	66.31	220220	Biochemists and biophysicists	64.41
	220250	Medical scientists, except practitioners	58.81	611110	Diagnosing and treating health practitioners	60.56	220250	Medical scientists, except practitioners	60.53
	611110	Diagnosing and treating health practitioners	56.75	640260	Technologists/ technicians in the life sciences	57.68	611110	Diagnosing and treating health practitioners	52.94
	210210	Agricultural and food scientists	41.79	220250	Medical scientists, except practitioners	57.10	210210	Agricultural and food scientists	34.37
	640260	Technologists/ technicians in the life sciences	40.59	230240	Forestry and conservation scientists	55.21	611120	Registered nurses, pharmacists, dieticians	23.64
	611130	Health technologists and technicians	35.38	210210	Agricultural and food scientists	49.20	611130	Health technologists and technicians	23.54
	230240	Forestry and conservation scientists	34.88	611130	Health technologists and technicians	47.22	640260	Technologists/ technicians in the life sciences	23.50
	611120	Registered nurses, pharmacists, dieticians	32.44	611120	Registered nurses, pharmacists, dieticians	41.24	711470	Other mid-level managers	22.22
	732550	Teachers—secondary, other subjects	26.63	732550	Teachers—secondary, other subjects	36.20	110510	Computer and information scientists	21.83
13. Math									
	121720	Mathematicians	62.89	651710	Actuaries	78.30	121720	Mathematicians	69.97
	651710	Actuaries	50.57	121720	Mathematicians	55.81	110510	Computer and information scientists	25.27
	732550	Teachers—secondary, other subjects	35.26	732550	Teachers—secondary, other subjects	45.46	732550	Teachers—secondary, other subjects	25.06
	110510	Computer and information scientists	26.99	510820	Aerospace, aeronautical or astronautical	30.21	651710	Actuaries	22.84
	570990	Other engineers	21.46	110510	Computer and information scientists	28.70	570990	Other engineers	18.34
	510820	Aerospace, aeronautical or astronautical	20.59	640520	Computer programmers	27.28	331910	Astronomers	17.56
	331910	Astronomers	20.48	721510	Accountants, auditors, other financial services	25.92	641030	Other engineers technologists/ technicians	16.84

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Appendix C. (*continued*)

Degree Field	All			Bachelor's degrees			Post-baccalaureate degrees		
	Occupations		MAJOCC	Occupations		MAJOCC	Occupations		MAJOCC
	641030	Other engineers technologists/ technicians	19.72	220220	Biochemists and biophysicists	24.78	711410	Top-level managers, executives, administrators	15.75
	721510	Accountants, auditors, other financial services	19.47	611110	Diagnosing and treating health practitioners	24.68	721510	Accountants, auditors, other financial services	13.03
	711410	Top-level managers, executives, administrators	18.76	570990	Other engineers	24.57	530860	Civil, architectural or sanitary engineers	12.98
14. Philosophy and *religious studies*									
	750400	Clergy and other religious workers	56.59	750400	Clergy and other religious workers	52.54	750400	Clergy and other religious workers	60.64
	742990	Post-secondary teachers—other non-S&E	33.41	742990	Post-secondary teachers—other non-S&E	22.74	742990	Post-secondary teachers—other non-S&E	44.09
	752400	Social workers	18.69	752400	Social workers	21.57	711470	Other mid-level managers	19.34
	732550	Teachers—secondary, other subjects	14.82	781200	Lawyers and judges	18.26	752400	Social workers	15.81
	711470	Other mid-level managers	12.16	750700	Counselor, educational and vocational	16.54	732550	Teachers—secondary, other subjects	14.71
	711410	Top-level managers, executives, administrators	11.56	732550	Teachers—secondary, other subjects	14.93	711410	Top-level managers, executives, administrators	10.85
	750700	Counselor, educational and vocational	11.15	711410	Top-level managers, executives, administrators	12.28	442370	Sociologists	9.78
	781200	Lawyers and judges	10.20	732520	Teachers—elementary school	11.84	110510	Computer and information scientists	7.67
	442370	Sociologists	9.44	770100	Artists, editors, entertainers, public relations	9.61	452380	Other social scientists	6.27
	732520	Teachers—elementary school	8.08	780330	Other administrators	9.41	432360	Psychologists	6.23
15. Physical sciences									
	321940	Geologists	60.10	321940	Geologists	66.90	331910	Astronomers	68.09
	331910	Astronomers	58.06	311930	Chemists, except biochemists	62.08	321920	Atmospheric and space scientists	55.22
	311930	Chemists, except biochemists	55.82	321920	Atmospheric and space scientists	52.75	321940	Geologists	53.30
	321920	Atmospheric and space scientists	53.99	331910	Astronomers	48.04	311930	Chemists, except biochemists	49.56
	220220	Biochemists and biophysicists	37.79	520850	Chemical engineers	45.40	220220	Biochemists and biophysicists	42.05
	570990	Other engineers	30.28	570930	Materials and metallurgical engineers	34.93	570990	Other engineers	30.67
	220250	Medical scientists, except practitioners	29.77	611120	Registered nurses, pharmacists, dieticians	34.79	220250	Medical scientists, except practitioners	26.69
	520850	Chemical engineers	28.76	220220	Biochemists and biophysicists	33.54	341980	Other physical and related scientists	26.36
	341980	Other physical and related scientists	28.21	220250	Medical scientists, except practitioners	32.84	611110	Diagnosing and treating health practitioners	23.13
	570930	Materials and metallurgical engineers	26.73	560940	Mechanical engineers	30.71	570930	Materials and metallurgical engineers	18.53
16. Psychology									
	432360	Psychologists	72.14	432360	Psychologists	65.08	432360	Psychologists	79.20
	750700	Counselor, educational and vocational	43.37	750700	Counselor, educational and vocational	51.89	611110	Diagnosing and treating health practitioners	45.92
	611110	Diagnosing and treating health practitioners	37.49	752400	Social workers	47.50	742990	Post-secondary teachers—other non-S&E	39.84

Appendix C. (*continued*)

Degree Field	All			Bachelor's degrees			Post-baccalaureate degrees		
	Occupations		MAJOCC	Occupations		MAJOCC	Occupations		MAJOCC
	752400	Social workers	37.11	611120	Registered nurses, pharmacists, dieticians	42.52	750700	Counselor, educational and vocational	34.86
	611120	Registered nurses, pharmacists, dieticians	36.06	732560	Teachers—special education	42.34	611120	Registered nurses, pharmacists, dieticians	29.61
	742990	Post-secondary teachers—other non-S&E	34.85	732520	Teachers—elementary school	37.88	711470	Other mid-level managers	27.29
	732560	Teachers—special education	34.09	732510	Teachers—pre-K and kindergarten	37.18	752400	Social workers	26.71
	732550	Teachers—secondary, other subjects	28.08	732550	Teachers—secondary, other subjects	33.96	732560	Teachers—special education	25.83
	732520	Teachers—elementary school	23.27	742990	Post-secondary teachers—other non-S&E	29.87	732550	Teachers—secondary, other subjects	22.20
	732510	Teachers—pre-K and kindergarten	22.54	611110	Diagnosing and treating health practitioners	29.07	750400	Clergy and other religious workers	17.59
17. Protective services									
	782220	Protective service workers	39.53	782220	Protective service workers	52.41	782220	Protective service workers	26.65
	752400	Social workers	25.13	752400	Social workers	30.29	752400	Social workers	19.97
	782230	Other service occupations, except health	16.90	782230	Other service occupations, except health	29.46	711410	Top-level managers, executives, administrators	13.74
	750700	Counselor, educational and vocational	15.66	750700	Counselor, educational and vocational	27.31	530860	Civil, architectural or sanitary engineers	6.23
	711410	Top-level managers, executives, administrators	15.25	781200	Lawyers and judges	20.54	570990	Other engineers	6.16
	781200	Lawyers and judges	12.12	711410	Top-level managers, executives, administrators	16.77	650810	Architects	6.11
	711470	Other mid-level managers	10.03	785000	Other occupations	15.21	784010	Construction trades, miners and well-drillers	6.02
	785000	Other occupations	9.17	711470	Other mid-level managers	14.74	550910	Industrial engineers	5.87
	721510	Accountants, auditors, other financial services	7.92	721510	Accountants, auditors, other financial services	13.56	750400	Clergy and other religious workers	5.56
	784010	Construction trades, miners and well-drillers	7.20	784010	Construction trades, miners and well-drillers	8.38	732550	Teachers—secondary, other subjects	5.36
18. Social work, public administration									
	752400	Social workers	55.48	752400	Social workers	55.44	752400	Social workers	55.53
	750700	Counselor, educational and vocational	37.30	750700	Counselor, educational and vocational	46.25	781200	Lawyers and judges	40.35
	781200	Lawyers and judges	29.93	611120	Registered nurses, pharmacists, dieticians	37.17	742990	Post-secondary teachers—other non-S&E	37.30
	432360	Psychologists	29.12	611140	Other health occupations	30.23	432360	Psychologists	36.54
	742990	Post-secondary teachers—other non-S&E	27.52	732520	Teachers—elementary school	28.95	750700	Counselor, educational and vocational	28.34
	611140	Other health occupations	25.39	711410	Top-level managers, executives, administrators	26.79	611110	Diagnosing and treating health practitioners	26.61
	611120	Registered nurses, pharmacists, dieticians	23.29	732550	Teachers—secondary, other subjects	22.41	611140	Other health occupations	20.55
	711410	Top-level managers, executives, administrators	21.24	782230	Other service occupations, except health	22.01	721520	Personnel, training and labor relations	16.11
	611110	Diagnosing and treating health practitioners	18.58	432360	Psychologists	21.70	711410	Top-level managers, executives, administrators	15.68
	721520	Personnel, training and labor relations	17.22	781200	Lawyers and judges	19.51	711470	Other mid-level managers	12.18

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Appendix C. (*continued*)

Degree Field	All			Bachelor's degrees			Post-baccalaureate degrees		
	Occupations		MAJOCC	Occupations		MAJOCC	Occupations		MAJOCC
19. Economics									
	412320	Economists	55.91	412320	Economists	52.11	412320	Economists	59.70
	711410	Top-level managers, executives, administrators	23.04	721510	Accountants, auditors, other financial services	27.53	742990	Post-secondary teachers—other non-S&E	23.63
	721510	Accountants, auditors, other financial services	20.77	711410	Top-level managers, executives, administrators	25.47	711410	Top-level managers, executives, administrators	20.60
	742990	Post-secondary teachers—other non-S&E	19.84	762000	Sales/mrkt.—insurance, securities, real estate	23.00	721510	Accountants, auditors, other financial services	14.02
	762000	Sales/mrkt.—insurance, securities, real estate	15.14	611110	Diagnosing and treating health practitioners	20.62	651710	Actuaries	9.71
	611110	Diagnosing and treating health practitioners	12.28	781200	Lawyers and judges	19.76	711470	Other mid-level managers	8.16
	651710	Actuaries	11.48	781100	Farmers, foresters and fishermen	19.32	762000	Sales/mrkt.—insurance, securities, real estate	7.29
	781200	Lawyers and judges	11.32	742990	Post-secondary teachers—other non-S&E	16.05	570970	Petroleum engineers	5.82
	781100	Farmers, foresters and fishermen	10.81	651710	Actuaries	13.25	780310	Accounting clerks and bookkeepers	5.70
	711470	Other mid-level managers	9.81	785000	Other occupations	12.77	550910	Industrial engineers	5.04
20. History									
	742990	Post-secondary teachers—other non-S&E	35.62	732550	Teachers—secondary, other subjects	40.61	742990	Post-secondary teachers—other non-S&E	44.94
	732550	Teachers—secondary, other subjects	31.84	732520	Teachers—elementary school	38.50	732550	Teachers—secondary, other subjects	23.07
	781300	Librarians, archivists and curators	23.94	781200	Lawyers and judges	32.88	781300	Librarians, archivists and curators	16.85
	732520	Teachers—elementary school	23.01	781300	Librarians, archivists and curators	31.03	452380	Other social scientists	12.54
	452380	Other social scientists	20.11	452380	Other social scientists	27.68	770100	Artists, editors, entertainers, public relations	9.62
	781200	Lawyers and judges	16.96	742990	Post-secondary teachers—other non-S&E	26.29	711410	Top-level managers, executives, administrators	8.20
	732560	Teachers—special education	13.88	732560	Teachers—special education	21.55	732520	Teachers—elementary school	7.53
	770100	Artists, editors, entertainers, public relations	11.06	782220	Protective service workers	16.83	732560	Teachers—special education	6.20
	711410	Top-level managers, executives, administrators	9.90	611110	Diagnosing and treating health practitioners	16.44	442370	Sociologists	5.66
	782220	Protective service workers	8.94	770100	Artists, editors, entertainers, public relations	12.49	785000	Other occupations	3.95
21. Sociology									
	442370	Sociologists	62.85	442370	Sociologists	45.96	442370	Sociologists	79.74
	752400	Social workers	32.41	752400	Social workers	42.29	452380	Other social scientists	28.82
	750700	Counselor, educational and vocational	22.36	732520	Teachers—elementary school	36.90	752400	Social workers	22.53
	732520	Teachers—elementary school	21.47	750700	Counselor, educational and vocational	36.36	711410	Top-level managers, executives, administrators	11.36
	732550	Teachers—secondary, other subjects	20.87	732550	Teachers—secondary, other subjects	35.10	432360	Psychologists	8.89

Appendix C. (*continued*)

Degree Field	All			Bachelor's degrees			Post-baccalaureate degrees		
	Occupations		MAJOCC	Occupations		MAJOCC	Occupations		MAJOCC
	452380	Other social scientists	20.57	742990	Post-secondary teachers—other non-S&E	31.98	750700	Counselor, educational and vocational	8.35
	742990	Post-secondary teachers—other non-S&E	19.77	782220	Protective service workers	29.84	742990	Post-secondary teachers—other non-S&E	7.57
	782220	Protective service workers	16.70	721520	Personnel, training and labor relations	20.26	732550	Teachers—secondary, other subjects	6.63
	711410	Top-level managers, executives, administrators	13.34	611120	Registered nurses, pharmacists, dieticians	19.89	341980	Other physical and related scientists	6.47
	611120	Registered nurses, pharmacists, dieticians	12.97	732560	Teachers—special education	19.73	110510	Computer and information scientists	6.19
22. Other social sciences									
	452380	Other social scientists	50.97	452380	Other social scientists	45.79	452380	Other social scientists	56.16
	781200	Lawyers and judges	41.93	732520	Teachers—elementary school	43.38	742990	Post-secondary teachers—other non-S&E	44.19
	732550	Teachers—secondary, other subjects	37.79	781200	Lawyers and judges	41.44	781200	Lawyers and judges	42.42
	742990	Post-secondary teachers—other non-S&E	35.62	732550	Teachers—secondary, other subjects	39.40	732550	Teachers—secondary, other subjects	36.19
	781300	Librarians, archivists and curators	26.18	732560	Teachers—special education	35.92	750700	Counselor, educational and vocational	19.30
	732520	Teachers—elementary school	26.13	641020	Surveying/mapping engineers technicians	33.43	412320	Economists	19.12
	732560	Teachers—special education	22.53	781300	Librarians, archivists and curators	33.33	781300	Librarians, archivists and curators	19.03
	752400	Social workers	22.52	611120	Registered nurses, pharmacists, dieticians	31.09	752400	Social workers	18.64
	750700	Counselor, educational and vocational	19.44	650810	Architects	30.87	711410	Top-level managers, executives, administrators	12.81
	641020	Surveying/mapping engineers technicians	19.33	742990	Post-secondary teachers—other non-S&E	27.05	442370	Sociologists	12.33
23. Commercial art, visual and performing arts									
	770100	Artists, editors, entertainers, public relations	44.56	770100	Artists, editors, entertainers, public relations	46.46	770100	Artists, editors, entertainers, public relations	42.65
	732550	Teachers—secondary, other subjects	35.45	732550	Teachers—secondary, other subjects	36.36	732550	Teachers—secondary, other subjects	34.53
	732520	Teachers—elementary school	26.65	650810	Architects	35.80	781300	Librarians, archivists and curators	20.11
	742990	Post-secondary teachers—other non-S&E	22.87	732520	Teachers—elementary school	35.75	732520	Teachers—elementary school	17.55
	650810	Architects	19.47	732560	Teachers—special education	32.80	742990	Post-secondary teachers—other non-S&E	17.40
	732560	Teachers—special education	17.28	742990	Post-secondary teachers—other non-S&E	28.33	784030	Precision production occupations	14.03
	781300	Librarians, archivists and curators	16.45	611120	Registered nurses, pharmacists, dieticians	24.82	781200	Lawyers and judges	11.18
	784030	Precision production occupations	13.52	732510	Teachers—pre-K and kindergarten	21.32	785000	Other occupations	10.96
	611120	Registered nurses, pharmacists, dieticians	13.00	611110	Diagnosing and treating health practitioners	15.95	711410	Top-level managers, executives, administrators	9.52
	732510	Teachers—pre-K and kindergarten	11.76	711410	Top-level managers, executives, administrators	13.58	711470	Other mid-level managers	8.03

(*continued on next page*)

Appendix C. (*continued*)

Degree Field	All			Bachelor's degrees			Post-baccalaureate degrees		
	Occupations		MAJOCC	Occupations		MAJOCC	Occupations		MAJOCC
24. Other fields									
	781300	Librarians, archivists and curators	29.04	732520	Teachers—elementary school	33.06	742990	Post-secondary teachers—other non-S&E	33.01
	742990	Post-secondary teachers—other non-S&E	25.64	732550	Teachers—secondary, other subjects	29.06	781300	Librarians, archivists and curators	29.50
	732520	Teachers—elementary school	25.03	781300	Librarians, archivists and curators	28.57	781200	Lawyers and judges	18.48
	732550	Teachers—secondary, other subjects	21.47	784050	Transportation and material-moving occupations	25.66	611110	Diagnosing and treating health practitioners	18.39
	611110	Diagnosing and treating health practitioners	17.06	750700	Counselor, educational and vocational	19.76	732520	Teachers—elementary school	17.01
	781200	Lawyers and judges	16.96	752400	Social workers	19.46	732550	Teachers—secondary, other subjects	13.88
	752400	Social workers	15.93	711410	Top-level managers, executives, administrators	19.31	752400	Social workers	12.41
	770100	Artists, editors, entertainers, public relations	15.37	770100	Artists, editors, entertainers, public relations	18.38	770100	Artists, editors, entertainers, public relations	12.36
	711410	Top-level managers, executives, administrators	14.90	742990	Post-secondary teachers—other non-S&E	18.28	711410	Top-level managers, executives, administrators	10.49
	784050	Transportation and material-moving occupations	12.83	784010	Construction trades, miners and well-drillers	18.10	785000	Other occupations	10.38

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