Title	Multinomial Probit Estimates of College Completion at Two-Year and Four-Year Schools
Authors(s)	Jepsen, Christopher
Publication date	2008-02
Publication information	Jepsen, Christopher. "Multinomial Probit Estimates of College Completion at Two-Year and Four-Year Schools" 98, no. 2 (February, 2008).
Publisher	Elsevier
Item record/more information	http://hdl.handle.net/10197/4447
Publisher's statement	This is the author's version of a work that was accepted for publication in Economics Letters. Changes resulting from the publishing process, such as peer review, editing, corrections, structural formatting, and other quality control mechanisms may not be reflected in this document. Changes may have been made to this work since it was submitted for publication. A definitive version was subsequently published in Economics Letters (Volume 98, Issue 2, February 2008, Pages 155–160) DOI:10.1016/j.econlet.2007.04.016 Elsevier B.V.
Publisher's version (DOI)	10.1016/j.econlet.2007.04.016

Downloaded 2023-04-07T10:52:29Z

The UCD community has made this article openly available. Please share how this access benefits you. Your story matters! (@ucd_oa)

© Some rights reserved. For more information

Multinomial Probit Estimates of College Completion at Two-Year and Four-Year Schools

Christopher Jepsen^{*}

Department of Economics and Center for Business and Economics Research
University of Kentucky
335BA Gatton Business and Economics Building
Lexington, KY 40506-0034

Abstract

This paper explores differences by race, ethnicity, and immigrant generation in an individual's likelihood of completing either a two-year or a four-year degree. Blacks and, to a lesser extent, Hispanics are more likely than whites to complete a four-year degree.

Keywords: Higher education; Discrete choice; Immigration; Race/ethnicity

JEL classification: I2, J1

^{*} Tel.: +1 859 257 1386; fax: +1 859 257 7671. E-mail address: jepsen@uky.edu.

Introduction

This paper provides a more detailed analysis of race, ethnicity, and immigrant generation than previous work on college attendance and completion.¹ Because community colleges are the predominant avenue for higher education among Hispanics, the inclusion of two-year institutions in addition to four-year institutions is essential for understanding the role of race and ethnicity in post-secondary education.

I find that females are more likely to attend and complete college than males. Blacks and Hispanics are more likely to complete a four-year degree than whites of similar family background and ability. Asians are more likely to attend college as well as complete both two-year and four-year degrees.

Data

The data set for this paper is the National Educational Longitudinal Survey of 1988 (NELS). Over 20,000 eighth-grade students were initially interviewed in the spring of 1988, with follow-up interviews in 1990, 1992, 1994, and 2000. All analyses are weighted to account for non-random attrition that occurs between follow-ups.

Because the pursuit of a college degree typically requires a high school diploma or equivalent, I exclude individuals who had not received a high school diploma or a GED by 1994. I also exclude students who were not educated in the United States, as the determinants of college attendance and completion may differ between students educated in U.S. schools versus those educated elsewhere. Native Americans, white children of immigrants, and Asian children of natives are excluded from the analysis due to small sample size.

¹ Examples of previous work include Chiswick and DebBurman (2004), Ganderton and Santos (1995), Gill and Leigh (2000), Hagy and Staniec (2002), Kane and Rouse (1999), Leigh and Gill (2003), Light and Strayer (2000, 2002, 2004), Manski and Wise (1983), and Rouse (1995, 1998).

Table 1 presents the descriptive characteristics for the sample. 38.6 percent of the high school graduates in NELLS attended a two-year or four-year institution but did not receive a degree. 7.7 percent received a two-year degree, and 34.5 percent received a four-year degree. Over 70 percent are white children of natives. About five percent of the sample is Hispanic children of immigrants, and four percent is Hispanic children of natives. More than ten percent are black, and two percent are Asian children of immigrants. Approximately five percent of students have missing information on immigrant generation.

Method

High school graduates have several choices for educational outcomes, ranging from no post-secondary attendance to the receipt of multiple degrees. This paper focuses on the completion of two-year and four-year degrees, but it also recognizes that college attendance without a degree is an outcome worthy of study.² The analysis considers four possible outcomes for each individual: (1) did not attend a post-secondary institution; (2) attended but did not receive a degree, (3) received a two-year degree, or (4) received a four-year degree (or more). Outcomes for individuals with multiple degrees are based on the highest degree received.

In order to estimate a model with multiple discrete outcomes, I use a multinomial probit model. This model is becoming more common in the post-secondary literature as an alternative to the more-established multinomial logit model, first used in post-secondary schooling by Manski and Wise (1983). In the multinomial probit model, each individual derives utility from each post-secondary schooling option. The individual chooses the option yielding the highest utility. The researcher does not observe the utility of each alternative, only the alternative chosen.

² For example, community colleges offer several outcomes in addition to a two-year degree, such as a certificate in dental hygiene. These outcomes are not considered in this paper because the NELLS data have little information on these other outcomes.

$$(1) \quad u_{ij} = R_i' \alpha_j + X_i' \beta_j + Z_i' \gamma_j + W_i' \lambda_j + \varepsilon_{ij}$$

Equation (1) contains the utility gained by individual i from choosing alternative j from the set of four post-secondary outcomes discussed previously. The model is estimated as a multinomial probit, as I assume that the four epsilon terms (i.e. the unobserved utility) are independently and identically distributed with a joint normal distribution. R_i is a vector of sex, race, ethnicity, and immigrant generation variables; X_i is a vector of parental background characteristics; Z_i is a vector of school factors (measured in tenth grade); and T_i is student i 's eighth-grade test score. The individual components of these vectors are listed in the descriptive statistics in Table 1.

The main advantage of the multinomial probit is that it allows an analysis of multiple, unordered outcomes. Unlike an ordered model, the multinomial probit estimates different coefficients for each outcome. The multinomial probit is not dependent on the independence of irrelevant alternatives (IIA) assumption, although it nonetheless requires numerous assumptions about the covariance structure of the unobserved terms (Train, 2002).

Results

Table 2 contains the multinomial probit results, where each column represents a different multinomial probit model. The three outcomes in the table are: attending college without completing a degree, completing a two-year degree, and completing a four-year degree. The omitted outcome is not attending college. The bottom portion of the table lists the control variables in each column. Column 1 contains the fewest controls, whereas column 4 contains the most.

Regardless of the model specification, females are noticeably more likely to attend and complete college than are males. Similarly, all the coefficients for Asians are positive and significant, illustrating higher educational attainment than whites. In fact, Asians are the only racial and ethnic group that is consistently more likely than whites to complete a two-year degree.

In contrast, blacks and Hispanics are less likely to complete a four-year degree in a model with no additional controls (column 1). However, the black-white and Hispanic-white differences in four-year degree completion become insignificant when I add controls for family background (column 2). Furthermore, once I include additional controls for school characteristics and student ability (column 4), blacks and Hispanics are actually more likely to complete a four-year degree than are observationally-similar whites. They are also more likely to attend college without completing a degree compared to whites (column 4). Blacks and Hispanic children of immigrants are no more or less likely to complete a two-year degree than whites, whereas Hispanic children of natives are marginally more likely to complete a two-year degree than whites in the most detailed model (column 4). These results are similar to previous work on black-white and Hispanic-White differences in college attendance and four-year degree completion (Ganderton and Santos, 1995; Light and Strayer, 2000, 2002; Hagy and Staniec, 2002).

Although not shown in the table, the results for other characteristics are also similar with previous work.³ Maternal college attendance and – to a lesser extent – parental income are associated with higher probabilities of college attendance and completion. Test scores in eighth grade are highly significant and positively associated with all schooling levels. School characteristics (measured in tenth grade) have limited impacts on educational attainment.⁴

Summary

College attendance and completion rates vary by sex, race, ethnicity, and immigrant generation. Females are more likely to attend and complete college than males. Blacks and Hispanics are no less likely than whites to attend college without completing a degree, and, once I

³ These results are available from the author upon request.

⁴ Using NELS data, Long (2006) finds that individual school-level coefficients often are not significant or have the “wrong” sign, but school characteristics have more significant positive effects on educational attainment than one would expect by chance.

control for family background, they are actually more likely to complete a four-year degree. All the coefficients for Asians are positive and statistically significant.

The general insignificance of the black and Hispanic coefficients for two-year degree completion is notable. Immigrants and nonwhites – particularly Hispanics – are much more likely than whites to start their post-secondary education in community colleges (Fry, 2002). With their sizable labor market returns, and their appeal to several demographic groups, community colleges have potential in reducing economic inequality. Further research with larger samples of two-year degree holders is needed to assess whether this potential has been met.

Acknowledgment

I thank the editor, an anonymous referee, Laura Hill, Lisa Jepsen, Debbie Reed, and participants at the 2003 APPAM and 2004 AEFA conferences for helpful comments. Shelley de Alth and Pedro Cerdán provided excellent research assistance. All errors and opinions are solely my responsibility.

References

- Chiswick, B. R., DebBurman, N., 2004. Educational Attainment: Analysis by Immigrant Generation, *Economics of Education Review* 23, 361-379.
- Fry, R., 2002. Latinos in Higher Education: Many Enroll, Too Few Graduate, Washington, D.C.: The Pew Hispanic Center.
- Ganderton, P. T., Santos, R., 1995. Hispanic College Attendance and Completion: Evidence from the High School and Beyond Surveys, *Economics of Education Review* 14, 35-46.
- Gill, A. M., Leigh, D. E., 2000. Community College Enrollment, College Major, and the Gender Wage Gap, *Industrial and Labor Relations Review* 54, 163-181.
- Hagy, A. P., Staniec, J. F. O., 2002. Immigrant Status, Race, and Institutional Choice in Higher Education, *Economics of Education Review* 21, 381-392.
- Kane, T. J., Rouse, C. E., 1999. The Community College: Educating Students at the Margin between College and Work, *Journal of Economic Perspectives* 13, 63-84.
- Leigh, D. E., Gill, A. M., 2003. Do Community Colleges Really Divert Students from Earning Bachelor's Degrees? *Economics of Education Review* 22, 23-30.
- Light, A., W. Strayer, W., 2000. The Determinants of College Completion: School Quality or Student Ability? *Journal of Human Resources* 35, 299-332.
- Light, A., W. Strayer, W., 2002. From *Bakke* to *Hopwood*: Does Race Affect College Attendance and Completion? *The Review of Economics and Statistics* 84, 34-44.
- Light, A., Strayer, W., 2004. Who Receives the College Wage Premium? Assessing the Labor Market Returns to Degrees and College Transfer Patterns, *Journal of Human Resources* 39, 746-773.
- Long, M. C., 2006. Secondary School Characteristics and Early Adult Outcomes, Daniel J. Evans School of Public Affairs working paper #2006-006, University of Washington.
- Manski, C., Wise, D. A., 1983. *College Choice in America*. Cambridge, MA: Harvard University Press.
- Rouse, C. E., 1995. Democratization or Diversion? The Effect of Community Colleges on Educational Attainment, *Journal of Business and Economic Statistics* 13, 217-224.

Rouse, C. E., 1998. Do Two-Year Colleges Increase Overall Educational Attainment? Evidence from the States, *Journal of Policy Analysis and Management* 17, 595-620.

Train, K. E., 2003. *Discrete Choice Methods with Simulation*. New York: Cambridge University Press.

Table 1: Descriptive Statistics

	Mean	Std. Dev.
<i>Educational Attainment</i>		
Attend, no degree	0.386	0.487
Two-year degree	0.077	0.266
Four-year degree	0.345	0.475
<i>Sex/Race/Ethnicity/Immigration</i>		
Female	0.511	0.500
Black	0.115	0.319
Hispanic child of immigrants	0.050	0.217
Asian child of immigrants	0.018	0.135
White child of natives	0.721	0.448
Hispanic child of natives	0.039	0.193
<i>Sex/Race/Ethnicity/Immigration</i>		
Mother high school degree	0.282	0.450
Mother some college	0.419	0.493
Mother four-year degree	0.193	0.395
Family income (000s)	42.9	39.3
Family income squared (000,000s)	33.8	97.6
Raised in single-parent home	0.162	0.369
Number of siblings	2.19	1.51
<i>School characteristics</i>		
Offers vocational education	0.877	0.328
School percent free lunch	0.191	0.205
<i>Student test score</i>		
Eight-grade test score	37.2	11.7
Observations	9,386	

Table 2: Multinomial Probit Results for Educational Attainment

	(1)	(2)	(3)	(4)
Attend, no degree				
Female	0.166 ** (0.080)	0.246 ** (0.081)	0.258 ** (0.080)	0.295 ** (0.083)
Black	0.035 (0.150)	0.188 (0.167)	0.213 (0.171)	0.392 ** (0.176)
Hispanic child of immigrants	0.070 (0.245)	0.485 ** (0.240)	0.505 ** (0.240)	0.571 ** (0.239)
Asian child of immigrants	0.885 ** (0.203)	1.098 ** (0.246)	1.140 ** (0.257)	1.237 ** (0.318)
Hispanic child of natives	0.419 ** (0.183)	0.629 ** (0.186)	0.645 ** (0.193)	0.757 ** (0.197)
Two-year degree				
Female	0.241 ** (0.091)	0.339 ** (0.094)	0.359 ** (0.093)	0.395 ** (0.095)
Black	-0.298 (0.182)	-0.107 (0.192)	-0.040 (0.196)	0.132 (0.196)
Hispanic child of immigrants	-0.213 (0.228)	0.265 (0.235)	0.323 (0.234)	0.378 (0.235)
Asian child of immigrants	0.611 ** (0.244)	0.771 ** (0.292)	0.817 ** (0.301)	0.889 ** (0.350)
Hispanic child of natives	-0.027 (0.184)	0.214 (0.196)	0.247 (0.198)	0.352 * (0.199)
Four-year degree				
Female	0.300 ** (0.079)	0.505 ** (0.083)	0.534 ** (0.083)	0.602 ** (0.087)
Black	-0.556 ** (0.169)	-0.128 (0.184)	-0.003 (0.190)	0.435 ** (0.193)
Hispanic child of immigrants	-0.592 ** (0.231)	0.451 ** (0.207)	0.547 ** (0.212)	0.801 ** (0.213)
Asian child of immigrants	1.593 ** (0.205)	1.702 ** (0.318)	1.737 ** (0.346)	1.835 ** (0.481)
Hispanic child of natives	-0.573 ** (0.146)	-0.057 (0.156)	0.013 (0.158)	0.280 * (0.166)
Family background	no	yes	yes	yes
School characteristics	no	no	yes	yes
8th grade test score	no	no	no	yes

Notes: 9,386 observations. Standard errors are in parentheses. All models also include region and dummy variables for missing characteristics (except race/ethnicity). * and ** denote statistical significance at the 10% and 5% levels, respectively.