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# THE GENDER COMPOSITION AND SCHOLARLY PERFORMANCE OF ECONOMICS DEPARTMENTS: A TEST FOR EMPLOYMENT DISCRIMINATION

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Using data on academic economists in the years 1973, 1977, 1982, and 1987, the authors investigate gender differences in placement and their consequences for departmental productivity. The initial analysis shows that in the years studied, the departments that were highest-ranked on a measure of scholarly publications per faculty member were the least likely to hire female faculty. A second analysis shows that departments that hired fewer women in the 1970s subsequently declined in publications rank relative to other departments. Finally, in a third analysis the authors find that the research output of women in the 1970s cohort of economists was greater than that of their male counterparts at comparable institutions. These results reject productivity-based explanations for the observed differential placement, and they provide some of the first formal evidence that employment discrimination is costly to the employer.

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**D**espite increasing opportunities for women in recent decades, many professions remain predominantly male. One setting that may be useful for studying women's entry into male-dominated occupations is the academic labor market. Unlike most labor markets, academia has a well-defined hierarchy of large employers, ranked by external evaluators on the basis of quantifiable measures. As such, it permits an examination of how the positions obtained by women compare to those obtained by men and, if there are systematic

differences between the two, the extent to which those differences reflect gender discrimination.

The labor market for academic economists provides a particularly rich background for an analysis of female employment. The profession has always been predominantly male, but the Committee on the Status of Women in the Economics Profession (CSWEP) reported the proportion of female assistant and associate professors nearly tripled between 1974 and

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A data appendix with additional results, and copies of the computer programs used to generate the results presented in the paper, are available from Larry D. Singell, Jr., at the Department of Economics, University of Oregon, Eugene, OR 97403-1285.

1989 (Gordon 1991). Although this trend suggests improving opportunities for women in economics, CSWEP also reported that during the 1970s and 1980s female economists tended to place in "less scholarly" departments than male economists, were less likely to be promoted, and comprised a relatively constant and small percentage (4%) of full professors (Sawhill 1986; Gordon 1989). Because it is likely that the differences between male and female academics are largely determined at the time of hire (for example, see Megdal and Ransom 1985; Olson et al. 1987), in this study we focus on factors that affect a department's decisions to hire new male and female Ph.D. recipients. These decisions occur relatively frequently and are likely to reflect current faculty objectives.

The study consists of three related empirical analyses. First, we use employment data over several years for economics departments that grant advanced degrees to examine whether, all else equal, the "better" economics departments, as measured by rates of publication of scholarly articles, were less likely to hire women than were other departments. Such a pattern, if found, would be consistent with but not sufficient to prove the existence of employment discrimination. The second analysis investigates whether there is an association between the publication performance of departments and the prior hiring of female faculty by those departments. If women were underplaced, departments that hired female professors, all else equal, should have subsequently enjoyed an increase in publishing productivity relative to departments that did not hire female professors. If, on the contrary, gender-based differences in productivity explain differential hiring of male and female faculty, we should find no pattern of relative gains for departments hiring women. Finally, the third analysis, which uses individual data on personal attributes and research output of American Economic Association members, compares the publication output of male and female faculty at comparable institutions. Jointly, the findings from these analyses provide some of the first formal evi-

dence on the question of whether, and to what extent, employment discrimination is costly to an employer.

### **Departmental Rank and the Probability of a Female Hire**

Our first analysis examines whether departments' hiring of female academic economists is correlated with the degree to which the departments are research-oriented. The gender composition of economics departments is examined using a probit model that estimates the probability of observing a female assistant professor in a department. This analysis provides a point of departure for the subsequent analysis of possible consequences of differential placement.

### **Data**

For the majority of departments that grant advanced degrees in economics, we obtained employment and institutional characteristics from four editions of the *Guide to Graduate Study in Economics*. The data include 528 observations from 181 different departments for 1973, 1977, 1982, and 1987. Departments are observed an average of three of the four periods, because employment data were not always provided or updated.<sup>1</sup> We use only four of the eight editions of the *Guide* so that, between one set of observations and the next, enough time will have elapsed for departments to make additional hires and to adjudicate possible tenure cases. Although departments that do not offer advanced degrees are not included in the *Guide*, these schools can reasonably be excluded from the analysis because they place less emphasis on publishing research than do advanced degree-granting institutions,

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<sup>1</sup>Departments that only offer degrees in fields related to economics (for example, agricultural economics and finance) are excluded because they differ from pure economics departments both in the markets in which they operate and in the quality measures applicable to them.

and thus have relatively small reputation costs of discrimination.<sup>2</sup>

We obtained employment data from a list of department faculty. The numbers of senior and assistant female professors were determined using faculty members' first names cross-referenced with 1981, 1985, and 1989 American Economic Association (AEA) directories on magnetic tape that, unlike the printed volumes, identify gender. The approximately 5% of faculty whose gender could not be determined (that is, faculty with non-gender-specific or foreign names who are not members of the AEA) are assumed to be men. The number of misclassified economists is likely to be small, however, because nearly 80% of current economists and over 90% of foreign-born economists are men.<sup>3</sup>

The dependent variable in the probit analysis is defined to equal one when the number of female assistants is greater than zero. The probability of hiring a woman is expected to be positively related to two employment measures: the number of assistant professors, because female economists are likely to be considered during a job search, and the number of female senior professors, because academics tend to co-author with others of the same gender (see, for example, Ferber and Teinman 1980) and because female job candidates may prefer departments that have hired and promoted female faculty in the past.

In addition to employment data, the *Guide* also includes other departmental characteristics that may affect employment. A binary variable is included for three types of institutions: public universities, because of a potentially greater influence of affir-

mative action on government institutions than on private institutions; Ph.D.-granting departments, which are likely to be better funded and to provide greater access to teaching or research assistants than departments that do not grant a Ph.D.; and "pure" economics programs, which are likely to better match new entrants' research interests (and thus to provide a pool of potential co-authors) than programs that are amalgamations of economics with other disciplines. Ph.D. programs and pure economics departments are expected to hire more female economists, because resource-rich departments can better compete for the relatively scarce top female economists. Another variable we include is the number of applicants for graduate study, which may also proxy for pecuniary and non-pecuniary attributes of a department that affect its ability to hire women. Finally, a time trend is included because descriptive evidence suggests that opportunities for female economists, while different from the opportunities of their male counterparts, are improving (for example, Gordon 1991:410).<sup>4</sup>

We supplement data from the *Guide* with the Graves et al. (1982) publication rankings, which rank departments on the basis of the number of pages published per faculty member in 24 leading journals for the period between 1974 and 1978. This publication ranking is selected over its alternatives because it ranks a greater number of departments than other rankings and because it was updated by Hirsch et al. (1984) for the period from 1978 to the spring of 1983.<sup>5</sup> The rankings order the top

<sup>2</sup>For example, 96 of the top 100 departments in the Graves et al. (1982) publication rankings had Ph.D. programs, whereas only four (all with masters programs) did not.

<sup>3</sup>Our data yield a percentage of female economists close to percentages found elsewhere (for example, Gordon 1991). There is no *a priori* reason to expect a systematic relationship between gender-evident names and departmental characteristics, in any event. Thus, the misclassification of some female economists should affect only the magnitude and not the sign of the estimates.

<sup>4</sup>A likelihood-ratio test that compares the proposed specification (which includes a time trend) to four separate probit models for each year yields a Chi-Square statistic of 19.68, which does not reject the hypothesis that the coefficients are constant over time net of the time trend.

<sup>5</sup>While citation rankings have been proposed as a superior proxy for departmental quality (for example, see Davis and Papanek 1984), such rankings have been compiled for relatively few schools and have not been updated. To test the sensitivity of the results to the ranking system, we also tried using the Hogan (1984) ranking. The results of that estimation were

Table 1. Average Attributes of Economics Departments by Publication Rank and Year.

Rank/Year	Female Assist. Profs.	Total Assist. Profs.	Prop. Female Assists.	Female Senior Profs.	Total Senior Profs.	Ph.D. Inst.	Grad Stds.	Public Univ.	Econ. Only	No. of Obs.
<i>By Rank</i>										
1-10	0.97	9.06	0.67	0.81	27.31	1.00	304.11	0.28	1.00	36
11-20	0.78	0.78	0.57	0.91	23.68	1.00	214.52	0.57	1.00	37
21-35	1.24	8.80	0.67	0.64	20.15	1.00	140.56	0.87	0.93	45
36-80	0.65	6.31	0.50	0.81	16.64	0.93	83.75	0.69	0.96	133
81-130	0.76	5.74	0.54	0.67	14.10	0.78	60.48	0.74	0.94	105
>130	0.38	3.65	0.31	0.57	9.80	0.23	27.71	0.78	0.90	170
<i>By Year</i>										
1973	0.44	5.19	0.37	0.58	14.08	0.67	81.56	0.72	0.91	147
1977	0.58	5.67	0.46	0.63	14.83	0.68	76.62	0.75	0.92	141
1982	0.71	5.89	0.49	0.71	16.03	0.68	91.84	0.71	0.95	139
1987	1.08	6.44	0.62	0.98	17.53	0.75	119.75	0.67	1.00	99

Note: Lower number rankings correspond to better publication records.

Sources: Owen and Cross (1974-89); Graves et al. (1982); Hirsch (1984); 1981, 1985, and 1989 American Economic Association directories on magnetic tape. For details, see text.

240 departments from 1 (the greatest number of journal pages) to 240 (the least number of journal pages). This publication ranking is an inverse measure of quality and thus is expected to be negatively related to the probability of hiring a female assistant.

Publication rankings are an imprecise quality measure, especially for departments with fewer publications. For example, such rankings treat the difference between the rank of 10 and 1 as identical to the difference between a rank of 110 and 101. To account for the resulting measurement error, we construct a proxy for departmental quality by classifying schools into five groups (see, for example, Kmenta 1971:316-17), with a value of 0 assigned to the top ten, 1 assigned to 11 through 20, 2 assigned to 21 through 35, 3 assigned to 36 through 80, 4 assigned to 81 through 130, and 5 assigned to those schools whose rank is greater than 130. The number of schools increases in successive categories (corresponding to incrementally higher number rank, or fewer published pages) to account for the greater imprecision of the quality measure for "less scholarly" departments. To improve the

precision of the rank measure, we use the updated "Graves" ranking by Hirsch et al. to determine the rank for the later two sample periods (1982 and 1987).

Rank is defined as a continuous variable because the number of published pages, though inexact, is a cardinal measure of quality. While the "true" cardinal ranking is unknown, we conducted sensitivity tests that used alternative groupings (for example, 1-10, 11-30, 31-60, 61-100, 101-150, >150), a fixed effect for all but one rank category, the log of the Graves et al. ranking, and the actual number of pages published by each department. These alternative methods of accounting for the non-linearity and measurement error of the rank variable yielded the same qualitative prediction as our rank measure.

Descriptive statistics for the data by rank and year are presented in Table 1. Table 1 indicates that nearly one out of every 10 assistant and 20 tenured professors were women. "Better" departments tended to have more faculty and graduate applicants and were more likely to be in private institutions that only offer economics degrees. However, there does not appear to be an obvious relationship between a department's publication ranking and the number of female assistants. While female

similar to those discussed, though with somewhat reduced statistical significance.

Table 2. Effects of Selected Variables on the Probability That Economics Departments Hired Female Assistants in 1973, 1977, 1982, and 1987: Probit Estimates. (Standard Errors in Parentheses)

<i>Independent Variable</i>	<i>Model 1</i>	<i>Marginal Probability</i>	<i>Model 2</i>	<i>Marginal Probability</i>
Constant	-5.222** (1.031)	-2.115** (0.436)	-5.651** (1.056)	-2.283** (0.451)
Assistant Profs.	0.141** (0.022)	0.057** (0.009)	0.260** (0.068)	0.104** (0.001)
Assistant Profs. Squared	—	—	0.008** (0.003)	-0.003** (0.029)
Senior Profs.	0.114* (0.078)	0.045* (0.029)	0.121** (0.073)	0.049** (0.029)
Rank of Department	0.137** (0.068)	0.055** (0.027)	0.138** (0.068)	0.055** (0.065)
Ph.D. Institution	0.446** (0.158)	0.178** (0.064)	0.392** (0.137)	0.157** (0.065)
Economics Only	0.661** (0.228)	0.264** (0.112)	0.657** (0.279)	0.262** (0.106)
Graduate Applicants	0.0018** (0.0009)	0.0006** (0.00037)	0.0017** (0.0007)	0.0007** (0.00037)
Public University	0.230** (0.137)	0.091** (0.055)	0.227** (0.136)	0.091** (0.055)
Year	0.033 (0.012)	0.013** (0.005)	0.034** (0.012)	0.014** (0.005)
Degrees of Freedom	516		515	
Log-Likelihood	-309.77		-307.28	
Predicted Depts. with no Women	<u>204</u>		<u>197</u>	
	274		274	
Predicted Depts. with Women	<u>159</u>		<u>164</u>	
	252		252	

Sources: See source note to Table 1.

\*Statistically significant at the 0.10 level; \*\*at the 0.05 level (one-tail tests where appropriate).

economists became more numerous over time at both the assistant and senior ranks, the relative number of female Ph.D.s and the average department size also generally increased for each rank over the sample period.<sup>6</sup>

<sup>6</sup>Table 1 indicates that the number of departments sampled declines over time, which reflects the fact that the faculty lists for mainly masters-granting institutions are less frequently updated in later editions of the *Guide*. A likelihood-ratio test comparing separate probit estimates for masters and Ph.D. programs with a joint specification (including a binary variable for program type) yields a statistic of 2.94, which indicates no significant differences between masters and Ph.D. programs in the probability of hiring a female assistant professor beyond that of an intercept shift.

## Results

We estimated a linear specification and a model that examines the possible nonlinear relationship between the number of assistants and the probability of hiring a woman. The probit estimates and associated marginal probabilities for the "average" department are provided in Table 2. The explanatory variables are significant at conventional levels and the model correctly predicts between 159 and 164 of the 252 observations in which a department had at

Thus, the subsequent results do not likely hinge on the decline in representation of masters programs over the sample interval.

least one female assistant professor in a particular year and between 197 and 204 of the 274 that did not. The coefficients on the explanatory variables have the expected signs and support the hypothesis that women tended to place in lower-ranked departments than men.

The coefficient on the rank variable is significantly positive at the 1% level in both models, suggesting that, all else equal, low-ranked departments (that is, those with a poor publication record and consequently a high number rank) have a higher probability of hiring a female assistant than do high-ranked departments. The marginal probability indicates that a one-category improvement in rank reduces the probability of hiring a woman by 5.5%.

Although that pattern is consistent with the existence of employment discrimination, female economists would also place in lower-ranked departments if they have lower qualifications than their male counterparts. To test this hypothesis directly requires an aggregate qualification measure for male versus female faculty that cannot be constructed for "all-male" departments. Nonetheless, the remaining two empirical analyses test these competing hypotheses either indirectly, by examining the productive consequences of gender differences in employment, or directly, by examining gender differences in the research output of this cohort of assistant professors.<sup>7</sup>

The probability that a department included a female assistant professor increased with the number of assistants in the

department. The marginal probability implies a 6–10% increase in the probability of hiring a female assistant for an additional assistant in a department; this percentage range is lower than a purely random hiring process predicts, because women comprised approximately 15% of new Ph.D.s between 1970 and 1989. The effect of the number of assistants does not appear to be linear, however, as the coefficient on its square in Model 2 is significantly negative. Model 2 predicts that the probability of observing a woman increases at a decreasing rate for departments with fewer than 16 assistant professors, which includes 99% of the sampled departments. The declining probability of a female hire could imply tokenism, but may also reflect the high value of an initial female hire due to affirmative action or the historical concentration of women in fields such as labor economics. The results also suggest that the ability or willingness of economics departments to hire women increased with the number of senior female faculty members.<sup>8</sup>

The coefficients on variables measuring other qualitative aspects of departments—the number of graduate applicants, whether the department granted Ph.D.s, and whether the department was a pure economics program—are each positive and significant. This finding suggests that, controlling for rank, "better" departments hired more women than did lesser departments, and it may indicate that either demand-side factors, such as superior resources, or supply-side factors, such as departmental

<sup>7</sup>The sensitivity of the results to an explicit consideration of the number of female assistant professors in a department is examined using several poisson models. The poisson estimates support the probit finding that women placed in significantly lower-ranked departments than men.

Singell and Stone (1993) used AEA data on economics Ph.D.'s who obtained their degrees between 1960 and 1989 to examine gender differences in academic job placement, controlling for degree quality and the choice of academic vs. nonacademic sector. They found significant underplacement of women in both current and first jobs in years through the mid-1980s.

<sup>8</sup>Lindsay and Maloney (1988) provided a theoretical basis for the expectation that women will seek out large departments to maximize their opportunity for scarce female co-authors, and McDowell and Smith (1992) found empirical support for that expectation. However, estimates from several models indicate that department size does not significantly affect the probability of a female hire when there is a control for the number of senior female faculty. Moreover, when the relative proportion of senior female faculty is included instead of the number of senior female faculty, its coefficient is insignificant. Thus, it is the number of senior female faculty, not their relative representation, that appears to be important.

amenities, improved a department's competitiveness for the scarce top female economists. The results also support descriptive evidence that women are more likely to be hired by public universities than by private universities (for example, Gordon 1991:410).

The coefficients on the time trend suggest that the probability of hiring at least one female assistant professor increased significantly over time. While this finding is consistent with the hypothesis that opportunities for women were improving, it is difficult to disentangle this hypothesis from the response of departments to the increasing number of female job candidates. A separate supply variable was included in several models (not presented), but the strong correlation between this variable and the time trend prevent the identification of statistically distinct supply and trend effects.<sup>9</sup>

### Departmental Rankings and the Gender Composition of Faculty Members

To what degree might gender discrimination explain the results of our first analysis? Empirical evidence suggests that employer discrimination is more persistent in less atomistically competitive markets (Ashenfelter and Hannan 1986; Johnson 1978). Thus, persistent discrimination and its attendant costs are particularly likely to be found in industries like academia, where firms may be insulated from the discipline of perfect competition. However, the results of our first analysis, consistent though they are with the existence of discrimination, could also be explained by other mechanisms—most notably, differences in productivity between male and female economists.

<sup>9</sup>The supply of female economists is measured using data from the *Digest of Education Statistics* on the relative number of female Ph.D.s in the five years prior to the year of the cross-section. The coefficients on the supply variable and the time trend are significant when included separately but insignificant when included jointly. We selected the time trend because of its greater explanatory power.

To test productivity-related explanations of the differential placement of men and women in economics departments, in our second analysis we examine whether the proportion of female assistant professors a department employed in 1973/74 is positively correlated with that department's publication ranking for the period between 1978 and 1983. If top departments were predisposed to hire men and left relatively talented women in the pool of job candidates, the relative output of departments that hired women should have increased. If, on the other hand, female academics placed relatively poorly because they were less qualified than men due, for example, to a self-selection of the best female economists out of academia (McMillen and Singell 1993), we should find no relative improvement in the research output of departments that hired women.

### Data

The data for the analysis are 115 observations of departments listed in the *Guide* for the 1973/74 academic year and for either 1982 or 1987. The dependent variable is the "Graves-type" publication ranking constructed by Hirsch et al. (1984) for 1978 to 1983.

While this rank measure is likely to be highly correlated with some objective measure of quality, it presents two empirical problems. First, nine non-publishing-oriented departments are included in the *Guide* but not listed in the Graves et al. or Hirsch et al. ranking. Second, a simple ranking of departments does not reflect the fact that it is much harder for "better" departments to improve in the rankings than for lower-performing departments to do so. To alleviate these problems, we assign unlisted departments the value 240 (that is, the lowest observed rank) and use the natural log of the rank to proxy for departmental quality. Thus, our rank measure implies a given difference in rank is larger the "better" the department and treats all non-research-oriented departments as essentially the same in placement. The results are not qualitatively affected by exclud-



ing unranked departments from the analysis.

To control for a department's prior performance, we use the log of the Graves et al. publication ranking for the years 1974–78. Because this rank variable is likely to be measured with error, we instrument by using its predicted value from a regression of the log rank measure on the grouped rankings used in the first analysis. Because the “quality” of a department's faculty is unlikely to change dramatically over the time interval considered, we expect a strong positive relationship between each pair of rank measures.<sup>10</sup>

If the gender differential in placement was due to discrimination, we can expect a positive correlation between departments' publication records in the 1980s and their placement of women in the 1970s. Because most hires are made at the assistant level, a department's employment policy with respect to women is likely to be reflected in the gender composition of its assistant professors. The proportion of female assistant professors in 1973/74 is thus included as an explanatory variable. We use the 1973/74 interval because House and Yeager (1978) found that the publishing productivity of faculty at “research-oriented” departments was highest in the four to five years following tenure; thus, on average, we expect that the maximum contribution of female economists who were assistant professors in 1973 occurred between 1978 and 1983.<sup>11</sup>

<sup>10</sup>The instrument controls for regression to the mean of the measurement error in rank over time; if departments with a larger rank (a poorer publication rate) are measured with greater error, as expected, the coefficient on the rank variable for 1974–78 will be biased downward. The actual coefficient estimates for the 1974–78 rank are not significantly affected by instrumenting, perhaps because the compression of the log specification adequately accounts for the potential bias.

<sup>11</sup>Several models also include the proportion of tenured female professors in 1973/74, because the “best” departments often hire at the senior level. This variable is insignificant in the subsequent analysis, however, perhaps because the rank variable controls for the contribution of tenured female faculty for 1974 through 1978.

While the number of new faculty positions varied markedly among departments, the average size of economics departments increased during the 1970s. To account for the effect of a change in department size on publishing output, we include changes in the numbers of assistant and senior professors. The inclusion of two variables in this case, one for junior faculty and one for senior faculty, helps control for life cycle differences in productivity. We use the change in the number of graduate students and the change in the undergraduate enrollment of the university to proxy for other resource changes. For 73 of the observations, the differences are calculated for the 1973–87 interval, and for the remaining 42 observations, the differences are calculated for 1973–82. A relatively long time interval is used to capture how both prior changes and the “future direction” of a department affect current performance. A shorter interval is used for schools that are observed in the 1982 *Guide* but not in the 1987 *Guide*. A dummy variable is used to control for possible differences in these schools for 1982.<sup>12</sup>

Summary statistics for departments that did and did not hire at least one female assistant professor in 1973/74 are provided in Table 3. The mean rank indicates that departments that hired a female assistant tended to have a higher rank (a better publication record), which the prior analysis suggests is because higher-ranking departments hired more faculty and not because they were more likely to hire a woman. On average, those departments that hired at least one female assistant in 1973/74 improved in rank by 1978–83, whereas the other departments declined in rank. In addition, departments that hired at least one female assistant professor experienced

<sup>12</sup>Our sample includes 40 fewer departments than the maximum of 147 (the number observed in 1973) because faculty lists of some departments are not included or updated in the *Guide*. However, because the included departments yielded nearly 90% of the publication output recorded in the Graves et al. ranking, our analysis does consider the potential effects of discrimination on the major producers.

Table 3. Average Attributes of Economics Departments.  
(Standard Errors in Parentheses)

<i>Independent Variable</i>	<i>All Departments</i>	<i>Departments That Hired Female Assistants in 1973/74</i>	<i>Departments That Did Not Hire Female Assistants in 1973/74</i>
Log of Rank 1978–83	4.045 (1.127)	3.706 (1.155)	4.262 (1.060)
Log of Rank 1974–78	4.043 (1.127)	3.722 (1.200)	4.248 (1.036)
Change in No. of Assist. Professors	0.426 (4.724)	-0.467 (4.930)	1.000 (4.530)
Change in No. of Senior Professors	2.504 (4.838)	2.867 (5.294)	2.271 (4.530)
Change in No. of Graduate Applicants	16.486 (60.184)	17.713 (55.215)	15.693 (63.532)
Change in Size of University	1620.912 (2695.817)	2006.721 (2937.601)	1372.932 (2518.971)
Proportion of Assists. Who Are Female	0.074 (0.111)	0.189 (0.099)	0.000 (0.000)
1982 Data	0.365 (0.484)	0.333 (0.477)	0.386 (0.386)
Observations	115	45	70

Sources: See source notes for Table 1.

a larger increase than other departments in the number of senior professors, the number of graduate applications, and university size; they experienced a decrease in the number of assistant professors, however, as opposed to an increase in number for those departments that did not hire a female assistant.

## Results

The estimates from a regression of the log publication ranking in 1978–83 on log publication ranking in 1974–78 and the other explanatory variables are included in Model 1 in Table 4. The model accounts for 94% of the variation in the dependent variable, and most of the coefficients have the predicted signs and are significant at conventional levels. The results suggest that rank is strongly correlated over time, indicating that a 1% improvement in rank for 1974–78 yields a 0.95% improvement in rank for 1978–83; however, the coefficient on the 1974–78 rank is significantly less than one. The results also suggest that

rankings improved both with the number of junior faculty and, even more so, with the number of senior faculty. The model provides only weak support for the hypothesis that non-faculty resources, as measured by the change in the number of graduate applications and university size, affected research output. The results also suggest that the publishing output of departments taken from the 1982 *Guide* does not differ significantly from that of departments taken from the 1987 *Guide*.

The results indicate that departments with a higher proportion of female assistants in 1973/74 improved their subsequent ranking, suggesting that this cohort of female assistant professors published more than their male counterparts employed at comparable departments. This finding supports the central prediction of the employment discrimination literature that departments are penalized for past discrimination.<sup>13</sup> The sign and significance of the

<sup>13</sup>This hypothesis is supported by sensitivity tests that include the log of the number of pages published

coefficient for the proportion of female assistants remain unchanged in several alternative specifications.<sup>14</sup>

Model 2 in Table 4 includes estimates from the specification in Model 1 excluding top-20 departments in the 1974-78 period. The absolute value of the coefficient for the proportion of female assistants is larger in Model 2 than in Model 1. Thus, consistent with the theoretical literature on discrimination (for example, Becker 1971), lower-ranked departments (those with a poorer publication record) appear to have been penalized more than top departments for past discrimination.<sup>15</sup>

### Gender Differences in Research Productivity at Comparable Institutions

The finding that departments that hired a greater proportion of female assistants in 1974 improved their subsequent publishing ranking suggests that this cohort of female economists published more than their male counterparts at comparable institutions. This implication is surprising

Table 4. Factors Associated with Publication Ranks of Economics Departments: Regression Estimates. (Standard Errors in Parentheses)

<i>Independent Variable</i>	<i>Model 1</i>	<i>Model 2</i>
Constant	0.266 (0.109)	0.581 (0.225)
Log Rank 1974-78	-0.948** (0.025)	0.882** (0.050)
Change in Number of Assistant Professors	-0.010** (0.005)	-0.009** (0.007)
Change in Number of Senior Professors	-0.019** (0.006)	-0.021* (0.063)
Change in Number of Graduate Applicants	-0.048 (0.048)	-0.025 (0.063)
Change in Size of University	-0.014 (0.010)	-0.005 (0.011)
Proportion of Assistants Who Are Female	-0.422** (0.249)	-0.477** (0.266)
1982 Data	0.044 (0.059)	0.063 (0.067)
Degrees of Freedom	107	87
R <sup>2</sup>	0.939	0.832

Sources: See source notes for Table 1.

\*Statistically significant at the 0.10 level; \*\*at the 0.05 level (one-tail tests where appropriate).

between 1974-78 and 1978-83 in the specification for Model 1 in Table 4 instead of the publication rank variables.

<sup>14</sup>The log specification is the most conservative of various alternatives estimated by Ordinary Least Squares. For example, coefficient estimates on the proportion of female assistants using the rank measures in levels or first difference form are significantly negative at the 1% level. We also estimate several ordered probit models in which departments are grouped by high, medium, and low rank. These results suggest that departmental employment policy, in general, does not move a department (up or down) from one broad rank category to another if we control for prior rank. Thus, the continuity of our rank variable appears necessary if we are to detect the marginal impact of employment decisions, including possible gender discrimination, on output.

<sup>15</sup>The bias from truncating the sample on the dependent variable is well known (for example, Cain 1976:1246-47); we select non-top-20 schools from the 1974-78 ranking that can be assumed to be exogenous to the rank in 1978-83. An interaction between the variables for proportion of female assistants and the 1974-78 publication ranking yields a finding similar to that derived from an analysis excluding the top-20 departments (though the results are not statistically significant).

because numerous studies find that women, on average, publish significantly less than men (for example, Willis and Pieper 1995; Stafford and Johnson 1974). To get direct evidence on gender differences in productivity, we use individual data on economists who obtained their Ph.D. between 1967 and 1974 (that is, the cohort of assistant professors examined in the prior analysis) to estimate a tobit model for two different measures of research output.

### Data

The data for the analysis are from roughly a 10% random sample of economists in the 1974 and 1985 American Economic Association (AEA) directory who obtained their Ph.D. between 1967 and 1974 and were employed in economics departments. These economists are likely to have been assistant professors in the 1973/74 academic

year, and thus members of the cohort examined in the above analyses. Samples drawn from both the 1974 and 1985 AEA directories document up to an 18-year career interval, permitting us to examine possible life-cycle effects. These data provide information on personal and employment characteristics (for example, gender, Ph.D. institution, and current job placement). Ph.D. institution and current job placement are identified by the Graves et al. (1982) rankings.

AEA data are supplemented with publication data from the *Index of Economic Articles*. We collected two alternative measures of research productivity for a two-year interval, the year of the sample (that is, 1974 and 1985) and the subsequent year (that is, 1975 and 1986). The first measure accounts for qualitative differences in publications by assigning each article an "impact factor" from the 1986 *Citation Reports*, which is the number of citations the journal receives divided by the number of articles published in the journal times 1000.<sup>16</sup> The volume of output is incorporated by summing these impact factors over all publications in the two-year interval. Because this measure may overstate output that is produced jointly with co-authors, we obtained an additional measure by dividing the impact factor by the number of co-authors and then summing this value over all articles. Each research measure is a proxy for research productivity at a point in the economist's career.

The production of research is hypothesized to depend on the number of years of post-graduate-school experience and its square; gender; national origin; age at Ph.D.; whether the Ph.D. was received prior to 1970; the quality of the Ph.D. institution; and the quality of the current job placement. Personal experience and its square are included because publishing productivity is likely to have a concave life-cycle

profile due to the initial acquisition and subsequent depreciation of human capital over a career. The prior analyses suggest that the coefficient on the binary variable for female economist should be positive, reflecting the greater productivity of women relative to men at comparable institutions. The coefficient on the binary variable for foreign-born economists is also expected to be positive because, controlling for job placement (for which foreign-born economists may suffer a disadvantage), a number of studies suggest foreign-born academics dedicate more effort to research than do native-born academics (for example, Singell et al. 1996). Two other expectations are that the coefficient for age at Ph.D. and pre-1970 Ph.D. will be negative: persons who obtain their Ph.D. at a younger age are hypothesized to have a greater professional focus than those who are older, and Ph.D. recipients who have an earlier vintage (and thus are likely to be older than others in the sample) are postulated to have a lower research commitment.<sup>17</sup>

We constructed variables for Ph.D. quality and current job quality using the Graves et al. publication ranking. A dummy variable for Ph.D. quality, based on whether or not the individual received a Ph.D. from a top-35 institution, provides a proxy for whether the individual attended a research-oriented institution, and a piece-wise continuous variable, rank if from a top-35 institution, measures differences in research ability for those whose degree was conferred by a research-oriented institution. Similarly, a dummy variable for job quality, top-50 current job placement or not, provides a proxy for whether the individual is employed at a research-oriented institu-

<sup>16</sup>We choose an impact factor from the end of the interval studied because it includes all journals born between 1974 and 1986 and maximizes the number of journals that have impact factors.

<sup>17</sup>Levin and Stephan (1991) observed both life cycle and vintage effects in publishing productivity among scientists. Vintage effects may occur because of a major change in the discipline or because of changes in the economic opportunities of new Ph.D. recipients. Brook and Marshall (1974) observed that the academic market softened considerably in the early 1970s, which may have increased the incentive of new faculty to publish in order to be hired or promoted.

tion, and a piece-wise continuous variable, rank if placed in the top 50, captures differences in research ability of economists placed at research-oriented departments. The mixture of discrete and continuous variables helps account for both the inherent nonlinearity of the rank measures and the possibility that prestige and networks that arise from an affiliation with a research-oriented institution may facilitate the production of research independent of the quality of the department. The research orientation classification is narrower for Ph.D. institutions than for current job placement because fewer departments have the resources to produce both high-quality graduate students and high-quality research. The research orientation classifications are admittedly arbitrary, but we find that reasonable alternative definitions (for example, Ph.D. top-10 or not, current job placement top-35 or not) yield the same qualitative conclusions.<sup>18</sup>

Descriptive statistics are provided in Table 5. Consistent with the first two analyses, the means of the publications measures suggest that the 1967-74 cohort of female economists published more than their male counterparts despite, on average, having fewer years of experience and placing in lower-ranked institutions. There are fewer observations in 1985 than in 1974. This difference is attributable partly to the fact that the 1967-74 cohort constituted a smaller share of AEA members in 1985 than in 1974 (the AEA membership in 1985 included Ph.D.s subsequent to 1974). However, it may also partly reflect attrition from the AEA, and the descriptive statistics would then suggest that female economists are

Table 5. Descriptive Statistics of Data on Publications of Members of the American Economic Association Who Obtained Their Ph.D. Between 1967 and 1974. (Standard Errors in Parentheses)

<i>Independent Variable</i>	<i>All Data</i>	<i>Men</i>	<i>Women</i>
Articles Weighted by Quality Index	335.2 (1047.8)	334.0 (1042.4)	352.9 (1068.8)
Articles Weighted by Co-Authors and Quality Index	237.0 (729.2)	235.2 (734.5)	264.4 (572.6)
Experience	7.563 (5.83)	7.760 (5.58)	4.684 (5.18)
Age at Ph.D.	31.02 (5.31)	30.94 (5.28)	32.24 (6.48)
Ph.D. at Top 35 Institution	0.678 (0.46)	0.676 (0.46)	0.702 (0.46)
Rank if Ph.D. at Top 35 Institution	8.976 (9.73)	9.009 (9.79)	8.484 (8.91)
Current Job at Top 50 Institution	0.362 (0.48)	0.363 (0.48)	0.351 (0.483)
Rank if Job at Top 50 Institution	7.348 (12.7)	7.287 (12.7)	8.270 (14.3)
Foreign	0.187 (0.39)	0.197 (0.39)	0.027 (0.16)
Female	0.062 (0.24)	0.000 (0.00)	1.000 (0.00)
Pre-1970 Ph.D.	0.317 (0.47)	0.325 (0.47)	0.189 (0.45)
Observations	594	557	37

Sources: 1974 AEA directory; 1985 AEA directory on magnetic tape; *Index of Economic Articles*, 1986 Citations Reports; Graves et al. (1982).

more likely than men to be absent from the AEA in 1985. Such a gender difference could bias the results if, for example, economists who are AEA members tend to be more productive than economists who are not. However, several specifications (not presented) include a dummy variable set equal to one for the 1985 sample observations, and an interaction between this variable and the binary variable for female; these specifications indicate no significant differences in output between the economists sampled from the 1967-74 cohort in the two periods. Moreover, these variables do not change the qualitative results or the level of significance of the other explanatory variables.

<sup>18</sup>Current job placement is treated as a predetermined variable that reflects both observed attributes and past productivity, both of which also determine current productivity. As a sensitivity test, the placement and publishing equations are estimated simultaneously using log of current job placement. Explanatory variables in the placement equation are those used in Singell and Stone (1993), who also modeled current job placement and used AEA data. The qualitative findings from the publication equation are unaffected by using the log of current job placement and instrumenting.

Table 6. The Qualitative Research Output of Economists: Tobit Analysis.  
(Standard Errors in Parentheses)

<i>Independent Variables</i>	<i>Dependent Variable: Articles Weighted by Quality Index</i>	<i>Dependent Variable: Articles Weighted by Co-Authors and Quality Index</i>
Constant	4102.5** (2456.1)	-2862.3** (1025.0)
Experience	538.73** (143.21)	388.05** (101.1)
Experience Squared	-17.81** (7.54)	-13.51** (5.33)
Age at Ph.D.	-59.96* (39.45)	-41.97* (27.77)
Ph.D. at Top-35 Institution	389.31 (565.3)	232.23 (399.5)
Rank if Ph.D. at Top-35 Ph.D. Institution	1.351 (25.24)	0.710 (17.86)
Current Job at Top-50 Institution	1442.38** (603.3)	1037.3** (427.2)
Rank if Job at Top-50 Institution	-47.19** (22.69)	-35.461** (16.12)
Foreign	1333.39** (426.1)	965.56** (515.4)
Female	1429.8** (729.5)	1013.4** (515.4)
Pre-1970 Ph.D.	-670.07* (0.20)	-477.23* (278.7)
Degrees of Freedom	582	582
Log-Likelihood	-1229.8	-1191.0

Sources: See source notes for Table 5.

\*Statistically significant at the 0.10 level; \*\*at the 0.05 level (one-tail tests where appropriate).

## Results

Approximately 27% (159) of the 594 economists in the sample published in the given two-year interval. Thus, we use a tobit model to account for the zero values for the dependent variable. The empirical results are provided in Table 6.

The signs of the coefficients on the explanatory variables are as expected, and most are significant at conventional levels. The coefficient on female is positive and significant, indicating that the research

output of this cohort of women was greater than that of their male counterparts at comparable institutions. This result supports our prior finding that women were underplaced. It also suggests that the observed improvement of departments that hired more women in the mid-1970s is due to gender differences in output as opposed to some unobserved departmental attribute with a positive but spurious correlation between the likelihood of hiring a woman and the research output of a department.<sup>19</sup>

While these results do not support the hypothesis that gender differences in placement merely reflect gender differences in productivity, they do not necessarily confirm the presence of employment discrimination. For example, using survey data for new Ph.D. economists from 46 graduate programs in 1988, Barbezat (1992) found, after controlling for various personal attributes, that female economists were more likely than male economists to accept jobs at liberal arts versus research institutions. Thus, for example, if women are relatively risk-averse toward a negative tenure decision, they could "choose" lower-ranked departments and publish more than men at comparable institutions. Nonetheless, the employment discrimination hypothesis is certainly as compelling as any explanation for our findings.

The other explanatory variables also yield some interesting findings. The coefficients on experience and its square suggest that post-graduate-school experience had a

<sup>19</sup>Willis and Pieper (1995) used data on 314 individuals who obtained both a Ph.D. in economics from a U.S. institution between 1970 and 1980 and an assistant professor position at a graduate degree-granting institution. They found that women published fewer articles than men over the seven years after receiving their Ph.D. The raw publication counts in our data also suggest that women published fewer articles than men. However, estimates from a negative binomial count model for the number of articles using the specification in Table 6 yield a positive, although not statistically significant, coefficient on the variable for female economists after controlling for current job rank. Thus, our finding of significantly more publishing by women than by men requires the use of our qualitative publication measure.

positive but diminishing effect on productivity, with the maximum positive effect occurring at approximately 15 years. The coefficients on the three graduate school measures, age at Ph.D., top-35 Ph.D. institution, and rank if top-35, are each insignificant. However, each of the three graduate school quality measures is significant and has the expected sign in specifications that exclude measures of current job placement (not presented), suggesting that graduate school performance and current job placement are highly correlated. The coefficients on both measures of current job placement are significant. The positive coefficient on top-50 current job placement indicates that economists at "research-oriented" institutions published more than those at other institutions, and the negative coefficient on rank if in the top-50 indicates that economists at "better" research-oriented institutions published more than those at "lesser" institutions. Finally, the results also suggest that foreign-born economists and post-1970 Ph.D. recipients produced more research than, respectively, native-born economists and those who received their Ph.D.'s prior to 1970.

### Conclusion

Understanding market processes that affect women's entry into and progress in traditionally male occupations is increasingly important for the transition to an integrated labor market. In this paper, using data for 1973, 1977, 1982, and 1987, we have examined whether women were underplaced in economics—a profession with a relatively small but increasing proportion of women—and whether gender differences in placement in top economics departments affected departmental productivity. The first of these issues is important because it speaks to the experience of initial female entrants into male-dominated occupations, and the second is important because of its relevance to the general question of whether employers pay a price for continuing discriminatory employment practices.

We have presented three separate but related empirical analyses. The first indicates that the probability of a female hire in an economics department increased as the publication rate among faculty in that department declined (that is, women were placed in relatively unproductive departments). Given that the research productivity of a faculty member is not simply a function of individual skills but is also affected by the "quality" of colleagues, it is not surprising that some studies have found women tend to publish less than men (for example, Johnson and Stafford 1974; Over 1982). The relatively poor placement of female Ph.D.s may also have a great effect on their life-cycle earnings, because early publications matter more for salary increases than publications occurring later in a career (for example, Siow 1991).

In the second analysis, we found that the relative proportion of female assistant professors in 1973/74 was a significant predictor of a department's 1978–83 publication ranking, net of its 1974–78 rank and other relevant factors. Because the "quality" of new assistant professors is reflected in the department's subsequent publication ranking, our findings suggest that the research output of female hires was greater than that of their male counterparts at comparable institutions. This result contradicts the hypothesis that the observed differential gender placement at top institutions simply reflects lower qualifications among female economists than among male economists, and it lends support to the employment discrimination hypothesis.

The final analysis, examining a random sample of AEA economists from the 1967–74 cohort of Ph.D. recipients (that is, assistant professors in 1973/74), yielded evidence that the research output of female economists was qualitatively greater than that of their male counterparts, controlling for life-cycle effects, the quality of the Ph.D. institution, and the quality of the current job. This result supports our prior two findings that the 1973/74 cohort of female economists are underplaced and that the departments that hired these female economists subsequently improved in the publi-

cations rankings at least in part because of their greater research output.

Although our findings are consistent with the existence of employment discrimination in research-oriented economics departments during the period we have examined, they do not eliminate all alternative explanations for women's relatively poor placement in economics in that period. For example, one alternative explanation for our findings is that female economists are more risk-averse than male economists and therefore more likely to accept positions in lower-ranked departments. Our analysis does, however, strongly reject productivity-based explanations for the gen-

der differences in placement in economics departments we have documented—an important implication, since such explanations are the most frequently proposed alternatives to employment discrimination hypotheses. Thus, recent evidence that there were no longer significant gender differences in placement in economics departments by the mid-1980s (Singell and Stone 1993) suggests either that women's preferences changed or that employment discrimination was dissipating. Our finding that employment discrimination was costly to the employers is suggestive of a mechanism compatible with the latter possibility.

#### REFERENCES

- Ashenfelter, Orley, and Timothy Hannan. 1986. "Sex Discrimination and Product Market Competition: The Case of the Banking Industry." *Quarterly Journal of Economics*, Vol. 101, No. 1 (February), pp. 149-73.
- Barbezat, Debra A. 1992. "The Market for New Ph.D. Economists." *Journal of Economic Education*, Vol. 23, No. 3 (Summer), pp. 262-76.
- Becker, Gary S. 1971. *The Economics of Discrimination*. Chicago: University of Chicago Press.
- Brook, Kathleen, and Ray J. Marshall. 1974. "The Labor Market for Economists." *American Economic Review*, Vol. 64, No. 2 (May), pp. 488-511.
- Cain, Glenn G. 1976. "The Challenge of Segmented Labor Market Theories to Orthodox Theory: A Survey." *Journal of Economic Literature*, Vol. 14, No. 4 (December), pp. 1215-57.
- Davis, Paul, and Gustav F. Papanek. 1984. "Faculty Ratings of Major Economics Departments by Citations." *American Economic Review*, Vol. 74, No. 1 (March), pp. 225-29.
- Ferber, Marianne A., and Michelle Teinman. 1980. "Are Women Economists Disadvantaged in Publishing Journal Articles?" *Eastern Economic Journal*, Vol. 7, No. 3 (August-October), pp. 189-93.
- Gordon, Nancy M. 1989. "Report of the Committee on the Status of Women in the Economics Profession." *American Economic Review*, Vol. 79, No. 2 (May), pp. 423-25.
- \_\_\_\_\_. 1991. "Report of the Committee on the Status of Women in the Economics Profession." *American Economic Review*, Vol. 81, No. 2 (May), pp. 409-12.
- Graves, Philip E., James R. Marchand, and Randall Thompson. 1982. "Economics Department Rankings: Research Incentives, Constraints, and Efficiency." *American Economic Review*, Vol. 72, No. 5 (December), pp. 1131-41.
- Hirsch, Barry T., Randall Austin, John Brooks, and J. Bradley Moore. 1984. "Economics Departmental Rankings: Comment." *American Economic Review*, Vol. 74, No. 4 (September), pp. 822-26.
- Hogan, Timothy D. 1984. "Economics Departmental Rankings: Comment." *American Economic Review*, Vol. 74, No. 4 (September), pp. 827-33.
- House, Donald R., and James H. Yeager, Jr. 1978. "The Distribution of Publication Success Within and Among Top Economics Departments: A Disaggregative View of Recent Evidence." *Economic Inquiry*, Vol. 16, No. 4 (October), pp. 593-98.
- Index of Economic Articles*. Homewood, Ill.: R.D. Irwin.
- Institute for Scientific Information. 1986. *Social Science Citation Index: Journal Citation Reports*. Philadelphia.
- Johnson, George E., and Frank P. Stafford. 1974. "Lifetime Earnings in a Professional Labor Market: Academic Economists." *Journal of Political Economy*, Vol. 82, No. 3 (May/June), pp. 549-69.
- Johnson, William. 1978. "Racial Wage Discrimination and Industrial Structure." *Bell Journal of Economics*, Vol. 9, No. 2 (Spring), pp. 70-81.
- Kmenta, Jan. 1971. *Elements of Econometrics*. New York: MacMillan.
- Levin, Sharon G., and Paula E. Stephan. 1991. "Research Productivity over the Life Cycle: Evidence for Academic Scientists." *American Economic Review*, Vol. 81, No. 1 (March), pp. 114-32.
- Lindsay, Cotton M., and Michael T. Maloney. 1988. "A Model and Some Evidence Concerning the Influence of Discrimination on Wages." *Economic Inquiry*, Vol. 26, No. 4 (October), pp. 645-60.
- McDowell, John M., and Janet Kilolm Smith. 1992. "The Effect of Gender-Sorting on Propensity to Coauthor: Implications for Academic Promotion." *Economic Inquiry*, Vol. 30, No. 1 (January), pp. 68-82.



- McMillen, Daniel P., and Larry D. Singell, Jr. 1994. "Gender Differences in First Jobs for Economists." *Southern Economic Journal*, Vol. 60, No. 3 (January), pp. 701-14.
- Megdal, Sharon Berstien, and Michael R. Ransom. 1985. "Longitudinal Changes in Salary at a Large Public University: What Response to Equal Pay Legislation?" *American Economic Review*, Vol. 75, No. 2 (May), pp. 271-74.
- Olson, Josephine E., Irene Hanson Frieze, and Debra Cain Good. 1987. "The Effects of Job Type and Industry on the Income of Male and Female MBAs." *Journal of Human Resources*, Vol. 22, No. 4 (Fall), pp. 532-41.
- Over, Raymond. 1982. "Research Productivity and Impact of Male and Female Psychologists." *American Psychologist*, Vol. 37, No. 1 (January), pp. 25-31.
- Owen, Wyn F., and Larry Cross. 1974-89. *Guide to Graduate Study in Economics and Agricultural Economics*. Boulder, Col.: Economics Institute.
- Sawhill, Isabel V. 1986. "Report of the Committee on the Status of Women in the Economics Profession." *American Economic Review*, Vol. 76, No. 2 (May), pp. 453-57.
- Singell, Larry D., Jr., Jane H. Lillydahl, and Larry D. Singell, Sr. 1996. "Will Changing Times Change the Allocation of Faculty Time?" *Journal of Human Resources*, Spring (forthcoming).
- Singell, Larry D., Jr., and Joe A. Stone. 1993. "Gender Differences in the Careers of Ph.D. Economists." *Contemporary Policy Issues*, Vol. 11, No. 4 (October), pp. 95-106.
- Siow, Aloysius. 1991. "Are First Impressions Important in Academia?" *Journal of Human Resources*, Vol. 26, No. 2 (Spring), pp. 236-55.
- Spurr, Stephen. 1990. "Sex Discrimination in the Legal Profession: A Study of Promotion." *Industrial and Labor Relations Review*, Vol. 43, No. 4 (April), pp. 406-17.
- U.S. Department of Education. 1980-90. *Digest of Education Statistics*. Washington, D.C.
- Willis, Rachel A., and Paul J. Pieper. 1995. "Gender Differences in Promotion for Academic Economists." Unpublished paper, University of North Carolina.