SALARIES OF RECENT MALE AND FEMALE COLLEGE GRADUATES: EDUCATIONAL AND LABOR MARKET EFFECTS

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Why do recent male college graduates earn more than their female counterparts? The author explores this question by estimating several salary regressions using data from the 1993–94 NCES Baccalaureate and Beyond Longitudinal Study. The results suggest that labor market variables outweighed academic variables in their contribution to the gender salary gap. Of the academic variables, gender differences in total credits accounted for more of the salary gap than did gender differences in majors, grades, or institution attended. Of the labor market variables, gender differences in job sector, industry, and hours worked had the largest effect on gender differences in salaries. Differences in how men and women searched for and selected first jobs appear to have had little impact on gender differences in salary. Most important, as much as 75% of the wage gap remains unexplained by both the academic and labor market variables.

Why do recent male college graduates earn more than their female counterparts? Prior research on students who graduated in the 1970s and 1980s found that a substantial portion of the salary gap was accounted for by gender differences in majors. Daymont and Andrisani (1984), Weinberger (1997), and Gerhart (1990), for example, found that gender differences in major could account for 40–50% of the wage gap between recent male and female college graduates (see also Brown and Corcoran 1997; Paglin and Ruolfo 1990; Loury 1997; and Grogger and Eide 1995).

Recent changes in the gender distribution of majors and occupations, however, warrant a reexamination of this hypothesis.

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Baccalaureate and Beyond Longitudinal Study 1993/94 restricted use data are available by contract from the National Center for Education Statistics. A data appendix with additional results, and copies of the computer programs used to generate the results presented in the paper, are available from Lois Joy at Smith College, Jahnige Center, Wright Hall, Smith College, Northampton, MA 01061.

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Women today, for example, are much more likely than 20 years ago to major in business, the sciences, mathematics, and engineering (National Center for Education Statistics 1996; Jacobs 1996; Jacobs 1995; Wilson and Boldizar 1990; Turner and Brown 1999). Further, with more current and expansive data on the labor market experiences of recent college graduates, we can compare the effects of education versus the labor market on the gender salary gap.

In this paper, I use data from the U.S. National Center for Education and Statistics Baccalaureate and Beyond Longitudinal Study 1993/94 (B&B) to update and extend prior research on the salaries of recent college graduates. Specifically, I explore the effects on the male-female salary gap of three categories of influence: gender differences in majors and other educational factors; gender differences in occupation, industry, and hours worked; and gender differences in job qualities, job search strategies, and job match.

Model

To examine gender differences in salaries, I estimate several salary equations. The dependent variable is the natural log of full-time salary. Independent variables include dummy variables for male, black, Hispanic, and Asian (Rumberger and Thomas 1993), as well as age, marital status, and number of children (Blau, Ferber, and Winkler 2001). Dummy variables for student socio-economic background include whether or not the student's mother or father has a Bachelor's degree and the parent's income as a percentage of the poverty level. Additional controls for type of college attended, yearly average tuition, and whether or not the student received a grant or a federal loan are also included (Joy 2001; Monks 2000). Finally, extensive academic controls, including student cumulative grade-point-average, major,[1] and credits by subject for all courses taken are also included (Bae et al. 2000).

On the labor market side, controls for occupation, industry, and sector are included in the regression. As noted by Hecker (1996), we might expect major and occupation each to have a separate effect on salaries.[2] In addition, a dummy variable for whether the job requires a college degree, a dummy variable for the respondent's estimate of the job's career potential, and dummy variables for job benefits are included to capture aspects of job quality, aside from occupation, that may influence salaries. Any gender differences in job quality may reflect gender differences in preferences, opportunities, or both. As noted by Rumberger and Thomas (1993), all else equal, a job that requires a degree would be expected to pay more than other jobs. The effect of career potential on salary is more ambiguous. It may be that students accept a lower starting salary in exchange for higher job potential (Borjas 1999). Alternatively, low job potential may reflect a job requiring lower skills and thus paying less (Bergman 1986).

Variables for job search are included to see if gender differences in how jobs are found contribute to the male-female wage gap (Holzer 1998; Mortensen 1986; King 1993). They include 14 dummy variables that signal which job search strategies graduates employed. It may be, for example, that reliance on want ads is a less effective way to land a high-wage job than are certain other strategies, like networking or learning from

[1]For convenience, I collapse the total 113 majors given in the B&B data into 26 (in addition to "no major") for use in the regressions: agriculture, ethnic studies, communication, computer science, engineering, languages, health (includes nursing, dentistry, mental health, audiology, veterinary medicine, clinical health, public health, science, hospital administration), law, English, biology, math, religion, physical science, psychology, protective services, social work, public administration, anthropology, economics, geography, history, sociology, political science, industrial arts, art, business/law, and no major. The missing category is education.

[2]Among recent college graduates and controlling for major and grades, Weinberger (2000), however, found no separate effect of occupation on the gender gap in wages.

mentors. Men and women may have different access to job search strategies. Even if men and women use the same strategies, if family, friends, or professors give women and men different career advice, salaries may differ.

Also included among job search variables is a dummy variable for whether the student received other similar job offers. Receipt of other similar job offers may strengthen a candidate's bargaining position for negotiating a starting salary. If a graduate receives other high-quality job offers, this may signal to other employers that he or she is particularly well qualified and worth paying more for. But even if the other job offers are not for high-quality jobs, a graduate who receives other similar offers is still in a stronger position than others to ask for a higher salary. By including this variable in the regression, we can test whether such competing job offers are an important source of the gender difference in wages.

Job choice variables include 12 dummy variables indicating why the students chose their jobs. We can use this variable to investigate whether women are more likely than men to forgo higher wages in exchange for desirable non-pecuniary job features.

The final variables are for job match. They include a dummy variable for whether the student wants the same job in two years and several dummy variables accounting for whether the student is satisfied with various aspects of the job, including benefits, challenge, working conditions, promotions, security, the supervisor, co-workers, and education (McLaughlin 1991).[3] We might reasonably posit a better job match among graduates who like their jobs than among those who do not. If a good job match increases productivity, then those graduates with better job matches may also be in a better position to bargain for and earn higher starting salaries. Any gender differences in salaries attributable to job match will be captured by this information.

Since part-time work may or may not be voluntary, I restrict the sample to graduates who are employed full-time in their primary job. To capture those graduates who are most likely to be starting their careers with their first jobs, I also restrict the sample to those graduates who are not currently in school and did not work in the same job while earning an undergraduate degree. I also restrict the sample to those graduates who have yearly salaries between $1,000 and $100,000.[4] Observations with missing values are deleted from the regressions. To account for oversampling of some occupations and to extend the analysis to the population, I weight regressions by the NCES sample weight. Like most researchers, I run the salary models both pooled and separately by sex in order both to estimate a controlled male-female wage gap and to decompose the male-female wage gap into its explained and unexplained portions (Oaxaca 1973).

Descriptive Statistics

In the B&B data, the degree of gender integration varies greatly by major.[5] For example, while women make up 75% or more of the psychology, health, and education majors, they comprise 39–60% of economics, computer science, and math majors. We do not find male dominance in the sciences or math, or female dominance in the humanities or most social science majors. As shown in the B&B, English, communication, biology, history, math, and computer science have between 40% and 65% women, which is considered gender-neutral in studies of occupational segregation (Anker 1998). Education and health,

[3]Note that job satisfaction is only slightly endogenous to salary. It would take a $25,000 increase in salary to increase total job satisfaction by 1 out of a total of 8 points, or by 12%.

[4]99.8% of the female sample and 99.7% of the male sample have yearly salaries under $100,000. While few in number, higher earners can potentially skew results. I exclude them from the analysis.

[5]The table is available from the author on request.

in which women predominate, and engineering, in which men predominate, account for most of the gender segmentation in majors.

Table 1 shows selected mean values of the dependent and independent variables used in the regressions.[6] The raw full-time salary difference between men and women is a yearly $3,405.[7] There are only a few small differences between male and female graduates in demographic and parental characteristics. On average, 5% of the male sample and 3% of the female sample is Asian, and slightly fewer women than men—2%—have a father with a Bachelor's degree. On average, women have .40 children while the men have .31, and men are 3% less likely than women to be married.

Greater gender differences in student characteristics emerge for the academic variables. Women earn higher cumulative grade point averages than men—3.21 versus 3.08. As noted above, women are much more likely than men to major in education and health, while men are more likely than women to major in business and engineering. Gender differences in all other fields are much smaller, with less than a 3 percentage point gender difference in the social sciences and psychology.

Regardless of major, men tend to have more credits than women do in the sciences and engineering, business, computer science, and (by a small margin) mathematics, while women have more credits than men do in the humanities, education, and (by a small margin) languages. Institutional differences between men and women are small, with women slightly more likely than men to have attended a public or private four-year college and slightly less likely than men to have received a grant or to have borrowed to finance their educations.

Occupational differences between male and female graduates are striking, with women much more likely than men to enter clerical, health, and teaching positions. Men outpace women in farming, labor, management, military, engineering, protective services, sales, and computer science occupations. Men are much more likely than women to work in the profit sector and the construction, durable goods, and business services industries. Women outpace men by 26 percentage points in the professional services industry.

In terms of job qualities, men are slightly more likely than women to be in a job with career potential, while women outpace men in job benefits and are more likely to have jobs requiring a degree. This may reflect the high share of women in education and health occupations that require college degrees and have good benefits but, for many, lack career potential. Gender differences in job search strategies exist but are slight, the largest being a slightly (2-percentage-point) higher use of the college placement office and headhunters by men than by women. There are some gender differences in the considerations guiding job choice. Men are more likely than women to have selected jobs with a good potential income and job security. Women are 8 percentage points more likely than men to have selected jobs in order to work with people. Men are slightly more likely than women to express interest in finding a job with high prestige and status and in having freedom at work and being able to travel. Two percent more women than men say they desire interesting work, and 1% more say they prefer having time for other activities and becoming established in their field. Women are 2 percentage points more likely than men to have received other similar job offers.

In measures of job satisfaction, including satisfaction with benefits, working conditions, promotional opportunities, supervisors, and co-workers, men tend to outscore women, though only slightly. Women, nevertheless, are more likely than men to desire the same job in two years. Among the speculative explanations for this seemingly

[6]Table 1 has been condensed to conserve space. The full table is available from the author.

[7]Most of these differences—even those as small as .02—are statistically significant at the 95% level, due to the large number of observations.

Table 1. Means of Characteristics of Full-Time Employed Recent College Graduates: 1994, Weighted.[a]

	(1)		(2)		(3)
Variable	*Male Average*	*S.D.*	*Female Average*	*S.D.*	*Difference, (1) – (2)*
Full-Time Yearly Salary	$24,154	$12,300	$20,749	$9,736	$3,405
Demographic Variables					
Black (1 = yes)	0.04	0.20	0.07	0.26	–0.03
Asian (1 = yes)	0.05	0.22	0.03	0.19	0.02
Hispanic (1 = yes)	0.04	0.21	0.05	0.22	–0.01
Age in 1992	25	6	25	7	0
Married (1 = yes)	0.31	0.85	0.34	1.06	–0.03
Number of Children	0.31	0.76	0.40	1.04	–0.09
Parents					
Father Has a BA (1 = yes)	0.22	0.41	0.20	0.40	0.02
Mother Has a BA (1 = yes)	0.21	0.41	0.21	0.40	0.00
Parents' Income as % of Poverty Level	362	240	383	261	–21
Academic					
Cumulative College Grade Point Average	3.08	0.45	3.21	0.46	–0.13
Total Credits					
Humanities	15.00	12.44	17.00	15.79	–2.00
Science/Engineering	18.00	25.16	10.00	14.63	8.00
Business	16.00	20.04	12.00	18.45	4.00
Personal Development	2.00	2.98	2.00	2.90	0.00
Remedial English	0.25	1.13	0.37	1.38	–0.12
Education	2.00	8.29	8.00	16.85	–6.00
Pre-Collegiate Math	0.43	1.45	0.51	1.48	–0.08
College Math	2.00	3.36	2.00	2.87	0.00
Transferred Credits	3.00	5.48	1.00	4.19	2.00
All Math	6.00	6.66	4.00	5.69	2.00
Computer Science	5.00	8.84	3.00	6.05	2.00
Statistics	2.00	2.99	2.00	2.38	0.00
Intro Foreign Language	2.40	4.48	3.00	4.89	–0.60
Advanced Foreign Language	0.42	2.69	0.83	3.68	–0.41
All Foreign Language	3.00	6.01	4.00	7.11	–1.00
Institution (1 = yes)					
Public, 4-year	0.21	0.41	0.24	0.43	–0.03
Public, Doctoral	0.44	0.50	0.40	0.49	0.04
Private, 4-year	0.16	0.36	0.19	0.40	–0.03
Private, Doctoral	0.14	0.35	0.12	0.32	0.02
Borrowed for Education (1 = yes)	0.40	0.50	0.41	0.50	–0.01
Received a Grant	0.37	0.48	0.39	0.49	–0.02
FT Tuition and Fees per Year	5880	4747	5718	4807	162
Occupation (1 = yes)					
Clerical	0.11	0.32	0.19	0.40	–0.08
Farmer	0.02	0.15	0.00	0.06	0.02
Laborer	0.02	0.15	0.00	0.06	0.02
Manager	0.20	0.40	0.17	0.38	0.03
Military	0.01	0.12	0.00	0.05	0.01
Skilled Operative	0.01	0.12	0.01	0.08	0.00
Art	0.04	0.20	0.04	0.20	0.00

Continued

Table 1. Continued

Variable	*(1)* *Male Average*	*S.D.*	*(2)* *Female Average*	*S.D.*	*(3)* *Difference, (1) – (2)*
Health	0.03	0.17	0.11	0.31	–0.08
Engineering	0.10	0.30	0.01	0.12	0.09
Physician	0.001	0.03	0.001	0.02	0.00
Legal	0.003	0.04	0.003	0.04	0.00
Prof. Other	0.09	0.29	0.10	0.30	–0.01
Owner	0.01	0.09	0.00	0.04	0.01
Protective Services	0.03	0.16	0.01	0.07	0.02
Sales	0.08	0.28	0.05	0.22	0.03
Teaching	0.06	0.25	0.18	0.38	–0.12
Service	0.04	0.19	0.06	0.23	–0.02
Computer	0.06	0.25	0.02	0.15	0.04
Technical	0.03	0.18	0.03	0.17	0.00
Sector (1 = yes)					
Profit	0.71	0.45	0.56	0.5	0.15
Not-for-Profit	0.10	0.30	0.21	0.40	–0.11
Government	0.16	0.40	0.22	0.42	–0.06
Self	0.009	0.01	0.003	0.05	0.01
Industry (1 = yes)					
Farming	0.02	0.14	0.007	0.08	0.01
Mining	0.001	0.52	0.001	0.04	0.00
Construction	0.05	0.18	0.005	0.09	0.05
Durable	0.10	0.23	0.04	0.18	0.06
Non–Durable	0.05	0.20	0.03	0.13	0.02
Transportation	0.07	0.23	0.05	0.20	0.02
Wholesale Trade	0.02	0.14	0.01	0.11	0.01
Retail	0.14	0.34	0.12	0.35	0.02
Financial	0.10	0.26	0.11	0.27	–0.01
Business Service	0.11	0.40	0.08	0.30	0.03
Personal Service	0.01	0.09	0.02	0.20	–0.01
Recreation	0.03	0.15	0.02	0.18	0.01
Professional Service	0.25	0.43	0.51	0.50	–0.26
Public Administration	0.06	0.31	0.05	0.15	0.01
Military	0.02	0.08	0.01	0.05	0.01
Career Potential at Job (1 = yes)	0.69	0.45	0.68	0.46	0.01
Job Requires a Degree (1 = yes)	0.53	0.50	0.56	0.50	–0.03
Job Benefits (1 = yes)					
Health	0.76	0.49	0.79	0.47	–0.03
Retirement	0.64	0.50	0.68	0.50	–0.04
Vacation	0.78	0.50	0.82	0.46	–0.04
Sick Leave	0.71	0.50	0.77	0.48	–0.06
Tuition Reimbursement	0.46	0.47	0.46	0.48	0.00
Other Family-Related	0.55	0.50	0.62	0.50	–0.07
Average Hours per Week	46	11	43	9	3
N	2,753		3,339		

[a]Table is reduced to conserve space. The full table is available from the author on request.

Source: National Center for Education Statistics, Baccalaureate and Beyond First Longitudinal Follow-Up, 1993/94.

contradictory pattern might be lower job expectations among women than among men, or fewer alternative superior job opportunities. Overall, men work 3 hours more per week than women.

Regression Results

Table 2 shows the pooled regression results. The regressions are organized to show the effects of various categories of variables on the estimated male coefficient. Model 1 includes all demographic and parental variables. Model 2 adds the academic variables, and Model 3 adds the institutional variables. In Models 4–9, I separately add variables for occupation (including occupation, industry, and sector), job quality (including job potential, whether the job requires a degree, and job benefits), job search, job choice, job match (including job satisfaction and wanting the job in two years), and then hours per week to Model 3 to see whether these labor market variables further reduce the estimated male coefficient.[8] I am particularly interested in knowing whether, controlling for demographic, educational, and socio-economic factors, the labor market variables have an additional independent effect on the male-female wage gap. Do occupational qualities or job search strategies, separate from occupation and major, have an effect on the wage gap? A reduction of the male coefficient indicates that they explain a portion of the wage gap. In Model 10, I add only the labor market variables to Model 1 in order to compare the overall effect of the labor market versus the education variables on the male coefficient.[9] Model 11 is the full-regression estimation.

Model 2 shows that the academic variables reduce the male coefficient by about 27%, from 15% to 11% (see Table 2). This means that gender differences in majors and credits account for about 27% of the male-female wage gap.[10] This effect is slightly below that estimated by Weinberger, whose regressions most closely resemble this model. Previous studies have estimated that majors reduce the wage gap by 30–40%, depending on the data and the model estimated.[11] The introduction of the institutional variables—Model 3—has no additional effect on the male-female wage gap, but the occupation variables—Model 4—reduce the male coefficient from 11% to 9%, or by another 18%. Model 5 shows that the job quality variables cause an increase in the wage gap from 11% to 12%.

Model 6, Model 7, and Model 8 show that accounting for gender differences in job search techniques, receipt of other similar job offers, considerations guiding job choice, and job match quality does not lower the male-female wage gap found in Model 3. In Model 9, when average work hours are added to the regression, the male coefficient falls the most—by 27%, from 11% to 8%. In Model 10, with only the labor market variables, the male coefficient falls from .15 to .07, a reduction of 53%. In the final model, the coefficient on the male variable is estimated to be only 6%, but still statistically significant. In terms of the average male income, this represents $1,449 in average salary per year.

Table 3 presents a Oaxaca-type decomposition of the estimated salary gap and shows the portion of the gap explained by gender differences in the independent variables as weighted by both male and

[8]Model 3 most closely resembles Weinberger's (1998) and Gerhart's (1990) regressions, Model 7 most closely resembles Daymont and Andrisani's (1984) wage regression, and Model 10, the full version, most closely resembles the models of Brown and Corcoran (1997) and Rumberger and Thomas (1993).

[9]Since the order in which variables are added to the regression will change their effect on the male coefficient, I cannot compare the overall effects of the education variables with the labor market variables from the previous regressions.

[10]To calculate the percentage, I divide the difference between the male coefficient in Model 2 and that in Model 3 (4%) by the male coefficient from Model 1 (15%).

[11]I also ran this regression including interaction variables between male and major. No statistically significant differences in the male coefficient were found, and the results are not reported.

female coefficients. Weighted by the male coefficients, the decomposition can be written as

$$(1) \qquad (\mathrm{Ln}S_m - \mathrm{Ln}S_f) = \Sigma(\bar{X}_m - \bar{X}_f)\beta_m + (\beta_m - \beta_f)\bar{X}_f,$$

where S is estimated yearly full-time salary, X are independent variables, β are the estimated coefficients, and m, f represent male and female, respectively. Weighted by the female coefficients, the decomposition becomes

$$(2) \qquad (\mathrm{Ln}S_m - \mathrm{Ln}S_f) = \Sigma(\bar{X}_m - \bar{X}_f)\beta_f + (\beta_m - \beta_f)\bar{X}_m.$$

All the unpooled regression coefficients are given in the appendix.

When weighted by the male or female coefficients, only 25% of the estimated gender differences in wages can be accounted for by gender differences in the independent variables. Focusing on the decomposition weighted by the male coefficients, the largest part of the explained portion of the salary gap—9% of the total gap—is accounted for by gender differences in industry and hours worked per week. Gender differences in job sector account for another 6% of the salary gap.[12] Majors account for 1% of the gap, while gender differences in total credits account for 6% of the gap. Two previous studies found much larger effects of college major than I do, despite using similar decomposition procedures from a model that, like mine, also included labor market variables, including occupation (Daymont and Andrisani 1984; Brown and Corcoran 1997). The contrast between the findings of these studies and the present study suggests that the relative effect of college major has declined over time as majors have integrated.[13] The effects of job quality, search, occupational choice, and job satisfaction are negligible.

When the decomposition is weighted by the female coefficients there are some different results. For example, major account for a larger 7% of the gap, while gender differences in industry explain none of the gap. Differences in hours worked per week account for 6% of the salary gap.

While the pooled regression shows that the estimated salary gap between men and women is smaller than the actual salary gap—6% (Table 2, Model 11) versus 15% (Table 2, Model 1), respectively—the unpooled regression shows the opposite—the estimated salary gap rises to 29% ($\Sigma\bar{X}_m\beta_m - \Sigma\bar{X}_f\beta_f$). This difference between the pooled and unpooled regressions reflects the large difference between the male and female returns to the independent variables. If women had the same values of the independent variables as the men but still had the female returns to those variables, the salary gap would fall 25%—$(\Sigma\bar{X}_m\beta_f - \Sigma\bar{X}_f\beta_f)/(\Sigma\bar{X}_m\beta_m - \Sigma\bar{X}_f\beta_f)$. If, however, women retained the same values of their independent variables but received the male returns to the variables in the labor market, the salary gap would fall 72%—$(\Sigma\bar{X}_f\beta_m - \Sigma\bar{X}_f\beta_f)/(\Sigma\bar{X}_m\beta_m - \Sigma\bar{X}_f\beta_f)$. Given their characteristics, we would have expected women to be earning more than they currently do. Overall, if the labor market treated women like men—that is, if women had the same estimated coefficients as men—women's wages would rise by 25%, $(\bar{X}_f\beta_m - \bar{X}_f\beta_f)/\bar{X}_f\beta_f$.

[12] I also ran the pooled regression separately by sector and found that men still earned more than women. In the full regression model, men earned 5% more than women in the profit sector, 6% more than women in the not-for-profit sector, and 10% more than women in the government sector (results not shown).

[13] Gerhart (1990) estimated male and female wage regressions with only education variables. As noted above, in this decomposition, Gerhart found that college major accounted for 43% of the gender gap in starting salaries. Using the B&B data, a similar education-only decomposition shows that college major alone accounts for 24% of the salary gap. By decomposing from a model that excludes labor market variables, I allow any indirect effects of college major on earnings—arising from which jobs particular majors help graduates get—to be counted as part of the effect of the education variables.

Table 2. Starting Salaries of Recent College Graduates: Weighted OLS Regression.

Variable[a]	*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*
Demographic						
Male	0.15 (.011)**	.11 (.011)**	.11 (.011)**	.09 (.011)**	.12 (.01)**	.11 (.011)**
Black	.006 (.023)	.04 (.023)	.05 (.023)**	.05 (.022)**	.04 (.023)	.05 (.023)**
Hispanic	.02 (.025)	.05 (.025)**	.05 (.025)**	.04 (.024)	.04 (.025)	.04 (.025)
Asian	.08 (.026)**	.03 (.026)	.03 (.026)	.02 (.024)	.009 (.025)	.03 (.025)
Age	.02 (.001)**	.02 (.001)**	.02 (.001)**	.02 (.001)**	.02 (.001)**	.02 (.001)**
Married	.08 (.013)**	.05 (.012)**	.05 (.012)**	.04 (.012)**	.05 (.012)**	.05 (.012)**
Number of Children	–.01 (.008)	–.01 (.008)	–.009 (.008)	–.009 (.008)	–.01 (.008)	–.01 (.008)
Parents						
Father BA, Mother BA	Yes	Yes	Yes	Yes	Yes	Yes
Parents' Income as % of Poverty Level	Yes	Yes	Yes	Yes	Yes	Yes
Academic						
College Cumulative GPA	No	Yes	Yes	Yes	Yes	Yes
Major	No	Yes	Yes	Yes	Yes	Yes
Course Credits	No	Yes	Yes	Yes	Yes	Yes
Institution						
School Type	No	No	Yes	Yes	Yes	Yes
Tuition	No	No	Yes	Yes	Yes	Yes
Received Grant	No	No	Yes	Yes	Yes	Yes
Received Federal Loan	No	No	Yes	Yes	Yes	Yes
Occupation/Industry/Sector						
Occupation	No	No	No	Yes	No	No
Industry	No	No	No	Yes	No	No
Sector	No	No	No	Yes	No	No
Job Qualities						
Job Potential	No	No	No	No	Yes	No
Job Requires Degree	No	No	No	No	Yes	No
Job Benefits	No	No	No	No	Yes	No
Job Search						
Search Methods Used	No	No	No	No	No	Yes
Received Other Offers	No	No	No	No	No	Yes
Job Choice						
Reason Chose Job	No	No	No	No	No	No
Job Match						
Want Same Job in 2 Years?	No	No	No	No	No	No
Satisfied with Various Job Factors	No	No	No	No	No	No
Hours per Week	No	No	No	No	No	No
N	6,404	6,064	6,064	5,967	5,294	6,058
Adjusted R–Square	0.13	0.25	0.25	0.33	0.38	0.26

Continued

Table 2. Continued

Variable[a]	*Model 7*	*Model 8*	*Model 9*	*Model 10*	*Model 11*
Demographic					
Male	.11 (.011)**	.11 (.011)**	.08 (.011)**	.07 (.01)**	.06 (.011)**
Black	.04 (.023)	.07 (.022)**	.06 (.023)**	.02 (.02)	.07 (.021)**
Hispanic	.05 (.025)**	.03 (.024)	.07 (.024)**	.003 (.023)	.04 (.023)**
Asian	.03 (.026)	.07 (.025)**	.05 (.025)**	.03 (.024)**	.02 (.025)
Age	.02 (.002)**	.02 (.001)**	.02 (.001)**	.02 (.001)**	.02 (.001)**
Married	.05 (.012)**	.04 (.012)**	.05 (.012)**	.05 (.01)**	.05 (.01)**
Number of Children	–.007 (.008)	–.01 (.008)	–.01 (.008)	–.009 (.007)	–.01 (.007)
Parents					
Father BA, Mother BA	Yes	Yes	Yes	Yes	Yes
Parents' Income as % of Poverty Level	Yes	Yes	Yes	Yes	Yes
Academic					
College Cumulative GPA	Yes	Yes	Yes	No	Yes
Major	Yes	Yes	Yes	No	Yes
Course Credits	Yes	Yes	Yes	No	Yes
Institution					
School Type	Yes	Yes	Yes	No	Yes
Tuition	Yes	Yes	Yes	No	Yes
Received Grant	Yes	Yes	Yes	No	Yes
Received Federal Loan	Yes	Yes	Yes	No	Yes
Occupation/Industry/Sector					
Occupation	No	No	No	Yes	Yes
Industry	No	No	No	Yes	Yes
Sector	No	No	No	Yes	Yes
Job Qualities					
Job Potential	No	No	No	Yes	Yes
Job Requires Degree	No	No	No	Yes	Yes
Job Benefits	No	No	No	Yes	Yes
Job Search					
Search Methods Used	No	No	No	Yes	Yes
Received Other Offers	No	No	No	Yes	Yes
Job Choice					
Reason Chose Job	Yes	No	No	Yes	Yes
Job Match					
Want Same Job in 2 Years?	No	Yes	No	Yes	Yes
Satisfied with Various Job Factors	No	Yes	No	Yes	Yes
Hours per Week	No	No	Yes	Yes	Yes
N	6,024	5,825	6,064	5,273	4,869
Adjusted R-Square	0.25	0.33	0.28	0.43	0.45

[a]Full list of variables given in Appendix A.
**Statistically significant at the .05 level.
Source: National Center for Education Statistics, Baccalaureate and Beyond First Longitudinal Follow-Up, 1993/94.

Discussion of Results

The regression results in this study show the labor market variables accounting for a larger share of the male-female wage gap than the education variables do, whereas studies using older data have shown the opposite. In the full-pooled regression,

Table 3. Decomposition of Unpooled Weighted OLS Salary Regression.

Variable[a]	*Male Coefficients* $(\bar{X}_m - \bar{X}_f)B_m$	% [b]	*Female Coefficients* $(\bar{X}_m - \bar{X}_f)B_f$	%
Demographic Variables	–0.002	–0.006	–0.001	–0.003
Parents	–0.002	–0.006	–0.001	–0.002
Cumulative College Grade Point Average	–0.009	–0.028	–0.010	–0.033
Major (1 = yes)	0.004	0.013	0.030	0.094
Total Credits	0.020	0.063	0.022	0.067
Institution (1 = yes)	0.002	0.006	0.003	0.008
Occupation (1 = yes)	–0.003	–0.009	0.005	0.016
Sector (1 = yes)	0.020	0.063	0.003	0.009
Industry (1 = yes)	0.030	0.094	0.026	0.082
Career Potential at Job (1 = yes)	0.001	0.002	0.000	0.000
Job Requires a Degree (1 = yes)	–0.002	–0.008	–0.003	–0.009
Job Benefits (1 = yes)	–0.009	–0.028	–0.010	–0.030
Job Search (1 = yes)	–0.001	–0.003	0.000	0.002
Occupational Choice (1 = yes)	0.006	0.019	0.004	0.011
Received Other Similar Offers (1 = yes)	–0.001	–0.003	–0.001	–0.003
Job Satisfaction (1 = yes)	0.000	0.001	–0.003	–0.010
Want the Same Job in 2 Years? (1 = yes)	–0.002	–0.006	–0.003	–0.009
Average Hours per Week	0.030	0.094	0.018	0.056
Total	0.082	0.255	0.079	0.247

[a]Full-regression results in Appendix A.

[b]$\% = [(\bar{X}_m - \bar{X}_f)B_m]/(\mathrm{Ln}S_m - \mathrm{Ln}S_f)$,where S is estimated yearly full-time salary, $\bar{X}$ are independent variables, B are the estimated coefficients, and m, f indicate male and female, respectively.

Source: Baccalaureate and Beyond Longitudinal Study and First Follow-Up, 1993/94.

men received a 6% wage premium, much less than the raw 15% salary gap. While controlling for the academic variables reduces the salary gap by 27%, controlling for the labor market variables, most notably hours worked per week, reduces the wage gap by a total of 53%.

Much less of the salary gap is explained by the unpooled regression due to gender differences in the returns to the independent variables. According to the decomposition weighted by the male coefficients, the academic variables and labor market variables explain, respectively, about 5% and 22% of the salary gap; weighted by the female coefficients, they account for about 14% and 12% of the gap, respectively. The difference in results between the male and female weighted decompositions again reflects gender differences in the returns to the education and academic variables. Differences between men in returns to the education variables are much smaller than differences between women. In contrast, there is much more variability in the male returns to labor market variables than in the female returns to these variables.

Returning to the three questions first asked, we find that gender differences in college major no longer account for much of the salary difference between recent male and female college graduates. Whereas previous studies estimated that gender differences in college major could account for 40–50% of the early gender gap in salaries, this study finds an explanatory power for that variable of less than 10%. The magnitude of the differences between the research presented here and older studies may be explained by the tremendous decline in gender segregation of majors that has occurred during the past 20 years. For example, while 3.2% of all engineering majors were women in 1975, this figure had risen to 13.1% in 1984 and to almost 17% in 1996. For the business major, women's share was almost 20% in 1975, almost 46% in 1984, and almost 54% in 1996. In the

physical sciences, women's share rose from 19.2% in 1975, to 27.4% in 1984, to 37.4% in 1996 (National Center for Education Statistics 1996). By majoring in historically male-dominated majors, women may have increase their access to higher-paying jobs.

Still, gender differences in total credits appear to account for a small but significant portion of the salary gap. Even though college majors are more integrated than formerly, regardless of major, women and men take different courses. According to the B&B data, for example, women in all majors are more likely than men to take education, humanities, and language courses, while men are more likely to take math and science courses. At the margin, the courses taken by men have a higher labor market payoff than those taken by women. If the extra math and science courses that men take make them more productive, then the salary gap due to differences in credits can be considered nondiscriminatory. If, however, the female science majors who take extra English courses are as qualified and productive as the male science majors who take extra science courses, then this portion of the salary gap may be considered an artifact of discrimination.

Turning to the second question, while occupational segregation accounts for little of the salary gap, segregation by industry and sector plays a fairly substantial role. Similar to the research of Blau (1977), this research finds that even when men and women work in the same occupation, they may be segregated by industry and sector. The male industries and sectors pay more than the female ones. In addition, within an occupational category, women may be resegregated into the lower-paying positions.

Why might this be the case? On the supply side, women may prefer lower-paying jobs, industries, or sectors for reasons like job location that are not accounted for in the data. Kodrzycki (2001), for example, found that female college graduates were less likely than their male counterparts to move more than 125 miles away from the state where they attended college. Some researchers have argued that young women may limit their job searches in order to stay close to (or care for) older family members or boyfriends (Holland and Eisenart 1990). Also, men may be less likely than women to relocate for their partners' jobs.

Finally, women may have lower salary expectations than men, or may be less informed than men about where to find high-paying jobs (Stone and McKee 2000). This problem will be exacerbated if friends, family, professors, and job counselors also anticipate lower salaries for women and are less energetic in helping women find high-paying jobs than in helping men.

On the demand side, employers may restrict women's access to higher-paying jobs, industries, or sectors (Roos and Reskin 1990). Due to convention or preferences, employers may start men at higher rungs of the pay scale than equally qualified women. They may also select men over equally qualified women for positions in higher-paying jobs, industries, and sectors. In terms of salary negotiations, employers may expect women to settle for lower starting salaries than men (King 1993; Solnick 2001). To the extent that these demand-side differences in positions and salaries are not related to gender differences in preferences or qualifications, they can be considered discriminatory. If discriminatory practices are not prohibitively costly to employers, they can persist even in the long run (Joy 2000).

With regard to the third question, I find that gender differences in job quality, match, search, and choice contribute little to the salary gap. Evidently, gender differences in these attributes and the returns to them are not large enough to influence the salary gap significantly. It does not appear to be the case, for example, that women are in jobs with more benefits but lower salaries than men. Nor do we find that women forgo higher salaries in exchange for other non-pecuniary aspects of jobs.

To a striking extent, the regressions show that even if women came to the labor market with the same educational credentials and labor market preferences as men, the labor market would still value them less. In

particular, if women received the same returns to their qualifications as men, their salaries would be 25% higher than they now are. Much more of the gender gap in salaries can be attributed to gender differences in the returns to qualifications than to gender differences in the independent variables.

Conclusion

This research suggests that for recent college graduates, gender differences in salaries tend to arise mainly from labor market differences between men and women rather than from academic differences. This pattern, which reverses the relative weight found by previous studies for those two sets of influences, undoubtedly reflects women's dramatic inroads in higher education in recent decades—not only the increase in their overall participation in college, but also the marked increase in the female:male ratio in some traditionally male-dominated college majors. As gender differences in educational profiles have declined, it is not surprising that gender differences of other kinds have moved into the foreground as potential explanations for salary differences between men and women.

Whether these findings point to discrimination depends on whether the women in the study sample freely chose their jobs and hours or, instead, were limited in those choices by employers. With regard to job choice, if women's access to occupations, job sectors, and industries is impeded by labor market discrimination—a phenomenon that is well documented in the literature—any reduction in their wage rewards assignable to that entry barrier can also be considered a product of discrimination. With regard to hours, weekly hours worked may also be influenced by discrimination. Among hourly paid employees, women may have less access than men to overtime hours. Among salaried employees, men may have greater access to supervisory positions not accounted for in the data that are correlated with both higher salaries and more work hours. Men may also be more likely than women to be in within-occupation jobs that offer bonuses or commissions, which would also raise hours worked and salaries. To the extent that gender differences in work hours stem from discrimination versus choice, the salary differences associated with gender differences in work hours can also be considered discriminatory.

The exploration of such questions is beyond the scope of this study. Future research will have to examine by what channels similarly trained men and women end up in such disparate labor market positions. For now, this research suggests that new strategies to ensure both equity and efficiency in the labor market may be required. Encouraging women to complete college and major in traditionally male-dominated fields has, in the past, contributed to the closing of the wage gap, but the evidence found in this study suggests that educational parity alone does not ensure labor market parity.

Appendix
Gender Differences in Coefficients: Weighted OLS Regression

	Coefficients				*Coefficients*		
Variable	*Male*	*Female*	*Difference*	*Variable*	*Male*	*Female*	*Difference*
Constant	8.31**	8.76**	–0.45				
Demographic Variables				All Math	–0.002	0.003	–0.005
Black	0.01	0.09**	–0.08	Computer Science	0.0003	–0.0008	0.0011
Asian	–0.0009	0.04	–0.0409	Statistics	0.002	–0.002	0.004
Hispanic	0.04	0.02	0.02	Intro Foreign Language	–0.002	0.002	–0.004
Age in 1992	0.02**	0.01**	0.01	Advanced Foreign Language	–0.01**	0.004	–0.014
Married	0.05**	0.02	0.03	All Foreign Language	0.003	–0.005	0.008
Number of Children	–0.0006	–0.02	0.0194	**Institution (1 = yes)**			
Parents				Public, 4-Year	–0.02	–0.06**	0.04
Father Has a BA (1 = yes)	0.01	–0.008	0.018	Public, Doctoral	–0.03	–0.05**	0.02
Mother Has a BA (1 = yes)	–0.007	–0.002	–0.005	Private, 4-Year	–0.03	–0.04**	0.01
Parents' Income as Percent of Poverty Level	0.00009**	0.00003	0.00006	Borrowed for Education (1 = yes)	–0.01	–0.04**	0.03
Academic				Received a Grant	–0.008	–0.05**	0.042
Cumulative College Grade Point Average	0.0007**	0.0008**	–0.0001	FT Tuition and Fees per Year	0.000006**	0.000001	0.000005
Major (1 = yes)				**Occupation (1 = yes)**			
Agriculture	–0.03	0.12	–0.15	Farmer	0.02	–0.17	0.19
Ethnic Studies	0.12	–0.1	0.22	Laborer	–0.11**	0.08	–0.19
Communication	–0.06	–0.07**	0.01	Manager	0.02	0.13**	–0.11
Computer	0.05	0.03	0.02	Military	0.01	–0.15	0.16
Engineering	0.15**	0.28**	–0.13	Skilled Operative	–0.05	–0.15	0.1
Languages	0.29**	–0.01	0.3	Art	0.1**	–0.02	0.12
Health	0.19**	0.21**	–0.02	Medicine	0.26**	0.27**	–0.01
English	0.04	0.006	0.034	Engineering	0.17**	0.2**	–0.03
Biology	0.001	–0.03	0.031	Physician	–0.04	0.06	–0.1
Math	0.03	0.1	–0.07	Legal	–0.006	0.27	–0.276
Religion	0.08	–0.08	0.16	Prof. Other	0.07**	0.14**	–0.07
Physical Science	0.03	0.07	–0.04	Owner	–0.09	0.42**	–0.51
Psychology	0.06	–0.09**	0.15	Protective Services	0.007	0.07	–0.063
Protective Services	0.08	0.07	0.01	Sales	0.1**	0.06	0.04
Social Work	–0.16	–0.03	–0.13	Teach	0.001	–0.02	0.021
Public Administration	0.22	–0.18	0.4	Service	0.09	0.03	0.06
Anthropology	0.15	–0.18**	0.33	Computer	0.17**	0.23**	–0.06
Economics	0.02	0.09	–0.07	Technical	0.04	0.04	0
Geology	0.01	–0.15	0.16	**Sector (1 = yes)**			
History	–0.12**	–0.005	–0.115	Nonprofessional	–0.12**	–0.05**	–0.07
Sociology	0.23**	–0.02	0.25	Government	–0.07**	–0.01	–0.06
Political Science	0.04	0.07**	–0.03	Self	–0.003	–0.12	0.117
Industrial Arts	0.07	0.07	0	**Industry (1 = yes)**			
Art	–0.11**	–0.02	–0.09	Mining	0.13	0.18	–0.05
No Major	–0.07	0.23	–0.3	Construction	0.19**	0.3**	–0.11
Business/Law	0.03	0.06**	–0.03	Durable	0.14**	0.08**	0.06
Total Credits				Non-Durable	0.19**	0.16**	0.03
Humanities	–0.002**	0.0005	–0.0025	Transportation	0.09**	0.12**	–0.03
Science/ Engineering	–0.0001	0.0005	–0.0006	Wholesale Trade	0.16**	0.12**	0.04
Business	0.002**	0.0003	0.0017	Retail	0.003	0.02	–0.017
Personal Development	–0.004	–0.007**	0.003	Financial	0.09**	0.08**	0.01
Remedial English	–0.003	–0.02**	0.017	Business Service	0.07**	0.08**	–0.01
Education	–0.0009	–0.002**	0.0011	Personal Service	–0.16**	0.07	–0.23
Pre-Collegiate Math	0.008	–0.005	0.013	Recreation	–0.01	0.08	–0.09
College Math	–0.002	0.0005	–0.0025	Public Administration	0.15**	0.05	0.1
Transferred Credits	0.001	–0.002	0.003	Military	0.06	–0.14	0.2
				Career Potential at Job (1 = yes)	0.08**	0.008	0.072
				Job Requires a Degree (1 = yes)	0.08**	0.1**	–0.02

Continued

Appendix (cont'd)

	Coefficients				*Coefficients*		
Variable	*Male*	*Female*	*Difference*	*Variable*	*Male*	*Female*	*Difference*
Job Benefits (1 = yes)				Job Security	–0.01	0.01	–0.02
Health	0.11**	0.1**	0.01	Interesting Work	0.01	0.006	0.004
Retirement	0.07**	0.06**	0.01	Intellectually Stimulating	0.01	–0.008	0.018
Vacation	0.03	–0.01	0.04	Freedom at Work	0.06**	0.03	0.03
Sick Leave	0.02	0.04	–0.02	Interaction with People	–0.02	–0.02	0
Tuition Reimbursement	0.01	0.05**	–0.04	Work Independently	0.01	0.01	0
Other Family-Related	0.01	0.03	–0.02	Travel	0.003	–0.01	0.013
Job Search (1 = yes)				Ability to Be Established	–0.04	0.03	–0.07
Sent out Resumes	–0.04**	–0.03**	–0.01	Time for Other Activities	–0.02	0.006	–0.026
Used Placement Office	–0.04**	0.03	–0.07	Received Other Similar Offers (1 = yes)	0.05**	0.05**	0
Searched Want Ads	–0.04**	–0.03	–0.01	**Job Satisfaction (1 = satisfied)**			
Asked Friends	–0.02	0.06**	–0.08	Benefits	0.008	–0.02	0.028
Asked Family	0.03	–0.07**	0.1	Challenge	0.006	0.02	–0.014
Asked Professors	–0.02	–0.06	0.04	Working Conditions	0.0007	–0.004	0.0047
Attended Recruiting Fairs	0.004	0.01	–0.006	Promotional Opportunities	0.008	0.03	–0.022
Did Volunteer Work	0.003	0.05	–0.047	Job Security	0.02	–0.02	0.04
Looked at Job Board	0.05	–0.01	0.06	Supervisor	0.005	–0.1	0.105
Headhunters	–0.04	–0.001	–0.039	Co-Workers	0.0001	–0.06	0.0601
Placed Want Ad	0.03	0.09	–0.06	Educational Benefits	0.02	–0.0004	0.0204
Subscribed to Trade Journal	–0.05	–0.1	0.05	**Want the Same Job in 2 years? (1 = yes)**	0.05**	0.07**	–0.02
Did Nothing	–0.02	–0.006	–0.014	**Average Hours per Week**	0.01**	0.006**	0.004
Occupational Choice (1 = yes)				N	2,231	2,271	
Previous Work Experience	–0.04	–0.03	–0.01	Adjusted R-Square	0.47	0.46	
Good Potential Income	0.02	0.02	0				

**Statistically significant at the .05 level.

Source: National Center for Education Statistics, Baccalaureate and Beyond; First Longitudinal Follow-Up, 1993/94.

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