
Gender and Academic Specialties: Trends among Recipients of College Degrees in the 1980s

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This article examines trends in the segregation of fields of study by sex for associate, bachelor's, master's and professional, and doctoral degrees from 1980 to 1990. Three dimensions of segregation are examined: unevenness, concentration or crowding, and intergroup academic contact. Trends in segregation during the college years are considered by comparing data on freshmen's intentions, based on data from the Cooperative Institutional Research Program, with degrees earned four years later, based on data from the National Center for Educational Statistics. The data indicate a remarkable slowdown in the trend toward gender integration after 1985. The slowdown is interpreted from a social-control perspective on sex segregation.

Since 1962, more women than men in the United States have earned college degrees. In 1990, 53.2 percent of bachelor's degree recipients and 49.9 percent of master's and professional degree recipients were women. Women's growing advantage in the acquisition of higher education surely is a positive development for their economic prospects because educational credentials facilitate access to rewarding jobs. However, the economic benefits derived from higher education partly reflect the fields of study students select, and women remain segregated from men in this regard.

During the late 1960s, 1970s, and early 1980s, the segregation of men and women in fields of study dropped precipitously. In 1964, 51.4 percent of women college students would have had to change majors to match men's distribution. By 1984, this figure had dropped to 31.0 percent, a decline of just under 40 percent (Jacobs 1989). By comparison, sex segregation in the labor force fell by 18 percent during the 1970s and 1980s (Jacobsen 1994; Reskin 1993).

This article documents a dramatic slowdown in the trend toward gender in-

tegration during the late 1980s. The level of sex segregation among bachelor's degree recipients declined only slightly from 1985 to 1990. Similar trends are evident among degree recipients at other levels of higher education. Data on the field-of-study plans of college freshmen parallel the findings for degree recipients and suggest that in the late 1980s, students actually experienced a slight increase in the extent of segregation from their freshman to their senior years—a marked shift from the late 1960s and 1970s. The fact that these disparate levels of higher education all exhibited the same trend at the same time suggests that a decline in support for new opportunities for women throughout higher education may be responsible.

GENDER AND COLLEGE MAJORS

Many studies (see, for example, Berryman 1983) have examined women's underrepresentation in particular fields, especially in engineering and the sciences. Other studies have investigated the overall level of segregation or why it may change. Jacobs (1985), for instance, documented trends in the sex segregation of college majors from 1948 through

1980 for all levels of higher education and through 1984 (Jacobs 1989) for bachelor's degree recipients (see also Beller, 1984; Lyson, 1981) and found declines at all levels, with the slowest declines among Ph.D. recipients. In this section, I review economic, psychological, and sociological research on gender and college majors and conclude with a brief discussion of how each approach may account for the observed changes in the level of segregation across fields of study.

Economists have estimated the impact of college majors on the gap in earnings between men and women. They have found that although many students do not pursue careers that are directly linked to their studies, students' college majors nonetheless affect their subsequent earnings. Graduates with bachelor's degrees in engineering, for example, earn 40 percent more in their first year on the job than do those with bachelor's degrees in education (National Center for Educational Statistics, NCES, 1991; see also Table 5). One study (U.S. Bureau of the Census 1987) estimated that 12 percent of the gap in wages between male and female college graduates is linked to gender differences in the field of degree (see also Berger 1988; Fuller and Schoenberger 1991; Gerhart 1990).

Economists have suggested that women select fields with higher initial earnings but low earnings trajectories because they expect their work careers to be interrupted. According to this logic, women could maximize their lifetime earnings by choosing such fields because they would gain the highest rewards during the life-cycle stages in which they are most likely to be employed. A corollary argument is that the fields women choose have the lowest cost to labor force interruption. That is, if skills become rusty when people are out of the labor force for some time, leading to lower earnings for labor force reentrants, women should choose fields in which the atrophy of skills is the most limited.

The evidence on earnings trajectories has been devastating to this earnings-profile explanation. There is no support

for the idea that women initially earn more in female-dominated fields than they would in male-dominated fields (England, Farkas, Kilbourne, and Dou 1988). Thus, women have no earnings advantage early in their careers to compensate for the earnings disadvantage later in their careers. If one focuses strictly on the issue of maximizing one's lifetime earnings, choosing employment in female-dominated fields makes no sense. Nor is there convincing evidence for the skills-disruption argument. Tests of the skills-depreciation thesis have not shown that rusty skills are more prominent in male-dominated than in female-dominated fields (England 1984). Moreover, there is little evidence that college students select their majors in accordance with this reasoning or that women choose certain majors on the expectation that their careers will be interrupted. Polachek (1978) found evidence consistent with this latter prediction (see Han 1985 for contrary evidence), but the great majority of the differential selection of majors by men and women remained unaccounted for in his analysis. Furthermore, Jacobs and Powell's (1995) analysis of a survey of college seniors found that the expectation of working full time 10 years after college does not explain women's concentration in different fields of study from their male counterparts. To my knowledge, no studies have examined these questions with respect to recipients of master's, professional, and doctoral degrees.

Social psychologists and vocational counselors who have studied the correlates of the choice of major (Betz and Fitzgerald 1987) have contended that sex-typed socialization leads women and men to favor sex-appropriate majors. Thus, women are drawn to fields involving people and nurturing, and men are drawn to fields involving analytic thinking. For example, the stereotyping of mathematics as a masculine domain results in women's underrepresentation in a wide range of fields of study that require preparation in mathematics (Beryman, 1983; Ethington and Wolfe 1988). The restricted set of career choices for women is seen as interfering with an optimal match between interests and

careers (Betz, Heesacker, and Shuttleworth 1990; Wolfe and Betz 1981). A minority of these studies have considered changes in majors, which approximately half the college students undergo at some point during their studies (Jacobs 1985); however, they have generally assessed the efficacy of various psychological inventories in predicting change, rather than whether the sex typing of fields increased or decreased over time.

Jacobs (1989) proposed a "social-control" model of sex segregation, suggesting that social pressures throughout the life cycle continually produce and reproduce the sexual division of labor. Sex-typed socialization is influential in setting this process in motion, but, by itself, is insufficient to keep men and women on sex-typed paths. Sex segregation is reproduced during the college years: Both freshmen and seniors are unevenly distributed across majors, even though at least half the undergraduates change majors in the interim. Gender differentiation is again reproduced during the years of labor force participation; discrimination in employment is not a onetime isolated process limited solely to hiring decisions, but is part of a lifelong system of social constraints on both men and women that begins well before hiring decisions are made and continues on the job. The segregation of college majors, from this point of view, is a strategic site for examining the extent to which sex segregation remains susceptible to social influences during this period of young adulthood.

These perspectives point to different factors that may account for the slowdown in the movement toward greater gender integration. An economic explanation could include an analysis of changes in the economic rewards to different majors. If the financial attractiveness of male-dominated fields declined during the late 1980s, then the slower movement of women into those fields may be accounted for from an economic cost-benefit perspective. Alternatively, the relative attractiveness of female-dominated fields may have increased, resulting in less impetus for women to seek alternatives. Later, I ana-

lyze changes in the economic rewards garnered by recent graduates to see if the facts are consistent with this explanation.

A social psychological perspective would hold that the slowdown in gender integration is due to changes in socialization patterns. This view would predict that a stabilization in the sex-role socialization of young women and men would lead to the subsequent stabilization in the sex typing of outcomes among college students and adults. Although I have no direct data on socialization practices, I charted trends in goals reported by incoming freshmen to see whether changes in the goals of freshmen over time mirror the trends in the degrees received by college seniors. Furthermore, I assess the impact of specific sex-typed socialization (in this case, women's avoidance of mathematics) by examining the extent of women's entry into fields that require preparation in mathematics.

The social-control perspective emphasizes the constraints that both women and men face in their consideration of sex-atypical majors. One version of the social-control thesis holds that constraints operating throughout the life cycle tend to tighten and relax during the same historical periods. That is, when sex-role norms are highly constraining among children, the same is likely to be true among adults, and, conversely, when sex roles are more flexibly defined among children and young adults, they are also likely to be so among adults. If this hypothesis is true, one would see parallel trends among freshmen and seniors and, indeed, throughout all levels of higher education. In the following sections, I explore this perspective by comparing the trends observed among bachelor's degree recipients with those found at all levels of higher education and examine the changing patterns of segregation during the college years to see if segregation declines or increases while students are in college. The purpose of this analysis is to determine if patterns of change among college students mirror changes in the larger society.

DIMENSIONS OF SEGREGATION

There are at least three distinct aspects of sex segregation (Jacobs 1993b; Massey and Denton 1989). They are uneven distribution across fields, crowding, and degree of intergroup contact.

Uneven distribution across fields. The principal dimension of sex segregation that is the focus of most research is the degree to which men and women are distributed unevenly across fields. This concept is typically measured with the index of dissimilarity (D), which indicates the proportion of women (or men) who would have to change fields to be distributed in the same manner as men (or women). Recent studies of the U.S. economy indicate that over half the women would have to change occupations and over two-thirds would have to change job titles to be distributed in the same manner as men (Jacobsen 1994; Tomaskovic-Devey 1993). The level of sex segregation in the labor force declined during the 1970s and 1980s after remaining largely unchanged for most of the century (Jacobs 1989). Similarly high levels were observed in other industrial countries, as well as in developing countries (Charles 1992; Jacobs and Lim 1992). As will be discussed later, about one-third of women undergraduates would have to change fields to be distributed in the same manner as their male counterparts.

Crowding. A second feature of sex segregation is the crowding of women into a limited number of fields. This aspect is not directly captured by the index of dissimilarity and requires the use of specific indices of concentration, designated C, for concentration or crowding.¹

Crowding is important for two reasons. First, it is an indication of the extent of opportunities for women. Al-

¹ Although complete integration implies no differential crowding of men or women, higher levels of segregation are not associated with specific levels of crowding. The same level of segregation can be caused by women being crowded into one field or men being crowded into one field, at the two extremes, or men and women being segregated into an equal number of fields.

though all degree fields are now formally open to both men and women, some fields, such as engineering, remain de facto male preserves. The concentration of a great majority of women into a handful of fields would be one indication of how pervasive social restrictions are on women. For example, in 1960 almost half the women who received bachelor's degrees did so in one field, namely teaching, and over 75 percent of the women received degrees in one of six fields: English, fine arts, history, home economics, nursing, and teaching. The men who received bachelor's degrees in that year were more widely dispersed across the range of specialties, with no single field garnering as much as 20 percent of male degree recipients. As will be shown later, this situation had changed dramatically by the 1980s.

The second reason why crowding is important is that the financial potential of a field is influenced by the relationship between supply and demand. Edgeworth (1922) argued that women earned less than men partly because they were crowded into a limited number of fields. (The issue of crowding was also discussed by Bergmann, 1986, and Parcel, 1989.) Restricting women to a narrow set of jobs approved of as "women's work" can produce an excess supply of women for these occupations, thus limiting women's bargaining power and lowering their wages. The extent to which women are crowded into a few fields of study is one indication of the potential economic returns to their degrees. The evidence of crowding provided by this measure is necessary but not sufficient proof of crowding because it does not directly compare the number of degrees to the demand for talent in different fields.

Degree of intergroup contact. The third aspect of segregation is the degree of intergroup contact, in other words, the chances of men and women sharing a field of study. Although male and female college students surely have many interactions outside the classroom, this measure indicates the probability of their having contact in the classroom. The intergroup contact index—designated P² by Lieberman (1980)—reflects both the level of segregation and the representa-

tion of each group. Moreover, women's chances of sharing a field of study with men differ from men's chances of sharing a field with women. One striking result of the growth in women's labor force participation is that women's chances of sharing an occupation with men have declined (as the number of working women increases, women's chances of sharing an occupation with another woman increase), whereas men's chances of sharing an occupation with women have increased markedly. The two groups thus differ in how they have experienced the same changes, an aspect of segregation revealed by measures of intergroup contact. As will be shown, the same pattern is evident in the segregation of college majors as the number of women enrolled in college continues to grow.

DATA AND METHODS

Data were obtained from annual reports on earned degrees for associate, bachelor's, master's and professional, and doctoral degrees published by the NCES (1980-93) that were based on the reports of all colleges and universities throughout the country and, in principle, represent a complete accounting of all degree recipients. Additional data on the intended majors of freshmen were obtained from the Cooperative Institutional Research Program (CIRP) at the UCLA Graduate School of Education (1976-92). These data are based on annual surveys of upwards of 500,000 freshmen; the CIRP staff weights the responses to reflect the distribution of students in U.S. colleges and universities.

I calculated measures of each of the three aspects of segregation, along with size-standardized measures, which assign each major the same size and hence enabled me to determine what the trends in segregation would have been had there been no growth or decline in the size of majors. Thus, I could see if the declines in segregation were offset by the growth in relatively segregated fields or whether increased integration was reinforced by the growth of relatively integrated fields.

Classifying Majors

Studies of segregation require consistent measures over time. This study relied on 24 broad fields of study that have consistently been available in published statistics over the study period—and, indeed, since the late 1940s (except for associate and master's and professional degrees, discussed later). Two issues must be considered in assessing the validity of these units of analysis. The first problem is that relying on a limited set of broadly defined fields will understate the level of segregation because broad aggregations lump together disparate subunits, some of which may be predominantly male and others, predominantly female. The greater the degree of aggregation, the more potential for downward bias.

The second problem is that a standard set of categories may become increasingly remote from the underlying phenomenon. Periodically, new fields, such as computer science or environmental science and technology, are introduced. In 1980, the NCES reported data for 313 fields of study, but by 1990, it reported data for 442 fields. If fields of study become more and more differentiated over time, standard categories may become increasingly inadequate in describing the fields of study pursued by undergraduates. It was therefore important to assess the validity of the categories by examining the extent to which they understate the true level of segregation and to consider whether the gap between broad and detailed measures has grown over time.

I compared the level of segregation obtained using the 24 categories used in this study with the most detailed classifications available. For bachelor's degree recipients, the 24 broad categories captured roughly 85 percent of the segregation revealed by the most detailed categories for both 1980 and 1990; similar findings were obtained for both master's and professional degrees and doctoral degrees.² These results are extremely

² For bachelor's degrees, segregation measured across 24 broad fields captured 84.8 percent as much as that revealed by the 313

reassuring, in that they demonstrate the high and stable degree of validity of my analysis. The measure used here reveals the overwhelming majority of the underlying phenomenon and does so consistently over time.

Trends in Segregation

Table 1 displays year-by-year trends in sex segregation for degree recipients at each of four levels of higher education: associate, bachelor's, master's and professional, and doctoral. It shows that the trend toward lower levels of segregation across majors that was evident in the early 1980s slowed or reversed direction in the late 1980s. In the first half of the 1980s, segregation among bachelor's degree recipients declined by 13.6 percent, but the rate of decline slowed markedly in the second half of the decade, when a 3.3 percent reduction was observed.

Size-standardized measures (not shown) indicate how much change in segregation would have occurred had the relative size of different fields of studied remained constant over time. In other words, did segregation decline because integrated occupations expanded (or segregated ones contracted)? The size-standardized results show that the expansion of integrated fields contributed to the decline in segregation. With no change in the relative size of fields, the decline in segregation during the early 1980s would have been much smaller (8.5 percent instead of 13.6 percent), and segregation during the late 1980s would actually have grown slightly (0.6 percent). In other words, the second half of the 1980s saw a slight increase in compositional segregation that was offset by a change in the size of fields.

The growth of business as an undergraduate major contributed to the decline in segregation throughout the 1980s. From 1980 to 1990, the business major grew by 3.8 percentage points while it was becoming more balanced by sex; by

fields in 1980 and 84.5 percent of the 442 fields listed in 1990. The comparable results for master's and doctoral degrees for 1990 were 90.5 percent.

1985, 45.1 percent of the recipients of bachelor's degrees in business were women (see Table 2). Other relatively integrated fields that grew in size from 1980 to 1990 included communications (up from 3.1 to 4.9 percent of all graduates) and computer science (up from 1.2 to 2.6 percent of all graduates, 30-36.8 percent of whom were women). Education, a relatively segregated field at the bachelor's degree level, declined in size (from 12.7 in 1980 to 10 percent in 1990) and thus contributed structural impetus to the decline in segregation. Engineering grew slightly in size, but the growth of this segregated field was offset by a decline in the size of the physical sciences, another highly segregated male-dominated field. Without the growth of integrated fields, segregation would have increased during the second half of the 1980s instead of dropping by 3.3 percent.

The trend toward greater integration across fields slowed down for master's and professional degrees as well.³ A 7.7 percent decrease in the first half of the 1980s was followed by a 1.3 percent decline in the second half of the decade. The level of segregation among doctoral degree recipients actually increased throughout the 1980s, with the rate of growth increasing in the latter half of the decade.⁴ For master's and professional

³ I grouped the data on master's and first professional degrees for two substantive reasons. First, the dividing line between master's and professional degrees is somewhat arbitrary. For example, teaching is classified as a master's degree, whereas pharmacy is listed as a professional degree, but in both cases, the credential is instrumental in gaining employment. Second, historically men have obtained more professional degrees and women have obtained more master's degrees; for instance, in 1990, women earned 52.6 percent of the master's degrees but only 38.0 percent of the professional degrees. Thus, the locus of segregation is between these areas as well as within them, so grouping them together into 34 master's and professional categories to measure segregation seemed advisable.

⁴ I explored whether the growth of segregation among doctoral degree recipients was due to men from foreign countries coming to

Table 1. Trends in Sex Segregation (D) among Recipients of Associate, Master's and Professional, and Doctoral Degrees^a

Year	Bachelor's Degrees	Associate Degrees	Master's Degrees	Doctoral Degrees
1980	35.2	—	42.9	32.2
1981	34.6	—	42.3	33.3
1982	33.7	—	41.4	33.6
1983	32.1	37.1	40.3	33.3
1984	30.4	37.2	38.4	33.9
1985	30.0	37.7	38.1	33.5
1986	29.7	37.3	37.8	34.1
1987	29.5	37.9	37.6	35.1
1988	29.5	37.0	38.0	35.0
1989	29.5	35.4	38.0	34.9
1990	29.4	34.9	37.6	36.2
Change				
1980-85	-13.6%	—	-11.2%	+4.3%
1985-90	-3.3%	-7.4%	-1.3%	+7.7%

^a Results calculated across 79 fields for associate degrees and 34 fields for master's and professional degrees. D=Index of Dissimilarity.
Source: NCES (1980-93).

degrees and doctoral degrees, structural changes operate in the opposite direction from those found among undergraduates. For these advanced degrees, the more segregated fields expanded in size relative to the more integrated fields. In other words, had the relative size of fields remained constant, there would have been a continued decline in segregation among recipients of master's and professional degrees throughout the 1980s (this point is discussed in greater detail in a lengthier version of this article available from the author). Associate degrees exhibited a slight drop in segregation in 1989 and 1990 after substantial continuity during the previous six years.⁵

the United States to obtain Ph.D.s. If these men were concentrated in certain male-dominated fields, such as engineering, and if their number increased in recent years, the result would be an inflation of the level of segregation. Since, the NCES data examined do not distinguish between degree recipients who are U.S. citizens and foreign born, I obtained data on Ph.D. degrees from the National Research Council. My analysis of these data, covering the period 1986-90, suggests that there was a slight increase in sex segregation at the Ph.D. level even among U.S. citizens (D = 30.2 in 1986 and 31.4 in 1990). The fields were consistent over time, but did not match those in the NCES data.

⁵ I decided not to collapse the data on associate degrees into the same 24 categories because vocationally oriented programs would

The slowdown in the movement toward integration is thus evident throughout all levels of higher education. This slowdown was aided by structural shifts at the master's and professional and doctoral levels, but was mitigated by countervailing trends at the associate and bachelor's levels.

Concentration

Table 3 presents data on the degree of concentration, or crowding, of women and men into fields of study. In essence, the measure presented (C) represents the distance from an even distribution across each of the 24 fields. Crowding was measured separately for women and men, with the difference between them simply subtracted. (In Table 3, negative numbers represent more crowding for women than for men.)

Female undergraduates were as evenly distributed across college majors as were their male counterparts. Indeed, for most of the 1980s, women were slightly more

be obscured in the process. A further difficulty is that the NCES reclassified the associate degree data in 1983, which broke the continuity in this series of data; consequently, it is not possible to compare these data before and after 1983, and so I grouped the data on associated degrees into 79 fields of study that were consistently available from 1983 on.

Table 2. The Sex Composition of Bachelor's Degree Fields, 1980, 1985, and 1990 (percentage)

Fields	1980		1985		1990	
	All	Female	All	Female	All	Female
Agriculture	2.4	29.6	1.8	31.1	1.2	31.5
Architecture	1.0	27.8	1.1	35.4	0.9	39.1
Ethnic studies	0.3	60.5	0.3	61.7	0.4	60.0
Business	20.1	33.6	23.8	45.1	23.8	46.7
Communications	3.1	52.3	4.3	59.0	4.9	60.6
Computer science	1.2	30.2	4.0	36.8	2.5	30.0
Education	12.7	73.8	9.0	75.9	10.0	78.0
Engineering	7.4	9.3	9.8	13.2	7.8	13.8
Foreign languages	1.2	75.5	1.0	73.4	1.1	73.4
Health professions	6.9	82.2	6.5	84.8	5.6	84.3
Home economics	2.0	95.3	1.6	93.5	1.4	90.1
Law	0.1	45.5	0.1	61.2	0.2	67.8
Letters	4.4	59.3	4.1	60.7	5.2	63.1
Library science	0.1	95.0	0.1	87.1	0.1	81.0
Life sciences	5.0	42.1	3.9	47.6	3.6	50.7
Mathematics	1.2	42.3	1.5	46.1	1.4	46.5
Military studies	0.1	4.0	0.1	8.7	0.1	7.9
Interdisciplinary	3.7	50.1	3.5	53.9	4.2	56.6
Physical sciences	2.5	23.7	2.4	28.0	1.5	31.2
Psychology	4.5	63.3	4.1	68.1	5.1	71.5
Public affairs	4.0	54.9	3.2	54.5	3.4	53.3
Social sciences	11.1	43.6	9.3	44.1	11.1	44.2
Theology	0.7	25.5	0.6	27.1	0.5	24.1
Visual and fine arts	4.4	83.2	3.9	61.8	3.8	61.4

Source: NCES (1993).

evenly distributed across fields than were men. This pattern emerged in the late 1970s, reversing a long-standing pattern of the concentration of women into a limited number of fields. Among undergraduates, then, segregation by sex is a matter of men and women pursuing different fields, rather than the channeling of women into a limited set of choices. In this regard, the pattern for bachelor's degrees differs from that found at other levels of higher education.

Among recipients of associate, master's and professional, and doctoral degrees, women continue to be concentrated in a more limited set of fields than are men (results not shown). Segregation at these levels of higher education represents a restricted set of opportunities for women, not just a different set of choices from men. There was little change in the second half of the 1980s, except at the associate degree level, where women's concentration relative to men's increased sharply. This change was due primarily to men's greater dispersion across fields and secondarily to a slight increase in crowding for women.

Contact

Table 3 also presents Lieberman's P' index, which indicates the probability of sharing a field of study. In this context, P' represents the chances that a randomly selected person in one's major is the same sex as the observer. As was noted earlier, P' is asymmetrical, with men's chances of sharing a field of study with women differing from women's chances of sharing a field with men. Table 3 presents two of the four possible measures: women's chances of sharing a field with other women and men's chances of sharing a field with men.

Among bachelor's degree recipients, women's chances of sharing a major with another woman actually increased from 1980 to 1990. This trend primarily reflects the growth in the enrollment of women, which made it more likely that women would encounter other women in classes, other things being equal. During the 1980s, the increase in women's representation offset the countervailing decline in segregation, which would tend to put women in increased ac-

Table 3. Trends in Concentration (Crowding) and the Probability of sharing a Major (P') among Bachelor's Degree Recipients*

Year	Index of Concentration (Women)	Index of Concentration (Men)	Difference (Men-Women)
	1980	42.4	43.1
1981	41.9	43.4	1.5
1982	42.3	41.4	-0.9
1983	41.0	43.4	2.4
1984	40.9	42.9	2.0
1985	40.6	43.1	2.5
1986	40.9	43.6	2.7
1987	41.2	43.6	2.4
1988	40.1	41.7	1.6
1989	41.0	41.1	0.1
1990	41.7	40.9	-0.8

Year	Intergroup Contact (Women with Women)	Intergroup Contact (Men with Men)
	1980	58.0
1981	58.4	58.8
1982	58.6	58.0
1983	58.4	57.4
1984	58.1	57.3
1985	58.2	56.9
1986	58.2	56.8
1987	58.6	56.0
1988	56.9	55.5
1989	59.3	54.9
1990	59.6	54.2

* Results calculated across 24 fields.

Source: NCES (1980-1993).

ademic contact with men. Women may thus have felt increasingly ghettoized in their studies, even though the actual level of segregation continued to decline, albeit more slowly in the late 1980s.

Men's chances of sharing a major with another man decreased from 1980 to 1990. For men, declining segregation and growing female representation in college reinforced one another: Both trends made it more likely that men would encounter women in their classes. These data indicate that there is an asymmetry in the experience of change: Women may have felt increasingly ghettoized into female-dominated fields as their chances of sharing a major with other women increased, whereas men may have perceived that women were increasingly evident in what were previously male bastions. This disparity in the experiences of men and women is

evident throughout all levels of higher education.

Intended Majors for College Freshmen

Did men and women arrive at college with different plans for their majors? Did the degree of differentiation grow or shrink during the college years? Comparing freshmen and seniors can help to shed light on the influence of the college experience on the level of segregation among graduates. This analysis focuses on undergraduate students because data are not available for those entering associate, master's and professional, and doctoral degree programs.

The results presented in Table 4 show that, indeed, male and female students do arrive at college with different plans of study in mind. The intended-fields data were collapsed into the same 24 fields as the degrees-received data. Be-

Table 4. Comparing Freshmen's Intended Majors with Degrees Received Four Years Later

Year	Intended Majors	Degrees Received	Seniors-Freshmen	Cohort Change among Freshmen ^a
1976-1980	34.5	35.2	+0.7	-2.8
1977-1981	35.2	34.6	-0.6	-1.9
1978-1982	33.5	33.7	+0.2	-3.8
1979-1983	32.9	32.1	-0.8	-3.9
1980-1984	31.7	31.2	-0.5	-2.3
1981-1985	33.3	30.4	-2.9	-5.1
1982-1986	29.7	30.0	+0.3	-0.6
1983-1987	29.0	29.7	+0.7	-2.0
1984-1988	29.4	29.5	+0.1	-1.0
1985-1989	28.2	29.5	+1.3	-0.5
1986-1990	29.1	29.4	+0.3	+0.8
1987	27.0			
1988	26.4			
1989	27.7			
1990	29.9			

^a These figures compare freshmen four years apart. For example, the first row compares segregation among freshmen in 1980 versus 1976.

Source: Data on freshmen, CIRP (1976-92); data on degrees from NCES (1980-93).

tween 30 and 35 percent of entering freshmen men would have to change majors to be distributed in the same manner as women. Trends over time among entering students broadly parallel those observed among degree recipients. Segregation in intended majors declined during the early 1980s and rose in the late 1980s. Among students entering four-year programs, segregation decreased by 11 percent between 1980 and 1985 and then rose by 6 percent in the late 1980s.

One may gain insights into the college experience per se by comparing students' intentions as entering freshmen with the degrees they obtained four years later. There are many limitations to this comparison; for example, it ignores the fact that some students do not complete college and that others do not complete their degrees in four years (Jacobs 1985). Therefore, these results must be considered suggestive rather than definitive. Nonetheless, this comparison is informative because it indicates the net effect of the frequent changes made by students during their years in college.

Table 4 compares the level of segregation observed from freshmen's reports about their intended majors with the degrees they received four years later. The dramatic result documented in Table 4 is that segregation *increased* slightly during the college years in the 1980s.

From 1981 on, the net change during the college years was positive, indicating an increase in the level of segregation. This result is a marked contrast from the results for the late 1960s and 1970s, when segregation declined sharply during the college years (Jacobs 1989). Thus, far from being the bastions of politically correct feminist ideology, colleges and universities actually molded men and women into slightly more sex-traditional academic pursuits in recent years.

It is also interesting to compare this result with cohort changes among entering freshmen. This measure gives some sense of the general social or environmental change during the period and can be contrasted with changes occurring within the confines of colleges. During the late 1970s, cohort declines in segregation among entering freshmen were larger than were those observed among college students. In other words, students in college were changing more slowly than were new cohorts of entering freshmen.

During the 1980s, students experienced increases in segregation during the college years, even while the level of segregation was dropping among successive cohorts of entering freshmen. This evidence suggests that college campuses constituted a more conservative environment for the promotion of a broader sense of opportunities for women during the late 1970s and 1980s than that experienced by prospective college stu-

dents. In other words, colleges were more conservative in their influence on the choice of majors than were contemporaneous social influences outside them. One must not put too much weight on the relatively small differential between the college effect and that observed in the external environment because of the unavoidable imprecision in the comparison between freshmen and seniors. Nonetheless, the data strongly suggest a reversal in the *direction* of the effect of college on sex typing from the 1970s to the 1980s.

A final point regarding the data in Table 4 should be noted. During the 1980s, the impetus for declines in segregation stemmed from declines across cohorts of entering freshmen, not as the result of changes experienced during college. The results in Table 4 and in Table 1 indicate that this trend among entering freshmen largely stopped during the mid-to-late 1980s. Since there was a decrease or a reversal in the movement toward integration among entering freshmen, and since the college experience tended to *increase* segregation slightly in the late 1980s, then there is little on the horizon to indicate that sex segregation is likely to decline soon.

There are several pieces of evidence to suggest that sex typing is not reducible to social class and, indeed, that it is essentially independent of social class. First, the level of sex segregation among associate degree recipients was nearly the same as among master's and professional degree recipients from 1980 to 1990. Thus, the more working-class students found in associate degree programs were tracked into sex-typed fields to essentially the same degree as were the more professional- and managerial-class students in master's and professional degree programs. Bachelor's degree recipients were a bit less sex typed than were associate or master's and professional degree recipients. The explanation for this pattern, I believe, is that professional and associate degrees have a somewhat more direct connection to a sex-typed job market than do bachelor's degrees; consequently, such degrees are a bit more sex typed than are bachelor's degrees.

To determine whether the level of sex segregation differed between elite and less selective institutions (results available from the author), I examined variation among colleges and universities, dividing the four-year institutions into the eight groups established by the Carnegie Foundation: Research Universities 1 and 2, Doctoral Granting Institutions 1 and 2, Liberal Arts Colleges 1 and 2, and Comprehensive Institutions 1 and 2. I observed little variation in the level of sex segregation among each of these eight groups of institutions, except that elite liberal arts colleges exhibited a lower level of segregation because these schools generally lack education and engineering programs, both of which tend to contribute to a higher level of segregation.

EXPLAINING THE SLOWDOWN IN INTEGRATION

A complete explanation of the trends documented here would require a great deal of additional data on the students' motives for the decisions reflected in their choices of degree fields. Such data are not readily available and, in any event, are not directly linked with the data analyzed thus far. Nevertheless, I next consider some of the explanations typically offered for sex-typed outcomes and consider whether they represent a plausible account of my findings.

The first point to be made is that the slowdown may be due to a decline in women's entry into male-dominated fields or a decline in men's entry into female-dominated fields. The focus of research on gender segregation has typically examined women's entry into traditionally male preserves (but see Williams 1989, 1993). And, indeed, much of the change in sex typing has been due to women's entry into male-dominated fields. In the occupational context, there was little movement of men into female-dominated fields during the 1970s and 1980s (Jacobs 1993a).

A review of the sex composition of individual fields presented in Table 2 reveals that women's entry into male-dominated fields has been the principal cause of declines in sex segregation.

Men have not made significant inroads into such female-dominated enclaves as the health professions (principally nursing), psychology, and the humanities. Indeed, the scarcity of men in these prominent female-dominated fields remains a significant obstacle to further gender integration. Men may avoid such fields because of the relatively low pay or because of the fields' feminine connotations; more research is needed on this issue.

I examined the earnings of recent college graduates to determine whether changes in the earnings of particular fields accounted for the slowdown in the trend toward gender integration. Table 5 presents data on the first-year earnings of college graduates, by major field of study as undergraduates. This material is drawn from a series of large (approximately 12,000–16,000 respondents) surveys of recent graduates sponsored by the NCES. First-year earnings, of course, do not provide a complete profile of career earnings, but these data are nev-

ertheless informative regarding potential changes in the relative economic rewards of different majors. Although these data are not disaggregated by sex, they reveal a number of striking continuities in the relative earnings by field. First, there is a great deal of stability over time in the earnings differentials across fields.

Keeping in mind that these are sample data that are subject to fluctuations based on sample size, misreporting, nonresponse bias, and other limitations, one can still see a number of remarkable similarities between the 1991 and 1978 ratios. Engineers are used as a baseline against which other groups are compared. The ratio of first-year earnings for teachers to those of engineers was consistently about .6, as was that of graduates who majored in the humanities. Social scientists earned about 70 percent of what engineers earned. The first-year earnings of graduates with business degrees declined, whereas the first-year earnings of those in the biological sci-

Table 5. The First-Year Earnings of Bachelor's Degree Recipients: 1978, 1984, and 1991

Field	As a Percentage of the Earnings of Engineers		
	1978	1985	1991
Business	86.5	75.7	79.9
Education	81.3	61.0	61.8
Health professions	80.6	84.1	102.0
Public affairs	74.2	59.4	67.3
Biological sciences	62.5	61.8	66.3
Mathematics and physical sciences	75.3	86.5	88.0
Social sciences	71.0	65.7	71.2
Humanities	58.7	57.4	61.8
Psychology	67.1	61.7	62.1
History	70.3	—	66.9

Field	Percentage Employed Full Time		Percentage Reporting Job Related to Field of Study	
	1985	1991	1985	1991
All	74	74	78	85
Business	85	83	87	81
Education	73	77	84	87
Engineering	84	85	93	89
Health professions	74	81	96	95
Public affairs	75	77	70	71
Biological sciences	45	51	66	73
Mathematics and physical sciences	76	71	86	86
Social sciences	62	68	52	53
Humanities	59	59	57	57
Psychology	57	60	57	85
Other	73	74	74	74

Source: Results calculated from data reported in NCES (1978, 1984, 1991).

ences, mathematics and the physical sciences, and the health professions rose.

What insights do these crude data on first-year earnings have for trends in the sex segregation of majors? It is not necessarily obvious that a change in earnings should result in a decline in segregation, since the latter requires the differential response of one group to the change in earnings prospects. Women entered business in large numbers, even though earnings dropped (the decline in earnings may have reflected the entrance of women). Fields in which earnings prospects increased—biological sciences and mathematics—saw an increase in women's representation, but so, too, did fields in which earnings decreased, such as business. If men avoid female-dominated fields because of the low earnings, then the improvement in the economic prospects of health professions—primarily nursing—should have resulted in men's entrance. Although this development has not yet occurred, men's entrance may follow with a lag after a sustained increase in the earnings of health professionals.

For changes in earnings to be responsible for the trends observed, the relative attractiveness of the male-dominated specialties would have had to have increased during the 1970s and 1980s to account for women's greater entry into male-dominated fields during that time. This trend would have to have been followed by an increase in the relative earnings of female-dominated fields during the later 1980s to account for the slowdown in women's entry into male-dominated fields.

This pattern is observable in several cases, yet a closer examination reveals that it does not provide a persuasive explanation for the changes for individual majors. The earnings of graduates in several female-dominated fields—psychology, the social sciences, and public affairs—declined in the early 1980s relative to engineering, while the earnings of graduates in mathematics and the physical sciences increased. This much would be consistent with the notion of the increasing earnings prospects in male-dominated fields except that business—the field with the largest increase

in women's representation during this period—also experienced a decline in the earnings of its graduates.

Did the earnings of female-dominated fields rebound during the late 1980s? The earnings in one field changed dramatically: Graduates in the health professions, particularly nurses, saw their starting salaries rise to parity with those of engineers by 1991. However, this field did not experience an increase in enrollments of either women or men during the period examined, and thus this development does not account for observed trends in majors. Two other female-dominated fields—public affairs and the social sciences—also saw modest increases in relative earnings, but neither field experienced an increase in women's representation during this period. Rosen (1994) noted an increase in the salaries of teachers during the 1980s, but he did not show whether teachers' salaries increased relative to other college graduates. Moreover, the proportion of recipients of degrees in education continued to decline through the early 1980s and rose only slightly in the late 1980s. Thus, if there was an increase in the attractiveness of teaching, it does not account for the trends documented here.

Two related measures, the percentage of graduates who were employed full time and the percentage who reported that their jobs were related to their studies, are also presented on Table 5. These measures changed little between 1985 and 1991 (and were not available in published form for 1978).

The general stability in earnings differentials and employment rates across fields and the failure of changes in earnings to correspond with changes in degrees awarded indicate that the "change-in-earnings structure" is not the principal explanation of the slowdown in the movement toward gender integration in college majors. Of course, sizable changes in earnings, with a sufficient lag time, may well influence enrollments, but they do not seem to account for the trends observed during the 1980s.

Another economic explanation for the observed trends is that women have expanded into fields of study that prepare them for careers that minimize work-

family conflicts. Although this explanation undoubtedly has some truth to it, there are a number of difficulties in relying on it to understand the stagnation in segregation during the 1980s. First, several studies have suggested that women's jobs are not always more flexible than men's jobs (Glass 1990). Nursing, for example, requires work at night and on weekends, and in this respect is not especially family friendly. Second, the male-dominated fields that experienced the largest growth in female participation during the 1970s and 1980s were those in which the clash between work and family may be the strongest—bachelor's degrees in business and professional degrees in law and medicine. The male-dominated field in which women made the smallest inroads—engineering—is not especially high on work-family conflict. This rationale for women's selection of majors does not explain the observed trends during the 1980s. However, I have no direct data on whether particular occupations became more family friendly during this period, and, consequently, this explanation cannot be ruled out.

As was noted earlier, the avoidance of mathematics is a common social-psychological explanation for women's underrepresentation in the hard sciences. Again, there is some kernel of truth to this theory, but the variation in women's representation among fields requiring mathematics or statistics is striking, although the evidence is not as complete as one would like. Data on mathematics performance are available, but data on the extent to which concern about mathematics may affect the choice of majors are not available on a consistent basis for this period. One is left to infer the significance of mathematics from the particular fields of study that women pursued.

In the 1980s, women entered many math-intensive fields in large numbers (see Table 2). For example, mathematics and computer science degrees were often awarded to women, whereas women were far less common in engineering and physics programs. Mathematics—at least statistics—is required for obtaining a business degree, and by 1990, 46.7 percent of the bachelor's degrees in business were

garnered by women.⁶ The most quantitative area in business programs—banking and finance—had a lower representation of women (33.1 percent), but still far higher than engineering or physics.

It is often suggested that women have difficulty pursuing the hard sciences because of inadequate preparation (Ethington and Wolfie 1988). However, studies of entrants have found that women are often as well prepared, if not better prepared, than their male counterparts yet experience higher attrition (Adams 1988). Furthermore, trends in preparation need to be linked to trends in subsequent behavior. Despite the impressive evidence compiled by Berryman (1983) on the significance of mathematics preparation as a handicap to women's advancement, the trend data show that women were narrowing the gap with men in obtaining mathematics and science degrees at the same time that the gap in men's and women's mathematics scores on the Scholastic Achievement Test was widening. These disparate trends can be reconciled as follows: The number of women engineering, mathematics, and science students by no means exhausted the pool of women with the talent and background to succeed in these areas. Thus, there was a great deal of room for expansion in women's enrollment in mathematics and the sciences despite the small sex gap in preparation and achievement. The problem, then, is to explain the rapid improvement in the 1970s but the stability from the mid-1980s to 1990. Mathematics performance, by itself, appears to be an unlikely explanation.

The social psychological approach focuses on the preferences that men and women bring with them to college. In line with this approach, there was a slowdown in gender integration among entering freshmen and among graduat-

⁶ Women were prominent in mathematics programs in elite colleges, as well as in institutions devoted to teacher training. Thus, the high representation of women among recipients of mathematics degrees was not due to a high number of women majoring in mathematics in nonselective institutions, as a number of scholars have suggested to me.

ing seniors at about the same time. Indeed, the rough comparison between freshmen and seniors suggests only a small net change during the college years. One may conclude, then, that some unspecified change in sex-role socialization accounted for the changes among seniors.

I view socialization as one important part of a lifelong process of social control. Therefore, freshmen's preferences seem to be insufficient, by themselves, to account for the degrees received by seniors because half the students change majors during college. One must account for why these changes result in greater gender integration in some periods and greater segregation in other periods. In short, one must consider the sex-typing processes that occur during college, as well as those that occur before entry into college. Nor is the process of sex typing complete when students obtain their degrees.

The social-control thesis focuses on the constraints that men and women face when choosing majors. This approach does not ignore economic incentives, but posits that change over time reflects changing social as well as economic incentives. In recent years, women have received much more encouragement to pursue nontraditional fields of study, which has led them to engage in previously male-dominated careers. The social control explanation for the slowdown in the trend toward integration is that the social environment, both inside and outside college, has stabilized in terms of its support for women's choice of nontraditional fields.

Several key findings are consistent with this interpretation. First, the timing of change was remarkably similar at all levels of higher education. The movement toward gender integration slowed down at the same time for recipients of associate degrees as for recipients of Ph.D.s, master's and professional degrees, and bachelor's degrees. And the slowdown was equally evident among entering freshmen. The consistency across levels of higher education, each of which face different occupational destinations and different economic prospects, suggests that there was a decline

in the momentum for expanding opportunities for women throughout higher education. In other words, the social controls that channel women into female-dominated fields weakened during the 1970s but began to stabilize again during the mid- to late 1980s. The result was a stabilization in the degree of sex segregation in majors.

The evidence is consistent with this hypothesis, and a corollary postulate is also supported. One important component of the social-control thesis is that individuals remain susceptible to social influences throughout their lives. During periods of rapid social change in women's roles, one should expect individuals to change their attitudes and behavior, as well as to observe change across cohorts. During more stable social periods, both individual and cohort change should decrease.

This pattern of change is supported by the data on trends in college majors. During the late 1960s and 1970s, declines in segregation were evident between the freshman and senior years and among new cohorts of entering freshmen. In other words, the change that occurred during college in a given cohort of students broadly resembled the change that occurred across cohorts of entering freshmen. During the 1970s, there was a bit more decline among those in college than among entering freshmen, while in the 1980s, there was a bit less. But these broad parallels suggest the following:

1. Changes in the social environment affect the level of segregation.
2. Students in college remain susceptible to these changes.
3. Many students do not make once-and-for-all study- and career-optimizing decisions on the basis of fixed preferences but, rather, remain open to influence by friends, family members, and broad changes in the social climate.
4. The effect of a given set of psychological predispositions remains susceptible to changes during college, and the extent of change varies, depending on prevailing social norms.
5. The effect of the college experience per se is limited; instead, change that occurs during the college years tends to

vary with that of the general social climate.

It should be noted that social change often takes the form of a logistic curve: rapid change followed by stabilization (Price 1963). A rapidly rising curve levels off and reaches a new asymptote. The logistic curve is a good antidote for unrealistic predictions based on linear extrapolation, but it is an incomplete explanation. One must explain where and when the curve levels off.

In other words, one may expect the momentum of the second wave of feminism that began during the late 1960s eventually to run out of steam because periods of social reform are routinely followed by periods of stabilization, if not retrenchment (Piven and Cloward 1979). It is not altogether surprising that significant inequality between men and women remains, since the "stalled revolution" left much unfinished business to be attended to (Hochschild 1990). The backlash against feminism (Faludi 1991) may have also contributed to the slowdown in the movement toward gender integration.

The social-control thesis points to the mechanisms by which these broad political and cultural changes occur and stresses the susceptibility of individuals to social control throughout their lives. Social control is not simply a matter of early life socialization that determines all adult behavior; rather, continuing social constraints are required to keep women and men in their sex-appropriate domains. A relaxing of these constraints affects those in college, as well as those in the labor force, while the reestablishment of constraints likewise has an effect on individuals across a wide spectrum of ages.

CONCLUSION

The results discussed here present some reasons for concern among those who are interested in women's economic prospects. The data indicate that the 20-year trend toward greater integration among college majors that began in the early 1960s slowed markedly during the late 1980s and, in some contexts, came to a complete stop. The data on

degrees received as well as the data on freshmen's intentions reflect similar trends. The review of related material suggests that these trends are not principally the result of the changing structure of economic opportunity but reflect the stabilization of a new pattern of gender roles.

A final point to be made is that few men have entered female-dominated fields and thus that most of the movement toward the greater integration of majors has been due to a greater number of women entering previously male-dominated fields. Therefore, the factors that inhibit men's interest in female-dominated fields, such as teaching and nursing, need further attention.

The evidence for the social-control thesis is largely indirect. It rests as much on the exclusion of other hypotheses as on direct evidence in its own support. More evidence on the specific mechanisms that are responsible for individual decisions is needed before a more complete assessment of the social-control perspective is possible.

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