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What Can You Do with That Degree? College Major and Occupational Status of College Graduates over Time

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While income inequality among college graduates is well documented, inequality in occupational status remains largely unexplored. We examine whether and how occupational specificity of college majors is related to college graduates' transition into the labor market and their subsequent occupational trajectories. Analyses of NLSY79 indicate that occupationally specific degrees are beneficial at the point of entry into the labor market but have the lowest growth in occupational status over time. Students earning credentials focusing on general skills, in contrast, begin in jobs with low occupational status but subsequently report the greatest growth. These findings illuminate specific ways in which educational and occupational systems interact and provide a novel approach for understanding inequality in labor market outcomes among college graduates.

College graduates have emerged as winners in the modern economy. Strong demand for more educated workers, coupled with a relative slowdown of their supply, has led to a sharp increase in the wage premium of college degrees in the United States since the 1980s (Goldin and Katz 2008). This increase in the returns to postsecondary education has not only produced greater wage inequality between college educated and other workers but also growing wage dispersion among highly educated workers (Autor, Katz and Kearney 2006; Lemieux 2006). Thus, while the importance of college degrees has been rising, so has inequality among degree holders, drawing increasing attention to the qualitative differences among college graduates, such as their fields of study.

Previous research provides ample evidence of income differentials among students majoring in different fields of study. Inequality in occupational status, however, remains largely unexplored. College graduates differ not only in how much money they make, but also in the occupations they pursue, and furthermore, in whether their chosen fields lead to desirable occupational trajectories over time. Stratification scholars have dedicated much attention to the study of occupational status and more recently to changes in occupational status over the life course (Miech, Eaton and Liang 2003; Warren, Sheridan and Hauser 2002). We extend these insights to examine inequality in occupational status

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among college graduates and thereby illuminate another important dimension of stratification among college educated workers.

In particular, we examine the relationship between occupational specificity of college majors and occupational status of college graduates over time.[1] The definition of occupational specificity is based on the proportion of students who obtain jobs related to their majors. Instead of considering college majors as characteristics of specific credentials held by individuals looking for jobs, we conceptualize college majors as representing structural links between the educational system and the labor market. As recent stratification research has shown, occupational attainment, in part, reflects characteristics of the educational system and its relationship to the labor market (Kerckhoff 1995, 2001). While some programs offer occupationally specific training and have clear occupational counterparts in the labor market, others focus on general education and have few discernable vocational traits or clear occupational trajectories. Thus, different credentials have varying "capacities to structure" labor market outcomes (Maurice, Sellier and Silvestre 1986).

Research on high school graduates and sub-baccalaureate labor market entrants has reported that occupationally specific training is associated with positive labor market outcomes. However, the modern labor market of college graduates may not follow the same pattern, given the increasing focus on higher order skills such as communication, problem solving and reasoning. Moreover, previous studies of occupational specificity have focused largely on entry into the labor market, ignoring the possibility that the benefits at entry may not persist over the course of individuals' careers. We thus examine whether and how occupational specificity of college majors is related to college graduates' transition into the labor market as well as their occupational trajectories over time. Results based on the National Longitudinal Survey of Youth of 1979 indicate that occupational specificity of college majors is related to inequality in occupational trajectories among college graduates, but not always in ways anticipated by the literature.

Literature Review

Over the past several decades, scholars have devoted increasing attention to horizontal stratification in higher education, i.e., variation in and the consequences of the *type* of education received (Charles and Bradley 2002; for a review see Gerber and Cheung 2008). College major represents one prominent dimension of horizontal stratification, and ample research has documented divergent labor market returns across different fields of study (e.g., Fuller and Schoenberger 1991; Grogger and Eide 1995; Roksa 2005; Rumberger and Thomas 1993; Thomas and Zhang 2005). A common analytical strategy in the literature is to divide college majors into a few broad categories and examine their association with wages. The observed wage gaps are assumed to reflect differential returns to specific types of human capital, although the actual skills of college graduates or the links between majors and jobs are rarely examined. Several recent studies, however, have begun

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to conduct more nuanced analyses of college major by examining how working in a job related to one's major shapes labor market rewards (Heijke, Meng and Ramaekers 2003; Robst 2007; Rumberger and Thomas 1993).

We extend this research by considering an often overlooked pattern: many educational credentials have no obvious matches in the labor market. This includes the majority of high school graduates in general and academic tracks and a large portion of college graduates majoring in liberal arts and sciences. Consequently, finding a job in one's field of study is not only an individual dilemma, it is a process that reflects the relationship (or lack thereof) between the educational system and the labor market. Liberal arts fields for example have no clear occupational matches (see Grubb 1997). The U.S. educational system is different from many other industrialized nations in that it provides credentials with limited or no occupationally specific training. This weak relationship between educational and occupational systems has been extensively criticized for creating challenges in youth labor market transitions (NCEE 1990; Rosenbaum 2001; Rosenbaum et al. 1990). However, much less is known about whether and how this lack of occupational specificity is related to the labor market trajectories of college graduates.

Building Bridges between College Majors and the Labor Market

Although the U.S. educational system tends to grant less occupationally specific credentials than many other industrialized nations, there is much variation across educational sectors, institutions and programs (Deil-Amen and Rosenbaum 2004; Rosenbaum, Deil-Amen and Person 2006). In higher education, some fields, such as education, provide specific occupational training as well as require state certification of skills, creating a particularly tight connection between the educational credential and the labor market. On the other hand, fields such as sociology focus on general skills and have less discernable occupationally specific components. One of the more difficult questions sociology faculty face from undergraduates is: what can we do with a sociology degree? College majors thus vary in their "capacity to structure" the transition to the labor market – a key insight that we focus on in this study (see also van de Werfhorst 2004).

Previous literature has shown that occupational specificity is a desirable characteristic of educational systems and credentials. Vocational specificity of educational systems on the secondary level has a strong relationship to a range of labor market outcomes, such as employment status, prestige of the first job and class location (Allmendinger 1989; Shavit and Müller 1998). On the individual level, vocational training has important benefits for non-college-bound youth in the United States (Arum and Shavit 1995; Bishop and Mane 2004; Mane 1999; Rosenbaum 2001). Similarly, vocational or career majors have notable economic benefits for students attending community colleges (Gill and Leigh 2003; Grubb 2002). These studies make a strong case for the importance of occupationally specific training and im-

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ply that college degrees with a stronger capacity to structure the transition to the labor market (i.e., higher occupational specificity) would receive greater rewards.

However, this conclusion may be premature in two respects. First, it is based largely on high school graduates and sub-baccalaureate labor market entrants. The market for college graduates provides a different context, particularly given recent structural changes in the economy. Several studies have suggested that the demand is shifting to a higher-skilled and more flexible labor force and that employers increasingly demand workers who not only have technical expertise but also general skills in areas such as critical thinking, written communication, and complex reasoning (AACU 2010; Autor, Levy and Murnane 2003; Grubb and Lazerson 2004). Thus, as college graduates enter the labor market, general education may have as much if not more value than more vocationally specific training.

Second, previous literature emphasizing the importance of occupational specificity has focused largely on entry into the labor market instead of on long-term occupational trajectories.[2] Although understanding initial labor market outcomes is important, there is much variation in occupational trajectories over time, which creates distinct patterns of inequality over the life course (Bernhardt et al. 2001; Fuller 2008; Miech, Eaton and Liang 2003). With respect to college major in particular, previous research has suggested that some fields are advantaged in the process of promotion, particularly in the middle of the occupational hierarchy. Specific results vary across studies, but in general, fields that are categorized as liberal arts, such as math and natural sciences (Spilerman and Lunde 1991) and social sciences and economics (Ishida, Spilerman and Su 1997), seem to enhance individual's likelihood of promotion. General skills appear to facilitate acquisition of "management competencies" that prepare workers for promotion to managerial and executive levels (Heijke, Meng and Ramaekers 2003). Moreover, while only a few studies have examined wage trajectories over time, Thomas and Zhang (2005) reported that math/science and social science majors experience faster wage growth over the first four years of their careers relative to education majors. Some studies have even suggested that although liberal arts majors enter the labor market with substantially lower salaries, they can catch up or surpass their vocationally focused counterparts over time (Giles and Drewes 2001).

Stratification research thus highlights the importance of building ties between educational and occupational systems. As such, it provides a new conceptual framework for studying college major, one grounded in the structural relationship between educational credentials and the labor market. However, because most previous studies in this tradition have focused on high school graduates or sub-baccalaureate degree holders and considered entry into the labor market, it remains to be examined whether occupational specificity is an important factor shaping labor market outcomes of college graduates, particularly over time.

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Data and Methods

Presented analyses are based on the National Longitudinal Survey of Youth of 1979, a nationally representative sample of 12,686 young women and men first interviewed in 1979 when they were 14-22 years old. Respondents were re-interviewed annually through 1994 and biennially since. For detailed information on study design and sample, see U.S. Department of Labor (1999). The military subsample is excluded from analyses in order to focus on labor market outcomes in the civilian labor force. Furthermore, to address research questions regarding occupational attainment of college graduates, the sample is restricted to respondents who obtained at least a bachelor's degree and reported the year of earning that credential.

Respondents' occupational data are based on the Current Population Survey question regarding the current or most recent job and include information from 1979 to 1998. From 1979 to 1981, occupations were coded in the 1970 three-digit occupational census codes and from 1982 to 1998 in the 1980 codes. All occupations are recoded into the 1980 codes using a crosswalk file provided by the National Crosswalk Service Center. In 2000, NLSY79 began reporting occupations in the 2000 census codes and dropped the CPS occupational questions. Consequently, the last year of labor market data included in this study is 1998, and the sample is restricted to individuals who obtained their bachelor's degrees prior to that year. The sample is also restricted to individuals who reported a college major and had at least one valid occupational code during the 12-year period examined in the study.[3] Among college graduates who completed degrees before 1998, approximately 4 percent were missing data on college major or occupations. The final analytic sample includes 1,970 college graduates–1,045 women and 925 men.

Analytical Strategy

We estimate college graduates' occupational trajectories as quadratic growth models using HLM (Raudenbush and Bryk 2002). Descriptive statistics indicate that the occupational growth is curvilinear, which is confirmed by the significant square term in the baseline HLM model. The baseline model for occupational status is estimated as follows:

Level 1:

$$Y_{ti} = \pi_{0i} + \pi_{1i}\,(\mathrm{YEAR}_{ti}) + \pi_{2i}\,(\mathrm{YEAR}_{ti})^2 + e_{ti}$$

Level 2:

$$\pi_{0i} = \beta_{00} + \beta_{01}\,\mathrm{HIGH\ OS}_i + \beta_{02}\,\mathrm{MODERATE\ OS}_i + \beta_{0k}X_{ki} + r_{0i}$$
$$\pi_{1i} = \beta_{10} + \beta_{11}\,\mathrm{HIGH\ OS}_i + \beta_{12}\,\mathrm{MODERATE\ OS}_i + r_{1i}$$
$$\pi_{2i} = \beta_{20} + \beta_{21}\,\mathrm{HIGH\ OS}_i + \beta_{22}\,\mathrm{MODERATE\ OS}_i + r_{2i}$$

where YEAR represents years since the bachelor's degree, with the intercept (YEAR = 0) being set at one year after the BA. $\mathrm{HIGH\ OS}_i$ and $\mathrm{MODERATE\ OS}_i$ are

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dummy variables representing college majors with high and moderate occupational specificity (fields with low occupational specificity serve as a reference), and X_i is a vector of time-invariant control variables. π_{0i} represents occupational status for the ith individual at YEAR = 0; π_{1i} is the instantaneous growth rate for the ith individual at YEAR = 0; and π_{2i} captures curvature or acceleration of individual growth trajectory. Due to the quadratic specification of the HLM model, both π_{0i} and π_{1i} refer to YEAR = 0 while the acceleration term is constant, i.e., its interpretation does not depend on the scaling of the time metric. Analyses are centered at YEAR = 0 because the impact of college major is greatest at the point of entry into the labor market. Parameters for initial status, growth rate and acceleration are estimated as random.

All analyses are run for the entire sample and separately by gender, and are weighted. Previous research indicates that while the overall process of occupational stratification is similar for women and men, different dimensions of occupational status show distinct patterns by gender (Miech, Eaton and Liang 2003; Warren, Sheridan and Hauser 2002). Moreover, women's occupational status tends to remain more constant over their lifetimes relative to men (Sewell, Hauser and Wolf 1980). Previous research has also suggested that rewards for vocational training in high school (Arum and Shavit 1995) or community college (Grubb 2002) vary by gender. Finally, there are notable differences in the distribution of women and men across college majors, which lead to differential labor market outcomes by gender (Jacobs 1996). Any analysis focusing on college major and its relationship to labor market outcomes thus necessitates a consideration of gender.

Dependent Variables

The main outcome of interest is occupational status, assessed along two dimensions: occupational education and occupational earnings. These two dimensions of occupations are typically used in creating the socio-economic index of occupations. However, recent research has convincingly argued for the importance of examining each component separately, especially when considering differences by gender (Hauser and Warren 1997; Warren, Sheridan and Hauser 2002). Measures for occupational education and occupational earnings are obtained from Hauser and Warren (1997). They define occupational education as the proportion of incumbents in each occupation who had completed at least some college as of 1990, and occupational earnings as the proportion of incumbents in each occupation who earned $14.30 or more per hour in 1989. Subsequently, they have transformed both measures into started logits: if p is the proportion of respondents above a threshold level, then started logit transformation takes the following form: $\ln [(p + .01) / (1 - p + .01)]$. The dependent variables for our analyses are therefore started logits of occupational education and occupational earnings. We track occupations for up to 12 years after bachelor's degree completion because the number of cases drops substantially after that point. While this limits the

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amount of time respondents are observed, a substantial amount of occupational growth occurs in the first decade of labor force experience (see also Fuller 2008).

Independent Variables

Occupational Specificity of College Major

A key set of independent variables measures occupational specificity of college major. Without the benefit of a pre-existing scale, we have defined occupational specificity based on the distribution of majors and occupations for a representative sample of college graduates, as reported in the National Center for Education Statistics' publication entitled "From Bachelor's Degree to Work."(NCES 2001:165) We have divided majors into three categories of high, moderate and low occupational specificity (see Table 1). High occupational specificity refers to majors in which the majority of graduates obtained jobs related to their fields of study. When individuals majoring in a particular field were distributed across different occupations, without a clear concentration in a specific occupational category, that field was considered to have low occupational specificity. As Table 1 shows, there is no dominant category of employment for fields with low occupational specificity. For these fields, we reported two of the most prominent categories of employment, one of which could be regarded as related to the field of study.[4] Fields with moderate occupational specificity are found between these two extremes.

Although this categorization draws on the vocational vs. academic distinction, our approach highlights that not all vocational fields have the same degree of connection to the labor market. Health and education stand out from other fields in terms of the percentage of graduates obtaining jobs in occupations related to their field of study. Moreover, these two fields are theoretically distinct because individuals in these fields generally undergo a state-mandated certification process. Although there is variation across states, certification provides some degree of standardization, leading to a closer alignment between educational credentials and the labor market than may be expected for other majors. These two fields alone are thus regarded as having high occupational specificity.

Control Variables

All analyses include a set of control variables describing individual characteristics before entry into the labor market that are typically found in similar analyses of occupational attainment. All of these variables are entered as time-invariant. We begin by controlling for gender and race/ethnicity, represented by dummy variables for females and three non-white racial/ethnic categories (black, Hispanic and other racial/ethnic groups). Because analyses include only college graduates, we represent family background with a dummy variable indicating whether at least one of the parents completed a bachelor's degree. We also include a proxy measure of academic ability, assessed by the AFQT percentile score.

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Age is often used in labor market analyses as a measure of labor market experience; in this case we include age when respondents received their bachelor's degrees because labor market outcomes are measured after that point.[5] Moreover, while the focus of this project is on occupational specificity of college majors, we also control for the percentage of women in the major. This variable is coded in the 1983-1984 academic year, because 1984 best describes the central tendency (mean and median) for the year of bachelor's degree completion. For each of more than 350 specific college majors included in NLSY79, we coded the percentage of females in the category as reported in the *Digest of Education Statistics* (NCES 1987). Continuous

Table 1: Occupational Specificity of College Majors

College Major	Occupational Specificity	Primary Occupational Category of Employment (and the Percentage of Graduates in the Category)[a]
Education	High	Educators (74%)
Health[b]	High	Medical professionals (82%)
Business	Moderate	Business or management (56%)
Engineering/ Architecture	Moderate	Engineers, software engineers, architecture (60%)
Computer science	Moderate	Computer science (58%)
Social work/ Protective services	Moderate	Human/ Protective service professionals (60%)
Humanities	Low	Editors, writers, performers (17%); business or management (23%)
Biological sciences	Low	Research, scientists or technical fields (24%); educators (25%)
Math and physical sciences	Low	Research, scientists or technical fields (24%); educators (26%)
Social sciences	Low	Business or management (32%); service occupations (18%)
Communication/ Journalism	Low	Editors, writers or performers (23%); service occupations (33%)
Other	Low	Business or management (33%); service occupations (15%)

Notes: This table is based on the National Center for Education Statistics report titled "From Bachelor's Degree to Work."(NCES 2001:165)

[a]The primary occupational category represents occupations related to the field of study for college majors with high and moderate levels of occupational specificity. Majors with low occupational specificity do not necessarily have a clear occupational match; therefore, the table reports percentages in two of the most prominent categories of employment, one of which could be regarded as related to the field of study.

[b]Health includes nursing and "other" health fields. While those two categories are separated in the original NCES report, they follow similar patterns and are employed in the same occupational category. The results are not substantively altered if "other" health fields are excluded from the category of high occupational specificity.

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variables (age at college graduation, percent female in the major and test scores) are grand mean centered. Among time-invariant controls, only parental education and test score have missing data. Both of them are missing very few cases: 1 percent for parental education and 2.5 percent for test scores. To preserve those cases in analysis, we use mean substitution, substituting the mean for missing values and including a dummy variable to indicate that the substitution was made. The missing dummy variables are included in analyses but not reported in the tables.

The second set of analyses reported in Table 4 control for a range of time-varying individual characteristics (included at level 1in the HLM model). We begin by including a dummy variable to indicate whether an individual earned a graduate degree; we do this because previous research has suggested that students majoring in different fields of study have differential likelihoods of pursuing graduate education, and in particular, that individuals holding bachelor's degrees in liberal arts fields are more likely to continue their educations.[6] The relationship between college major and occupational status could also be mediated by the proportion of women in specific occupations. Ample evidence demonstrates lower labor market rewards and lower probability of advancement in female-dominated occupations (Bielby and Baron 1986; Blau, Ferber and Winkler 2006; England 1992; Reskin and Hartmann 1986; Tomaskovic-Devey 1993). Since college majors with more or less occupational specificity may connect to occupations with varying percentages of women, this is an important variable to consider. Percent female in an occupation is obtained from the 1980 and 1990 IPUMS (Integrated Public Use Microdata Series) 5% sample. In addition, we include a few other variables commonly considered in analyses of labor market outcomes: a dummy variable indicating whether respondents are married, a dummy variable indicating whether respondents have any children, the proportion of the year respondents were unemployed (based on the number of weeks unemployed), and a dummy variable indicating whether respondents worked parttime (less than 35 hours per week).[7] Descriptive statistics for independent variables used in analyses are reported in Table 2.

Results

Initial Occupational Status and Growth over Time

Table 3 reports the baseline occupational growth models for two different components of occupational status – occupational education and occupational earnings – presented for the full sample and separately by gender. With respect to the control variables, models for the full sample replicate previously reported patterns: women report higher levels of occupational education but lower levels of occupational earnings than men; academic ability has a weak but persistent association with occupational status; and family background has no direct relationship to occupational status of college graduates (see also Miech, Eaton and Liang 2003; Warren, Sheridan and Hauser 2002). Moreover, the higher the

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Table 2: Means, Standard Deviations for Continuous Variables and Variable Definitions

Variables	Mean	SD	Definition
Time-Invariable			
Occupational Specificity of College Major			
High	.191		Dummy variable coded 1 for college majors with high occupational specificity
Moderate	.404		Dummy variable coded 1 for college majors with moderate occupational specificity
Low [reference]	.405		Dummy variable coded 1 for college majors with low occupational specificity
Controls			
Female	.506		Dummy variable coded 1 for females
White [reference]	.808		Dummy variable coded 1 for whites
Black	.071		Dummy variable coded 1 for blacks
Hispanic	.024		Dummy variable coded 1 for Hispanics
Other non-white	.097		Dummy variable coded 1 for other non-white racial/ ethnic groups
Test score (AFQT)	74.632	20.237	AFQT score, percentile
Parent college educated	.478		Dummy variable coded 1 if at least one parent completed a bachelor's degree
Age at college graduation	23.834	3.216	Age at the time of earning a bachelor's degree
Major % female	.531	.221	Proportion of women in a college major
Time-Varying[a]			
Graduate degree	.013		Dummy variable coded 1 for respondents who earned graduate degrees
Occupation % female	.521	.287	Proportion of women in an occupation
Married	.232		Dummy variable coded 1 if respondents are married
Children	.086		Dummy variable coded 1 if respondents have children
Unemployed	.078	.156	Proportion of weeks unemployed in a given year
Part-time employment	.324		Dummy variable coded 1 if respondents worked parttime

[a]Descriptive statistics for time-varying characteristics refer to the first year after earning a bachelor's degree.

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proportion of women in the major, the lower the occupational education and especially occupational earnings of respondents' occupations.

Considering the occupational specificity of college major, students who earned degrees in fields with high occupational specificity have significantly higher occupational status than those who earned degrees in fields with low occupational specificity in the first year after completing their bachelor's degrees. However, growth over time presents a notably different pattern: individuals majoring in fields with high occupational specificity experience a significantly lower growth in occupational status (including both, occupational education and occupational earnings) than do individuals majoring in fields with low occupational specificity.

In order to further explore these patterns, figures 1 and 2 report the predicted occupational education and occupational earnings for fields with high, moderate and low levels of occupational specificity, while holding all other variables at their means. Figure 1 depicts clear differences across college major categories in initial occupational education and growth over time. Graduates with highly occupationally specific degrees exhibit a notable advantage at the point of entry into the labor market–occupational education of their occupations is substantially higher than that of individuals majoring in fields with moderate or low levels of occupational specificity. However, these graduates also experience the lowest growth over time. By the end of the observation period, the gap between individuals majoring in fields with high and low levels of occupational specificity is much smaller, although still of sizable magnitude.

The relationship between fields with moderate and low levels of occupational specificity shows a different pattern. Graduates with degrees in fields with moderate occupational specificity have a significantly higher occupational education than those with degrees in fields with low occupational specificity in the first year after earning their bachelor's degrees. However, the latter show a particularly strong growth over time, eliminating the gap.[8] Thus, while individuals who majored in fields with low occupational specificity started with significantly lower occupational education, by the end of the observation period, they caught up to graduates holding degrees in fields with moderate occupational specificity.

The same pattern, although less pronounced, is revealed for occupational earnings. Individuals who major in fields with high occupational specificity have the highest occupational earnings of all categories in the first year after completing their degrees. However, they also have the lowest growth in occupational earnings over time. Individuals majoring in fields with low occupational specificity have the lowest starting point but the fastest growth. By the end of the observation period (12 years after earning bachelor's degrees), they substantially narrow the gap with individuals majoring in highly occupationally specific fields and almost catch up to individuals majoring in fields with moderate levels of occupational specificity.[9]

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Presented results confirm the importance of earning highly occupationally specific educational credentials for access to desirable occupations after degree completion. As previous research has suggested, based on analyses of high school graduates and sub-baccalaureate labor market entrants, occupational specificity is important for initial labor market outcomes (Arum and Shavit 1995; Bishop and Mane 2004; Grubb 2002; Mane 1999; Rosenbaum 2001). However, these initially advantageous positions do not lead to equally beneficial growth in occupational trajectories: individuals majoring in fields with high occupational specificity experience the lowest growth in occupational status over time. In contrast, individuals majoring in fields focusing on general education start with low occupational status but have the fastest growth over time. Thus, the gaps between fields with low occupational specificity and other fields are either substantially reduced or eliminated by the end of the observation period.

Table 3: Baseline Quadratic Growth Models of Occupational Status, by Occupational Education and Occupational Earnings[a]

	Occupational Status					
	Occupational Education			Occupational Earnings		
	All	Female	Male	All	Female	Male
College Major						
Initial Status						
High occupational specificity	1.380***	1.273***	1.272***	.901***	.798***	.823***
	(10.861)	(8.406)	(4.988)	(9.418)	(6.554)	(5.173)
Moderate occupational specificity	.396***	.174	.598***	.429***	.244*	.589***
	(4.465)	(1.427)	(4.789)	(5.898)	(2.192)	(6.175)
Intercept	.339***	.630***	.214*	-1.291***	-1.384***	-1.306***
	(4.371)	(6.226)	(2.042)	(-21.596)	(-16.797)	(-16.491)
Growth Rate						
High occupational specificity	-.162***	-.118*	-.172*	-.119***	-.076	-.160**
	(-4.126)	(-2.493)	(-2.201)	(-3.910)	(-1.957)	(-3.274)
Moderate occupational specificity	-.086**	-.040	-.138**	-.065**	-.027	-.106**
	(-2.894)	(-.946)	(-3.319)	(-2.741)	(-.726)	(-3.454)
Intercept	.166***	.108**	.225***	.144***	.101***	.189***
	(7.022)	(3.426)	(6.508)	(8.246)	(3.964)	(7.992)
Acceleration						
High occupational specificity	.010**	.007*	.010	.007**	.004	.011**
	(3.364)	(2.055)	(1.847)	(3.186)	(1.472)	(2.954)
Moderate occupational specificity	.003	.001	.006*	.003	.001	.006*
	(1.426)	(.233)	(1.978)	(1.896)	(.341)	(2.594)
Intercept	-.008***	-.004*	-.011***	-.007***	-.004*	-.009***
	(-4.748)	(-1.995)	(-4.697)	(-5.696)	(-2.391)	(-5.928)
Controls						
Female	.153**			-.136***		
	(3.227)			(-3.825)		
Black	.118	-.048	.323**	.038	-.018	.106
	(1.855)	(-.603)	(3.186)	(.751)	(-.256)	(1.477)

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Table 3 also presents results separately by gender. Women and men benefit equally from majoring in fields with high relative to low occupational specificity. Men also benefit from earning degrees in fields with moderate as opposed to low levels of occupational specificity at the point of entry into the labor market, but this advantage is reduced or eliminated over time. To illustrate these differences, Figure 3 reports predicted occupational education for women and men across different college major categories. Initially, women fare better than men when majoring in fields with low occupational specificity. However, men in these fields experience substantially more growth, compensating over time for their initial disadvantage. Gender gaps for fields with moderate and high levels of occupational specificity hold steady over time.

Figure 4 presents findings for occupational earnings. Men have higher occupational earnings than women in all three college major categories. Moreover,

Hispanic	.275**	.316**	.221	.053	.127	-.048
	(2.655)	(2.706)	(1.319)	(.734)	(1.385)	(-.453)
Other non-white	-.033	-.154	.044	-.082	-.129	-.058
	(-0.427)	(-1.395)	(.409)	(-1.446)	(-1.531)	(-.745)
Parent college educated	.079	.067	.096	.034	.023	.039
	(1.736)	(1.140)	(1.405)	(0.987)	(.470)	(.795)
Test score (AFQT)	.011***	.008***	.013***	.007***	.006***	.007***
	(9.444)	(5.354)	(7.556)	(8.065)	(5.103)	(6.026)
Age at college graduation	.024**	.026*	.020	.029***	.028**	0.029**
	(2.943)	(2.553)	(1.499)	(4.707)	(3.309)	(3.187)
Major % female	-.552***	-0.580**	-.588**	-1.042***	-.971***	-1.179***
	(-3.684)	(-2.928)	(-2.706)	(-9.299)	(-5.946)	(-7.788)

Notes: Continuous control variables (age at college graduation, major % female and test scores) are grand mean centered. Initial status, growth rate, and acceleration parameters are estimated as random (p < .001). Analyses for the full sample include 1,970 level-2 units and 18,563 level-1 units; models for women include 1,045 level-2 units and 9,650 level-1 units; and models for men include 925 level-2 units and 8,913 level-1 units.

[a]Occupational education and occupational earnings are two components of the socio-economic index of occupations (see Hauser and Warren 1997).

*p < .05 **p < .01 ***p < .001 (two-tailed tests; t-ratios in parentheses).

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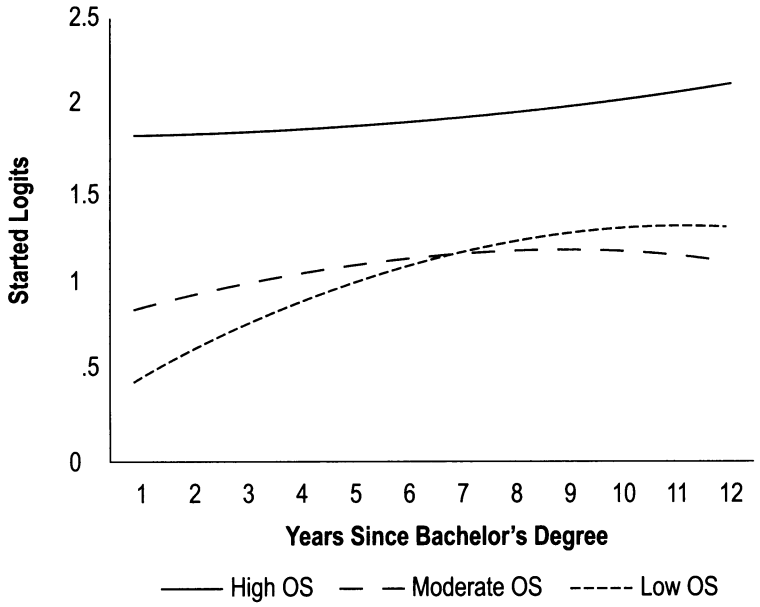
Figure 1. Predicted Occupational Education, by Occupational Specificity of College Major



Note: Predictions are based on Table 3 (full sample), with all controls set at the mean. Occupational education is an indicator of occupational status.

women's growth trajectories are more similar across college major types, while men's seem to be more sensitive to this aspect of their educational credentials. Men experience a particularly fast growth in fields with low occupational specificity. In fact, they substantially narrow the gap with men in fields with moderate and high occupational specificity and surpass or meet women in all fields. As was the case for occupational education, the growth trajectories for fields with moderate occupational specificity are similar for women and men, although their relationships to fields with low occupational specificity differ. Women benefit less from majoring in fields with moderate occupational specificity than men, particularly at the point of entry into the labor market.

Understanding Differences in Growth across College Major Categories

Graduate Degree

One of the possible explanations for the faster growth experienced in fields with low occupational specificity is graduate education. Previous research has suggested that individuals majoring in fields focusing on general education are often more likely to pursue graduate degrees (e.g., Zhang 2005). Four years after completing college, for example, students majoring in vocational fields are more

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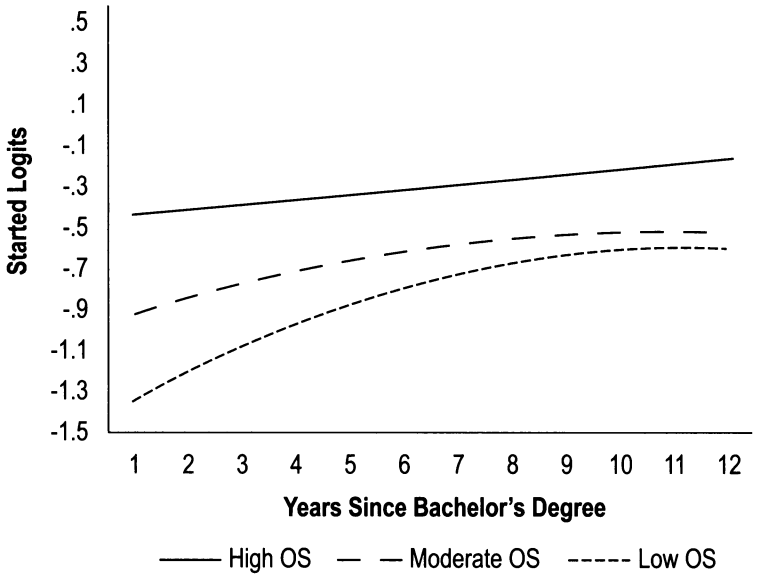
Figure 2. Predicted Occupational Earnings, by Occupational Specificity of College Major



Note: Predictions are based on Table 3 (full sample), with all controls set at the mean. Occupational earnings is an indicator of occupational status.

likely to be working fulltime, while those majoring in liberal arts are more likely to be enrolled in graduate school (Goyette and Mullen 2006). Indeed, Eide and Waehrer (1998) have suggested that many students choose their major with the intention to enroll in graduate/professional schools. This "option value" of pursuing graduate education is greater for liberal arts and science fields, and students choose to major in those fields in part due to their expectations of attending graduate school.

Results in Table 4 indicate that earning a graduate degree enhances individual's occupational status, and does so equally for women and men (reported differences are not statistically significant at $p < .05$). However, graduate degrees do not explain the differential growth rates across college major categories.[10] The coefficients for college majors with moderate and high occupational specificity remain significant and of similar magnitude after controlling for graduate credentials. There are at least two possible explanations for this finding: First, fields of study at the undergraduate and graduate levels are related. Earning a bachelor's degree in a field with high occupational specificity is positively correlated with doing so in graduate school as well ($r = .553$, $p < .05$). The same holds for other college major types. Graduate degrees thus do not appear to counter but instead reinforce the patterns observed for undergraduate majors.[11]

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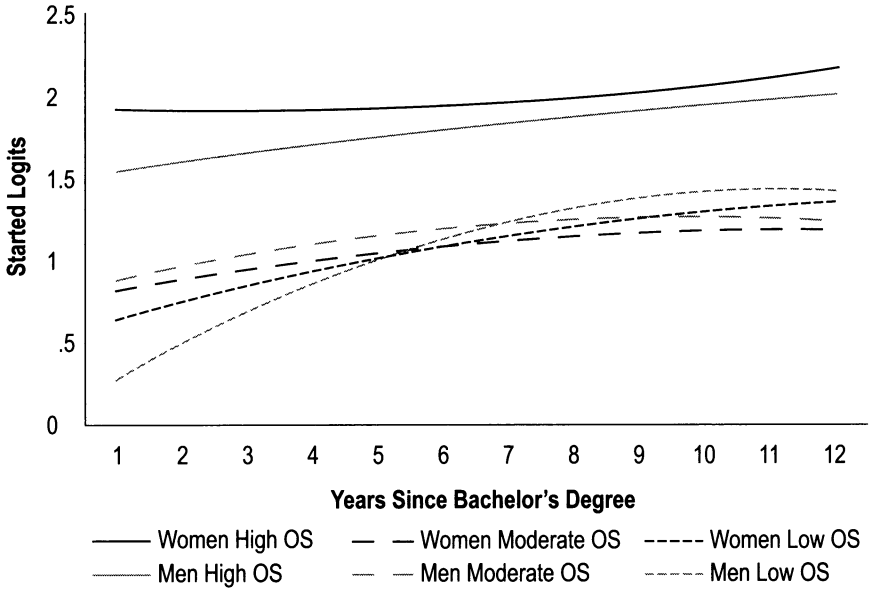
Figure 3. Predicted Occupational Education, by Occupational Specificity of College Major and Gender



Note: Predictions are based on Table 3, with all controls set at the mean. Occupational education is an indicator of occupational status.

Second, in the NLSY79 sample, individuals majoring in fields with low as opposed to high occupational specificity are not more likely to earn graduate degrees (28% vs. 33% respectively, $p > .05$). This is likely the case because the field of education is included in the category of majors with high occupational specificity. Zhang (2005), for example, reported that low paying fields, including both liberal arts and education, are more likely to seek graduate credentials. Consequently, obtaining graduate degrees does not differentiate between fields with high and low occupational specificity in this study.[12]

Female Concentration of Occupations

One of the most widely discussed characteristics of occupations in relation to labor market outcomes is the percentage of women employed in a given occupation. This is consequential for our analyses because field of study is related to female concentration in an occupation (Joy 2006; Roksa 2005), and female concentration in an occupation is associated with differential labor market rewards (England 1992; Tomaskovic-Devey 1993). Some studies have also reported that female-dominated occupations have shorter career ladders, offering fewer opportunities for advancement in pay, status and authority (Bielby and Baron 1986; Blau and DeVaro 2007;

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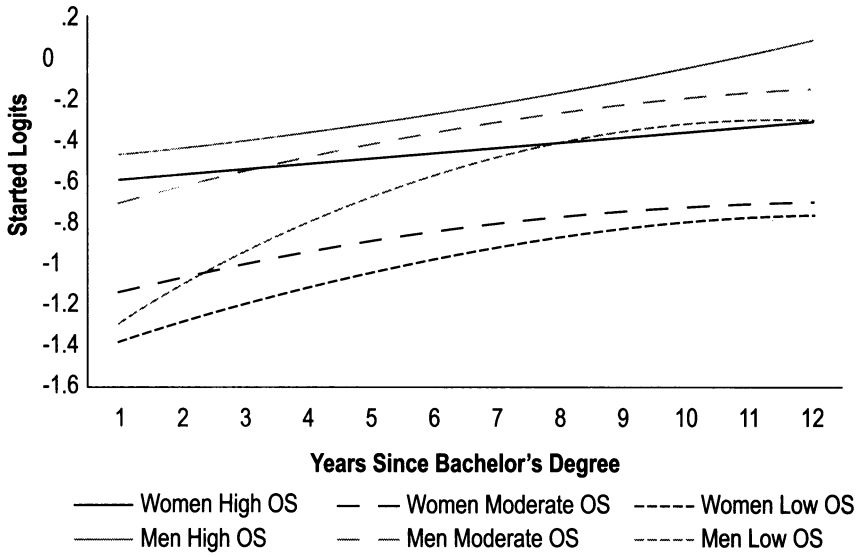
Figure 4. Predicted Occupational Earnings, by Occupational Specificity of College Major and Gender



Note: Predictions are based on Table 3, with all controls set at the mean. Occupational earnings is an indicator of occupational status.

Reskin and Hartmann 1986). Results in Table 4 corroborate previous findings regarding the female concentration in an occupation: the higher the proportion of women in a given occupation, the lower the occupational status. Women experience greater decreases in their occupational status than men when they are employed in occupations with a higher concentration of women (gender difference for occupational education is significant at $p < .05$ and for occupational earnings at $p < .10$), corroborating insights from previous research (see Simpson 2004; Williams 1995).

Concentration of women in an occupation is not only consequential for occupational status, it also illuminates how specific aspects of college majors are related to labor market rewards. After introducing the percentage of women in an occupation, the percentage of women in a college major drops below the level of statistical significance. This is the case for both occupational education and occupational earnings. Moreover, the coefficient for the percentage of women in a college major does not simply fall below the significance level – the magnitude is substantially reduced, almost equaling zero. Thus, the disadvantage of majoring in female concentrated fields is accounted for by the occupations pursued by individuals majoring in those fields.

The patterns for college majors with distinct levels of occupational specificity present a notably different pattern. After controlling for the percentage of women

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in an occupation, the coefficients for fields with high and moderate levels of occupational specificity change only slightly and remain at their previous levels of statistical significance. This holds for the entire occupational trajectory, including initial occupational status, growth, and acceleration. Thus, while the percentage of women in an occupation is consequential for occupational status, and while it explains the effects of female-dominated majors, it does not explain the relationship between occupational specificity of college major and individual occupational status.[13]

Discussion

The growing inequality among college graduates in recent decades has drawn increasing attention to qualitative differences among college educated workers,

Table 4: Quadratic Growth Models of Occupational Status by Occupational Education and Occupational Earnings[a]

	Occupational Status					
	Occupational Education			Occupational Earnings		
	All	Female	Male	All	Female	Male
College Major						
Initial Status						
High occupational specificity	1.374***	1.328***	1.151***	.959***	.926***	.760***
	(10.871)	(9.134)	(4.360)	(10.843)	(9.005)	(4.408)
Moderate occupational specificity	.314***	.121	.488***	.311***	.183**	.417***
	(3.655)	(1.097)	(3.933)	(5.586)	(2.642)	(5.101)
Intercept	1.033***	1.612***	.821***	-.004	.351***	-.122
	(11.749)	(13.837)	(6.826)	(-.066)	(4.716)	(-1.497)
Growth Rate						
High occupational specificity	-.156***	-.130**	-.136	-.117***	-.099**	-.120*
	(-3.973)	(-2.851)	(-1.707)	(-4.178)	(-3.018)	(-2.288)
Moderate occupational specificity	-.063*	-.034	-.101*	-.040*	-.027	-.060*
	(-2.267)	(-.908)	(-2.509)	(-2.243)	(-1.129)	(-2.317)
Intercept	.108***	.066*	.152***	.086***	.064***	.111***
	(4.900)	(2.400)	(4.493)	(6.462)	(3.853)	(5.353)
Acceleration						
High occupational specificity	.009**	.008*	.008	.007**	.006*	.008*
	(3.299)	(2.430)	(1.418)	(3.626)	(2.529)	(2.258)
Moderate occupational specificity	.002	.001	.004	.002	.002	.003
	(1.016)	(.363)	(1.322)	(1.701)	(.890)	(1.792)
Intercept	-.005**	-.002	-.007**	-.004***	-.002	-.005***
	(-3.070)	(-1.143)	(-3.093)	(-3.991)	(-1.807)	(-3.789)
Time-Varying Controls						
Graduate degree	.475***	.378***	.574***	.231***	.180***	.282***
	(8.034)	(5.267)	(6.121)	(6.501)	(3.894)	(5.317)
Occupation % female	-1.243***	-1.404***	-1.074***	-2.573***	-2.673***	-2.467***
	(-15.563)	(-13.419)	(-8.912)	(-48.742)	(-38.966)	(-30.730)

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and in particular, their fields of study. A number of scholars have explored the relationship between college major and wages, often within the human capital paradigm. We have aimed to provide a novel understanding of inequality among college graduates by focusing on occupational status and considering the structural link between educational and occupational systems. In this endeavor, we have drawn from what is often referred to as "the fourth generation of stratification research." While acknowledging the relevance of human capital factors, this research tradition highlights the role of the structural dimensions of the educational system and its relationship to the labor market in shaping individual outcomes (Kerckhoff 1995). Consequently, we have conceptualized college major as reflecting the structural relationship (or lack thereof) between the educational system

Married	.026	.026	.020	.020	.027	.006
	(.844)	(.634)	(.462)	(.969)	(.987)	(.208)
Children	-.008	.001	-.010	-.002	-.014	.016
	(-.250)	(.031)	(-.205)	(-.110)	(-.472)	(.515)
Unemployed	-.341**	-.359*	-.339*	-.231**	-.182	-.287**
	(-3.365)	(-2.494)	(-2.389)	(-3.301)	(-1.891)	(-2.842)
Part-time employment	-.163***	-.172***	-.150*	-.120***	-.125***	-.108*
	(-4.415)	(-4.064)	(-2.075)	(-4.883)	(-4.348)	(-2.331)
Time-Invariable Controls						
Female	.324***			.200***		
	(6.939)			(6.989)		
Black	.134*	-.037	.335**	.060	-.002	.143*
	(2.103)	(-.471)	(3.264)	(1.451)	(-.042)	(2.138)
Hispanic	.295**	.300*	.267	.106	.126	.072
	(3.058)	(2.596)	(1.739)	(1.779)	(1.586)	(.811)
Other non-white	-.006	-.151	.076	-.030	-.137	.027
	(-.079)	(-1.385)	(.713)	(-.603)	(-1.796)	(.405)
Parent college educated	.071	.057	.082	.021	.000	.034
	(1.598)	(1.013)	(1.216)	(.707)	(.002)	(.778)
Test score (AFQT)	.010***	.007***	.012***	.006***	.005***	.006***
	(8.545)	(4.737)	(6.825)	(7.502)	(4.641)	(5.464)
Age at college graduation	.022*	.023*	.020	.028***	.027**	.029**
	(2.600)	(2.270)	(1.407)	(4.641)	(3.479)	(3.035)
Major % female	-.030	.025	-.146	-.017	.135	-.252
	(-.213)	(.137)	(-.680)	(-.181)	(1.147)	(-1.879)

Note: See notes at the bottom of Table 3.

[a]Occupational education and occupational earnings are two components of the socio-economic index of occupations (see Hauser and Warren 1997).

*p < .05 **p < .01 ***p < .001 (two-tailed tests; t-ratios in parentheses).

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and the labor market (see also van de Werfhorst 2004). This approach illuminates how occupational outcomes may not only reflect individual characteristics and skills, which are the focus of the human capital theory, but also the allocation mechanisms associated with specific structural arrangements.

Presented results indicate that college majors with varying levels of occupational specificity have distinct points of entry into the labor market as well as notably different occupational trajectories over time. College majors with high occupational specificity are advantaged at the point of entry into the labor market but have the lowest growth in occupational status over time. Graduates in fields with low occupational specificity, in contrast, do not fare well at the beginning of their careers but experience the greatest growth in occupational status over time. These findings have implications not only for studying occupational trajectories and understanding inequality in labor market outcomes among college graduates but also for thinking about broader discussions regarding "vocationalization" of higher education. While some scholars have argued for the importance of occupationally specific training (Bishop 1998), others have cautioned against an exclusive focus of postsecondary education on occupational preparation (Grubb and Lazerson 2004, 2005). The majority of college graduates today major in "vocational fields," yet most employers also expect them to possess general skills such as written communication, critical thinking and problem solving (AAC&U 2010). Our findings indicate that different types of skills are associated with specific labor market trajectories and that general skills tend to offer greater opportunities for occupational mobility. Instead of abandoning general education or abolishing credentials with low levels of occupational specificity, policy makers and higher education administrators would do well to consider the potential benefits of flexibility associated with general skills.

The results also reveal notable gender differences in both entry into the labor market and occupational trajectories over time (see also Miech, Eaton and Liang 2003). Perhaps the most interesting finding concerns the trajectory of men who majored in fields with low occupational specificity: they not only narrowed the gap with men in fields with moderate and high levels of occupational specificity, they also caught up or surpassed women in all fields (at least for occupational earnings). One possible explanation for these patterns is that men fare better in less formalized contexts, while women benefit from reliance on formal employment channels (Drentea 1998; Reskin and McBrier 2000). Fields with low occupational specificity have no clear links to specific jobs or occupational trajectories, and men seem to benefit more from the flexibility available in these fields. Moreover, it may be that men are better positioned to take advantage of growth opportunities associated with fields that have low occupational specificity. Previous studies have shown that women tend to enter careers with low opportunity ceilings, while men enter occupations with greater prospects for promotion (Spilerman and Petersen 1999), and have a higher likelihood of be-

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ing promoted (Baron, Davis-Blake and Bielby 1986; Padavic and Reskin 2002). Graduates in fields with low occupational specificity experience greater growth in occupational status, and our findings imply that men in particular are able to translate these opportunities into greater occupational mobility.

We have conceptualized college major as reflecting the strength of the relationship between the educational system and the labor market and proposed that students majoring in more or less occupationally specific fields have distinct occupational trajectories. The inevitable question is whether the observed differences result from occupational specificity of college majors or other factors. Employment contexts and occupational trajectories of health and education, for example, differ notably from other economic sectors. These differences may be related, in part, to occupational specificity: when students have occupationally specific skills, they find employment in occupations closely related to their training and tend to stay in them, which can lead to relatively flat occupational trajectories over time. At the same time, occupational trajectories of specific fields have emerged through a complex interplay of many factors, including supply, demand, professionalization efforts and public policy (e.g., investment in specific educational programs and certification requirements and standards). Additional studies, particularly historical analyses and cross-national comparisons, are needed to examine these alternative explanations and clarify the extent to which occupational specificity and other dimensions of educational and labor market domains contribute to producing unique occupational trajectories across fields.

Future research is also needed to develop more nuanced definitions of occupational specificity. Previous studies have often simply divided fields into vocational and academic, presuming that the former provide occupationally specific training while the latter do not. We have aimed to improve on this definition by considering occupational destinations of college graduates across different fields (see also Shauman 2006). However, due to sample size limitations and reliance on secondary data, our college major categories are relatively broad, and the final categorization of occupational specificity includes only three levels. Previous studies focusing exclusively on specific fields have reported notable variation in labor market outcomes within broad categories of college majors (e.g., Fuller and Schoenberger 1991). Similarly, there may be institutional differences in the training and designation of specific majors. For example, students who intend to teach high school science may be classified as "science majors," while students intending to teach in other fields or in elementary school may be classified as "education majors," even though all of them are preparing to enter the teaching profession. Given our reliance on nationally representative data, we are not able to explore these nuanced differences within majors. Future research, focusing on a few specific fields and conducting an in-depth analysis of skills acquired and careers pursued, could provide a more precise portrayal of the relationship between occupational specificity and labor market trajectories.

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Moreover, our findings necessitate replication using more recent cohorts of college graduates. While reliance on NLSY79 has allowed us to track occupational trajectories over time, it has also meant that we are observing college graduates who entered the labor market in the 1980s. This is likely to have consequences for our overall findings as well as gender inequality. The structural changes that began during the 1980s have intensified since, leading to increasing worker mobility (Fuller 2008; Kambourov and Manovskii 2006). Emphasis on the knowledge economy and an increased likelihood of changing occupations may be placing a higher value on the possession of general, and therefore flexible, skills. If this is the case, the patterns observed in this study may be amplified today, with students majoring in fields focusing on general skills having even steeper occupational trajectories. At the same time, the number of college graduates and proportions of individuals in specific majors have changed over time. This could alter the balance and relationship between college majors and labor market outcomes, an examination of which is beyond the scope of this study. Although occupational status is a relatively stable characteristic of occupations (compared to individual income, for example), future studies could examine how students' decisions about pursuing specific fields and their occupational trajectories may be shaped by changes in the supply of and demand for different types of college credentials.

Observed gender differences may also in part reflect the time period examined. As women outnumber men in college and continue making inroads into traditionally male-dominated fields, described gender differences in labor market outcomes may be reduced. Our optimism, however, is tempered by recent findings which indicate that women's progress has stalled or reversed with respect to labor force participation, occupational segregation and the earnings gap (Cotter, Hermsen and Vanneman 2005). Moreover, gender inequality in labor market outcomes persists even when women and men major in the same fields of study (Fuller and Schoenberger 1991; Joy 2006; Rumberger and Thomas 1993). Entrenched gendered patterns at home and at work are thus likely to continue to play a role in producing different occupational attainments for women and men in the foreseeable future.

Notes

1. We use the term "occupational specificity" instead of "vocational education" due to the strong association of the latter term with secondary education and in order to highlight that educational credentials are not simply vocational or not, but that they reflect varying levels of occupationally-specific training.
2. For some recent exceptions see Bishop and Mane (2004); Rosenbaum (2001).
3. All analyses are based on respondents who are employed and report valid occupations. If participation in the labor force varies across college majors, this could bias the reported results. We have aimed to minimize the potential selection bias by coding respondents' occupations based on the CPS question (which refers to the current or most recent occupation, leading to fewer missing cases); including all respondents who reported at least one occupation in the 12 years after completing the bachelor's

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degree (although restricting the sample to individuals who reported at least three valid occupations does not substantively alter the results); and including an extensive list of controls in the models. Nevertheless, as Gerber and Cheung (2008) have indicated, research on college major would benefit from more attention to selection of students into majors as well as potential selection of majors into the labor force.

4. Some of the majors included in the moderate and weak occupational specificity categories have weaker connections to the labor market than may be expected. This may reflect how students reported their majors and the procedures used by NCES to create and match college major and employment categories. We have requested the original data from NCES to attempt a more nuanced matching strategy, but a small numbers of cases in specific majors and occupations prevented a more detailed analysis. Among fields with moderate occupational specificity, the next major category of employment (beyond the one reported in Table 1) for computer science majors is "business and management" and for business majors is "service occupations." The other two fields with moderate occupational specificity were employed in a range of occupational categories. It is also worthwhile to note that among fields with low occupational specificity, similar proportions of students majoring in biological sciences and math/physical sciences were employed in "research, scientist, or technical fields" and "education." These students reported science as their major, but they may have been taking education courses and preparing for a career in teaching. Given the challenges of classifying majors and occupations, there is inevitably some degree of measurement error in the data. If we had more precise measures, the patterns reported in this study may have been even more pronounced.

5. Age at the time of college graduation is highly correlated with work experience before earning a bachelor's degree ($r = .760$). This measure thus partially captures the tradeoffs between going to school and going to work. Using the total years of work experience does not substantively alter the reported results.

6. We have also conducted more nuanced analyses considering whether students earned graduate degrees in more or less occupationally specific fields. However, because only 22 percent of the sample earned graduate degrees, the number of cases in each cell is quite small. Consequently, we treat those results as suggestive, reporting them as supplemental models when appropriate.

7. Prevalence of part-time employment is relatively high in the first year, but decreases afterwards – 10 to 15 percent of respondents report part-time employment in subsequent years. In addition to part-time employment we have calculated the cumulative number of jobs held. Although there were some differences across college major categories, the cumulative number of jobs held had a weak and not statistically significant relationship to the occupational status variables, and thus was not included in the models.

8. The difference between fields with moderate and low occupational specificity is not statistically significant at the end of the observation period (based on an unreported OLS regression model predicting occupational education in year 12).

9. Unreported OLS regression models predicting occupational earnings in year 12 reveal that the differences between fields with high vs. low and moderate vs. low levels of occupational specificity are still statistically significant, although of much smaller magnitude than they were in the first year.

10. Supplemental models reveal significant interactions between graduate degree and college major categories, which imply that earning a graduate degree is particularly

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beneficial for students with undergraduate degrees in fields with low occupational specificity. This finding is consistent with the argument that "option value" is highest for fields focusing on general education.

11. Supplemental analysis suggests that graduate degrees with high occupational specificity are particularly beneficial for individuals' occupational status. However, these results are not definitive due to the small number of cases.
12. College graduates majoring in fields with low occupational specificity are more likely to attend graduate school than those majoring in fields with moderate occupational specificity (28% vs. 17% respectively, $p < .05$), although this does not alter the reported results for undergraduate majors.
13. Supplemental models show a positive interaction between college majors with high occupational specificity and female concentration of an occupation, indicating that the negative effects of working in female-dominated occupations are reduced when respondents have degrees in highly occupationally specific fields.

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