Research in Higher Education, Vol. 46, No. 8, December 2005 (© 2005)
DOI: 10.1007/s11162-005-6932-8

THE INFLUENCE OF AGE AT DEGREE COMPLETION ON COLLEGE WAGE PREMIUMS

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Although studies have shown a significant wage gain associated with the possession of a college degree, few have considered at what age the degree was received to estimate this college wage premium. Given the recent increase in the enrollment of older students, this study examines how the size of the premium is affected by college timing while focusing on a possible gender difference. Results from fixed-effects models show that those who complete their degree at 25 or older receive a significantly lower premium than those who graduate at a younger age, while the penalty for late graduation is much smaller for women than men. A further analysis suggests that the late college penalty is partly due to the delayed onset of the cumulative benefits higher education provides, and that women are penalized less for late degree completion because they gain less from college education over the course of time to begin with.

KEY WORDS: college wage premium; college timing; cumulative advantage of higher education.

There has been a significant increase in the number and proportion of older college students in the last few decades. Between 1970 and 2000, the period in which fall enrollment rose by about 6.7 million, the representation of undergraduates aged 25 and older jumped from 28% to 39% (National Center for Education Statistics, NCES, 2002a). The driving force behind this growth of so-called nontraditional enrollment is likely to be not only the shift in the age structure of the country's population (e.g., the aging of baby boomers into their middle ages), but also the changes in our economic and social life (Jacobs and Stoner-Eby, 1998). At a time of corporate downsizing and restructuring, semi- and un-skilled workers, typically with limited education, are

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0361-0365/05/1200-0861/0 © 2005 Springer Science+Business Media, Inc.

particularly vulnerable to the prospects of imminent joblessness and overall economic insecurity, which may in turn raise their motivation for upgrading their educational credentials (Settersten and Lovegreen, 1998). To the extent to which family circumstances such as loss of a spouse necessitate individuals, especially women, to find a way to be financially self-sufficient, the upward trend in divorce may also explain the rising nontraditional enrollment in recent periods (Elman and O'Rand, 2002; Teachman and Polonko, 1988).

While actually pursuing a degree after years out of school can be daunting, the strong presence of postsecondary institutions with open admission policies in the US appears to greatly facilitate the enrollment of older adults seeking to improve their career prospects (Levin and Levin, 1991; Settersten and Lovegreen, 1998). Indeed, these institutions typically organize their recruitment efforts (e.g., advertising) around the notion of a bachelor's degree as the basic necessity to compete in today's job market.

But exactly how much of an economic payoff is there to obtaining a college education at a later age? Although the detrimental effect of late degree completion on college wage premiums has received little attention, and thus supportive evidence is scarce, a study conducted by James Monks (1997) shows that late college timing exerts a significant negative influence on the size of the premiums. Using a national sample, he finds that, net of work experience, job tenure, hours of employment, etc., the premium is reduced by about 4% for each additional year of age at degree completion. The present study builds on this research, but also considers whether there is a gender difference in the effect of late degree completion on college wage premiums, and if there is, why.

COLLEGE TIMING AND THE SIZE OF COLLEGE WAGE PREMIUMS

While nontraditional college enrollment is far from a new phenomenon on the US higher education scene, postsecondary institutions, four-year institutions in particular, have largely been slow to provide curricula and support services that are specifically tailored to the needs of older students, most of whom have major responsibilities to support their families, financially or otherwise (Fairchild, 2003). Nontraditional students often reveal that they feel left out of class discussion and activities because their rich, real-life experiences are not valued in the educational programs (Merriam and Caffarella, 1991).

One indicator suggesting the compromised quality of the educational experience these older students receive is their lower college completion rates compared with those of traditional college-aged students. For instance, among those who entered college in 1989–1990 with the intention of obtaining a bachelor's degree, only 31% of nontraditional students earned one by 1994, compared with 54% of traditional students (NCES, 2002b, p. 34). Since nontraditional enrollees are also much more likely to leave college without a degree, the difference in graduation rates between nontraditional and traditional students does not seem to be fully explained by the overrepresentation of older students in part-time enrollment (NCES, 2002b). Even when nontraditional students manage to complete their degree, it is likely to have taken them longer to graduate (once again because they are more likely to have been enrolled part time) (Jacobs and King, 2002). Prolonged enrollment can interfere with the continuity of students' learning, and this can result in lower grades and less positive evaluations by instructors. These educational outcomes may, in turn, create significant obstacles in graduates' efforts to obtain good jobs and advance in their careers.

The career prospects of nontraditional college graduates could also be adversely affected by employers' perceptions of them (Monks, 1997). To decide whom to hire or promote, employers often use an academic credential as a proxy for the ability to learn new skills on the job. In doing this, they may approximate the value of a college degree partly by considering the ''timeliness'' of college completion, and view nontraditional graduates with more caution and scrutiny. Also more generally, employers may be rather reluctant to hire older workers for career-track jobs because they are perceived to be more costly (e.g., incurring higher health insurance costs to the employers), or harder to be retained. In any case, if employers consciously discriminate against nontraditional graduates, their access to high paying jobs can become systematically more restricted.

One related but separate factor (not addressed in Monks (1997)) that likely differentiates traditional and nontraditional graduates' college premiums is the so-called cumulative advantage of having a bachelor's degree. Generally speaking, college graduates are likely to benefit from their educational credential not only at the time of their labor market entry, but also over the course of their career (Grogger and Eide, 1995; Pascarella and Terenzini, 1991), while this pattern is shown to apply more to men than women (Grogger and Eide, 1995). Each career step taken by the graduate sets a higher baseline for future advancement, thus creating a steeper career profile than would be expected for the worker without a degree. What this means for wage attainment is not

only that college degree holders enjoy increasingly higher earnings than non-degree holders over time, but also that those who graduate at a younger age receive a higher college wage premium than late finishers. That is to say, the sooner the "career clock" for degree holders starts ticking, the more there is to be gained from their college education. Apparently for nontraditional graduates, the clock is set at a later time, and as a result, the economic benefit of postsecondary education may not be as great as it is for traditional graduates.

The rationale behind the differential effects of college education is derived from one of the key principles of life course theory that the developmental impact of a life transition or event is significantly influenced by when it occurs in an individual's life (Elder, 1998). This life course principle is often used to illustrate how life events such as transition to parenthood, when they are experienced "off time," i.e., prematurely or too late, could adversely affect individuals' socioeconomic and psychological well-being over the long run. The same principle serves as an overarching framework for this study.

UNOBSERVED HETEROGENEITY BETWEEN NONTRADITIONAL AND TRADITIONAL GRADUATES

Meanwhile, in order to fully discern the effect of age at degree completion on college wage premiums, the issue of unobserved heterogeneity must be addressed. That is, otherwise, the estimated effect of late degree completion could simply reflect some unobserved characteristics that simultaneously affect the timing of college completion and the level of wages. At any age, the decision about whether or not to attend college is likely tied to expected payoffs such as job security, financial reward, and social acceptance, net of anticipated expenses and other sacrifices. What might set nontraditional college enrollment decision apart from its traditional counterpart is that older adults are likely to have clearer expectations for their college experience. The large majority of nontraditional students would have presumably experienced at least some of the key life events – entering the workforce, getting married, and having children – and thus, they may be more driven to gain new knowledge and skills for better life chances (Eppler and Harju, 1997). These student characteristics are likely to be carried on after graduation and boost earning power. Disregarding this type of heterogeneity in the wage estimation can mask the adverse effect of late degree completion. As discussed shortly, a fixed-effects model allows us to consider a possible heterogeneity between nontraditional and traditional graduates.

In this study, it is hypothesized that those who complete their degree at a later age will receive a lower return on their college education (Hypothesis 1). This pattern should become especially clear when unobserved heterogeneity is taken into account (Hypothesis 2). Meanwhile, given the already mentioned link between the timing and cumulative benefits of college completion, including time passed since degree completion in the analysis will substantially mitigate the late college penalty (Hypothesis 3).

GENDER DIFFERENCE IN THE EFFECT OF COLLEGE TIMING ON COLLEGE PREMIUMS

The second part of this study explores a possible gender difference in the effect of college timing on college wage premiums, and its consequences in terms of the relative college premiums of men and women. As mentioned earlier, women tend to gain less than men from college education over the course of their career (Grogger and Eide, 1995). This may be because, based on the statistical fact that women are more likely to leave their jobs, employers are reluctant to hire or promote women, including college educated ones, for career-track jobs that typically require a long period of training (Blair-Loy, 2001; Lazear and Rozen, 1990; Reskin, 1998). Confined to non career track jobs with flat wage profiles, individuals cannot benefit much from a college education, especially in the long run. If women have less to gain by way of the cumulative benefits higher education provides, and also if the negative wage effect of late degree completion is at least partly due to the delayed onset of those benefits, they will not be penalized as severely as men for postponing graduation (Hypothesis 4). Therefore, once the effect of cumulative educational advantage is taken into account, the gender difference hypothesized just now should be significantly attenuated or even disappear altogether (Hypothesis 5).

Meanwhile, if men suffer a greater wage loss than women for late degree completion, what does this mean for the relative college wage premiums of men and women? This study explores the possibility that women's college premium relative to men's is overestimated when information on the timing of degree completion is omitted. It is thus hypothesized that women's relative premium will decrease when the timing factor is included in the analysis (Hypothesis 6). To reiterate, the hypothesized gender difference in the effect of college timing is based on the previous research showing that women gain less from college education over the course of their career. Given this research, it is also

expected that if women receive a lower college wage premium, it is largely because they are at a relative disadvantage in benefitting cumulatively from college education (Hypothesis 7).

METHODS

Data

Data come from the National Longitudinal Survey of Youth (NLSY79), a national probability sample of men and women who were born between 1957 and 1964 (Center for Human Resource Research (CHRR), 2001). They were asked about their jobs, education, families and other topics every year from 1979 to 1994, and every two years from 1996 onward. Over the years, the NLSY79 has maintained high retention rates, ranging from 80.6% (in 2000) to 96.3% (in 1983), for a longitudinal survey of national scope (CHRR, 2001, p. 27). While the NLSY79 is an ongoing survey, this study considers the period up to the year 2000 as it was the most recent year for which data were available when this study began.

Because of the statistical models applied in this study (see under Models section), the data file is organized by person-year as a unit. The analytical sample, after deleting cases based on sample restrictions and missing data, includes 25,723 units for 2548 men and 27,019 units for 2798 women.

Variables

The outcome variable is an hourly wage rate in FY 1996 constant US dollars (US Office of Management and Budget, 2004). The natural logarithm of the wage (in cents) is used in order to address the skewness of the wage distribution in the sample used in this study. Following Monks (1997), this study deletes cases with the pre-transformation hourly wages less than one dollar or more than a thousand dollars, as well as those with missing data.

College completion and timing are the key independent variables. In this study college completion is defined as the completion of a four-year undergraduate program and included as a binary variable. College timing is measured by a variable with three categories (received a college degree at age $\leq$21 (referent), 22–24, or $\geq$25). Age 25 is often used as the cutoff by which individuals are normatively expected to complete their formal education, as reflected in various statistics (e.g., labor force status by education among adults aged 25 or older) compiled by government agencies such as the National Center for Education Statistics

and the Bureau of Labor Statistics. Meanwhile, the present analysis differentiates those who graduate by age 21 and those who graduate between the ages of 22 and 24 to see whether just a few year difference in the age at degree completion makes a difference in college premiums. To reiterate, this study focuses on whether the size of college wage premiums is reduced by late degree completion, and also whether any such effect of college timing is mediated by the cumulative effect of college education. It thus includes an interaction of college completion and timing, and an interaction of college completion and the number of years passed since the receipt of a degree.

One might wonder if any variability in college wage premiums by college timing may be due to a difference in the level of cognitive skills between nontraditional and traditional graduates. Studies have found higher college wage premiums for individuals with higher ability (Taber 2001; Tobias 2003). If nontraditional graduates generally have lower cognitive skills than traditional graduates, this factor needs to be considered in order to isolate the effect of college timing. Indeed, a descriptive analysis (not shown) indicates that the mean age adjusted *Armed Forces Qualification Test* (AFQT) scores for those who graduate from college by age 21, at ages between 22 and 24, and at age 25 or older are 2.017, 1.948, and 1.616, respectively. The difference between either type of traditional graduates (graduating at "≤21" or "22–24" years of age) and nontraditional graduates is statistically significant at the 0.001 level. These figures certainly do not suggest that nontraditional graduates are inherently low on cognitive ability. Many factors, such as individuals' family background, and childhood and adolescent experiences, significantly influence scores on standardized tests such as the AFQT. The issue of what factors influence cognitive ability is important, but not directly relevant to the present study. In order to separate any possible effect of cognitive ability from that of college timing on college premiums, an interaction of college completion and the age adjusted AFQT score is included in the analysis. (It should be noted that the AFQT variable cannot be included by itself because the fixed-effects specification only allows for the estimation of the effects of time-varying variables (see Models section)).

A few control variables are included because of their known or probable links to employment outcomes, and to the key independent variables considered in this study. These controls include cumulative work experience, job tenure, and their squared terms (to account for possible diminishing returns to experience and tenure), hours of employment, region, and unemployment rates. Work experience is measured by the number of weeks ever worked since age 18, while job tenure refers to

the number of consecutive weeks a respondent has worked for the current employer. Hours of employment refers to the number of hours worked since last interview. Region is coded with four categories (North East, North Central, South (referent), or West) and unemployment rate is the proportion of jobless persons who are seeking employment in the respondent's region of residence. Appendix A shows means and standard deviations of the study variables by gender across all person-year units, and the statistical significance of gender differences in the mean values.

Models

The regression analysis begins by estimating OLS models. Data are pooled to maximize the number of respondents included in the analysis and to reduce a possible selection bias. That is, if respondents were excluded just because of nonresponse years, the remaining cases could be less representative of wage earners. Meanwhile, because most respondents are observed across multiple years, the correlation between repeated observations for any given respondent may bias the standard errors of estimates. There is also a need to adjust for the study's "unbalanced" pooled data, i.e., the data in which the number of observations varies among respondents. Specifically, Stata's *survey* procedures (Stata, 2003a) are used to allow for the clustering of person-year units along with the inclusion of sampling weights. The sampling weights are adjusted for the number of, and the variation in, repeated observations per respondent.

Directly applying OLS models to the pooled cross-sectional time series data could be problematic for reasons other than the dependency of observations and the use of an unbalanced data set. As discussed earlier, those who complete their degree at an older age may be systematically different from traditional graduates in the distribution of the unobserved characteristics that influence wages. This possible unobserved heterogeneity between nontraditional and traditional graduates, if ignored, is likely to produce a spurious coefficient estimate for the interaction of the completion and timing of college education. To adjust for this problem of unobserved heterogeneity, fixed-effects models are considered.

The fixed-effects models are estimated by transforming variables to deviations from individual means for all person-year units. [Statistical software Stata (Stata, 2003b) was used for this estimation]. One could also estimate the same coefficients by including respondent dummy variables. This alternative estimation method, while impractical for this

study given the large number of respondents considered, gives us an intuitive understanding of purging the coefficient estimates of (time-invariant) unobserved individual characteristics. In a fixed-effects model, only the individual characteristics that are time-variant can be included as parameters because the individual mean subtraction would give zeros to all observations on time-invariant variables. While it is impossible to estimate the effects of time-invariant variables (e.g., gender), one can estimate the effects of interactions between time-variant and time-invariant variables (e.g., gender by college degree completion).[1]

This study then attempts to understand whether the effect of the interaction of college completion and timing is biased by unobserved heterogeneity, and if it is, in which direction by comparing estimates from OLS and fixed-effects models. For example, if late degree completion indeed reduces college wage premiums, and also if nontraditional college graduates share the unobserved characteristics that are associated with higher earning potentials (e.g., a tendency to persevere under the most challenging circumstances), the fixed-effects estimate of the late college penalty would be larger than its OLS counterpart, because, in the OLS model, the "true" penalty is likely to be suppressed by those unobserved characteristics. If, by contrast, nontraditional graduates share among themselves the unobserved characteristics associated with lower earning potentials, the fixed-effects estimate of the late college penalty should be smaller because the unobserved heterogeneity between nontraditional and traditional graduates likely accounts for part of the negative OLS estimate. Although Monks (1997) uses fixed-effects models in his study, he provides no estimates from alternative specifications, which makes it unclear whether the unobserved characteristics of nontraditional graduates bias the estimate of the late college penalty upward or downward. The present study attempts to clarify this matter.

FINDINGS

As Table 1 shows, at a descriptive level, nontraditional college graduates, both male and female, here defined as those who complete their degree at the age of 25 or older, receive a lower wage than their traditional counterparts (see column 1). (Given the way these descriptive statistics are presented, some of the wage rates assigned to person-years for nontraditional graduates are measured prior to degree completion.) The size of the traditional-nontraditional gap is larger for men. One might also notice that nontraditional male graduates begin with a wage rate lower (though only slightly) than those who have no college education

TABLE 1. Logged Hourly Wage by College Timing and Gender

	≥25		25–29		≥30	
Age	Mean (S.D.)	*n*	Mean (S.D.)	*n*	Mean (S.D.)	*n*
Men						
College degree at ≤21	7.445 (3.202)	514	7.326 (3.621)	279	7.571 (5.050)	235
College degree at 22–24	7.417 (1.970)	1807	7.259 (2.499)	983	7.592 (2.792)	824
College degree at ≥25	7.208 (4.178)	552	6.999 (5.137)	266	7.399 (5.817)	286
Non-college educated	7.093 (0.795)	14284	7.015 (1.132)	6793	7.158 (1.092)	7491
Women						
College degree at ≤21	7.170 (3.895)	561	7.079 (4.649)	310	7.286 (6.359)	251
College degree at 22–24	7.198 (2.324)	1718	7.122 (3.023)	937	7.282 (3.504)	781
College degree at ≥25	7.048 (2.931)	836	6.967 (3.943)	406	7.126 (4.202)	430
Non-college educated	6.811 (0.831)	14962	6.755 (1.214)	6550	6.852 (1.123)	8412

(column 2). For both genders, the wage gap between traditional and nontraditional graduates remains well into their thirties (column 3).

Table 2 presents the effects of college completion, an interaction of the completion and timing of college education, and the related interaction terms estimated in the pooled cross-sectional models predicting logged hourly wages (see Appendix B for the omitted results). As we can see, there is a negative effect of late degree completion on college wage premiums (Hypothesis 1), although this effect reaches statistical significance only under the fixed-effects specification (compare Models 2 and 4). Consistent with Hypothesis 2, this suggests that nontraditional graduates share the unobserved characteristics more in line with high earning potentials (e.g., resilience in adversity), and that it is only when these traits are taken into account that we see the previously hidden economic disadvantage of late degree completion. Specifically, relative to the respondents who complete their degree by age 21, those who graduate at 25 or older receive a significantly lower college wage premium by 25% (Model 4). These late finishers are also more

TABLE 2. Coefficient Estimates on Key Variables ($n = 52,742$)

Variable	OLS Model 1	OLS Model 2	Fixed-effects Model 3	Fixed-effects Model 4	Fixed-effects Model 5	Fixed-effects Model 6
College degree holder	.338***	.335***	.371***	.463***	.402***	.177***
	(.020)	(.036)	(.011)	(.026)	(.027)	(.043)
College × degree at 22–24		.012		−.038	−.029	−.006
		(.042)		(.029)	(.029)	(.029)
College × degree at ≥25		−.068		−.250***	−.217***	−.163***
		(.065)		(.032)	(.032)	(.033)
College × degree at ≤21		–		–	–	–
College × no. of years since degree					.010***	.010***
					(.001)	(.001)
College × AFQT						.113***
						(.017)
Constant	6.405***	6.404***	6.451***	6.450***	6.455***	6.454***
	(.023)	(.023)	(.012)	(.012)	(.012)	(.012)
Adjusted R^2	.279	.279	.267	.269	.270	.271

Coefficients and their standard errors are not shown for the control variables: work experience, work experience squared, job tenure, job tenure squared, hours employed, region of residence, regional unemployment rate. For the omitted results, see Appendix B.
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$ (two tailed).

disadvantaged compared to those who receive degrees at ages between 22 and 24 (the intergroup difference is significant at the 0.001 level, not shown in Table 2). Meanwhile, there is no significant difference in the size of college premiums between those who graduate at 21 or younger and those who graduate between the ages of 22 and 24. In a preliminary analysis, following Monks (1997), college timing was also considered as a continuous variable (i.e., age at degree completion minus 21). While the interaction of this variable with college completion produced a significant negative effect, ultimately the discrete measure of college timing was chosen because its effect turned out to be nonlinear.

As expected, the number of years passed since degree completion has a highly significant positive effect on college wage premiums (one additional year since degree completion results in a 1% increase in the premiums) (Model 5). More importantly for the purpose of this study,

however, the inclusion of this variable reduces the size of the negative effect of delayed degree completion down to 21.7%. This result supports Hypothesis 3 suggesting that part of the late college penalty is mediated by the cumulative advantage of college education. Because some researchers talk about the depreciation of college degrees (e.g., Groots, 1998), in a preliminary analysis, an interaction of college completion and the number of years passed since college completion squared was considered to test for the nonlinearity of the relationship between the time since college completion and the size of college wage premiums. No such relationship was indicated.

In order to consider the possibility that the economic penalty attributable to late degree completion reflects the generally lower cognitive ability of nontraditional relative to traditional graduates, an additional model is run with an interaction of college education and the age adjusted AFQT score. The effect of delayed degree completion does remain highly significant ($p \leq 0.001$), even though the size of this effect becomes further attenuated, now standing at a negative 16.3% (Model 6).

In an analysis not shown here, other factors were also considered to see if they attenuate the extent of the late college penalty. Those factors included whether or not the respondents with college degrees had become parents as teens, whether or not they had entered the labor force before reaching 18, and what fields of study they had majored in at college. However, none of these factors significantly changed the effects of college timing reported above.

We now move on to examine a possible gender difference in the effect of age at degree completion on college wage premiums. Given the above results (suggesting that the adverse effect of late college completion is better discerned when the unobserved individual heterogeneity is taken into account), in Table 3 only the results from fixed-effects models are reported. As these results suggest, while, regardless of gender, the size of college wage premium is reduced by postponing degree completion until after age 25, this penalty for late graduation is significantly greater for men than women, which is consistent with Hypothesis 4. Male nontraditional graduates receive a premium 33.7% lower than male traditional graduates, but for women the college timing gap is nearly half in size (i.e., $-0.337-(-0.158)=-0.179$) (Model 2). Models were also run separately by gender (see Appendix C). In these alternative models, the effect of the interaction of the completion and timing of college education was statistically significant for women as well as men.

As expected (Hypothesis 5), the gender difference in the effect of college timing becomes smaller and loses statistical significance once the cumulative advantage of college education is taken into account (Model 3). This

TABLE 3. Coefficient Estimates on Key Variables with Gender Interactions

Variable	Model 1	Model 2	Model 3	Model 4
College degree holder	.414***	.552***	.439***	.200**
	(.016)	(.040)	(.041)	(.067)
College × degree at 22–24		−.086*	−.064	−.035
		(.044)	(.044)	(.044)
College × degree at ≥ 25		−.337***	−.279***	−.226***
		(.049)	(.049)	(.051)
College × degree at ≤21		–	–	–
College × no. of years since degree			.019***	.019***
			(.002)	(.002)
College × AFQT				.113***
				(.025)
Female × college degree holder	−.076***	−.158**	−.062	−.029
	(.021)	(.053)	(.054)	(.088)
Female × college × degree at 22–24		.082	.062	.051
		(.059)	(.059)	(.059)
Female × college × degree at ≥25		.159*	.111	.111
		(.065)	(.065)	(.067)
Female × college × degree at ≤21		–	–	–
Female × college × no. of years since degree			−.016***	−.016***
			(.002)	(.002)
Female × college × AFQT				−.006
				(.034)
Constant	6.454***	6.452***	6.457***	6.456***
	(.012)	(.012)	(.012)	(.012)
Adjusted R-squared	.269	.270	.272	.273

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$ (two tailed).

suggests that men are more adversely affected by delaying college completion because they have more to lose by waiting longer to benefit from the cumulative advantage of education. The pattern remains the same when the interaction of college completion and AFQT is further introduced in the analysis (Model 4).

Finally, the results here are in line with the argument that analyses not accounting for the gender difference in the effect of college timing tend to overestimate women's college wage premium relative to men's (Hypothesis 6). While the baseline model shows that women's college premium is lower than men's by 7.6% (Model 1), this gender gap more

than doubles when the college timing factor is considered (Model 2). Ultimately, though, the gender gap in college premiums originates from the disparity between men and women in the extent of cumulative advantage of college education. For each additional year passed since degree completion, women lose out to men in the rate of increase in premiums by 1.6% (Models 3 and 4). When the cumulative disadvantage of female college graduates is taken into account, the gender interaction term for college completion itself becomes smaller and statistically insignificant, as predicted (Hypothesis 7).[2]

In summary, those who complete their degree at 25 or older receive a significantly lower college wage premium than those who graduate at a younger age, and this late college penalty is in part due to the delayed onset of the cumulative benefits higher education provides and in part due to the relatively low cognitive ability among nontraditional college graduates. As for the gender difference in the effect of late degree completion on collage wage premiums, women are found to be penalized significantly less than men. This is because women do not gain as much from college education over time. The gender disparity in the cumulative benefits of higher education further explains why men receive a higher college premium than women.

DISCUSSION

Bolstered by the openness of colleges and universities about the so-called "educational late blooming" (Levin and Levin, 1991) and the popular notion of college degree as a precondition for a successful career, taking a nontraditional route to higher education has been increasingly accepted and practiced in this country (Astone, Schoen, Ensminger, and Rothert, 2000; Settersten and Lovegreen, 1998). Meanwhile, the reports of significantly lower completion and higher dropout rates among nontraditional relative to traditional students (NCES, 2002b) suggest that the quality of the educational experience these older students receive may somehow be compromised. It is in this context that the present study focuses on the influence of age at degree completion on college wage premiums.

As expected, and consistent with life course theory, delaying graduation into the mid-twenties and beyond results in a substantial reduction in college wage premiums. Part of this pattern appears to be attributable to the fact that nontraditional graduates spend fewer years as college educated workers, thus unable to gain as much by way of the cumulative benefits of higher education. Meanwhile, this study finds

that even after controlling for the cumulative effect of higher education (and also the cognitive ability of college graduates), the adverse effect of late degree completion remains highly significant, leaving room for alternative explanations of nontraditional graduates' economic disadvantage, such as the reduced quality of college education for older adults.

This study also finds that men receive a significantly higher penalty than women for late degree completion, while this gender difference disappears when the cumulative effect of college education is taken into account. These results suggest that men who complete their degree at an older age lose out substantially to their younger counterparts in terms of the cumulative benefits of college education. By contrast, the timing of graduation does not differentiate women's college premium as much because women, regardless of when they finish college, experience a significantly lower growth of returns to college education.

Contrary to popular belief, the number of jobs requiring higher education may be increasing only moderately. A study conducted by economists Pryor and Schaffer (1999) shows that the sort of jobs that have been steadily expanding in recent periods actually requires the level of education somewhat lower than what would be expected of typical college graduates, while at the same time jobs requiring even less formal education are quickly disappearing. These scholars' findings are consistent with the significant variability in college premiums observed in recent studies (e.g., Hoxby and Terry, 1999; Rosenbaum, 2001). The present study adds to the literature by examining a possible variation in the level of economic payoffs to college education by the timing of graduation. The issue deserves close attention as nontraditional enrollment will likely continue growing in a foreseeable future, especially in light of today's skyrocketing college costs that would force more and more teenagers and young adults to postpone college and to fill jobs in the lower end of the labor market before returning to school.

Although this study illustrates one major reason why late degree completion erodes the premium paid for a college degree by focusing on the cumulative effect of college education, more research is certainly needed to identify what other factors are behind the late college wage penalty. Given the concentration of older students in public, urban commuter schools, future studies might consider how particular institutional and organizational characteristics of schools affect the employment outcomes of graduates.[3] While there has been research showing significant disadvantages of community college graduates in occupational and wage attainment (e.g., Monk-Turner, 1990, 1994), we know little about possible variability in the labor market experiences of four-year college graduates (but see Brewer, Eide, and Ehrenberg, 1999).

Employers' perceptions of nontraditional college graduates are another area that needs more research. What concerns might employers have about hiring these graduates? How do their perceptions of them vary by factors such as company size and industry? Examining questions such as these will contribute to a more complete understanding of the reasons behind the career disadvantage faced by nontraditional college graduates.

ACKNOWLEDGMENT

I would like to thank Bob Carini for his comments on the earlier version of this paper. This research was supported by a grant to the author from the American Educational Research Association (AERA), which receives funds for its "AERA Grants Program" from the National Science Foundation and the US Department of Education's National Center for Education Statistics and the Institute of Education Sciences under NSF Grant No. REC-9980573.

ENDNOTES

1. In a preliminary analysis, random-effects specifications, an alternative approach to account for unobserved heterogeneity, were also considered. On the one hand, the random-effects specification has the advantages of being more efficient and being able to estimate the effects of time-invariant variables. On the other hand, this specification imposes the rather restrictive assumption that individual specific effects are uncorrelated with independent variables. In the end, the random effects specification was rejected in favor of the fixed-effects specification based on results from Hausman tests (Stata, 2003b).
2. In a preliminary analysis, I examined if the effect of college timing on college wage premiums varied by race/ethnicity, and if this was due to the racial/ethnic differential in the size of cumulative benefits of college education. While non-Hispanic black and Hispanic respondents were found to be penalized less for their late degree completion, this was not accounted by the racial/ethnic differential in the cumulative benefits of college education. The size of these benefits was larger for whites than minorities, but this difference did not reach statistical significance.
3. No information on the characteristics of NLSY79 respondents' alma maters is available. Meanwhile, since the geocode version of the NLSY79 includes the location of most recent college attended, one could merge the NLSY79 and the Integrated Postsecondary Education System (IPEDS) and study the effects of school characteristics on college premiums. It should be noted, however, that not all postsecondary institutions reported in the NLSY79 are covered in the IPEDS, and that the institutional information is unavailable for the NLSY79 respondents who completed their degrees prior to 1986.

APPENDIX A. Summary Statistics

Variable	Men $n=25723$ Mean	Men $n=25723$ S.D.	Women $n=27019$ Mean	Women $n=27019$ S.D.	$\mu_{men}-\mu_{women}$ t-score
Hourly wage (¢)	1338.260	2388.338	1049.003	2309.468	15.07
Logged hourly wage	7.029	.744	6.787	.749	39.98
College degree holder	.157	.509	.148	.509	2.24
College × degree at ≤21	.034	1.371	.036	1.545	−.91
College × degree at 22–24	.110	.253	.099	.267	3.09
College × degree at ≥25	.013	.437	.013	.427	.22
College × no. of years since degree	1.007	.161	.931	.163	2.23
College × AFQT	.301	1.013	.277	.993	2.94
Work experience (weeks in 100s)	4.621	3.818	4.295	3.846	10.45
Job tenure (weeks in 100s)	2.127	3.055	1.844	2.875	11.63
Hours employed	24.302	13.942	20.773	14.587	31.11
North East	.205	.564	.203	.576	.32
North Central	.329	.657	.288	.649	7.69
South	.305	.644	.350	.683	−8.64
West	.161	.513	.158	.522	.68
Unemployment rate	2.950	1.487	2.866	1.478	7.07

APPENDIX B. Coefficient Estimates on the Control Variables not Reported in Table 2 ($n = 52,742$)

Variable	OLS Model 1	OLS Model 2	Fixed-effects Model 3	Fixed-effects Model 4	Fixed-effects Model 5	Fixed-effects Model 6
Experience	.076***	.076***	.084***	.082***	.083***	.083***
	(.005)	(.005)	(.002)	(.002)	(.002)	(.002)
Experience squared	−.003***	−.003***	−.003***	−.003***	−.003***	−.003***
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Tenure	.097***	.097***	.075***	.075***	.074***	.074***
	(.006)	(.006)	(.003)	(.003)	(.003)	(.003)
Tenure squared	−.008***	−.008***	−.007***	−.007***	−.007***	−.007***
	(.001)	(.001)	(.000)	(.000)	(.000)	(.000)
Hours employed	.004***	.004***	.001***	.001***	.001***	.001***
	(.001)	(.001)	(.000)	(.000)	(.000)	(.000)
North East	.164***	.163***	.109***	.109***	.110***	.110***
	(.018)	(.018)	(.016)	(.016)	(.016)	(.016)
North Central	.062***	.061***	.005	.005	.006	.006
	(.016)	(.016)	(.015)	(.015)	(.015)	(.015)
West	.170***	.170***	.106***	.104***	.102***	.101***
	(.020)	(.020)	(.016)	(.016)	(.016)	(.016)
South	–	–	–	–	–	–
Unemployment rate	−.037***	−.037***	−.023***	−.023***	−.023***	−.023***
	(.005)	(.005)	(.002)	(.002)	(.002)	(.002)

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$ (two tailed).

APPENDIX C. Coefficient Estimates from the Models Run by Gender

Variable	Model 1 Men	Model 2 Women	Model 3 Men	Model 4 Women	Model 5 Men	Model 6 Women	Model 7 Men	Model 8 Women
Experience	.414***	.338***	.552***	.394***	.439***	.377***	.200**	.171**
	(.016)	(.014)	(.040)	(.035)	(.041)	(.036)	(.067)	(.056)
College × degree at 22–24			−.086*	−.004	−.064	−.003	−.035	.017
			(.044)	(.039)	(.044)	(.039)	(.044)	(.039)
College × degree at ≥25			−.337***	−.178***	−.279***	−.168***	−.226***	−.116**
			(.049)	(.042)	(.002)	(.043)	(.051)	(.044)
College × degree at ≤21			–	–	–	–	–	–
College × no. of years since degree					.019***	.003	.019***	.003*
					(.002)	(.002)	(.002)	(.002)
College × AFQT							.113***	.107***
							(.025)	(.023)
Constant	.595***	.319***	6.591***	6.320***	6.599***	6.321***	6.599***	6.320***
	(.017)	(.016)	(.017)	(.016)	(.017)	(.016)	(.017)	(.016)
R^2	.276	.261	.278	.262	.282	.262	.283	.263

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$ (two tailed).

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Received September 29, 2004.