

# WOMEN SCIENTISTS IN ACADEMIA: Geographically Constrained to Big Cities, College Clusters, or the Coasts?

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Women scientists in academia have been shown to be less geographically mobile than their male counterparts, a factor that may exacerbate gender inequities in faculty representation, tenure, and salary. This study examines the extent to which the jobs of academic women scientists are disproportionately concentrated in large cities, areas with many colleges and universities, and regions where most doctorates are granted. We also investigate whether jobs in these locations affect salary, tenure, full-time faculty status, and employment outside one's field of training in ways that differ for women and men. Our analysis is guided by arguments that geographic constraints on women's mobility are rooted in social factors, such as gender roles and mate selection patterns. Data are drawn from over 13,000 faculty respondents in the national Survey of Doctoral Recipients, representing 22 science and engineering disciplines and over 1,000 4-year colleges or universities. Regression analysis reveals that, irrespective of their family status, women faculty are more likely than their male counterparts to reside in doctoral production centers, areas with large clusters of colleges, and large cities. Responsibility for children intensifies women's geographic concentration more than marriage does and in ways that differ from men. Geographic concentration also appears generally more harmful to women's careers than to men's. Women in doctoral production centers are less likely to have tenure and more likely to work part time; those in larger cities are more likely to be in jobs off the tenure track. Locales with many colleges appear to present somewhat better career prospects for women.

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**KEY WORDS:** women faculty; women scientists; gender equity; occupational mobility; geographic constraints.

A long recognized factor in the persistence of the gender gap in representation, tenure, and salary among college faculty is geographic constraints on the career mobility of academic women (Marwell, Rosenfeld, and Spilerman, 1979). In an era when Ph.D.s seeking faculty positions face a small number of geographically scattered opportunities in a "buyer's market," lack of mobility can

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foreclose or seriously limit women's success in academia. Constraints on women's mobility may stem from family and gender role dynamics, as well as enduring patterns of age, educational, and occupational hypergamy (women's pattern of marrying older and better educated men with more prestigious jobs). This article examines whether women are disproportionately drawn to large cities, areas with many local colleges, and the regional centers of doctoral production. These locations represent three different ways that geographic constraints may disproportionately influence women's faculty careers: by becoming "rooted" to the areas in which one earns the doctoral degree; by being drawn to large cities with plentiful employment opportunities that accommodate dual-career couples; and by gravitating to areas with many colleges and universities, where dual academic career couples find it easier to find jobs for both partners. We also consider whether age and responsibility for children in the home are related to these constraints and whether they operate differently for single women and single men than for married women.

## EVIDENCE AND EXPLANATIONS FOR GEOGRAPHIC CONSTRAINTS ON SCIENCE CAREERS

College and university faculty are presumed to be drawn from national rather than regional or local labor pools. Yet there is evidence that college faculty are geographically rooted to the areas of their training in the critical move to their first job after receiving the doctorate (Hargens, 1969). This appears to be especially true of longitudinal rather than latitudinal movement (McGinnis and Long, 1988). Those earning degrees on the East Coast or West Coast are more likely to stay there for their first jobs than one would expect in a freely mobile national market. This tendency appears to affect women more than men (Marwell et al., 1979), presumably constraining women's academic job opportunities disproportionately to regions with the largest production of doctoral recipients: the "megalopolis" stretching across the Northeast corridor from Boston to Washington, DC, the West Coast states from California to Washington, and the Great Lakes states stretching from Minnesota to Ohio.

Some of these centers of doctoral production, such as the Northeast corridor, are also large metropolitan areas with populations numbering in the many millions. The relatively plentiful and diverse economic opportunities in these areas may create a second constraining dynamic that affects academic women disproportionately, both by attracting women to the largest cities and reducing their propensity to leave them in pursuit of career advancement. Marwell et al. (1979) found that married academic men are more likely than academic women to relocate to small communities where there are few academic positions available and less likely than women to choose positions in large metropolitan areas. Women academics are also more likely than their male counterparts to make

job shifts within the same locality, but these job changes are less likely to result in improved job status for women than for men. This may be due to a larger academic labor supply and more intense competition for coveted positions in the largest cities.

Life as an academic in the big city appears to come at a cost. In a study of academic psychologists, Rosenfeld and Jones (1987) found that those residing in larger cities are less likely to secure promotions to associate or full professor, and the effect is stronger for women than for men. The large supply of academic women in major metropolitan areas may enable institutions to expand “secondary sector” employment, such that women are directed disproportionately to nontenure-track jobs (Rosenblum and Rosenblum, 1990). Women constrained to big city jobs might also be directed toward positions in higher administration and professional jobs without faculty status. The proportional representation of women in these job categories is substantially higher in 4-year colleges and universities that are located in the largest cities (Kulis, 1997). Moving to or remaining in large metropolitan areas, where career opportunities are more plentiful for both partners, may allow academic women to accommodate the needs of two careers.

When both partners’ careers are in academia, matters become considerably more complicated. Academic women are more likely to be married to a fellow academic than are academic men. This creates a third geographic constraint that might disproportionately affect women. A large national survey of college faculty found that, although men are more likely than women to be married (82 percent versus 62 percent), among those with spouses or partners, more women (40 percent) than men (35 percent) have partners who are college faculty members (Astin and Milem, 1997). The odds of having a fellow academic as a partner are higher for some ethnic-gender groups (Native American women, African American men) and lower for others (Mexican American men, Asian American men, Puerto Rican women).<sup>1</sup> In addition, academic couples are more numerous in certain fields: men in education, English, and fine arts (where women are more prevalent among the faculty) are more likely to have an academic partner than other male faculty. Conversely, more than half the women in agriculture, history, math, and political science (where male faculty predominate) report that their partners are academics (Astin and Milem, 1997). This tendency appears to be even more pronounced in science fields where women faculty are scarcest. For example, Gibbons (1972) estimated that about 70 percent of female physicists have scientist husbands, often academics as well.

Academic couples are not a new phenomenon; they have existed, albeit in minuscule numbers, since the nineteenth century. For the cohort of women born around 1890, getting a doctorate typically meant they had chosen career over family. The overwhelming majority of female Ph.D.s in this cohort remained single (Goldin, 1992). The cohort born around 1930 were far more likely to

marry and build both families and careers, but only serially—the overwhelming majority raised families first and then started careers. The tendency for academic women to have spouses in academia emerged in the 1960s and 1970s (Ferber and Huber, 1979), a departure from earlier cohorts of academic women who were mostly unmarried. However, for the cohort earning doctorates in the 1980s, a third pattern developed: that of combining education and career with marriage and family (Goldin, 1992). Although it is still true that fewer women than men in academia are married, this new pattern indicates that women no longer view their options as a choice between family and career, nor are they willing to put careers on hold to raise children. But this growing propensity to combine marriage and parenthood with their faculty careers disproportionately places women in a dual-career dilemma. When academic couples find themselves up against antinepotism rules and a scarcity of faculty positions, it is difficult for both partners to find faculty positions at the same university. This situation might restrict academic women's choices of location to areas with more colleges and universities, where colleges and faculty positions are more densely concentrated, enabling both them and their husbands/partners to find academic jobs more readily.

Although some contend that marriage-related factors other than constraints on geographic mobility damage the careers of academic women (Lester, 1974; Sowell, 1975), there is evidence that dual-career marriages and partnerships can be advantageous for women, especially if the partner is a fellow academic. Astin and Milem (1997) report that women faculty with academic partners have better career outcomes than those with nonacademic partners: the former are more likely to teach at 4-year universities; hold higher academic rank and experience smaller gender gaps in rank compared with men at their institutions; receive higher salaries; and are oriented more toward research than teaching. One explanation for these findings is that a male academic partner grants female faculty greater access to professional networks from which they would otherwise be excluded. These networks can aid careers by increasing information about and access to opportunities and enhance scholarly productivity by stimulating ideas and identifying scholarly errors early (Astin and Davis, 1985; Clark and Corcoran, 1986; Fox, 1985). Women faculty with academic partners also tend to come from more educated families (Astin and Milem, 1997), so at least part of the reason for their better career outcomes may lie in advantages associated with higher social class background.

How marriage or an academic partner affect women's scholarly productivity is less clear. Contrary to arguments that marriage disadvantages women's scholarly productivity but enhances men's, large surveys of women faculty and women scientists show that married women publish more than single women (Astin and Davis, 1985; Cole and Zuckerman, 1987). Women with academic partners also publish more than women with nonacademic partners, while the reverse is found

for men (Astin and Milem, 1997). However, in a study of Illinois college faculty, the extra productivity of women with academic partners disappeared after controlling for other factors associated with higher rates of publication: experience, doctoral degree, employment in doctorate-granting institutions, full professor rank, and generating grant revenues (Bellas, 1997). The same Illinois data show that characteristics of women faculty's male academic partners (education, employment status, years together on the same faculty, residential separation) have little or no influence on women's attainment of academic rank, salary, or the type of academic institution that employs them. These outcomes for women are even unrelated to whether or not the partners are married or have children together (Ferber and Hoffman, 1997). However, it is unclear whether the same findings would be found nationwide. Perhaps the advantage of being married to a fellow academic offsets some of the disadvantages associated with women's traditional subordinate role in marriage. In any case, the answer to the question of whether being married to an academic helps or harms the careers of academic women is far from straightforward.

Regardless of whether a woman is part of an academic couple, a contributing factor—if not the root—of all three of the geographical constraints faced by women has been their long-standing tendency toward age and educational hypergamy in partner selection. Women's traditional pattern of marrying men who are older and more advanced in their careers increases the risk of later encountering resistance to geographical moves that favor the woman's career advancement over that of her husband's. Women may thus become "rooted" to areas of concentrated doctoral production because moving away disrupts their husbands' more established careers. Women will also be likely to remain in or move to large cities that offer attractive career opportunities for their partners. And if their partners are fellow academics, preference given to the husband's career will lead women to academic jobs mainly in areas with many postsecondary institutions that more readily accommodate dual academic careers. The pattern of female hypergamy in marriage was widespread and quite stable through 1980 (Cooney and Uhlenberg, 1991). Since then, however, a tendency toward homogamy (marrying those similar in age and education) has emerged in the general population (Qian and Preston, 1993). This trend appears to be strengthening, particularly among the highly educated. The odds of marriage between college-educated men and college-educated women now exceed the odds that marriages will take place between college-educated men and less well-educated women.

Both the past tendencies toward hypergamy and recent trends toward homogamy present academic women with dual-career dilemmas. The few married couples pursuing dual academic careers in the past found it extremely difficult to find faculty positions at the same university. Historical studies of women faculty suggest that antinepotism rules kept academic wives from holding tenure-track positions and that when one spouse was tenured, it was generally the husband.

This began to change in the 1970s. As faculty couples became more common, so did situations where both spouses held tenured positions at the same university (Stephan and Kassis, 1997). However, in the current tight academic job market, academic couples still face difficult choices when job offers for spouses come from different regions or cities. When sacrifices have to be made, women appear to shoulder them disproportionately. The husband's career is more likely to "come first," and he is less likely than his wife to face restrictions that stem from the wife's career concerns. In a study of criminologists, 21 percent of the women but only 5 percent of the men had left an academic position for family reasons, most commonly for a spouse's employment (McElrath, 1992). At one university, only 3 percent of the male faculty but 43 percent of the female faculty had moved exclusively for their spouse's career (Weishaar, Chiaravalli, and Jones, 1984). In a study of all types of employment, Bielby and Bielby (1992) found that women are more reluctant than men to relocate for a better job. Further, while most women cite "family considerations" as the reason for their reluctance to move, few of the men do.

Regardless of academic achievement, wives in dual-career households are more likely to be the "trailing spouse" or "tied migrant" whose career suffers after a move, or to be the one who is constrained from moving to a more advantageous career destination. A variety of studies, outside and inside academia, establish that a woman's career interests generally play a subsidiary role in a couple's geographic moves, and these moves increase her chances of being unemployed or suffering career setbacks. Shihadeh's (1991) study of relocating families shows these moves are far more likely to be prompted by the career concerns of husbands than of wives. Moreover, wives play a subsidiary role in the family's decision to migrate regardless of their level of academic achievement or employment. One study estimated that husbands "follow" their wives to another location only if the women earn substantially (at least 25 percent) more than the men (Hendershott, 1995). The wife's secondary role in the decision to move is also a strong predictor of her subsequent unemployment in the new location.

Similar outcomes are suggested for married academic women who migrate. They are more likely to be unemployed or underemployed after a relocation than before a move necessitated by the husband's career concerns (Brooker-Gross and Maraffa, 1989). When married to a fellow academic, women are less likely to receive faculty job offers than those with nonacademic partners; however, when the academic job seekers are male, whether or not the wife is an academic makes no difference in how many job offers are received (Astin, Korn, and Dey, 1991). Because networks of information and contacts that people use to find employment are particularly crucial in the academic job market, moving as a "tied migrant" makes it harder to find appropriate employment by disrupting these networks (Campbell, 1988). Even when "tied migrant" wives do find

faculty employment in their new location, the career interruption caused by the move can be a serious setback. McElrath's (1992) study of criminologists reports that, controlling for publications and length of service, women who leave an academic position because of a spouse's job are less likely to be tenured and take longer to achieve tenure than those who maintain continuous employment. For men, however, career interruptions do not impact the probability of being tenured. There are also gender differences in the reasons for career interruptions. For women they are prompted more often by marital (usually spouse's employment) than by childbearing considerations, indicating they affect childless women too. In a national study of academics in all fields, 29 percent of women but only 4 percent of men report some interruption in their faculty careers, and these proportions remain the same whether the women are married to academics or not (Astin et al., 1991). McElrath suggests that moving for a spouse's career can be damaging in two ways: first, by separating academic women from communication networks that enable them to find desirable jobs; second, by adding support to sexist perceptions that women should not be hired for faculty positions or given tenure because they are more committed to family life than to their careers. This harms not only the careers of the women involved but also adds fuel to statistical discrimination against all women (i.e., relying on perceptions about groups of people in the aggregate to discriminate against individuals).

These findings contradict theories that attribute the greater propensity to move for the sake of the man's than for the woman's career to factors like women's lower level of human capital investments in education and work experience or the need to maximize family resources by focusing on the man's career. Instead, some researchers argue that gender role socialization is responsible. Much research supports the conclusion that even ambitious, highly educated, and well-compensated men and women are socialized toward gender-specific ways of balancing career and family concerns (Shihadeh, 1991). The pressures on academic women toward husband-centered migration may be intensified by sanctions from family and friends when women ask men to follow them to another city (Hendershott, 1995). Living apart is another way of accommodating the demands of dual careers and one that appears to come at less expense to the careers of women. In her Illinois sample, Bellas (1997) found that greater physical separation from their partners (such as partners living in different cities) increased scholarly productivity for academic women but decreased it for academic men, perhaps because commuter relationships decrease household labor demands on women but increase such demands on men. Another approach might be to adopt less traditional gender and family roles. Bielby and Bielby (1992) found that both men and women express great reluctance about moves that further the wife's career unless they embrace nontraditional gender roles. In households where both partners are academics, the roles appear more egalitar-

ian in nature; women whose partners are academics report feeling less stressed by child care and household responsibilities than women whose partners are not academics. Men with academic partners, however, report more domestic stress from these sources than men whose partners are not academics (Astin and Milem, 1997).

Even if the costs that married academic women bear to remain with their husbands may be offset by certain career or domestic advantages, efforts to accommodate all the pressures of dual-career couples are still more likely to be successful if they locate in large cities and areas with many colleges that offer ample employment opportunities for both partners. The same pressures decrease the likelihood that married academic women would look favorably on rural faculty positions for themselves. Married men, however, would appear to be in the best position to consider job offers in small towns distant from the site of their doctoral training. Their path is eased not only by cultural preferences given to men's career advancement but also by the fact that they take with them a family support network that may help ease social and cultural isolation.

Although unmarried faculty with partners, or cohabitants for short, are also affected by dual-career dilemmas, there is reason to expect that they resolve them somewhat differently than married academics. Academic women who cohabit with a partner endorse less traditional gender roles (Miller and Skeen, 1997). Cohabiting women are also less likely to make sacrifices for their partner's career (such as relocation or postponement of their own careers) than are married women. Among heterosexual cohabiting couples, however, this may signify not just less traditional gender roles, but a possible reluctance to sacrifice too much for a relationship seen as less secure than marriage (Kotkin, 1983). We are unable to explore these issues in the present study because the available data do not distinguish unmarried faculty with cohabitating partners (whether heterosexual or same-sex) from unattached singles.

While both theory and empirical findings suggest that geographical constraints operate quite differently for married men than for married women, geographic pressures for unmarried academics are more difficult to predict. They are likely to reflect the social forces leading to an increasing prevalence of cohabitating, single-parent, same-sex, and two-income households over the last three decades, as well as trends toward educational homogamy in mate selection. Career destinations for unmarried academics may reflect concerns about partners with whom they are cohabitating—including same-sex partners—or the concerns of unattached single parents. Even currently unattached singles may harbor concerns about the size of the pool of similarly educated potential mates in rural areas or small towns.

Apart from mate selection considerations, both unattached single men and women may find larger cities highly desirable for their social and cultural opportunities and the availability of wider, more diverse friendship and support net-

works. The decision to locate in these areas may then reflect positive choices more than social constraints. For women in particular, larger settings may provide better access to an academic community where they find support networks of other women. In general, however, we expect that single women will be less geographically concentrated than married women, but expect single men to be more geographically concentrated than married men. For reasons similar to those of single women, single men may choose faculty positions in large metropolitan areas and eschew positions in rural areas. This would be consistent with Oppenheimer's (1977) assertion that the wife's employment status must reflect favorably on the husband's class status to preserve harmony in the family, which suggests that highly educated single men would be drawn to an environment where appropriate marriage partners could be found. Apart from large cities, that may include areas with many colleges and universities.

## HYPOTHESES

The main hypothesis for this study is:

*H*<sub>1</sub>: Women scientists in academia will be more likely than their male counterparts to be geographically constrained, that is, more likely to be employed in (a) large population centers, (b) areas with numerous colleges or universities, and (c) regions with the most concentrated doctoral production.

We expect that these geographic constraints will be most pronounced for certain subgroups.

*H*<sub>2</sub>: Assuming marriage constrains career mobility in academia more for women than men, ever-married women will be more likely than both ever-married men and never-married women to be located in large population centers, areas with numerous colleges or universities, and the regions with most concentrated doctoral production.

*H*<sub>3</sub>: Because child care responsibilities may reinforce gender socialization toward traditional family roles and impede women's career mobility, academic mothers with dependent children at home will be more likely to reside in larger cities, college clusters, and doctoral production regions. However, academic fathers will be less likely to be concentrated in these areas.

*H*<sub>4</sub>: Because traditional gender socialization patterns have weakened over time, the propensity for married women and those with children to be located in larger cities, college clusters, and doctoral production regions will be more pronounced for older than for younger cohorts.

*H*<sub>5</sub>: Given the emerging pattern of educational homogamy in mate selection

among the highly educated, unmarried academic men will locate more often than married men where highly educated marriage partners are more readily available: in larger cities and college clusters.

On balance, we expect that women pursuing careers in geographically constrained locations will suffer career disadvantages.

*H<sub>6</sub>*: Because women's geographic concentration may stem from a preference given to male partners' careers over their own, women in these locations (large cities, college clusters, and doctoral production centers) will be less likely than their female counterparts in other locations or their male counterparts in the same locations to occupy tenured positions and more likely to have jobs that are off the tenure track, part time, outside of their doctoral field of training, and less well paid.

## DATA AND METHODOLOGY

The data for this study merge questionnaire responses from college faculty in the United States with characteristics of the institutions employing them. Individual respondents are drawn from the 1989 Survey of Doctoral Recipients (SDR). This representative survey of the doctoral-level labor force in the United States is conducted biennially by the National Research Council (NRC) for the National Science Foundation and other federal agencies. The SDR contains profiles of the academic careers of doctorate holders, with large oversamples of women from all disciplines. The present article employs an SDR subsample consisting only of faculty members in 4-year colleges or universities in science or science-related disciplines. Although the SDR is not deliberately stratified by type of postsecondary employer, the respondents work in a large heterogeneous array of colleges and universities. The sample includes 13,159 faculty members (before attrition due to missing values on some predictors) from a large cross-section of all U.S. baccalaureate-granting institutions. Over three fourths of all 4-year colleges and universities are represented, encompassing 1,071 out of the universe of 1,378 4-year institutions enumerated by the Carnegie Foundation for the Advancement of Teaching (1987). The vast majority (78 percent) of the represented institutions have multiple faculty respondents, some as many as 73. When properly weighted, the individual-level data comprise a representative sample of 4-year college faculty holding doctorates in science and engineering.

We employ several variables from the faculty respondents' SDR data: age, presence of any children under 19 at home, marital status, employment status (full time versus part time), tenure status, 9-month equivalent salary, the discipline in which they are currently employed, and whether that is different than their field of doctoral training. The respondents were grouped into 22 broadly

defined science fields of current employment: agriculture, anthropology/archaeology, area studies, biology, chemistry, communications, computer science, criminology, demography, earth sciences (geological, marine, and atmospheric), economics, engineering, geography, health sciences, international relations, mathematics, physics/astronomy, political science, psychology, public affairs, sociology, and urban studies. To determine whether faculty were employed in areas outside their field of doctoral training, we experimented with very specialized breakdowns (e.g., plant pathology), intermediate groupings into disciplinary subfields (e.g., botany), and the broad breakdowns into 22 fields (e.g., biology). Using the finest field breakdowns, over 40 percent of faculty were defined as employed outside their area of doctoral training, compared with about 33 percent using the intermediate, and 16 percent using the broadest field breakdowns.<sup>2</sup> In predicting employment outside one's doctoral field, conclusions are the same using both narrow and broad definitions of fields. Here we report results based on the broadest definitions of fields.

The individual-level SDR data are also matched to several sources of information about their employers. There are three variables based on the employer's geographic locale, defined as its Metropolitan Statistical Area, or county (for non-MSAs): (a) the size of the local population, in thousands, from 1990 U.S. Bureau of the Census data; (b) the number of local "competitors," a count of all 4-year postsecondary institutions in the same MSA/county or within 25 miles of its boundaries, and (c) the region of the country in which the institution is located. Although we investigated other regional breakdowns, our analysis highlights differences between areas where doctoral production is concentrated (the Boston-New York-Washington metropolitan corridor, the Great Lakes states of Illinois, Indiana, Ohio, Michigan, Minnesota, and Wisconsin, and the West Coast states of California, Oregon, and Washington) with all remaining areas of the nation.

Our analysis strategy employs ordinary least squares and logistic regression to model an array of continuous and dichotomous outcomes. First, we use gender, marital, and family status of the faculty members to predict their geographic locations, while controlling for other relevant factors that affect these locations such as the faculty member's current age. Second, we investigate how different geographic locations affect career outcomes like obtaining tenure, working full time, working outside one's field of training, and salary. Results are also presented separately for women and men to highlight the mediating role of gender in the sources and consequences of different geographic locations for academics. To determine whether the factors that predict geographic locations differ for men and women, we tested for gender interaction effects as well as age interaction effects. Variance inflation factors were scrutinized in all the regression models to ensure that estimates were not subject to multicollinearity biases.

The unit of analysis for all results is the individual level, although some of

the key variables are macro-level ecological factors like region, population size, and number of competitors. We include these macro-level variables for both theoretical and methodological reasons. The hypotheses under examination assume that factors measured at the local or regional level influence the labor market for faculty appointments at particular institutions. To avoid methodological complications of using ecological factors as predictors, all of the organizational variables are measured as global characteristics, rather than as contextual measures composed by aggregating the individual-level data.

## RESULTS

Descriptive statistics and correlations among the variables used in analysis are presented in Table 1. The correlations indicate that there are moderate to strong relationships among the three geographic indicators. Those located in regions where doctoral production is relatively high also tend to live in large cities and places where there are many colleges and universities. The significant, although weak, correlations with gender also suggest that women are somewhat more likely than men to live in these same three locations. There are modest relationships suggesting that women have lower salaries, are younger, and are less likely to be married and tenured than men are. There are also well-known or predictable relationships among salary, age, tenure, and full-time status, as well as among age, marital status and childrearing responsibilities.

Table 2 compares the geographic distribution of faculty women and men and then breaks them down by marital status after separating respondents who have never been married from those who are currently married, widowed, divorced, or separated.<sup>3</sup> The top panel of Table 2 shows the percentage of women and men who live in locales with small, medium, and large populations. Differences in the distributions are most appreciable at the extremes of population size, with proportionally more of the men than women living in the smallest locales and proportionally more of the women than men living in cities of over 2 million people. However, when broken down by gender and marital status simultaneously, it becomes clear that marriage has far more potent spatial consequences for men than for women, with the largest differences in the distributions appearing between ever-married men and all others. Ever-married women are much more likely to live in large cities and away from the smallest locales than ever-married men, but no more so than never-married women or never-married men. As expected then, ever-married men are least concentrated in big cities, but ever-married women are not distinguishable from never-married women and men in terms of being concentrated in small towns.

The same patterns surface in the middle panel of the table, which examines the distribution of faculty in areas with single, few, or many local 4-year colleges and universities. Women are substantially more concentrated than men in

TABLE 1. Means, Standard Deviations and Correlations of Variables Used in Analysis

	N	Mean	S. D.	Correlations												
				(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Ph.D. Production Region (Y = 1 N = 0)	13188	0.51	0.50	1.000	0.386	0.420	0.073	-0.046	0.043	0.049	0.016	0.081	-0.077	0.024	-0.055	-0.023
(2) Number of Local Colleges (log)	13188	1.63	1.22	0.386	1.000	0.710	0.107	-0.080	0.074	0.057	-0.003	0.061	-0.100	0.036	-0.050	-0.032
(3) Local Population Size (log)	13188	6.34	1.58	0.420	0.710	1.000	0.108	-0.080	0.079	0.066	0.007	0.101	-0.100	0.045	-0.054	-0.026
(4) Gender (Female = 1 Male = 0)	13188	0.17	0.37	0.073	0.107	0.108	1.000	-0.176	0.118	0.102	0.021	-0.231	-0.200	0.106	-0.056	-0.152
(5) Tenured (Y = 1 N = 0)	13188	0.61	0.48	-0.046	-0.080	-0.080	-0.176	1.000	-0.691	-0.295	-0.058	0.461	0.137	0.011	-0.006	0.428
(6) Not Tenure Track (Y = 1 N = 0)	13188	0.23	0.42	0.043	0.074	0.079	0.118	-0.691	1.000	0.436	0.063	-0.345	-0.074	-0.002	-0.024	-0.154
(7) Not Full Time (Y = 1 N = 0)	13188	0.08	0.26	0.049	0.057	0.066	0.102	-0.295	0.436	1.000	0.032	-0.380	-0.049	-0.032	-0.075	-0.076
(8) Not in Ph.D. Field (Y=1 N=0)	13188	0.15	0.35	0.016	-0.003	0.007	0.021	-0.058	0.063	0.032	1.000	-0.019	0.004	-0.004	0.005	0.027
(9) Annualized Salary (\$000)	12683	51.53	18.90	0.081	0.061	0.101	-0.231	0.461	-0.345	-0.380	-0.019	1.000	0.141	-0.005	-0.060	0.421
(10) Now Married (Y = 1 N = 0)	13188	0.80	0.40	-0.077	-0.100	-0.100	-0.200	0.137	-0.074	-0.049	0.004	0.141	1.000	-0.615	0.322	0.140
(11) Previously Married (Y = 1 N = 0)	13188	0.09	0.28	0.024	0.036	0.045	0.106	0.011	-0.002	-0.032	-0.004	-0.004	-0.615	1.000	-0.137	0.022
(12) Child Home (Y = 1 N = 0)	13188	0.42	0.49	-0.055	-0.050	-0.054	-0.056	-0.006	-0.024	-0.075	0.005	-0.060	0.322	-0.137	1.000	-0.300
(13) Age	13144	47.08	9.85	-0.023	-0.032	-0.026	-0.152	0.428	-0.154	-0.076	0.027	0.421	0.140	0.022	-0.300	1.000

Note: Correlations greater than .018 in absolute value are significant at  $p < .05$ ; those greater than .023 are significant at  $p < .01$ ; and those greater than .03 are significant at  $p < .001$ .

TABLE 2. Size of Locale, Number of Local Colleges/Universities, and Regional Location, by Gender and Marital Status

	Women (N = 5,270)	Men (N = 7,969)	Never-Married Women (N = 1,164)	Never-Married Men (N = 771)	Ever-Married Women (N = 4,050)	Ever-Married Men (N = 7,144)
<i>Population Size</i>						
<100,000	12%	18%	11%	12%	12%	19%
100-499K	23%	27%	22%	21%	22%	28%
500-999K	17%	17%	17%	19%	16%	17%
1-2 million	15%	12%	12%	13%	15%	12%
>2 million	34%	25%	36%	34%	34%	24%
	100%	100%	100%	100%	100%	100%
	$\chi^2 = 140.2^{***}$		$\chi^2 = 0.9$ n.s. <sup>a</sup>		$\chi^2 = 132.5^{***}$	
<i>Local Colleges</i>						
1	13%	21%	14%	14%	13%	22%
2-3	20%	23%	20%	17%	20%	23%
4-10	30%	29%	28%	32%	31%	29%
>10	37%	26%	38%	37%	36%	26%
	100%	100%	100%	100%	100%	100%
	$\chi^2 = 140.3^{***}$		$\chi^2 = 0.4$ n.s. <sup>a</sup>		$\chi^2 = 131.5^{***}$	
<i>Region</i>						
NE corridor	28%	19%	31%	28%	27%	18%
Great Lakes	17%	18%	21%	19%	16%	18%
West Coast	14%	12%	11%	14%	15%	12%
Other Region	41%	51%	37%	37%	42%	52%
	100%	100%	100%	100%	100%	100%
	$\chi^2 = 110.9^{***}$		$\chi^2 = 0.1$ n.s. <sup>ab</sup>		$\chi^2 = 96.3^{***}$	

Note: Reported Ns are unweighted. Percentage breakdowns are for properly weighted results.

<sup>ab</sup>Unreported chi-square tests show that there are significant differences in the distributions at  $p < .05$  comparing never-married men to ever-married men (<sup>b</sup>), and comparing never-married women to ever-married women (<sup>b</sup>).

<sup>\*\*\*</sup> $p < .001$ ; <sup>\*\*</sup> $p < .01$ ; n.s. = nonsignificant for the  $2 \times 5$  or  $2 \times 4$  table comparing women and men.

locales with more than 10 institutions, and men are more likely than women to be employed by the sole college or university in an area. Once again, ever-married men are distinctive as the group least likely to be located amid dense college clusters, but unexpectedly, women are about equally unlikely to be found in these clusters whether they have been married or not. Marriage appears again to affect men's locations much more than women's, with substantial differences between ever-married and never-married men.

The regional locations of science faculty are portrayed in the bottom panel, which shows the percentage of women and men employed in areas where doctoral production is concentrated (the Northeast corridor, Great Lakes, and West Coast) versus all remaining "other" regions.<sup>4</sup> Women are substantially more likely than men to be located in the Northeast corridor and are less likely than men to reside in "other" regions with less concentrated doctoral production. Once again, ever-married men are the most distinctive gender-marital group. They are least likely to reside in the Northeast corridor or the West Coast and most likely to live in "other" regions of less concentrated doctoral production. Although there are no appreciable differences between never-married women and never-married men, there are differences in an unexpected direction between never-married and ever-married women, with the former more likely to live in the regions of concentrated doctoral production.

One explanation for the strong similarities in the relationships among gender, marriage, and the three measures of geographic location is that they are due to strong interrelationships among the geographic variables. Population size is highly correlated with the number of colleges in the area ( $r = .71$ ), and postsecondary institutions are more densely clustered in the Northeast corridor than in other regions.<sup>5</sup> To examine the impact of gender, marriage, and children on geographic location while controlling for other geographic concomitants, Table 3 presents logistic and ordinary least squares regressions. The three sets of regressions predict (a) whether faculty work in the high doctoral production regions (the Northeast corridor, West Coast, Great Lakes) versus other areas, (b) the number of colleges and universities in their locale, and (c) the 1990 local population (MSA or county), in thousands. An inspection of the distributions of the latter two variables revealed them to be highly skewed to the right, so natural log transformations are employed to normalize the distributions and obtain better fitting models.

In Table 3 individual characteristics appear first as predictors: gender (with men as the reference category), presence of any children under 19 at home (a dummy variable), marital status (those currently married and those previously married versus the reference category, those never married) and age (in years). Possibly confounding geographic factors are also included as control variables. The equations are estimated first for men and women together, then separately, along with indicators of significant gender interaction effects ( $\dagger$ ), based on equa-

TABLE 3. Logistic and OLS Regressions Predicting Locations of Faculty Members' Employers

	High Ph.D. Production Region (Y = 1 N = 0) [odds ratios]			Number of Local Colleges (log) [standard errors]			Local Population Size (log, in 000s) [standard errors]		
	All	Women	Men	All	Women	Men	All	Women	Men
Gender (Female = 1 Male = 0)	0.122* [1.129]			0.039* [0.015]			0.051** [0.020]		
Now Married (Y = 1 N = 0)	-0.202*** [0.817]	-0.263* [0.769]	-0.203* [0.816]	-0.066*** [0.020]	-0.046* [0.023]	-0.077** [0.028]	-0.004 [0.025]	0.042 [0.027] <sup>a</sup>	-0.020 [0.036]
Previously Married (Y = 1 No = 0)	-0.184* [0.832]	-0.296 [0.744]	-0.149 [0.862]	-0.072** [0.026]	-0.127*** [0.028]	-0.056 [0.037] <sup>b</sup>	0.058 [0.032]	0.125*** [0.034] <sup>a</sup>	0.027 [0.047] <sup>a</sup>
Child Home (Y = 1 N = 0)	-0.135** [0.874]	0.054 [1.056]	-0.164*** [0.849] <sup>†</sup>	-0.002 [0.013]	0.054** [0.020] <sup>b</sup>	-0.009 [0.017] <sup>†</sup>	-0.014 [0.016]	-0.047* [0.024] <sup>a</sup>	-0.007 [0.022]
Age	-0.003 [0.997]	-0.008 [0.992]	-0.002 [0.998]	0.001 [0.001]	0.001 [0.001]	-0.001 [0.001]	0.001 [0.001]	0.001 [0.001]	0.001 [0.001]
High Ph.D. Production Region				0.078*** [0.012]	0.051** [0.019]	0.082*** [0.016]	0.334*** [0.015]	0.314*** [0.022]	0.339*** [0.020]
Number of Local Colleges (log)	0.174*** [1.191]	0.156* [1.169]	0.175*** [1.191]				1.050*** [0.006]	1.021*** [0.009] <sup>a</sup>	1.056*** [0.008] <sup>†</sup>
Local Population Size (log)	0.484*** [1.622]	0.535*** [1.708]	0.477*** [1.610]	0.648*** [0.004]	0.703*** [0.006]	0.637*** [0.005] <sup>†</sup>			
Intercept	-2.959 (.481)	-2.941 (.501)	-2.933 (.457)	-2.447 0.731	-2.841 0.761	-2.359 0.722	4.441 0.739	4.486 0.769	4.443 0.730
R <sup>2</sup> (Gamma) <sup>‡</sup>	13.144	5.240	7.904	13.144	5.240	7.904	13.144	5.240	7.904
N									

<sup>a</sup>Positive (°) or negative (°) significant interaction effect by age; coefficients (not presented in table) for younger and older women are different.

<sup>†</sup>Significant gender interaction effect ( $p < .05$ ); coefficients (not presented in table) for women and men are different.

<sup>‡</sup>Gamma is on a scale similar to R<sup>2</sup> such that a high gamma indicates a high degree of fit in the model.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

tions not presented in the table.<sup>6</sup> Significant interactions signify that the particular variable predicts the outcome in a direction or to a degree that differs for women and men.

The results show that, even after adjusting for gender differences in marital status, dependent children, and age, women are more likely than men to be employed in the regional centers of doctoral production, in areas with many colleges, and in larger cities. The odds ratios in the first logistic regression equation can be interpreted as indicating that the odds that women faculty will be located in a region of concentrated doctoral production are about 12 percent higher than for men and that currently married faculty are about 20 percent less likely than never-married faculty to live in these locations. Interpretations of the ordinary least squares equations predicting number of local colleges and local population size need to account for their natural log transformations. Each predictor in these equations actually has a different impact on these outcomes at their low and high original ranges. A one-unit change in the predictor will predict a small difference in the number of competing institutions or in population size at the low original ranges of these variables but predict very large differences at their top ends.

Adjusting for the log transformations, a typical woman (with mean values on all other predictors) lives in a locale with one more college and a population about 30,000 larger than that of a typical man. Faculty who are currently or previously married, both men and women, generally are less likely than the never married to live in doctoral production centers or areas with many colleges. Previously married women are, however, more likely than never-married women to live in big cities; the corresponding effects for currently married women and for both currently and previously married men are not significant. There are also strong gender differences in how children affect location. Compared to those without parental responsibilities, men with dependent children at home are less likely to reside in high doctoral production regions, while women with children at home tend to live in areas with many colleges and in smaller cities or towns.

As a main effect, age has no discernable impact on the locations of faculty. However, in addition to the gender interactions reported in Table 3, we also investigated interactions between age and marital status and between age and the presence of children in the home (results are summarized in the table footnotes a and b but not presented in the table).<sup>7</sup> These interaction effects show that marriage and responsibility for children affect geographic locations differently for older than younger cohorts of women. Older women who are or who have been married, and those with dependent children are more likely than younger women to reside in large cities. Compared to their younger counterparts, however, older women with children at home are less likely to reside in areas with many colleges. These interaction effects do not indicate that the impact of marriage and children on career locations has reversed direction for younger women. They do

suggest that pressures or inducements for married women faculty to live in large cities have been stronger for older than for more recent cohorts. Among the younger generation of women, however, childrearing obligations are linked most strongly to residing near college clusters and away from big cities.

Age interaction effects among men are more limited. Compared to younger men, older male faculty who have been married previously are more likely to live in large cities, but less likely to live in areas with many colleges. The fact that these interaction effects do not extend to currently married men suggests that the termination of a marriage through divorce or widowhood has different consequences on the locations of older than younger men.

It is important to note that individual demographics—gender, age, marriage, children—explain very little of the faculty variation in geographic location, particularly in comparison to the enormous explanatory power of the related geographic factors. But, even with these more potent predictors in the picture, there are both gender differences in location and some gender differences in the impact of other familial factors on location. Marriage and dependent children both affect one's location in doctoral production centers and college clusters differently for men and women. These differences also persisted after we controlled for other variables that might impact career locations, such as differences in scholarly field and institution type (public/private, land grant, Carnegie classification). Although faculty in some science fields have distinctive locations, they are irrespective of gender.<sup>8</sup> We have not included any of these additional control variables in Table 3 because they do not change the pattern of significant effects shown there.

Table 4 addresses our sixth hypothesis by estimating the impact of geographic location on selected career outcomes: annual salary (9-month equivalent) and whether or not the job is tenured, nontenure-track (instructor or lecturer), less than full time, and in a field outside one's doctoral training. The equations are presented separately for men and women, once again with indications of significant interaction effects by gender and age.<sup>9</sup>

Geographic location has a different impact on career outcomes for women than for men in several ways. Women with jobs in regions of high doctoral production are less likely to have tenure and more likely to work part time, both in comparison to women living elsewhere and to men living in the same regions. For men who reside in these regions there are significant but much smaller effects in the same direction on the odds of being tenured, off the tenure-track, and working part time, as well as enhanced odds of being employed in a field outside of one's doctoral training. Further, while men and women both earn more in regions of concentrated doctoral production, the estimated annual premium for men (\$2,724) is nearly double the premium for women (\$1,420).

Academic jobs in institutions in areas with many local colleges are not generally any less desirable employment situations for women than for men. Women

**TABLE 4. Logistic and OLS Regressions of Tenure and Full-Time Status, Employment Outside Ph.D. Field, and Salary**

	(1) Logistic Regression: Tenured		(2) Logistic Regression: Not Tenure-track		(3) Logistic Regression: Not Full Time		(4) Logistic Regression: Switched Fields		(5) OLS Regression: Annual Salary(\$000)	
	Women b [odds]	Men b [odds]	Women b [odds]	Men b [odds]	Women b [odds]	Men b [odds]	Women b [odds]	Men b [odds]	Women b [std.err.]	Men b [std.err.]
High Ph.D. Production	-0.057*	0.006	0.219***	0.084**	-0.010	0.124***	1.420***	2.724***		
Region	[0.944]	[0.964]†	[1.017] <sup>a</sup>	[1.006]†	[1.245]	[1.088]†	[0.990]	[0.424]	[0.424]	[0.407]
Number of Local Colleges (log)	-0.013	-0.037***	-0.085***	0.040***	0.010	-0.081***	0.074**	-0.701*	-0.701*	-0.998***
Local Population Size (log)	[0.987] <sup>a</sup>	[1.031]	[0.918]	[1.041]†	[1.010] <sup>b</sup>	[0.922]†	[1.077]	[0.893]†	[0.312]	[0.288]
	-0.066***	-0.052***	0.125***	0.072***	0.053*	0.176***	-0.100***	1.544***	2.309***	
	[0.937]	[0.950]	[1.134] <sup>a</sup>	[1.075]†	[1.055]	[1.193]†	[0.905]	[0.259]	[0.224]	
Now Married (Yes = 1 No = 0)	-0.333***	0.572***	0.323***	-0.420***	0.599***	-0.529**	0.243***	1.223*	4.280***	
	[0.717]	[1.771]†	[1.382]	[0.657]†	[1.820]	[0.589]†	[1.275]	[0.817]†	[0.731]†	
Previously Married (Yes = 1 No = 0)	-0.079	0.760***	-0.142**	-0.396***	0.078	-1.468***	0.388***	-0.353***	1.614*	3.395***
	[0.924]	[2.138]†	[0.868]	[0.673]†	[1.081]	[0.230]†	[1.473]	[0.703]†	[0.640]	[0.947]
Child Home (Yes = 1 No = 0)	0.504***	0.456***	-0.266***	-0.204***	-0.006	-1.019***	-0.007	0.146***	-1.205**	0.325
	[1.658]	[1.593]	[0.767]	[0.816]	[0.994]	[0.361]†	[0.993]	[1.158]†	[0.446]	[0.434]
Age	0.113***	0.110***	-0.036***	-0.035***	-0.038***	-0.026***	0.006***	0.013***	0.299***	0.513***
	[1.120]	[1.117]	[0.964]	[0.966]	[0.962]	[0.975]†	[1.006]	[1.013]†	[0.024]	[0.023]†
Tenured (Yes = 1 No = 0)	-4.763	-4.853	0.129	0.218	-1.126	-1.669	-1.815	-2.642	12.530	2.508
	(.522)	(.573)	(.212)	(.258)	(.265)	(.342)	(.059)	(.058)	0.282	0.282
N	5,240	7,904	5,240	7,904	5,240	7,904	5,240	7,904	5,026	7,617

<sup>a,b</sup> Positive (<sup>a</sup>) or negative (<sup>b</sup>) significant interaction effect by age; coefficients (not presented in table) for younger and older women are different.  
<sup>†</sup> Significant gender interaction effect ( $p < .05$ ); coefficients (not presented in table) for women and men are different.  
<sup>‡</sup> Gamma is on a scale similar to  $R^2$  such that a high gamma indicates a high degree of fit in the model.  
<sup>\*</sup>  $p < .05$ ; <sup>\*\*</sup>  $p < .01$ ; <sup>\*\*\*</sup>  $p < .001$ .

who hold jobs in these locales are actually less likely to be off the tenure track, but these jobs do not carry better odds of being tenured or working full time, although they are more likely to be jobs involving a switch out of one's doctoral field. Men with jobs in schools with many local competitors are less likely to be tenured and more likely to be off the tenure track, but they are also less likely to work part time or to have switched fields. Perhaps because the impact of working for institutions with many local competitors is mixed for both men and women, proximity to large numbers of academic employers appears to depress men's and women's salary to the same small degree.

Academic jobs in large cities generally have negative implications for the careers of both women and men: decreasing the odds of being tenured and increasing the chances of working off the tenure track or less than full time. The tendency for big city jobs to be off the tenure track, however, is stronger for women than men, while the opposite holds for the tendency toward less than full-time jobs. Big city jobs are also less likely to involve a change in field for women and more likely to do so for men. Jobs in big cities do have one major benefit—yielding higher wages—but here the premium is again much higher for men than for women.

There are also gender differences in the way that marriage and children impact these career outcomes. Currently married women are less likely than never-married women to be tenured and more likely to hold nontenure-track and part-time appointments and those outside their fields of training, but each of these relationships is reversed for currently married men. The relative advantages that marriage appears to bestow on men extend to previously married men: they are more likely than their female counterparts to be tenured and less likely to be off the tenure track, working part time, or in fields outside their training. As other studies have found, currently and previously married men have substantially higher salaries than ever-married women. Unlike their female counterparts, men with dependent children are less likely to be employed part time but more likely to be working outside their doctoral field. Both male and female faculty with dependent children at home are much more likely to have tenure and less likely to be in positions off the tenure track, even controlling for age. The women, however, experience a wage penalty for having responsibility for children, though their male counterparts do not.

The interaction effects between age and geographic location summarized in Table 4 suggest that the negative consequences of being geographically concentrated are most acute for older cohorts of women. Older women residing in doctoral production regions or in large cities are especially likely to be employed off the tenure track. But older women in locales with many colleges are more likely to enjoy tenure and full-time work than their younger counterparts. The careers of older male faculty in these three types of locations are not similarly affected.

## DISCUSSION

Our main hypothesis led us to expect, and results confirm, that women scientists overall have more geographically constrained careers in academia, even controlling for marital status, parental responsibilities, and age. Compared to their male counterparts, they are more likely to reside in large cities, in areas with many colleges, and in regions where doctoral production is heavily concentrated. Their geographic locations reflect a distinct rootedness in or preference for the largest metropolitan areas and regions where many of the nation's doctoral degrees are granted. Although the fact that large cities provide the greatest density of postsecondary job opportunities may be part of the attraction, women's preference for big population centers persists independently of the availability of academic jobs in areas with many colleges. In addition, there is a marked tendency for women scientists to locate in proximity to the nation's centers of doctoral production, especially in the Northeast corridor. This tendency persists independently of the density of colleges found in most regions of concentrated doctoral production and their very large populations. One feature of the Northeast corridor that may distinguish it from other centers of doctoral production on the West Coast and around the Great Lakes is the availability of relatively convenient mass transportation within and among the string of metropolitan areas in the region that may make commuter relationships, in which partners live in different cities, more feasible.

Results are less clear about the continuing reasons for this concentration. The idea that marriage constrains women's career's more than men's is not strongly supported. In bivariate results married men are indeed least likely to be concentrated in the largest metropolitan areas, the regional centers of doctoral production, or areas with many colleges. However, in these findings, the locations of married women are hardly different than those of unmarried women and unmarried men. Moreover, in tests that control for age, children, and the interrelationships among geographic factors, the impact of marriage reverses: it appears to draw both women and men not toward, but away from doctoral production centers and college clusters. Net of other factors, marriage may increase pressures for both women and men to move out of the regions where they earned their doctoral degrees, and this pressure appears to be greater for married women than married men. This may reflect, in part, married women's role as "tied migrants" who follow their husbands' careers and move away from the site of their doctoral training. It is even less clear how to explain the finding that unmarried female and male faculty are more likely than those who have married to secure jobs in locales with many colleges. Perhaps there is an attractive intellectual and social climate in these areas that married faculty are more willing to forego when job opportunities that benefit their families present themselves elsewhere.<sup>10</sup>

A finding more consistent with our second hypothesis is that women who have been married are more likely than never-married women to live in large cities, but this effect is significant only for those whose marriages have ended. It is difficult to attribute this pattern to a preference among previously married women to move to big cities for their cultural or social climate because they are more likely than never-married women to favor these locations. Perhaps they gravitated to larger cities when still married to maximize their own career options and had resisted subsequent moves that favored their husbands' careers. Although marriage, net of other factors, does not appear to constrain women geographically more than it does for men, it is important to remember that married women have jobs that are frequently less desirable in other ways: compared both to married men and to never-married women, ever-married women are more likely to be untenured and in part-time jobs off the tenure track and outside their fields of training.

Results are more in line with our third hypothesis that responsibility for children would geographically constrain women's careers more than men's. Unlike studies from two decades ago, which showed that marriage constrains women's careers in academia more than having children (Marwell et al., 1979), our data show that children are now more crucial. This is consistent with a recent study that finds that dependent children, but not marriage itself, decreases the likelihood that women scientists in general—those holding master's and doctoral degrees and those both inside and outside of academia—will make career moves (Shauman and Xie, 1996). Women with children at home are more concentrated in areas with many colleges, while men with dependent children are less likely to reside in these areas or in those with the most concentrated doctoral production. Compared both to women without responsibilities for children and to men with them, responsibility for children may decrease women's propensity to move away from the site of their doctoral training: if single, they may be reluctant to move away from sources of social support; if with a partner, they may favor family stability and the partner's local career over opportunities to move for their own career. Responsibility for children may also decrease women's propensity to leave the areas of their doctoral training by restricting their job-related social networks, a frequent consequence of women's child care duties in nonacademic jobs (Campbell, 1988; Huber and Spitze, 1983; Michelson, 1985; Vanek, 1980). Women with children who do move, especially who move to "follow" a partner's career, may find it easiest to locate a job when local colleges are more numerous.

Although they may face more constraints, in some ways women scientists with dependent children who remain in academia have better jobs overall than women without these responsibilities. Much like men with children, they are more likely to have tenured appointments and less likely to be off the tenure track. Perhaps the financial responsibilities that come with children make non-

tenure-track positions so unattractive that faculty parents turn to jobs outside academia if they cannot secure tenurable employment. This is suggested especially for academic scientists fathers, who are more likely to work full time and to have switched to jobs outside their doctoral fields. The academic scientist mothers, however, suffer a wage penalty compared to women without children at home, a penalty that the scientist fathers do not experience.

Gender effects on geographic location and the impact of these locations on career outcomes persist even after controlling for the large differences in the ages of male and female academics. For both men and women, age is unrelated to the size of one's current hometown, residence in a doctoral production region, or the number of local colleges and universities. Although these results do not support our fourth hypothesis that geographic constraints on women's careers in academia are substantially weaker for younger cohorts in general, interaction effects suggest that marriage and parental responsibilities impact older women's career locations more than for younger women. When older women are married or have children still at home they are considerably more likely than younger women with the same responsibilities to live in doctoral production regions. Older women with children at home are also more likely to live in large cities, although away from dense clusters of colleges. Interaction effects with age also suggest that careers of older women that are geographically constrained suffer more than those of younger women. Older women who reside where doctoral production is concentrated or in large cities are more likely than their younger female counterparts to have positions in academia's secondary sector of employment, off the tenure track. And older women employed in areas with many colleges suffer a significantly greater wage penalty compared to their younger counterparts.

There was mixed support for the fifth hypothesis of the study, that unmarried men are more likely than married men to reside in large cities and college clusters because of a larger pool of suitable highly educated marriage partners in these locations. Although unmarried men are more likely than married men to reside in areas of dense college clusters, they are not more likely to live in large cities. And they tend to be employed in the regional centers of doctoral production, which we did not predict. In support of the hypothesis, the contrasts with married men hold more strongly for never-married men than for widowed, divorced, and separated men. On the other hand, although large cities and college clusters might be expected to be especially attractive to younger unmarried men, age interaction effects do not generally support this interpretation. Results, then, indicate that both never-married men and women tend to live amid dense clusters of colleges and in the centers of doctoral production. Perhaps both unmarried women and unmarried men make location decisions for similar reasons, adopting the patterns of homogamy in mate selection that increasingly typify the general population, with marriage increasingly likely to occur among highly

educated people with equivalent educational backgrounds (Qian and Preston, 1993). Opportunities to find such mates may be more favorable if one remains within the social and professional orbit of one's doctoral degree program. In addition, there is the reality that a greater density of highly educated unmarried professional men and women are available in areas such as the Northeast corridor. It may be more appropriate to consider opportunities rather than constraints as the root of unmarried women's and men's concentration in these areas.

A fair assessment of gender and marital effects on faculty career locations would have to note that their impact is generally relatively modest. Far more sizable is the gender gap in how these locations affect faculty careers. In keeping with our final hypothesis, geographic constraints appear to be more disadvantageous for women, and the career advantages associated with certain locations generally seem to help women much less than men. For example, compared to men living in the same areas and women living elsewhere, women located in high doctoral production regions are less likely to have tenure and more likely to work part time. Both men and women in large cities are more likely to be employed off the tenure track, but the women occupy these jobs far more often than the men. Perhaps women are more likely to accept less attractive job opportunities because they are constrained by familial obligations to remain in these locations after graduate school. We can infer that, in a job market where mobility is crucial, the greater "rootedness" of women has an adverse effect on their likelihood of securing full-time employment and eventual tenure. It is interesting that the large cities and areas of concentrated doctoral production where women generally occupy less desirable jobs than men are also areas where men are more likely than women to switch to jobs in fields outside their doctoral training. In both these locations men and women also tend to earn higher salaries, but the wage premium is higher for men than for women. Perhaps men seek these locations in order to take up especially lucrative positions, even switching fields to do so.

A different set of implications emerges for academic jobs in settings with dense clusters of colleges and universities: here men's careers seem to suffer relatively more than do women's. In areas with many colleges, men are less likely to have tenure and more likely to work off the tenure track or part time. Compared to their counterparts living elsewhere, women are more likely to switch fields, while the men are less likely to do so. Salaries are somewhat lower in locales with numerous colleges but to a nearly equal extent for men and women. Perhaps the greater availability and variety of faculty jobs acts as a magnet that draws in academic labor while cutting the faculty's bargaining power. Women and men may both choose these locations despite the wage penalty because they increase the odds that they can secure some academic employment. Perhaps because of the greater availability of academic jobs, women are less likely to have to accept nontenure-track and part-time positions, although they may have to switch fields to secure the more desirable jobs.

The most detailed past studies of geographic constraints on women's academic careers have focused on a single discipline, psychology (e.g., Marwell et al., 1979; Rosenfeld and Jones, 1987). Our results verify that some of the same constraints impact women in other science fields as well and are not artifacts peculiar to any one discipline.<sup>11</sup> Because our data are limited to scientific and engineering disciplines, it is possible that the results do not fairly represent geographic constraints that operate differently for faculty women in the humanities and in professional schools. Another limitation is that our results address only the current locations of academic women, without directly measuring the mobility processes that led them to those locations. In the most comprehensive and recent direct examination of these dynamics, Shauman and Xie (1996) found no evidence that women scientists in two-career marriages migrated to new jobs any more or less often than men. However, that study examined scientists in and out of academia and included a large majority without doctorates. Our sample is confined to academic scientists with doctorates who may operate within a far more constricted labor market than scientists in general. Still, we can only attempt to infer the family and career dynamics that lie behind the differential geographic distributions that we find for groups distinguished by gender, age, marital, and parental status. Moreover, our data are insufficiently detailed to distinguish the situations of unmarried women with partners, and the special situations of dual academic couples who face the most complicated geographic choices. Perhaps most limiting of all, by restricting the sample to doctoral-level scientists with current faculty positions we have excluded those who may have faced the most severe geographic constraints and paid the price by being unemployed or resorting to employment outside academia.

But if our sample restrictions introduce any bias, these arguments generally suggest it would be in the direction of underestimating rather than overestimating the extent of geographic constraints and their impact on women's careers. If academics who pay the biggest price in terms of unemployment, underemployment, lower salaries, nontenure-track positions, and positions outside academia are disproportionately women, particularly those with children, it is evidence that women are still being required to choose between career and family. In decades past, academic women may have dealt with this choice often by remaining single. With recent gains in gender equality, women's options for combining meaningful work with family life may have expanded. But the family-related constraints on women's careers that emerge from this study illustrate a very slow pace of change.

For higher education policymakers and those involved at all levels in the recruitment and hiring of college faculty, the results provide some cautionary lessons. Colleges in rural settings, those far from the centers of doctoral production, and those with few academic competitors nearby may need to make special or more vigorous efforts to recruit female faculty. Although the results do not address academic partners specifically, one policy change that might make a

difference in these smaller, more isolated settings is the elimination of archaic antinepotism policies that have barred academic partners from working in the same department or institution. In addition, every effort should be made to eliminate bias through statistical discrimination when a female applicant is considered for a faculty job. Career or family issues involving a male applicant's spouse do not seem to be a common consideration for hiring committees, so the career or family issues of a female applicant's spouse should not be either. Finally, results showing that women with dependent children face the most severe geographic constraints suggests that the needs and concerns of these caregivers cannot be ignored by academic institutions that hope to recruit from the widest possible academic labor market. Still, the limited scope of our study leaves the details of many key policy questions unresolved. Further research is needed to pinpoint exactly the mix of attractions, constrained choices, perceived obstacles, and disincentives that lead men and women to different career locations.

*Acknowledgments.* This research was supported by the National Science Foundation (grant SES-8922477) and an Arizona State University Faculty Grant-in-Aid. Thanks are due to Donna Fossum, Gwen Lewis, Carolyn Shettle, and Murray Webster for their help in providing access to data from the Survey of Doctoral Recipients. We are also grateful for helpful comments from Karen Miller-Loessi and able technical assistance from Wei-jie Chen, Yinong Chong, Ione DeOllos, Heather Shaw, and Teresa Stensrud. A version of this article was presented at the August 1997 annual meeting of the American Sociological Association in Toronto.

## NOTES

1. The dual-career dilemma faced by the small number of African American academic couples may have worsened in some ways. College desegregation widened the pool of job opportunities, but because faculties of historically Black institutions were also integrated, it became more difficult for an African American academic couple to find two tenure-track jobs at these institutions (Perkins, 1997). The possibility of social and cultural isolation and tokenism when moving from a large urban graduate school environment to a small college town is another constraint on the geographic mobility of Black academic couples (Fields and Erkut, 1983).
2. Men were slightly more likely to be defined as switching fields using the narrow definitions; women switched more often using the broad definitions. Regardless of definition, however, gender differences in propensity to switch fields were less than 3 percent.
3. We examined the 10 percent of the sample who were previously but not currently married (widowed, divorced, separated) to determine whether we should present results for them separately. Because their locations were nearly identical to currently married respondents, we have combined the two groups to simplify the presentation in Table 2. In later regression results we do separate them.
4. A detailed investigation of regional variations in women's faculty representation showed that the East and West Coasts of the United States, as well as the Great Lakes region, were distinguishable from other regions of the country in recruiting women faculty. On the East Coast, institutions in the mid-Atlantic region appeared somewhat more likely to recruit women com-

pared to those farther to the north or south. This led to a finer breakdown, separating all the MSAs stretching from Boston to Washington from the rest of the East Coast. The Northeast corridor MSAs contain a large number of major graduate schools, as do the states on the West Coast and Great Lakes.

5. For faculty in the Northeast corridor, the median number of local 4-year institutions in an MSA or county is 22, compared to 8 on the West Coast, 4 in the Great Lakes states, and 3 in the rest of the United States. By definition, faculty in the Northeast corridor also tend to live in very large cities (median population size is 3,784,000), as do faculty on the West Coast (median population size of 1,973,000). Faculty in the Great Lakes and remaining regions typically occupy much smaller locales (population medians of 367,000 and 273,000, respectively).
6. The models with gender interaction effects were performed on the combined sample of men and women and included 13 predictors: the 7 original main effects plus interactions between gender and each of the remaining 6 variables. Interaction terms were computed after first centering all continuous predictors on their respective means, i.e., after subtracting the mean from each original score. The interactions represent the distinctive effect for women versus men of the last six main effects in the model; for men the value of each interaction term is zero.
7. The models with age interaction effects were estimated separately for men and women. As with the gender interaction effects each model included 13 predictors: the 7 original predictors plus interactions between age and each of the remaining 6 variables, after first centering all continuous predictors on their respective means.
8. The respondents' original set of 22 doctoral fields of training were regrouped into nine categories based both on substantive affinities and similarities in effects: (1) agriculture, (2) health, (3) engineering, (4) physical sciences (physics, astronomy, chemistry, earth sciences), (5) biological sciences, (6) math and computer science, (7) political science and economics, (8) anthropology, archaeology, psychology and sociology, and (9) various applied social science fields (e.g., area studies, communications, criminology, demography, public affairs and urban studies). When these were included in the regression equations in Table 3, with biological sciences as the reference category, results showed that both men and women in agriculture tend more often than others to be located away from doctoral production centers, college clusters, and large cities. Those in medical and engineering fields tend to be in larger cities, but not always in doctoral production centers or locales with many colleges. Those in the social sciences tend to be located amid dense clusters of colleges and universities. Except for economics and political science, social scientists also tend to be located in doctoral production centers.
9. For simplicity of presentation, we also do not present here the equations employing the whole sample of men and women together. These demonstrate that there are significant gender differences in all of the outcomes, even after controlling for all the independent variables in Table 4. Overall, women are less likely than men to hold tenured appointments, are more likely to be paid less, and to be in nontenure-track, part-time jobs, and those outside their field of graduate training.
10. It is noteworthy that although married men do tend to locate more often in small towns, this effect is nonsignificant after controlling for other geographic factors in Table 3. It may not be attraction to rural life that leads married men to smaller locales, but rather lesser attachment to doctoral production regions or places with many colleges and universities. Perhaps marriage and responsibility for children increase men's propensity to leave the areas of their doctoral training in search of better career opportunities. Marriage and children may increase the preference given men's career options over those of their partners, and these familial responsibilities may encourage married men to pursue career advancement vigorously even if it requires a move, including one over long distances, or to places with only one college.
11. Although the gender effects on career locations that we report here persist after controlling for differences among the science disciplines, careers in certain fields are still more geographically

concentrated than others. In results not presented here, we found that faculty careers in agricultural sciences tend to be pursued in rural areas away from doctoral production centers, perhaps because of the locations of land grant schools. Health sciences and engineering programs are not universal, but appear to be located in schools within large cities although not necessarily in doctoral production areas. This may reflect the tendency for most states to have such programs, usually located in their larger metropolitan areas close to major hospitals and industrial centers. There is also an interesting difference among the social sciences. Faculty men and women in political science and economics—the most male-dominated social sciences—are less likely to locate in doctoral production regions, while those in the other social sciences are more likely to do so than faculty in other science fields. This may reflect relative economic power in a marriage, with the career mobility options of men in economics and political science taking precedence over that of their spouses' employment concerns.

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Received August 22, 2000.