DOCUMENT RESUME

ED 318 371 HE 023 451

AUTHOR Grubb, W. Norton
TITLE The Causes and Consequences of Enrollments in Higher Education: Evidence From the National Longitudinal Study of the Class of 1972. Final Report.
INSTITUTION Institute for the Study of Family, Work, and Community, Berkeley, CA.
SPONS AGENCY Department of Education, Washington, DC.
PUB DATE Jun 89
GRANT G008610958
NOTE 147p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC06 Plus Postage.
DESCRIPTORS Adult Education; Adult Students; Compensation (Remuneration); Dropout Rate; *Economic Status; *Enrollment Trends; Expectation; Graduate Surveys; *Higher Education; *Outcomes of Education; Reentry Students
IDENTIFIERS *National Longitudinal Study High School Class 1972

ABSTRACT

An examination of the probability of enrolling in postsecondary education, the likelihood of completing various types of credentials, and the effects of these credentials on wage rates, earnings, and other adult outcomes was conducted using data derived from the National Longitudinal Study of the Class of 1972. The followup survey in 1986 suggested that while enrollment in postsecondary education has been stable, or in some cases increased, the probability of completing a B.A. degree declined. There was shown to be an increased tendency to drop out of postsecondary education, particularly among minority students. Finally, the study indicated that the rate at which adults are enrolling in higher education has apparently increased, but it was difficult to detect the benefits, either economic or non-economic, for this group. It is concluded that postsecondary education has failed to materialize the great promise of economic and other benefits historically assigned to getting advanced degrees, while higher education policy pretends that the postsecondary market works, with well-informed students facing a labor market that can absorb all its graduates. Includes supporting bibliography of 104 reference. (GLR)

June 1989

Final Report to the U.S. Department of Education

THE CAUSES AND CONSEQUENCES OF ENROLLMENTS IN HIGHER EDUCATION: EVIDENCE FROM THE NATIONAL LONGITUDINAL STUDY OF THE CLASS OF 1972

W. Norton Grubb

School of Education
University of California, Berkeley
Berkeley, CA 94720

and

Institute for the Study of Family, Work, and Community
1995 University Ave., Suite 225
Berkeley, CA 94704

Acknowledgements: The research described in this report has been performed under grant G008610958 from the U.S. Department of Education to the Institute for the Study of Family, Work, and Community, Berkeley. Paul Weber provided outstanding assistance with the programming of the analyses reported in this research, and Ellen Liebman prepared the data files used in this analysis. Suzette Kellar, Leslie Retallick, and Kathy Dodge were unfailingly helpful in the preparation of tables, figures, and the manuscript, and Jonathan White provided invaluable research assistance.

THE CAUSES AND CONSEQUENCES OF ENROLLMENTS IN HIGHER EDUCATION: EVIDENCE FROM THE NATIONAL LONGITUDINAL STUDY OF THE CLASS OF 1972

W. Norton Grubb

The benefits of formal schooling have been celebrated for some time. Horace Mann stressed the economic value of education in promoting public support of the common school, and reformers of the Progressive Era stressed "learning to earn" as a fundamental purpose of schooling in general and vocational education in particular. The human capital school, first codified during the 1960s, elaborated the historical interest in the economic value of schooling and prompted many empirical studies. Others, less interested in the purely economic benefits of schooling, have stressed its benefits in other realms of adult life, including its positive effects on occupational choice and status, social and political participation, marriage and child-rearing, overall sense of well-being, and the ability to cope with changes.[1]

By now the benefits of more education have been firmly established, and widely used to promote further education as the solution to a variety of individual and social problems. However, most of the evidence about the effects of schooling examines relatively gross differences in educational attainment — in particular, the differences among high school dropouts, those who have completed high school, and those who have completed a B.A. degree or more. The effects of formal schooling differentiated more finely, or described more precisely than by asking individuals how many years of school they have completed, are not well known.

Increasingly, the decisions which individuals must make about their education involve decisions about whether to continue in postsecondary education, and if so which of a tremendous variety of options to pursue. Currently, slightly over 70 percent of each cohort graduates from high school;[2] about 60 percent of high school graduates continue their formal schooling in some type of postsecondary institution (as described in Chapter I), and they are joined by increasing numbers of adults who return to formal schooling after some years working in order to upgrade their skills or prepare for a different occupation. As the population in postsecondary education has increased during the last thirty years, the options prospective students face have widened. Community colleges have expanded, relative to four-year colleges; and community colleges have increasingly

---

[1] See especially Leslie and Brinkman (1988) for a review of many of the benefits of postsecondary education.

[2] These figures are based on institutional data collected by the Department of Education. The 1987 figure was 71.1 percent, up from 69.5 percent in 1982; see *Education Week*, May 10, 1989, p. 16.

become vocational institutions offering a wide variety of vocational programs, Associate degree and certificate programs, and other short courses of study. Public postsecondary technical institutes and private vocational schools have expanded, both of them offering concentrated vocational programs without the academic and transfer programs of the community colleges. Four-year colleges have become more differentiated as well: during the expansion of postsecondary education in the 1960s states established many more public institutions of higher education, many of them branch campuses of a university system with lower status than the older "flagship" universities, and many in a "second tier" of institutions (like state colleges as distinct from state universities). Particularly during the 1970s and 1980s, four-year colleges became increasingly vocationalized as enrollments concentrated in more occupationally-specific programs — like business, engineering, education, and the like — rather than in the liberal arts. For the majority of students in a cohort, then, the crucial schooling decision involves whether or not to continue to postsecondary education, which type of institution and field of study to choose, and whether to complete a program of study. These decisions are much more complex, and the results are much more varied, than can be summarized in the conventional description of educational attainment in categories of high school completion, some college, and completion of a B.A. or higher degree.

In this research, therefore, I examine the probability of enrolling in postsecondary education, the likelihood of completing various types of credentials, and then the effects of these credentials (as well as course credits earned, among those who do not complete credentials) on wage rates, earnings, and other adult outcomes (both economic and non-economic). The research is based on a data set — the National Longitudinal Study of the Class of 1972 — which has several distinct advantages over other data. First, it is a longitudinal data set, following a national probability sample of students from the high school Class of 1972. In addition, the study collected postsecondary transcripts for these individuals, so that an extraordinary amount of information about postsecondary education is available. Finally, the last follow-up of these individuals, in 1986, provided information about them (including their wages and earnings) when they were old enough — around 32 — to have moved into "adult" roles and jobs, unlike other data sets which often have information available only for the period immediately following graduation. Thus it is possible to analyze first the decision to enroll in postsecondary education, then the patterns of completion, and non-completion, and finally the effects of postsecondary education on adult outcomes, all with much richer data on postsecondary education than is conventionally available.

I. The Nature of the NLS72 Data

The National Longitudinal Study of the Class of 1972 first surveyed a national probability sample of high school seniors in the the spring of 1972. They were then followed up in fall 1973,

fall 1974, fall 1976, and fall 197 / (Ricobono et al., 1981); the fifth and final follow-up took place in the spring and summer of 1986 when the cohort was fourteen years out of high school and the individuals were about 32 years old (Tourangeau, 1987). A transcript study was conducted in 1984-85 of all those attending postsecondary education (Jones et al., 1986); it requested transcripts from all postsecondary institutions the individuals in the sample reported attending in any of the first four follow-ups, and then coded information from these transcripts about courses taken by field of study,[3] course grades and credits, and credentials received. Because the specific institution an individual attended is known, the transcript study therefore contains information about courses and credentials in different types of institutions.

The tremendous advantage of the NLS72 data, therefore, is that is provides finely detailed information about postsecondary education, not merely an estimate of years of school. Furthermore, information about postsecondary information is based on transcripts rather than self-reported information. Self-reports about education are subject to both forgetting and to exaggeration, so that it is difficult to say *a priori* the direction of bias in self-report information. However, in comparing self-reports with transcript information about enrolling in postsecondary education (presented in Table 1), the self-reported probability of enrollment is always higher than the transcript-reported probability. The difference is not random; it is essentially zero (that is, insignificantly different from zero) for students of the highest abilities, the highest grades, those from academic tracks, and those planning to go on to a four-year college — all individuals most likely to go on to postsecondary education. The difference is substantial — between 10 and 15 percentage points — for students of low ability, low grades, the vocational and general tracks, and those without postsecondary plans of planning to attend a vocational/technical program. It therefore appears that self-reports of education attainment are unbiased for those individuals likely to have high levels of educational attainment, but are upwardly biased for those individuals with lower levels of attainment. One implication is that conventional estimates of the rate of return to education, which rely on self-reported years of schooling, are upwardly biased and that the estimates of returns to postsecondary education based on the NLS72 transcript data will be lower than those in the literature.[4]

The disadvantage of NLS72 data is that they provide information about only one graduating

---

[3] Fields of study are describe by CIP (Classification of Instructional Programs) codes; see Malitz (1981). The technical appendix to this report describes how CIP codes are further classified into vocational, academic, and remedial or avocational subjects.

[4] That is, starting from the usual human capital equation, the reported level of education is Ed*=Ed + u, where Ed is the actual level of education and u is measurement error correlated with Ed; then the estimated equation is LogY = a + b(ED + u) + ... + e, and the estimated coefficient b will be upwardly biased compared to the true b. Of course, it is also possible that there is measurement error in earnings Y, in which case the estimated b may be biased in still other ways. However, all studies are forced to rely on self-reported earnings, and so my results will not differ from other estimates in this respect.

TABLE 1

Proportion of High School Graduates
Enrolling in Postsecondary Education by 1978-1979

		Transcript-Reported	Self-Reported
Total		61.4%	68.1%
Ability:	Upper 25%	86.6	88.4
	Middle 50%	63.2	67.1
	Low 25%	32.9	45.2
H.S. Grades:	A's	80.3	82.8
	B's	60.7	66.8
	C's	39.8	51.5
	D's	31.7	42.2
H.S. Program:	Academic	86.2	89.0
	General	47.0	57.7
	Vocational	31.7	43.9
Socio-economic Status:	High 25%	89.4	88.7
	Middle 50%	57.9	63.8
	Low 25%	40.7	48.1
Postsecondary Plans:	4-yr college	92.2	94.3
	2-yr college	73.2	77.9
	Voc/Tech School	38.9	55.6
	None	17.2	26.2

class. Consequently there is no real variation in age in the sample, so it is impossible to analyze the effects of education on employment over many years. In addition, while the fifth follow-up occurred 14 years after high school — certainly long enough for individuals to settle into "adult" employment, after the period of experimentation which often characterizes the youth labor market and individuals in their teens and early twenties (Osterman, 1980) — this is still not enough time for individuals to have come close to their maximum earnings. As can be seen from the age-earnings profiles in Figure 1, drawn from the Current Population Survey, the differences in earnings by years of schooling continue increasing past age 32, especially for men. Thus the returns to schooling at age 32 may understate the returns to schooling over an entire lifetime. However, by 32 the differences which characterize older cohorts have clearly emerged, which is not true of individuals in their twenties. Thus it should be possible to detect the consequences of postsecondary education with the NLS72 fifth follow-up data, whereas data sets which report earnings at younger ages cannot be used for this purpose.

Finally, the results described below, for earnings and wages in 1985 and 1986, reflect the experiences of a cohort passing through postsecondary education during the 1970s, and these results may not be valid for cohorts passing through higher education in the 1980s when conditions in postsecondary education have changed.[5] It is necessary to keep these limitations in mind in interpreting the results presented in this report. Of course, all data have limitations, and the richness of information about postsecondary education makes it worthwhile to analyze the NLS72 data carefully — particularly since there is no other comparable data set.[6]

II. The Plan of This Report

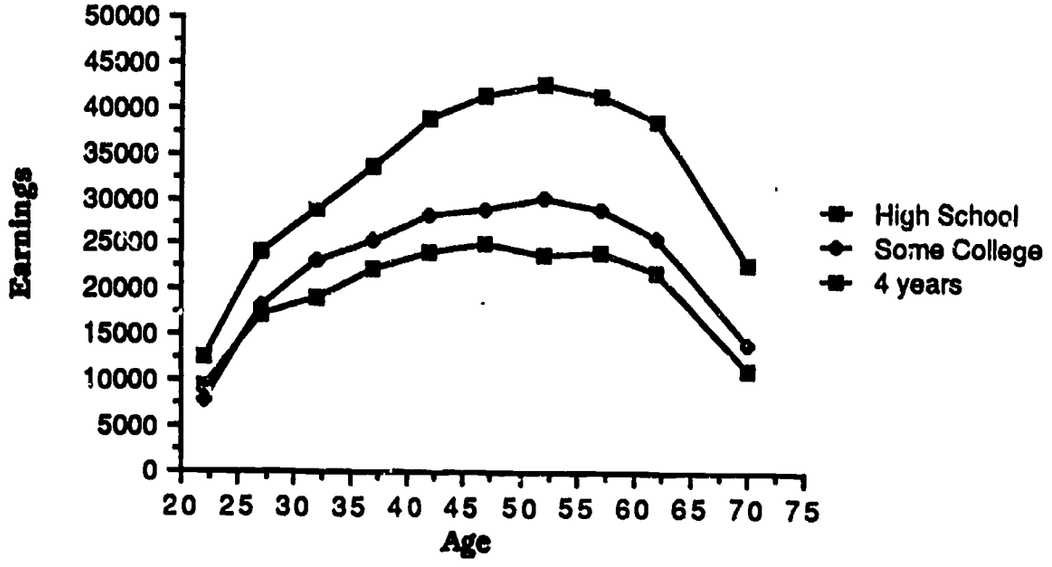
Chapter I presents an overview of both enrollment in and completion of postsecondary education, distinguishing enrollment and completion rates for various types of postsecondary institutions as well as different groups of students. These results are based on both the NLS72 data and on comparable data from the High School and Beyond survey of the high school class of 1980,

---

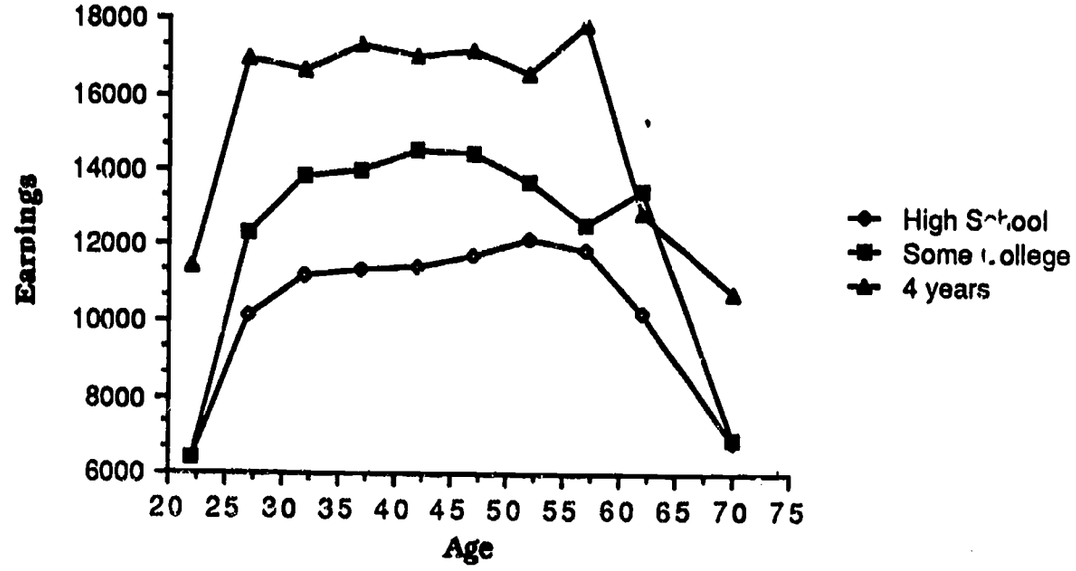
[5] Among the potentially important changes are increasing rates of participation by women relative to men and of "non-traditional" students with lower grades or from vocational tracks, and substantial increases in rates of non-completion, which are particularly serious for minority students; a deterioration in the transfer rates from two- to four-year colleges; a general tendency to lengthen the period of time which students take to complete credentials; and a greater tendency to combine employment with postsecondary education. Many critics have alleged that standards in higher education have declined; if so this might affect returns to postsecondary education over high school unless high school standards have also declined, as is frequently asserted.

[6] There are no plans to collect postsecondary transcripts until the 1992 follow-up of the high school class of 1982. These data will then have ten years of postsecondary transcripts (compared to seven years for the class of 1972), and will measure earnings and other adult outcomes ten years after high school graduation (compared to fourteen years after graduation in the NLS72 data used in this research).

Age-Earnings Profile: Males



Age-Earnings Profile: Females



in order to describe trends. In addition, some information on the credits earned by non-completers is presented. One implication is that the amount of variation among completers — with some earning a B.A. degree, but others earning various kinds of certificates and Associate degrees — is substantial, as is the variation among non-completers who leave with different amounts of course credits.

Chapter II presents a multivariate analysis of the causes of enrollment, expanding on the enrollment patterns described in Chapter I. A model of enrollment is presented, and then operationalized with variables available in the NLS72 data. Then enrollment equations estimated with the technique of logit analysis are presented, describing the probabilities of enrolling in different types of postsecondary institutions.

Chapter III presents the results of analyzing wage rates, earnings, and other adult outcomes, considering the effects of detailed postsecondary education as well as experience, other informal kinds of training, race and ethnicity, and socio-economic background. The effects of fields of study on outcomes, and of receiving credentials from different kinds of postsecondary institutions, are also analyzed.

The results in Chapter III indicate that while B.A. degrees have substantial effects on earnings, sub-B.A. credentials gain individuals access to positions in which they can accumulate more experience but provide no further advantage once experience has been considered. Furthermore, for non-completers postsecondary course credits seem to provide them little advantage (with a few exceptions). This raises the question of why programs which enroll substantial numbers of individuals, and courses which should provide some additional skills to students who have been through them (even if they have not completed full programs), seem to provide so few benefits. The last chapter provides a series of possible explanations for these results, both as a way of interpreting these findings and as a way of outlining further research suggested by these results.

Finally, a technical appendix includes documentation about several issues in the analysis of the NLS72 data, including the use of weights, the standardization of course credits, the classification of courses and credentials into vocational and academic fields of study, the calculation of parameter variances with the method of Balanced Repeated Replication, and some experiments with Tobit analysis.

Chapter One

ENROLLMENTS AND COMPLETION IN POSTSECONDARY EDUCATION

During the 1960 and 1970s access to higher education expanded enormously. Enrollments in almost every form of postsecondary education boomed, and the structure of higher education changed as certain types of institutions — particularly state colleges and community colleges — grew especially fast. Private vocational schools also claimed expanding enrollments — and have more recently claimed that private vocational training is the fastest-growing segment of postsecondary education (Wilms, 1987). More recently it has become clear that simple access to higher education may be insufficient. High rates of attrition, especially among minority students, have clarified the distinction between access and achievement, and attacks on the content and quality of college programs have raised the possibility that time in postsecondary schooling may have little educational value.[7] The charges, originating at the high school level, that too many students have incoherent programs of study and simply "mill around" aimlessly among courses (Powell, Farrar, and Cohen, 1985; Hoachlander and Choy, 1986) could be levied at postsecondary education as well. With these criticisms, the issue for higher education has moved beyond the simpler one of access to questions about the content and coherence of programs.

Concern about "milling around" starts from a presumption that education is properly sequential and cumulative, so that a coherent sequence of courses is necessary to achieve any particular vocational or academic goal. Such a sequence is normally required for postsecondary credentials, whether B.A. degrees, Associate degrees, or certificates in vocational programs. As a result, students who complete Associate degrees and certificate programs have generally completed coherent programs, with substantial credits in their major area, related coursework in complementary fields, and (especially for Associate degree students) a substantial amount of academic preparation (Grubb, 1987a and 1987b). However, students may interrupt these programs in several ways. The simplest is simply to drop out of higher education, in the sense of leaving postsecondary education without completing a credential; while there are many other forms of "milling around", this appears to be the most common.

---

[7] The commission reports on higher education include *To Secure the Blessings of Liberty*, American Association of State Colleges and Universities, 1986; *Integrity in the College Curriculum: A Report to the Academic Community*, Association of American Colleges, 1985; *Involvement in Learning: Realizing the Potential of American Higher Education*, Study Group on the Conditions of Excellence in American Higher Education, U.S. Department of Education, 1984; Frank Newman, *Higher Education and the American Resurgence*, Carnegie Foundation for the Advancement of Teaching, 1985; Ernest Boyer, *College: The Undergraduate Experience in America* (New York: Harper and Row, 1987).

However, it is important to recognize that this conception of dropping out assumes that *educators* should define educational programs, through the requirements they impose for degrees and certificates. Another point of view, especially common among postsecondary vocational educators, is that *students* define their own programs. Educators in community colleges and technical institutes often claim that students attend with precise goals in mind, and leave for employment after completing the coursework that they need. In these cases what appears to others as dropping out, even after a course or two, may indicate attainment of a student's goals. In essence, this view assumes that students are fully informed about their educational needs and that the educational "marketplace" requires no intervention. Defining students who have failed to complete credentials as dropouts assumes that they are poorly informed and should have the content of programs specified for them.

Still another view of non-completion is that of Manski (1988), who argues that college enrollment is an "experiment" in which students learn about crucial outcomes — including their likelihood of completion and possibly the economic consequences of completion and non-completion — that they could not have known beforehand. Then postsecondary enrollment is an investment in information; non-completion may simply mean that a student has learned that it is not to his or her advantage to continue, but the decision to learn is still optional. In contrast to the conviction among postsecondary vocational educators, this model presumes postsecondary students are initially ignorant, but learn more about likely outcomes through attendance.

Deciding which of these views is correct is crucial, because very different conceptions of success in postsecondary vocational education flow from each of them. Different implications for policy follow as well; for example, if the educational "marketplace" works quite imperfectly, and students enter and drop out without knowledge of the consequences and without formulating programs suited to their needs, then state and federal policy may need to improve the workings of this "market" rather than concentrating solely on expanding access to higher education through grants and loans. Thus one goal of this research is to evaluate the claims that even short spells in postsecondary education benefit students; in particular, the results on earnings in Chapter III will examine whether short periods of time in postsecondary education, without completing credentials, increase wage rates, earnings, or other measures of employment.

The problem of access, completion, and dropout (or attrition) has been the subject of an enormous literature (Tinto, 1986; Tinto, 1987). Much of this work has focused on four-year colleges, ignoring two-year institutions and postsecondary vocational education. Much of the research is based on records from individual institutions, rather than national data, so its generalizeability is uncertain. Rather than using truly longitudinal data, most of it depends on surveying a sample of students enrolled at one time, and then seeing whether they are still enrolled at some later time — one year later, for example. This procedure counts as dropouts those students

who transfer to other institutions, those who drop out but later return to higher education ("stopouts"), and those who have completed credentials — the latter group being potentially important in examining postsecondary vocational education with credentials (like certificates) requiring only short periods of time.

In this chapter I examine the tendency of students first to enroll in postsecondary education; then among those who have enrolled, the probabilities of completing various types of credential and the probability of leaving without completing credentials are estimated. The methods used depart from the usual procedures in several ways. The results are based on nationally-representative data, rather than institutional data; they are based on longitudinal surveys that can distinguish dropouts from students who have transferred, "stopped out", or completed credentials; and they are based on transcripts rather than student interviews, so that the problems of recall and exaggeration of educational attainment are eliminated. The data used in this chapter include High School and Beyond (HS&B), a survey of the high school class of 1980, and the National Longitudinal Study of the Class of 1972 (NLS72), which follows the high school class of 1972 (Riccobono et al., 1972; Jones et al., 1985). The availability of data for two high school classes allows me to describe trends in postsecondary enrollment, completion, and dropout. For the class of 1980, postsecondary transcripts were collected from those institutions they had attended as of 1984, providing four years of information; for the class of 1972, seven years of transcript data are available (Jones et al., 1986a and 1986b).[8] Since it is inappropriate to compare four years of postsecondary experience of one cohort with seven years of another, the solution is to examine the NLS72 seniors within four years after high school, for comparability with the HS&B cohort after four years; and also to examine the NLS72 seniors within seven years, to obtain more information about postsecondary experiences than can be captured with only four years of data.

Despite the power of these data, they also have substantial drawbacks built into their design. For this analysis, the most important is that each survey examines one cohort of students passing from high school into postsecondary education; the surveys do not, therefore, present a complete profile of all students in postsecondary institutions since they ignore older students returning to education after years of employment or homemaking. Since much of the growth in postsecondary enrollments (especially in two-year colleges and vocational programs) has come from older students, these results understate the growth of postsecondary vocational education.

---

[8] The data are both based on samples, but they are not random samples because of non-response (to both student questionnaires and requests for transcripts) and because of the two-stage sampling procedure used. To minimize the problem of non-response, all statistics are weighted by weights included as part of the NLS72 and HS&B data to compensate for both types of non-response. To compensate for the two-stage sampling procedure, which reduces the variance of all parameter estimates, standard errors are estimated by a Taylor series method. In these results I have not presented standard errors, but all comparisons made in the text are statistically significant at the 5 percent level unless otherwise noted.

In these surveys, students reported the names of the institutions they attended, and it is therefore possible to divide institutions of higher education into different types.[9] The results in this analysis distinguish several types of institutions: (1) community colleges, which are comprehensive institutions in the sense that they grant degrees in both academic and vocational subjects; (2) public technical institutes, including one- and two-year institutions and some area vocational schools, which specialize in vocational subjects; (3) private vocational schools, which tend to specialize in particular occupational areas; and (4) four-year colleges.Four-year colleges are in turn differentiated into so-called Carnegie categories (Carnegie Commission, 1973):

Research Universities I and II: These grant doctoral degrees and receive considerable amounts of federal research support. Research Universities II (like Georgia Institute of Technology and Boston University) tend to receive less support for research than Research Universities I (like the University of California at Berkeley and Harvard).

Doctoral-Granting Universities I and II: These institutions offer doctorates, but lack the research emphasis of Research Universities. Again, the distinction between a level I (institutions (like the University of California at Riverside and Notre Dame) and level II institutions (like Western Michigan University and Southern Methodist University) is primarily in the number of doctorates granted.

Comprehensive Universities I and II: These institutions may have masters' programs but lack doctoral programs; at the undergraduate level they offer a liberal arts program plus some professional programs. Comprehensive Universities I (like many and e California State University campuses and Fairleigh Dickinson) tend to have more professional programs than do Comprehensive Universities II (like Boston State College and George Peabody College), many of which are former teachers' colleges with a liberal arts program added.

Liberal Arts I: These are highly selective liberal arts colleges with few professional programs, and almost all are private; examples include Oberlin and Swarthmore.

Liberal Arts II: Again these are primarily undergraduate and liberal arts colleges, but they are not selective; most are private, and many are affiliated with some religious denomination.

Professional colleges: These typically offer specialized B.A. programs, usually for a narrow range of occupations; examples include religious colleges and colleges of design. Medical, dental, and law schools, which fall into this category, are not relevant because of the emphasis in this work on pre-graduate education.

The first section of this chapter presents enrollment rates for different types of institutions; these are simple bivariate results, with a more complex analysis of enrollment patterns postponed

---

[9] Postsecondary institutions are identified by their FICE codes. They were classified into types of institutions according to information taken from HEGIS surveys, from PSVD data, and for a few cases of inconsistent information from their names.

until Chapter Two. The second section examinees the tendencies to complete credentials and to drop out, and outlines some hypotheses about dropout rates. The third section reports the credits earned by non-completing students, as another way of judging how much postsecondary education they accumulate. The most powerful implication of these results is that, given high and increasing rates of non-completion in all of postsecondary education, it is crucial for any analysis of earnings (such as that reported in Chapter III) to consider the effects not only of credentials completed, but also of credits earned among those who fail to complete credentials.

I. Enrollments in Postsecondary Education

Tables I-1 and I-2 present enrollment rates within four years of high school graduation among high school graduates,[10] for the Class of 1972 and 1980 respectively. These results indicate that enrollment rates in higher education have been relatively stable over time: 59.2 percent of graduates from the Class of 1972 entered postsecondary education within four years of high school graduation, increasingly only slightly to 60.9 percent of the Class of 1980. However, this stability masks some important patterns. Enrollment rates increased at two-year colleges, while those at four-year colleges declined slightly. In addition, enrollment rates in technical institutes and private vocational schools increased substantially in relative terms, though these institutions are still small in absolute terms. Increases in postsecondary enrollment were especially marked among women, among students of low and middle socio-economic status, among students from vocational tracks, and among students with the lowest and the highest educational aspirations. Enrollment rates among men actually declined slightly, from 62.4 percent to 60.9 percent.

Simple bivariate analysis of these enrollment patterns indicate that enrollment rates in public two-year colleges and technical institutes tend not to vary much, or vary erratically and insignificantly,[11] by family income, parental education, overall socio-economic status, high school grades, achievement measured in high school, and amount of homework and paid employment

---

[10] In theory it is possible for those who fail to complete high school to enroll in postsecondary education, particularly in community colleges, technical institutes, and private vocational schools. However, there prove to be almost no non-graduates who enroll in postsecondary education; in addition, these longitudinal data sets do not include many non-graduates, since they first survey students in the fall of their senior year and therefore do not include the majority of high school drop-outs. For these reasons the research reported here is based on high school graduates only. The results in Tables I-1 and I-2 report enrollment rates within four years; for the Class of 1972 enrollment within seven years of high school can be calculated, and — while these rates are slightly higher than the rates within four years, especially for community colleges, technical institutes, and private vocational schools — the patterns are still the same.

[11] Since the figures in Tables I-1 and I-2 are drawn from samples, they obviously have sample variances, though these are not presented in Tables I-1 to I-4. Because of the two-stage sampling procedure in NLS72, these sample variances are calculated by a Taylor series approximation. Only statistically significant differences are mentioned in the text.

Table I-1

Probability of entering postsecondary education within four years: Class of 1972

	Community College	Tech Inst.	Pri Voc. School	4-Year College	Research: Public	Research: Private
Total	18.1%	2.9%	2.0%	36.2%	7.7%	1.2%
Male	19.1	3.2	1.5	38.6	8.7	1.4
Female	17.1	2.6	2.6	33.7	6.8	1.1
White	18.1	3.0	1.9	37.6	8.2	1.3
Black	14.6	3.2	2.8	34.9	4.2	1.3
Hispanic	26.1	2.1	0.8	21.0	2.7	0.0
Asian Am.	25.5	1.6	1.4	48.1	24.9	3.4
Native Am.	18.8	1.1	3.5	14.9	4.7	1.1
SES:						
Low	13.8	3.9	1.7	19.4	1.1	0.4
Middle	20.1	3.0	2.5	30.8	5.9	0.7
High	18.3	2.0	1.3	60.9	15.7	3.1
Test Score:						
Low	15.7	3.5	1.7	10.9	1.1	0.0
Middle	22.3	3.9	2.9	30.5	5.4	0.4
High	14.7	1.7	1.1	64.9	17.2	3.4
Track:						
Academic	17.9	2.0	1.8	61.3	13.9	2.5
General	20.8	3.3	1.7	21.9	4.5	0.4
Vocational	14.5	4.2	2.9	9.6	1.0	0.0

Table I-1 (Cont.)

	Doct. Public	Doct. Private	Comp. Public	Comp. Private	Liberal Arts I	Liberal Arts II	Prof.
Total	4.3%	1.2%	12.0%	3.9%	1.2%	2.6%	1.7%
Male	4.7	1.8	12.1	4.2	1.1	2.4	2.1
Female	4.0	0.6	12.0	3.7	1.3	2.7	1.3
White	4.6	1.3	12.0	4.1	1.3	2.7	1.8
Black	3.8	0.6	16.4	3.9	0.8	2.6	1.1
Hispanic	2.4	0.7	11.3	1.7	0.0	0.8	1.3
Asian Am.	2.9	1.1	9.8	4.0	0.4	0.0	1.5
Native Am.	2.1	2.0	3.4	0.0	0.0	1.1	0.4
SES:							
Low	2.0	0.4	8.9	2.3	0.3	1.7	0.8
Middle	3.8	0.8	11.5	3.1	0.6	2.4	1.8
High	7.4	2.7	15.8	6.9	3.1	3.7	2 3
Test scores:							
Low	0.8	0.3	5.9	1.2	0.0	1.1	0.5
Middle	4.3	0.6	11.8	3.3	0.5	2.6	1.6
High	7.4	2.7	17.8	6.9	3.3	3.4	2.3
Track:							
Academic	7.2	2.5	18.8	7.2	2.5	4.2	2.2
General	2.7	0.3	8.6	1.8	0.3	1.8	1.4
Vocational	1.3	0.2	4.3	1.0	0.0	0.5	1.2

Table I-2

Probability of entering postsecondary education within four years: Class of 1980

	Community College	Tech Inst.	Pri Voc. School	4-Year College	Research: Public	Research: Private
Total	9.4%	3.6%	2.4%	35.5%	6.7%	1.3%
Male	18.6	3.8	1.3	35.1	7.2	1.6
Female	20.2	3.4	3.4	35.9	6.1	1.0
White	19.2	3.7	2.3	36.7	7.0	1.3
Black	16.4	3.4	2.7	33.4	3.6	1.4
Hispanic	26.7	3.3	2.5	22.1	5.5	1.3
Asian Am.	23.6	0.7	1.7	45.6	14.5	2.5
Native Am.	22.9	7.8	0.2	17.8	4.1	0.0
SES:						
Low	15.9	4.2	2.5	19.7	2.5	0.4
Middle	21.4	4.1	2.8	31.4	5.4	0.9
High	19.0	2.1	1.4	59.9	13.5	3.0
Test Scores:						
Low	17.2	4.1	3.0	11.1	1.1	0.2
Middle	22.6	4.5	2.4	22.8	2.4	0.3
High	18.5	3.1	2.1	53.8	11.6	2.2
Track:						
Academic	16.8	2.0	1.5	62.9	13.5	0.4
General	21.8	3.7	1.8	23.2	3.1	2.9
Vocational	19.6	6.0	4.31	1.3	1.2	0.0

Table I-2 (Cont.)

	Doct.: Public	Doct.: Private	Comp.: Public	Comp: Private	Liberal Arts I	Liberal Arts II	Prof.
Total	4.5	1.1	12.5	3.7	1.4	2.4	1.7
Male	4.8	1.2	11.2	3.5	1.3	1.8	2.1
Female	4.2	1.0	13.7	3.8	1.5	2.8	1.3
White	4.9	1.2	12.3	3.8	1.7	2.3	1.7
Black	3.4	0.5	16.0	3.4	0.2	3.1	1.5
Hispanic	1.3	0.7	7.8	2.4	0.4	1.3	1.3
Asian Am.	2.1	0.8	17.6	3.1	1.3	0.9	2.6
Native Am.	2.9	0.0	5.7	1.8	0.2	2.6	0.0
SES:							
Low	1.7	0.5	9.6	1.6	0.2	1.9	1.1
Middle	3.7	0.9	12.8	3.2	0.6	2.1	1.4
High	8.9	2.2	15.1	6.7	4.2	3.4	3.0
Test Scores:							
Low	1.0	0.0	6.2	1.2	0.1	1.0	0.4
Middle	2.7	0.4	11.1	1.6	0.3	2.2	1.2
High	7.2	1.9	16.5	6.0	2.5	3.2	2.5
Track:							
Academic	8.2	2.0	18.1	7.0	3.3	4.5	2.7
General	2.6	0.7	11.4	2.3	0.3	1.3	1.0
Vocational	1.5	0.1	5.7	0.5	0.1	0.7	1.1

during high school; some of these results are given in Tables I-1 and I-2.[12] In addition, enrollment rates of whites and blacks in community colleges (as well as technical institutes and private vocational schools) are quite close, and Hispanics, Asian Americans, and Native Americans enroll in community colleges in greater numbers than whites. These results suggest that the claims among community colleges that they are egalitarian, in the sense that they accept all types of students, is generally valid.

In contrast, enrollment rates in four-year colleges confirm well-known patterns: Whites and Asian-Americans are more likely to attend than blacks, Hispanics, and Native Americans; the rates of enrollments as especially high for Asian Americans. Students with lower family incomes, whose parents have lower education levels, and from lower socio-economic backgrounds have lower enrollment rates; those students with higher grades, with higher levels of ability as measured by standardized tests, who did more homework and engaged in less paid employment during high school, and who were enrolled in academic rather than vocational or general tracks[13] are all more likely to enroll in four-year colleges.

These patterns are repeated for particular types of four-year colleges. The most selective colleges — the Research Universities I and II, both public and private, and Liberal Arts I institutions — have particularly sharp patterns: these institutions take most of their students from the highest SES groups, the highest groups in terms of test scores, and from academic tracks, and the racial and ethnic differences are especially large (with the exception of private research universities, where the probability of attending is roughly the same for whites, blacks, and Hispanics). At the other end, Comprehensive institutions (both public and private) and the Liberal Arts II institutions have less sharp patterns, since a somewhat higher fraction of their students come from the middle and the bottom of the SES distribution, from the middle of the distribution of high school achievement, and from the general and even the vocational tracks. In addition, the racial and ethnic differences are less severe for these institutions: blacks are somewhat more likely than whites to enroll in public Comprehensive institutions and Liberal Arts II institutions, and just as likely to enroll in private Comprehensive colleges; and the gap between white and Hispanic

---

12 If there is any pattern, it is a tendency for community colleges to enroll students from the middle of the distributions of socio-economic status and achievement. One obvious explanation is that the highest-status and the highest-performing students tend to go to four-year colleges; the lowest-status and lowest-performing students tend not to go on to postsecondary education at all. In the middle of the distributions of status and performance, then, the enrollment rates in community colleges tend to be slightly higher. However, these patterns are not particularly strong, and many of them are statistically insignificant.

13 The measure of high school track used here is the student's *self-reported* track, rather than the track as reported by the school or measured by course-taking patterns. As others have shown, self-reported track often does not agree with the track school officials report for a student, and is often poorly related to course-taking patterns because many secondary vocational students fail to take occupationally-relevant courses. Given these problems with self-reported track, it is surprising that it has so much explanatory power in these results, and it should therefore not be dismissed as an indicator of high school performance.

enrollment rates, while still substantial, is not as great in relative terms as it is for the more selective institutions. Still, there remains a large difference between the community colleges and technical institutes, for which enrollment rates are relatively uniform across different class, race, ethnic, and ability groups, and the patterns for four-year colleges.

Patterns of enrollment will be more precisely examined in Chapter II, with logit equations describing enrollment in different types of institutions. Still, basic differences in patterns of enrollment emerge even with quite simple bivariate results.

II. Completion and Dropping Out

Once an individual has entered a particular institution, there are four mutually exclusive possibilities: either the student completes a credential, transfers to another institution without completing a credential, leaves higher education without completing a credential, or is still in school when the period of observation ends (either four years or seven years after high school graduation for these two data sets). Students who attend several institutions may, at each subsequent institution, complete a credential, drop out, transfer to yet another institution, or remain in that institution until the end of the period of observation. Thus it is possible for students to wend their ways among several institutions, though finally they either complete credentials, leave without a credential, or remain in school at the end of the period of observation. Unfortunately, even with longitudinal data, information on completion is never quite complete: even with a relatively long period of observation there are individuals who are still in school at the end of the period, who can be considered neither completers nor drop-outs.

Table I-3 presents information on rates of completion and non-completion, for both the Class of 1972 and the Class of 1980, for students differentiated by the type of institution they entered. Results are presented for the Class of 1972 both after four years, for comparability with the Class of 1980, and after seven years, to take advantage of the longer period of time for which postsecondary data are available fro the NLS72 transcripts. These results confirm some well-known patterns. Students entering community colleges tended to complete Associate degrees, rather than certificates; and there were noticeable increases in vocational Associate degrees and declines in academic Associate degrees. However, the rates at which students entering community colleges transferred to four-year colleges and then completed B.A. degrees declined markedly, even during the eight-year period between these two cohorts: In the class of 1972 7.4 percent of students entering community colleges went on to complete a B.A. degree within four years, compared to half as many — 3.6 percent — in the Class of 1980. Of course, it is possible to argue that students are now progressing through postsecondary education more slowly, and that this reduction in completing B.A. degrees will over longer periods of time (e.g., over seven or ten

Table I-3

Completion and non-completion in postsecondary education: Class of 1972 and Class of 1980

	Class of 1980 (after 4 years)	Class of 1972 (after 4 years)	Class of 1972 (after 7 years)
Entered community colleges			
Completed certificate	2.7%	2.3%	2.8%
Completed vocational associate	10.8	8.5	9.2
Completed academic associate	5.7	7.5	5.3
Completed B.A.	3.6	7.4	16.9
Left without completing	48.5	30.9	44.1
Still in school	28.7	41.6	21.7
Entered public technical institutes			
Completed certificate	19.8	13.6	16.4
Completed vocational associate	17.8	13.5	15.8
Completed academic associate	0.9	2.3	2.5
Completed B.A.	0.9	1.2	3.7
Left without completion	50.2	34.5	45.6
Still in school	10.5	30.1	16.1
Entered private vocational school			
Completed certificate	23.7	24.1*	28.4
Completed vocational associate	11.3	8.1*	9.5
Completed academic associate	1.2	0.9*	0.9
Completed B.A.	0.0	0.0*	2.0
Left without completing	54.3	43.0*	49.8
Still in school	9.5	19.3*	9.5
Entered all four-year colleges			
Completed B.A.	29.4	36.4	55.1
Completed other credential	4.5	5.1	6.3
Left without completing	25.7	17.9	26.5
Still in school	40.3	40.7	12.1

	Class of 1980 (after 4 years)	Class of 1972 (after 4 years)	Class of 1972 (after 7 years)
Entered public Research I & II			
Completed B.A.	26.5	37.0	55.1
Completed other credential	2.4	4.0	5.4
Left without completing	22.6	12.6	21.3
Still in school	48.6	46.4	11.4
Entered private Research I & II			
Completed B.A.	70.2	53.0	68.3
Completed other credential	0.2	4.6	4.7
Left without completing	7.3	9.3	20.4
Still in school	22.4	33.1	6.6
Entered public Doctoral-granting I & II			
Completed B.A.	26.1	31.9	56.1
Completed other credential	4.8	3.8	5.1
Left without completion	28.9	18.0	27.2
Still in school	40.3	46.3	11.7
Entered private Doctoral-granting I & II			
Completed B.A.	38.7	49.0	60.5
Completed other credential	5.9	4.1	4.8
Left without completion	19.4	11.6	18.4
Still in school	36.0	35.4	16.2
Entered public Comprehenstve I & II			
Completed B.A.	19.6	30.0	48.1
Completed other credential	4.6	3.5	5.1
Left without completion	30.4	23.4	32.2
Still in school	45.4	43.1	14.6

	Class of 1980 (after 4 years)	Class of 1972 (after 4 years)	Class of 1972 (after 7 years)
Entered private Comprehensive I & II			
Completed B.A.	46.1	47.9	59.7
Completed other credential	3.0	6.2	6.7
Left without completion	21.3	16.2	23.9
Still in school	29.6	29.7	9.7
Entered Liberal Arts I			
Completed B.A.	52.6	52.7	67.5
Completed other credential	14.7	9.1	11.6
Left without completing	12.0	8.9	13.9
Still in school	20.7	29.3	7.0
Entered Liberal Arts II			
Completed B.A.	30.1	40.1	56.1
Completed other credential	2.8	6.2	7.3
Left without completing	32.8	19.1	27.0
Still in school	34.4	34.7	9.6
Entered professional college			
Completed B.A.	26.9	24.2	39.7
Completed other credential	9.7	14.3	13.4
Left without completion	24.3	23.7	34.6
Still in school	39.1	37.9	12.4

years) disappear as those students who did not complete a B.A. within four years manage to do so in five or seven or ten. However, this possibility seems unlikely, partly because the magnitude of this trend is so substantial. It seems more likely that, even though students may be taking longer to complete their postsecondary programs, larger rather than smaller fractions of individuals who take a relatively long time to complete credentials will drop out of postsecondary education.[14]

Other results about completion are also well-known: technical institutes and private vocational schools grant large numbers of certificates and vocational Associate degrees, but very few academic Associate degrees; and almost no students from these institutions transfer to four-year colleges and complete B.A.'s. These results indicate that the probability of completing either a certificate or a vocational Associate degree, among those entering technical institute, has *increased* over time, as has the completion of certificates among those entering private vocational schools.

The most striking pattern, however, is the high and increasing rate of non-completion (or the dropout rate) among students in community colleges, technical institutes, and private vocational schools. For the class of 1980 about half of students entering these institutions left postsecondary education without any credential within four years of graduating from high school — much higher than the dropout rate of 25.7 for four-year colleges — and these dropout rates have increased by about 50 percent for all three types of institutions.[15]

Among those students entering four-year colleges, relatively few received certificates or Associate degrees. The likelihood of obtaining B.A. degrees within four years of leaving high schools fell somewhat between the Class of 1972 and the Class of 1980, from 36.4 percent to 29.5 percent. Of course, completion rates over longer periods of time (like seven years) are substantially higher, but the decrease in completion over four years indicates that fewer students entering four-year colleges are likely to wind up completing the credential they planned to receive.[16] The drop in

---

[14]However, there are no data to calculate completion rates over longer periods of time for the Class of 1980 or any subsequent class, and therefore no data to determine whether "final" completion rates have remained the same even through short-term completion rates have declined.

[15] The results in Table I-3 indicate that dropout rates are about the same for community colleges, technical institutes, and private vocational schools. However, a problem with data collection suggests that dropout rates are probably the highest in private vocational schools. For a non-trivial number of students, requests for postsecondary transcripts were returned with an indication that the student never attended. These students, termed "out of scope", may have been exaggerating their postsecondary attendance, but another explanation is that they did attend but attended for such a short period of time that the institution never recorded their presence by generating a transcript. (No doubt the truth in somewhere in between these two extremes.) The number of "out-of-scope" students is much higher for students reporting enrollment in private vocational schools than for those in community colleges, technical institutes, or four-year colleges. If we assume that every student reported as "out-of-scope" enrolled and then dropped out before a transcript was created, then dropout rates for the Class of 1980 increase from 48.5 to 51.9 percent among those entering community colleges, from 50.2 to 53.5 percent among those entering technical institutes, from 54.3 to 61.5 percent among those entering private vocational school, and from 25.7 to 30.1 percent among students initially enrolling in four-year colleges. This pattern, suggesting the highest dropout rates from private vocational schools, also characterized the Class of 1972.

[16] Of course, the behavior of those considered "still in school" is crucial to any "final" rates of completion and dropping out. For the Class of 1972, 40.3 percent of students enrolling in four-year colleges were still enrolled at the

completion was paralleled by an increase in the likelihood of leaving higher education before completion, from 17.9 percent in the Class of 1972 to 25.7 percent in the Class of 1980. Furthermore this rate increased in every type of four-year college except private Research institutions and professional colleges, in which it remained roughly constant. To be sure, this increase was not as substantial as those for community colleges, technical institutes, and private vocational schools, but it still represents an increase of about one third in the likelihood of dropping out.

Not surprisingly there is some variation among different types of four-year colleges in the propensity to complete a B.A. and to leave without completion. Private Research institutions had the highest rates of completion and the lower rates of dropout, followed by the selective Liberal Arts I colleges. At the other end of the spectrum, public Comprehensive institutions had the lowest rates of completion for the class of 1980, and among the highest dropout rates, though public Doctoral-granting institutions and Liberal Arts II colleges also had dropout rates around 30 percent. However, no four-year college approached the high dropout rates around 50 percent typical of community colleges, technical institutes, and private vocational schools. Evidently, despite the variation among four-year colleges, there is a relatively wide gulf between the behavior of students in four-year colleges and those in other postsecondary institutions.

Another obvious pattern is that, within each type of postsecondary institution, private colleges had higher completion rates and lower dropout rates than their public counterparts. This may be a function of their greater selectivity, of course, rather than a function of the quality of the institutions itself.

The patterns of total dropout rates for different types of students are also well known (see Tinto 1986, 1987). Table I-4 presents some information on dropout rates from different types of postsecondary institutions for students in the Class of 1972. (The results for the Class of 1980 are identical, and the results for rates of completing B.A. degrees are virtually the obverse of those for dropping out.) Students from lower-income families, whose parents have lower education levels, and who are of lower socio-economic status were less likely to complete, at both two-year and

---

end of four years past high school, but only 12.1 percent were still enrolled after seven; comparing these two time periods the completion rate increased from 36.4 percent to 55.1 percent, and the dropout rate increased from 17.9 percent to 26.5 percent. This suggests that roughly 46 percent of those still in school at the end of four years then completed their B.A.,3 percent completed a different credential, 21 percent dropped out, and the other 30 percent remained in school. (Of course, these proportions are valid for groups of students entering postsecondary education but not for individuals because the group entering postsecondary education within seven years is different from — and necessarily larger than — the group entering within four years.) If these proportions were stable over time, then completion and dropout rates would follow a simple exponential model. However, there is no reason why the proportions should remain constant since there are powerful selection effects operating over time to remove both the most able (or motivated) and the least able from the sample of those remaining in school. The problem of time-varying rates of completion and dropout is best handled analytically with the technique of event history analysis, a subject for further exploration with the NLS72 data set.

Table I-4

Probability of leaving postsecondary education without a credential: Class of 1972 (after seven years)

	Entered Community College	Entered Technical Institute	Entered Pri. Voc. School	Entered 4-Year College
Total	44.1	45.6	49.8	26.5
Male	45.3	46.4	48.2	26.8
Female	43.0	44.8	50.7	26.1
White	42.4	45.1	48.8	25.2
Black	55.0	50.2	62.1	37.3
Hispanic	59.2	low n	low n	40.8
Asian American	30.3	low n	low n	12.2
Native American	26.1	low n	low n	42.5
SES:				
Low	49.8	44.2	49.7	34.8
Middle	45.1	43.4	48.4	30.2
High	37.9	54.6	55.0	20.6
Test Scores:				
Low	53.1	50.3	44.0	49.0
Middle	44.3	44.2	48.8	33.7
High	36.8	41.0	40.2	18.1
Track:				
Academic	37.4	34.9	44.4	21.8
General	47.9	46.3	51.8	36.9
Vocational	51.5	55.7	54.6	48.6

four-year colleges levels. Blacks had higher rates of dropping out than whites, no matter what type of institution they entered; Hispanics entering four-year colleges were more likely to drop out, while those entering technical institutes were less likely to drop out than whites.[17] High school performance — measured as before by grades, ability, track, homework, and paid employment — consistently influenced the likelihood of dropping out, in expected ways. Finally, in results not presented here, all groups of students experienced increased dropout rates — high ability as well as low ability students, students of high socio-economic status and well as those of lower status, those with high aspirations as well as individuals with more moderate ambitions. The increase in dropout rates was therefore real and pervasive, rather than due to changes in the composition of students in higher education. However, the increase was especially large among women in community colleges and technical institutes, among blacks in all institutions, among Hispanics in four-year colleges, among students with low aspirations, and among students of low socio-economic status and low ability.

III. Implications for the Analysis of Earnings

There are several obvious implications of the preceding results. One is that the issue of *access* to higher education, the focus of so much of state and federal policy, is at best inadequate because it fails to consider whether individuals who gain access also complete the credentials they plan to earn. A second implication, especially important for examining earnings, is that the group of individuals with "some college" is quite heterogeneous: some have completed Associate degree and certificates, while others have dropped out of a variety of institutions and have accumulated various credits. The pattern of credits earned by non-completers is described in Table I-5.[18] For example, students in the Class of 1972 initially enrolling in community colleges who dropped out earned an average of 31.1 credits including 18.7 academic credits, 10.1 vocational credits, and 2.3 credits in remedial or avocational subjects;[19] students entering technical institutes and private

---

[17] With simple controls for ability, blacks have higher dropout rates than whites from four-year colleges, but middle- and high-ability blacks have lower dropout rates from two-year colleges.

[18] The credits reported in the HS&B and NLS72 data have been corrected to conform to semester credits. Some courses — especially some vocational courses — report absurdly high numbers of credits; in these cases contact hours rather than credits seem to have been reported, and these are converted to semester credits by using generally-accepted conversion rates. For these details see the technical appendix.

[19] Many avocational and remedial courses are given on a non-credit basis, and therefore the count of credits in these areas understates the number of courses taken. As benchmarks, students completing vocational Associate degrees in the Class of 1980 earned an average of 71.8 credits, including 39.7 in vocational subjects and 28 in academic areas; students earning academic Associate degrees earned an average of 76 credits, including 57.9 in academic subjects and 13.6 in vocational areas; and students completing certificates accumulated 39.3 credits on the average, the majority

Table I-5
Credits Received by Non Completers

	Average credits	Average vocational credits	Average academic credits	Percent with 0-6 credits, 1 voc. area	Percent with 0-6 credits, 1 ac. area	Percent with over 18 credits, 1 voc. area	Percent with over 18 credits, 1 ac. area
Class of 1972							
Students entering two-year colleges:	31.1	10.1	18.7	57.9	45.3	11.3	10.3
Students entering technical institutes:	33.9	21.8	9.9	34.1	66.9	36.7	4.4
Students entering private vocational schools:	37.0	25.1	10.8	30.9	64.1	42.3	9.2
Students entering four-year colleges:	53.5	13.9	37.3	57.7	22.3	16.6	29.3

vocational schools but dropping out earned about the same total numbers of credits, but weighted more toward vocational credits; and those entering four-year colleges but leaving before completion earned substantially more credits — about 54 — weighted toward academic rather than vocational subjects.

What is perhaps more striking is that very few of these dropouts managed to earn substantial numbers of credits in any particular area of the curriculum. Of students entering community colleges but dropping out, only 11.3 percent managed to accumulate at least 18 credits in any vocational field, and another 10.3 percent earned 18 credits or more in some academic subject. The comparable figure for students entering other types of institutions are somewhat different, and dropouts who entered technical institutes were especially likely to complete 18 or more credits in a vocational field, and dropouts who had entered four-year colleges were more likely to complete 18 or more credits in an academic subject. Still, the unavoidable conclusion is that many individuals who enroll in postsecondary but fail to complete credentials earn relatively few credits, and most of them have failed to accumulate substantial numbers of credits in any one field of study.

As a result it will be necessary, when examining earnings in Chapter III, to consider the varying numbers of credits earned by non-completers. If the claims of some educators — particularly those in community colleges — that individuals enroll in a few courses closely related to their occupations and to advancement are correct, then we should expect to see substantial returns to even small numbers of credits, and even non-completers should prove to benefit from their time in higher education. If, on the other hand, many students enroll without any clear idea of the educational requirements of jobs they want to enter — if they are poorly informed about occupations and their education requirements, or if they are "experimenters" gathering information about their options — then the relatively small numbers of credits earned by non-completers should have virtually no economic consequences.

— 25.7 — in vocational subjects (Grubb, 1987a and 1987b).

Chapter Two

THE CAUSES OF ENROLLMENT IN POSTSECONDARY EDUCATION

The expansion of choice in postsecondary education has made decisions about enrollment increasingly complex. In contrast to the situation three or four decades ago, graduating seniors now face a broader array of institutions — including many more two-year as well as four-year colleges, a larger number of four-year colleges with the expansion of public systems of higher education, more technical institutes, private vocational schools, and other specialized institutions of postsecondary education. The expansion of federal aid has made access to postsecondary education much more widely available, and — as the evidence in the previous chapter indicated — increased enrollments in higher education have been greatest among those groups of students who traditionally have had relatively low enrollment rates, including women, students with lower performance during high school, students from vocational and general tracks, and lower class (or lower SES) students. For these students, postsecondary education has become a reasonable option.

Furthermore, as the results in the next chapter will clarify, decisions about postsecondary education are crucial to adult outcomes. Despite the persistent leitmotif that "college is not for everyone" (e.g., Bird, 1975), the value of a B.A. degree — for both its economic benefits to the individual as well as its effects on political and social participation — is substantial. Certain sub-B.A. credentials — particularly the vocational Associate, at least in some fields, and some certificates for women — provide access to higher wages and earnings, though the effects are indirect. Other forms of postsecondary education — particularly the programs of non-completers — have very few consistent benefits, though here too there are exceptions. The benefits to higher education are not uniform, then; decisions about which types of institutions and which fields of study to enter are crucial, as are decisions about completing programs of study rather than dropping out.

In this chapter I develop a model of enrollment in postsecondary education and then estimate the model with data from the National Longitudinal Study of the Class of 1972 (NLS72). The model encompasses more types of variables than those which have been used in the past. The NLS72 data are also richer and contain a greater variety of variables, so that it is possible to examine not only the effects of high school performance and family background, which have dominated previous efforts to analyze enrollment patterns, but also the effects of labor markets, the availability of places in postsecondary institutions and other structural aspects of a state's higher education system, and subtle aspects of an individual's personality and perception of his or her

ability. Furthermore, the NLS72 data allow me to examine the probability of enrolling in different types of institutions including community colleges, technical institutes, private vocational schools, and four-year colleges (in section III); four-year colleges in turn can be more finely described in terms of Carnegie classifications (in Section IV). In contrast, most previous research has examined only enrollment in four-year colleges.[20] The result is a more detailed examination of enrollment in different types of institutions, and of the causes of this enrollment, than has been available.

I. A Model of Enrollment

There have been two or three different traditions in the efforts to analyze postsecondary enrollment. The earliest models of economists posed higher education as a kind of consumer good, and stressed the effects of income and price — that is, parental income and tuition — on the decision to enroll (e.g., Campbell and Siegel, 1967; Galper and Dunn, 1969; Jackson and Weathersby 1975). A more sophisticated approach within the human capital framework has recognized that college is not merely a consumption good but an investment good as well, and that labor market consequences of higher education may also affect enrollment. Despite the prominence of human capital theory, very few analyses have managed to incorporate labor market conditions, although Mattila (1982) confirmed a significant positive effect of the rate of return to schooling on enrollment and Bishop (1977) found a small enrollment response to the expected college payoff.

A very different approach, in spirit if not in practice, has stressed postsecondary enrollment not as an economically rational decision but more as a social and institutional decision. This approach has stressed the influence of high school performance and ability (since access to college is presumably competitive) and family background including socio-economic status and parental education as well as income (e.g., Christensen et al., 1975; Corrazini, 1972; Freeman 1975; Kohn et al, 1976; Hoenack and Weiler 1979; Feldman and Hoenack 1969; Manski and Wise 1983). Although the causal mechanism by which family background leads to a higher probability of enrollment is sometimes left unclear, higher status families can better afford postsecondary education for their children (a simple income effect), provide them with models of college-going and information about the benefits of college, may be more likely to pressure their children toward college, and may induce them to be more future-oriented and therefore to postpone immediate

[20] However, Lehr and Newton (1978) examined community college enrollments in Oregon; Corman and Davidson (1984) examined the variation across states of enrollment rates in two-year colleges, four-year colleges, and postsecondary vocational schools; Sulock (1982) analyzed enrollment in a sample of community colleges; and I analyzed enrollment in public community colleges (Grubb 1988), again by examining variation across states.

employment opportunities for college and future earnings gains.[21] In addition, race and ethnicity have been of interest, because of concern that minority students have been under-represented in higher education; and gender has been important because historically women continued to postsecondary education in smaller numbers than men, and faced weaker economic incentives to do so. There is, then, general agreement about the kinds of variables which should be included in any analysis of postsecondary enrollment, though different analytic traditions have stressed different classes of variables and the causal mechanisms have often been left vague.

A relatively simple and intuitively appealing model of enrollment decisions can encompass all of the variables which previous work has considered, as well as suggesting a role for some variables which are generally ignored. If we assume that students choose the best of the postsecondary enrollment alternatives available to them (including the option of not enrolling), contingent on being accepted, then we need to define how students might define "best", and to do so in a way that could encompass a variety of both economic and non-economic motives, benefits, and costs. This approach, following Kohn, Manski, and Mundel (1976) and Manski and Wise (1983), assumes that the student faces a number of postsecondary alternatives; these include non-enrollment and employment, community college, a technical institutes, a private vocational school, or a four-year college (further differentiated into different types).[22] Then a particular alternative, call it the ith alternative, is chosen if the *expected* value V^*_i of this alternative is greater than the expected value of any other alternative, or

$$V^*_i > V^*_j \quad \text{for all } j \neq i \tag{1}$$

If it were important to consider the acceptance process as well[23] then the value of the ith alternative is actually $V^*_i A_i$, where A is a binary variable taking the value of one if a person is accepted to the ith institution and zero otherwise. The acceptance variable A varies in obvious ways across postsecondary alternatives; A for four-year colleges is a function of high school performance; A for community colleges and most technical institutes is equal to one (though a few technical institutes have competitive admissions); and A for military training is a function of skills as measured by the Armed Forces Qualifying Test. Then the ith alternative is chosen if

---

[21] In the model of Rosen and Willis (1978), students maximize the present value of earnings. The effects of SES and achievement enter the model by affecting the discount rate; that is, students of higher SES and those of greater achievement are assumed to have lower discount rates. In the end the discount rate enters the model in linear form, so that SES and achievement are present in the estimated equations as they would be if a different role of family background and achievement had been postulated.

[22] Enlistment in the military might also have been considered an option, but has not been included in this analysis.

[23] Kohn, Manski, and Mundel (1976) stress that the maximizing decision of students is contingent on acceptance; Manski and Wise (1983) model the process of college selection as a series of discrete steps — the decision to apply, the acceptance decision by the college itself, and the decision where to enroll given acceptances.

$$V^*_i A_i > V^*_j A_j \text{ for all } j \neq i \quad (2)$$

However, given the finding of Manski and Wise (1983) that 89 percent of students applying to four-year schools get into their first choice, the acceptance process appears to be of very little importance in the process of deciding among postsecondary alternatives, and I do not separately model this process. In effect, the model presented in the section and the empirical equations of the next section are reduced-form equations where the decisions of where to apply and the acceptance decisions are conflated. Given the Manski and Wise findings, it is clear that most of the variation in enrollment rates comes from the student's decisions rather than the colleges' acceptance process.

For any postsecondary institution the value a student places on going is assumed to depend on both the earnings effects of going and on the non-economic value — the consumption value, so to speak — of attending. More precisely,

$$V_i = P_i \left(\sum Y_{c,i,t}/(1+r)^t + U_{c,i}\right) + (1 - P_i)\left(\sum Y_{d,i,t}/(1+r)^t + U_{d,i}\right) - P_i C_{i,c} - (1 - P_i) C_{i,d} \quad (3)$$

where P_i is the probability of completing the ith institution; $Y_{c,i,t}$ are the earnings associated with completing the ith institution for the years $t = 1$ to some time horizon; $Y_{d,i,t}$ are the earnings associated with enrolling in the institution but dropping out before completion; r is a discount rate, assumed to be subjective and to vary among individuals; $U_{c,i}$ and $U_{d,i}$ reflect the non-economic value associated with completion and dropping out respectively; and $C_{i,c}$ and $C_{i,d}$ represent the costs of completion and of enrolling but dropping out. In this model, the economic value of enrollment is crucially dependent on the probability of completion P_i, since if $Y_{c,i,t} >> Y_{d,i,t}$ only those students with relatively high probabilities of completion will attend. The non-economic value of attending also depends on the probability of completion; but in addition it is important to note that $U_{c,i}$ and $U_{d,i}$ may be either positive — for those students who enjoy postsecondary education, for whom student life and the "moratorium" afforded by college are attractive — or negative, for those students who, either because of temperament or family background, find student life foreign, hostile, or irrelevant to their needs. The costs can be further decomposed into

$$C_i = T_i - G_i + L_i + F_i - W_i \quad (4)$$

where T=tuition, G=grants, L=living expenses above the ordinary (including books and materials, fees, and any extra costs associated with student life and culture), F is an effort variable describing how hard it is to gain access to postsecondary education and to complete, and W=wages while

working in college. (These costs could also be expressed in present value form, though over the relatively short period of time these costs are incurred the discount rate will make relatively little difference, at least compared to its effect on the valuation of earnings streams.) Combining (2) and (3) yields

$$V_i = P_i \sum Y_{c,i,t}/(1+r)^t + U_{c,i} + (1 - P_i) \sum Y_{d,i,t}/(1+r)^t + U_{d,i} - P_i (T_{i,c} - G_{i,c} + L_{i,c} + F_{i,c} - W_{i,c}) - (1 - P_i) (T_{i,d} - G_{i,d} + L_{i,d} + F_{i,d} - W_{i,d}) \quad (4)$$

One particular alternative, of course, is the decision not to enroll in postsecondary education at all. The value of this alternative is simply the present value of the associated stream of earnings plus any non-pecuniary value an individual may receive from working rather than going to school, or

$$V_w = \sum Y_{w,t}/(1+r)^t + U_w \quad (5)$$

where w designates working after high school graduation and $Y_{w,t}$ represents the earnings of those with high school diplomas only. In practice Y_w for the first few years after high school will be equal to W, the wages of students who work during education, clarifying that such wages can have two quite different effects: they represent an opportunity cost of enrolling in postsecondary education, and will tend to reduce the likelihood of enrollment for individuals for whom $V_w > V_i$; and they reduce the costs of higher education and may therefore increase the probability of enrolling.

What counts in the student's decision to enroll is not the actual value of any particular alternative, but the *expected* value V^*_i, where asterisks denote expected values. This will then be a function of the expected probability of completion P^*_i rather than P_i, the expected utility associated with postsecondary education $U^*_{c,i}$ and $U^*_{d,i}$, the expected effort $F^*_{c,i}$ and $F^*_{d,i}$, and the expected or projected earnings from completing versus dropping out $Y^*_{c,i,t}$ and $Y^*_{d,i,t}$. In addition the discount rate r affects the value of each alternative. Since the expected values of these variables and the discount rate are subjective, they may be formed in several different ways. If students are well-informed, they may base their estimates of Y^*_i on current labor market conditions, their estimates of P^*_i on observations of how students like themselves succeed in postsecondary education, and their estimates of U^*_i and F^*_i on knowledge about how they function in educational institutions. If they approach the enrollment decision in a less informed way, then these expected values may come from a variety of different sources. For example, the subjective estimate of P^*_i may be affected by parental and teacher (or counselor) exhortations rather than evidence about completion

rates — which is very difficult to collect and often not made public. Parental and school influences may be class-linked if parents and teachers of upper-class students exhort them to continue to college while parents and teachers of lower-class students stress the difficulties of postsecondary education, or they may be linked to indicators of ability when high-performing students are assured that college will be easy for them. Familiarity with college may influence subjective estimates of U^*_i and F^*_i, and so students whose parents have gone to college may have different assessments of these crucial variables than those with no direct experience within their families of college-going.

Thus the shift from basing decisions on actual values of variables, as equation (4) implies, to relying on expected values clarifies that a variety of variables describing family background, ability, and other student characteristics will affect enrollment decisions, not necessarily through the acceptance process but through the student's subjective evaluation of postsecondary alternatives. Unfortunately, this also means that many independent variables — particularly those describing family background and ability (or achievement) have multiple influences on the enrollment decision, and in the absence of direct observation of such variables as U_i and F_i it becomes impossible to disentangle the multiple effects of such complex variables.

Because the individual's decision as described in equation (1) or (2) above requires assessing the value of all alternatives, the decision to choose a particular postsecondary option is a function of not only the probability of completion, earnings, non-economic consequences, costs, and effort required of the alternative chosen, but also those of every other alternative. That is, the system of comparisons implied in equation (1) or (2) involves every variables in the entire system. For example, the probability of enrolling in a community college is a positive function of the earnings associated with completion but an negative function of the earnings associated with both completion of four-year college programs and those associated with working right after high school $Y_{w,t}$ — the opportunity cost of any form of postsecondary education. Thus the probability that an individual will choose any particular alternative is a function of not only the benefits (including both earnings and the consumption value) and the costs (including both direct costs and subjective difficulty) of that alternative, but the costs and benefits of every other alternative as well.

II. Operationalizing the Model

The variables which enter the model of the previous section are in most cases not observed, particularly in shifting from actual values of these variables to expected values. It is therefore necessary to devise empirical counterparts or proxies for these variables. In the NLS72 data used to estimate this model, a large number of independent variables are available, including some

which provide direct observations of P^*_i, the subjective assessment of whether an individual will complete postsecondary program or not. In addition, the NLS72 data includes the state of each respondent, and therefore variables describing labor market conditions and postsecondary institutional characteristics in the different states[24] can be included.

In this analysis, the probabilities of enrolling in different postsecondary institutions are all measured relative to the probability of not continuing in postsecondary education at all; thus the dependent variables include the probability of continuing to a community college pr(CC) rather than remaining a high school graduate, the probability of entering a technical institute pr(TI), the probability of enrolling in a private vocational school pr(PRI), and the probability of enrolling in a four-year college pr(4YR). In addition, the probability of attending a four-year college is further differentiated into the probabilities of attending the following types of institutions described by their Carnegie classifications: public Research I & II; private Research I and II; public Doctoral-Granting I and II; private Doctoral-Granting I and II; public Comprehensive I and II; private Comprehensive I and II; Liberal Arts I; and Liberal Arts II. Differentiating enrollment this finely will allow us to see whether the enrollment patterns evident in Chapter I (in Table I-1) can be more precisely described with multivariate analysis.

The independent variables used, the counterparts to the variables of the previous section, are as follows:

Family background: Family background can conceivably influence many of the variables in the model of the previous section, especially the subjective estimates of the probability of completing P^*_i, the intrinsic value of college U^*_i, the difficulty of getting through college, and the discount rate. The following variables measure the effects of family background:

PARED1: equals one if the highest level of parent's education was less than high school.

PARED2: equals one if the highest level of parent's education was some college.

PARED3: equals one if the highest level of parent's education was a B.A. degree.

PARED4: equals one if the highest level of parent's education was a graduate degree.

SES: a composite measure of socio-economic status, a weighted sum of father and mother's education, father's occupation, family income, and the presence in the household of specific items like encyclopedias and appliances.

---

[24] Obviously states are not necessarily the best unit to describe variations in labor market conditions, especially for large states like Texas and California with considerable internal variation. However, individuals who continue to postsecondary education are often thought to operate in regional rather than purely local labor markets, and so from this vantage states may be more appropriate units of analysis than local labor markets.

DEPENS: the number of individuals dependent on the individual's parents. The higher the number of dependents, the lower the resources available for college and the lower enrollment rates might be.

Race and ethnicity

These variable measure other aspects of family background. They also may reflect patterns of discrimination for or against minority students, or unmeasured aspects of the quality of high school education. The variables include binary variables for individuals who are black, Hispanic (HISP), Asian-American (ASIAN), and Native American (NATAM); the reference group is includes whites.

High school achievement and other experiences

Again, achievement during high school is related to several of the variables in the enrollment model. The measures include:

HSGRADE1: equals one if a student's high school grades were A's.

HSGRADE2: equals one if a student's high school grades were A's and Bs.

HSGRADE3: equals one if a student's high school grades were B's.

HSGRADE4: equals one if a student's high school grades were C's.

HSGRADE5: equals one if a student's high school grades were D's.

MDGRADE: equals one for those for whom data on high school grades are missing, who are otherwise included in the reference group of those with grades of B's and C's.

TESTCOMP: a composite achievement test administered to all NLS72 seniors, including sections on vocabulary, reading, letter groups, and mathematics.

EXTRACUR: a scale from zero to 24 based on the number of extracurricular activities in which a student participated and the intensity of participation.[25] If colleges reward extracurricular activities in their admissions process, then this would affect admissions variables A_i. However, this variable may also be a partial proxy for family background and ability, because students who participate in extracurricular activities tend to be those who perform well and come from higher-status families, and it may be a proxy for certain personality traits like extroversion.

HSEMP1: equals one if an individual did not work during high school. Work during high school may be a substitute for educational achievement, though small amounts of employment have been found to reinforce high school completion (Greenberger and Steinberg, 1986).

HSEMP2: equals one if an individuals worked less than 10 hours per week.

---

[25] For each of eight categories of extracurricular activities, individuals were given a one if they reported participating, a two if they reported frequent participation, and a three if they were an officer, captain, or other leader.

HSEMP3: equals one if an individuals worked 20 to 30 hours per week.

HSEMP4: equals one if an individuals worked over 30 hours per week.

WRKEXP: equals one for those who reported that they were in a formal work experience program. As for employment during high school, work experience programs are intended to increase a student's chances of completing, but they may also compete with academic coursework.

HSEOP: equals one for those who reporting participating in a Talent Search or Upward Bound program, both intended to enhance the ability of disadvantaged youth to complete high school and continue to postsecondary education.

GENTRCK: equals one for those who report they were in the general track.

VOCTRCK: equals one for those who reported they were in the vocational track.

HSAG: number of units of agriculture course. The variables GENTRCK and VOCTRCK are subject to measurement error because there are inconsistencies between the student's report of track and the school's report (Meyer, 1981). Inclusion of these school-reported counts of actual vocational courses taken is an effort to compensate for this error.

HSBUS: number of units of business courses.

HSDE: number of units of distributive education (i.e., marketing and retailing).

HSHLTH: number of units of health-related courses.

HSHMEC: number of units in home economics.

HSTI: number of units in trades and industry courses.

PRIHS: equals one if a student's high school was private. This variable may reflect differences in quality, as well as differences in the orientation of private versus public high schools towards postsecondary enrollment.

AREAVOC: equals one if a student's high school was an area vocational school. Again, while this variable may capture some aspects of quality, area vocational schools may also be less clearly oriented toward preparing students for college enrollment, or may lead them to enroll in postsecondary vocational institutions (like technical institutes) rather than academic institutions.

*Measures of P**

To be sure, many variables may influence a student's estimate of his or her probability of completing any particular postsecondary program, P^*_i, including measures of family background and those measuring school performance. However, there are also several more direct measures in the NLS72 data of this subjective assessment, which figures prominently in the model of the previous section. These include the following:

PSABIL1: equals one for individuals who say they will be able to complete college.

PSABIL2: equals one for individuals who say they are "not sure" if they can complete college.

PSABIL3: equals one for individuals who say they doubt they can complete college.

PSABIL4: equals one for individuals who say they would not be able to complete college.

MDPSABIL: equals one for those who have missing data for this variable, otherwise included in the reference group for this variable which includes those who say they are "probably" able to complete college.

PSDOUBT1: equals one for those students who would like to attend a two-year college or vocational program but who report in high school that they plan to attain only a high school diploma or less. This variable and the following one express a gap between educational aspirations and expectations.

PSDOUBT2: equals one for those students who would like to complete a B.A. or higher degree but report in high school that they plan to attain an Associate degree or less.

LOCON: a measure of locus of control, or the tendency to view events as under the control of the individual rather than due to fate or external circumstances. An individual with a higher score on the locus of control scale will be more likely to view the course of postsecondary education, including completion, as under his or her control, and should be more likely to consider P* high.

SLFCON: a measure of self-confidence. As with LOCON, a person with a high score on this measure should have a higher estimate of the likelihood of postsecondary completion.

One other psychological variable is included: WRKVAL, related not to P* but to the value an individual places on work and earnings. Those with higher values for this variable might attach a greater value to those postsecondary options which increase occupational success.

Labor market variables

The following labor market variables are measured at the state level; they are all taken from the 1970 Census, and so measure labor market conditions in 1970 and earnings in 1969. Those denoted M or F are measured separately for males and females.

ROR13 (M,F): a measure of the rate of return to 1 to 3 years of college, defined as the ratio of average earnings for those with 1-3 years of college to average earnings of high school graduates.

RORCOL (M,F): a measure of the rate of return to college, defined as the ratio of average earnings for those with 4 years of college to average earnings of high school graduates.

Y1824 (M,F): the average earnings of those 18 to 24, the opportunity cost of attending college (or W in the model of the previous section).

UE: the overall unemployment rate. Normally this is considered component of the opportunity cost of attending school, since a higher unemployment rate reduces the likelihood of being employed if an individual decides not to attend school; thus higher unemployment rates

should increase postsecondary enrollments However, if students can combine schooling and work — as almost all of them now do (Grubb, 1989) — and rely on earnings to stay in school, then higher unemployment rates may reduce their earnings (as indicated by W_i in the model of the previous section) and their ability to enroll.

PROF (M,F): the proportion of the labor force which is professional. The higher the fraction of occupations which are professional the greater the incentive to enroll in those postsecondary institutions — primarily four-year colleges — which prepare for professions.

PROFGRO: the growth rate of professional occupations between 1970 and 1980. Again, incentives to continue to higher education are stronger in states with higher rates of growth in professional occupations.

FPART (F): the female labor force participation rate. The earnings advantages associated with continuing to college are higher if women work, and so postsecondary enrollments should be higher in states with higher female labor force participation rates.

The structure of postsecondary education

One element in the decision to enroll in postsecondary education is the cost of attending. This in turn includes both financial costs — especially tuition and fees — and non-pecuniary costs, especially the access costs that are thought to be especially important for low- and moderate-income students, and for those who choose local "commuter" schools — community colleges, technical institutes, private vocational schools, and some branches of state college systems which draw almost entirely from local populations. These costs are affected by many different aspects of a state's postsecondary system; the variables which have been included are the following:

TUICC: tuition in community college.

TUIPUB: average tuition in public four-year colleges in the state.

TUIPRI: average tuition in private four-year colleges within the state.

The effects of tuition on different probabilities of enrollment will capture both own-price and cross-price effects.

PUB2YR: the relative size of the public two-year college sector, measured as enrollments in two-year institutions (including public technical institutes) divided by the population aged 18 to 30. Where this ratio is high, access to two-year institutions will be easier and enrollment rates should be higher.

PUB4YR: the relative size of the public four-year college sector, measured as enrollments in four-year institutions divided by the population aged 18 to 30. The higher this ratio, the easier the access to four-year college. This can also be viewed as reflecting higher acceptance ratios A_i for public four-year colleges.

VOCED: the fraction of Associate degrees awarded in the state that were in vocational (as distinct from academic) fields of study. This is an effort to portray state two-year college systems as essentially vocational versus transfer-oriented. If students view the two-year college as a route to the B.A. degree, then they will be more likely to enroll in two-year colleges in states where VOCED is low. If they view the institution as a terminal vocational institution, then they will be more likely to enroll where VOCED is high. The effect of VOCED is crucial to the argument, made by Brint and Karabel (forthcoming) and others, that community colleges have vocationalized as a way of attracting enrollments.

The effect of a state's postsecondary education structure on enrollment rates is not simply an issue of describing enrollment patterns as accurately as possible. Many political and policy debates about two-year colleges have turned on whether community colleges increase access to higher education to students who otherwise would not continue past high school, or whether they enroll students who would otherwise enroll in four-year colleges and have a greater chance of receiving a B.A. degree. Of course, both these effects may occur simultaneously, and in this case a judgement about the value of the community college depends on the relative strength of the two effects. In a previous analysis using states as the units of analysis (Grubb, 1989), I showed that both effects do in fact occur, but the data were not powerful enough to indicate whether one effect dominated the other. The inclusion of variables describing the structure of postsecondary education in equations describing the enrollment probabilities of *individuals* provides another opportunity to test the relative strength of these competing hypotheses.

In addition, a state variable — PCTRUR, the proportion of the population living in rural areas, taken from the 1970 Census — is included as a measure of access costs, since most educational institutions are located in urban areas and access may be more difficult (and enrollment rates lower) in rural states.

III. Initial Results

Because the dependent variables describing enrollments in postsecondary education are binary variables, ordinary least squares estimates are inefficient, and also theoretically awkward because they may predict probabilities lower than zero and higher than one. The solution is to use a logit formulation, where the dependent variable is log(p/(1-p)) as a linear function of the independent variables. While logit estimates are time-consuming, because they require the use of

maximum-likelihood techniques, and awkward to interpret because of the non-linear form of the equation,[26] they are both theoretically and statistically preferable (Pindyck and Rubinfeld, 1983).

Tables II-1 and II-2 present the parameters of logit equations for Pr(CC), pr(TI), pr(PRI), and pr(4YR).[27] These equations are estimated separately for men and women because historically the motives for attending postsecondary education and the patterns of attendance for women have been very different from those of men. In addition, the reactions of women to labor market conditions are likely to be quite different.

Many of these results confirm well-known patterns, or patterns which are obvious even from the simple cross-tabulations in Table I-1. For example, parental education does have a significant effect on the probability of entering a community college, among both men and women, but the effects are smaller than they are for the probability of entering a four-year college. Similarly, the effect of SES on pr(CC) is two-thirds the effect on pr(4YR) for men and one-half the effect for women. (In general, the effects of family background are similar for men and women, though the effects are somewhat larger for women than they are for men.) Not surprisingly, the effects of parental education and SES on pr(TI) are insignificant (except for the highest education group). Surprisingly, given the claims of the private vocational schools that they enroll the most disadvantaged individuals, both parental education above the average and SES affect the probability of enrolling in private vocational schools. It may be that patterns of enrollment for the relatively young students included in the NLS72 sample are considerably different than for the majority of students in private vocational school, who tend to be much older. In fact, other evidence suggests that many of the private vocational schools in the NLS72 sample are business schools, rather than trade and cosmetology schools, and it appears that these private schools attract a higher status, better-prepared group of students than private schools as a whole do.

The remaining family characteristic, DEPENS, significantly affects only the probability of enrolling in a four-year college, and does so for both men and women.

---

[26] To help in the interpretation of these coefficients, if $\log p/(1-p) = a + bX + \ldots$, then $dp = bp(1-p)dX$. Obviously this increase in the probability of attendance varies as p varies, and is greatest when p=.5. One way to interpret these effects, then, is to calculate dp at the mean value for p, given in Tables II-1 and II-2; most of the variables are binary, so dX=1.

[27] These are bivariate logit equations, each estimated independently of the other. Multinomial logit estimates, in which the four equations are estimated simultaneously, would be somewhat more efficient, but the number of parameters included in each equation is too large for the software used in this analysis — LIMDEP — to estimate multinomial logit parameters. The standard errors presented in Tables II-1 and II-2 are the conventional asymptotic standard errors estimated by the maximum likelihood procedure, with no special effort to compensate for the two-stage sampling procedure used in collecting the NLS72 data. To my knowledge, no one has investigated alternative methods of calculating standard errors for logit parameters, though jackknife techniques like Balanced Repeated Replication, used in Chapter III, would be appropriate. Given the findings, presented in the technical appendix, that true standard errors for OLS regression coefficients average about 1.54 times conventional standard errors, parameters which are of borderline significance should be interpreted with caution.

Table II-1
Logit Equations for Enrollment in Postsecondary Education: Males

	pr(CC)	pr(TI)	pr(PRI)	pr(4YR)
Family background				
PARED 1	**-.017** (.126)	**.211** (.216)		**.064** (.146)
PARED 2	**.373** (.115)	**.258** (.211)		**.345** (.131)
PARED 3	**.527** (.167)	**.337** (.309)		**.670** (.193)
PARED 4	**.685** (.240)	**.812** (1.398)		**.846** (.264)
SES	**.347** (.108)	**.082** (.193)		**.558** (.124)
DEPENS	**.007** (.023)	**-.061** (.041)		**-.070** (.028)
BLACK	**-.293** (.174)	**.199** (.291)		**.889** (.182)
HISP	**.140** (.192)	**-.573** (.431)		**.186** (.233)
ASIAN	**.106** (.582)	**-.262** (1.15)		**1.62** (.569)
NATAM	**-.503** (.357)	**-.694** (.716)		**-.149** (.453)
High school experiences				
HS GRADE1	**.751** (.269)	**.629** (.484)		**1.38** (.253)
HS GRADE2	**-.099** (.151)	**-.293** (.291)		**.895** (.146)

	pr(CC)	pr(TI)	pr(PRI)	pr(4YR)
HS GRADE3	**.142** (.116)	**.167** (.204)		**.547** (.125)
HS GRADE4	**-.236** (.108)	**-.194** (.191)		**-.295** (.134)
HS GRADE5	**-.299** (.143)	**-.612** (.294)		**-.295** (.134)
MDGRADE	**.281** (.791)	**1.17** (.775)		**-.556** (.202)
TESTCOMP	**.0022** (.0007)	**.0033** (.0011)		**.0035** (.0008)
EXTRACUR	**.057** (.024)	**-.079** (.048)		**.158** (.026)
HSEMP1	**-.154** (.128)	**-.316** (.225)		**.058** (.138)
HSEMP2	**-.042** (.123)	**-.416** (.230)		**.050** (.142)
HSEMP3	**-.104** (.120)	**-.067** (.201)		**.046** (.139)
HSEMP4	**-.406** (.131)	**-.836** (.252)		**-.281** (.154)
WRKEXP	**-.229** (.09)	**.096** (.192)		**.365** (.139)
HSEOP	**.030** (.265)	**.588** (.392)		**.048** (.333)
GENTRCK	**-.715** (.103)	**-.506** (.190)		**-1.13** (.110)
VOCTRCK	**-.870** (.122)	**-.251** (.213)		**-1.54** (.144)
HSAG	**.011** (276)	**-.011** (.045)		**-.063** (.036)

	pr(CC)	pr(TI)	pr(PRI)	pr(4YR)
HSBUS	**-.223** (.071)	**.036** (.133)		**.061** (.077)
HSDE	**.066** (.048)	**.056** (.072)		**.031** (.077)
HSHLTH	**.086** (.114)	**.263** (.184)		**.310** (.114)
HSHMEC	**.033** (.067)	**.130** (.100)		**-.133** (.091)
HSTI	**-.020** (.012)	**-.070** (.327)		**-.061** (.185)
AREAVOC	**-.246** (.239)	**-.592** (.492)		**.232** (.245)
PRIHS	-.314 (.214)	.195 (.327)		.877 (.185)
Measures of P*				
PSABIL1	**.212** (.108)	**-.188** (.205)		**.427** (.122)
PSABIL2	**-.459** (.120)	**-.369** (.205)		**-.402** (.150)
PSABIL3	**-1.11** (.228)	**-.925** (.391)		**-.729** (.270)
PSABIL4	**-.939** (.280)	**-2.87** (1.19)		**.2.16** (.555)
MDPSABIL	**-.980** (.204)	**-1.01** (.343)		**-1.14** (.236)
PSDOUBT1	**-.653** (.183)	**.191** (.254)		**-1.95** (.338)
PSDOUBT2	**.051** (.126)	**.238** (.230)		**-1.42** (.196)
LOCON	**.251** (.060)	**.033** (.104)		**.346** (.072)

	pr(CC)	pr(TI)	pr(PRI)	pr(4YR)
SLFCON	**.203** (.066)	**.032** (.121)		**.130** (.077)
WRKVAL	**-.062** (.089)	**-.317** (.156)		**-.090** (.110)
Labor Market Variables				
ROR13(M)	**-1.94** (1.88)	**.845** (2.62)		**3.32** (2.04)
RORC (M)	**1.77** (.953)	**-.761** (1.61)		**.103** (1.08)
Y1824(M)	**.0007** (.0002)	**-.00065** (.00027)		**.00034** (.00020)
UE	**-.258** (.062)	**-.011** (.102)		**-.160** (.073)
PROF (M)	**-.128** (.038)	**-.122** (.057)		**-.072** (.048)
PROF GRO	**.446** (.258)	**-.438** (.271)		**-.191** (.323)
Postsecondary structure				
TUICC	**.571** (.578)	**.325** (.765)		**.508** (.596)
TUIPUB	**-.125** (.263)	**-.391** (.355)		**-2.21** (.318)
TUIPRI	**-.366** (.189)	**-.266** (.276)		**-.490** (.199)
PUB2YR	**40.5** (4.34)	**-3.57** (5.63)		**7.90** (4.88)

	pr(CC)	pr(TI)	pr(PRI)	pr(4YR)
PUB4YR	**10.1**	**7.93**		**11.85**
	(2.81)	(4.45)		(3.19)
VOCED	**.760**	**-.182**		**.858**
	(.313)	(.249)		(.361)
PCTRUR	**.016**	**-.033**		**.0065**
	(.008)	(.012)		.0094
N	**3378**	**2251**		**3979**
Log likelihood	**-1911**	**-702**		**-1562**
Percent correct	**75.7**	**91.6**		**85.3**

The effects of race and ethnicity are not especially powerful, once family background and achievement have been considered. Black and Asian-American students have higher probabilities than others of enrolling in four-year colleges. In addition, black and Hispanic women (but not men) have higher probabilities of attending community colleges, partly confirming their claims to be being relatively egalitarian institutions.[28] These results confirm what has become increasingly clear: the problem for minority students is not one of simple access to postsecondary education, but rather one of completion.

Similarly, the effects of high school achievement and performance on postsecondary enrollment are generally predictable. Among men, grades and achievement (measured by TESTCOMP) affect enrollment in community colleges, despite the fact that these institutions do not have admissions standards; evidently those with low grades and test scores think either that that would be unable to complete a postsecondary program or that doing so would be too arduous. Not surprisingly, the effects of these variables on pr(4YR) are much greater — in most cases almost twice as high as on pr(CC). However, grades and achievement do not affect enrollment in community colleges for women, though they do influence pr(4YR) about as much as they do for men. Among both men and women grades tend not to affect enrollment in technical institutes, though they do affect enrollment in private vocational schools; and for men higher achievement test scores also enrollments in both technical institutes and private vocational schools.[29] Thus, particularly for men, high school achievement does affect enrollment even in non-selective postsecondary institutions so that high school graduates at the bottom of their classes are very unlikely to go on to any form of postsecondary education. This reinforces the conclusion that community colleges and technical institutes take their students from the middle of the distributions of ability and class; those with the highest ability levels, and the highest class status as measured by parental education or SES (or, in other formulations, parental income) are most likely to enroll in four-year colleges, while those at the lowest levels are unlikely to enroll in any postsecondary institution at all.

The effects of high school track on postsecondary enrollment are very strong: Those from the general and vocational tracks are much less likely than students from academic tracks to enroll in community colleges, four-year colleges, or private vocational schools, with the effect of being in a vocational track track especially powerful. However, enrollment in technical institutes is not affected by track (nor is it enhanced by being in a vocational track, as one might think likely). Even

---

[28] The claims to being egalitarian are based on evidence about simple enrollment rates, like those in Table I-1, not enrollment rates standardized for family background and ability.

[29] Somewhat surprisingly the effects of achievement as measured by test scores is relatively uniform across these four types of institutions. It is important to remember, however, that these reflect effects with a large number of variables already controlled, many of which (like grades and high school track) are moderately correlated with test scores.

Table II-2
Logit Equations for Enrollment in Postsecondary Education: Females

	pr(CC)	pr(TI)	pr(PRI)	pr(4YR)
Family background				
PARED 1	-.121 (.119)	.216 (.226)	-.019 (.183)	.059 (.152)
PARED 2	.269 (.110)	.761 (.220)	.331 (.155)	.458 (.132)
PARED 3	.227 (.166)	.335 (.361)	.470 (.223)	.891 (.195)
PARED 4	.426 (.246)	.840 (.520)	.765 (.306)	.989 (.283)
SES	.420 (.106)	.096 (.215)	.567 (.154)	.819 (.129)
DEPENS	-.038 (.022)	-.038 (.041)	.024 (.028)	-.079 (.029)
BLACK	.705 (.149)	.321 (.256)	.897 (.200)	1.32 (.185)
HISP	.454 (.188)	-.173 (.494)	-.185 (.448)	.311 (.269)
ASIAN	-.345 (.544)	-.770 (2.29)	-.171 (.782)	1.73 (.537)
NATAM	-.741 (.400)	-16.4 (2016)	-.319 (.544)	-.399 (.480)
High school experiences				
HS GRADE1	.106 (.173)	.514 (.314)	.622 (.216)	1.27 (.184)
HS GRADE2	.100 (.118)	.334 (.221)	.362 (.161)	.900 (.141)

	pr(CC)	pr(TI)	pr(PRI)	pr(4YR)
HS GRADE3	**.061** (.109)	**-.130** (.228)	**.252** (.150)	**.457** (.139)
HS GRADE4	**-.086** (.133)	**-.373** (.311)	**-.161** (.225)	**.014** (.192)
HS GRADE5	**-.317** (.218)	**-.860** (.542)	**-.195** (.377)	**-.142** (.340)
MDGRADE	**-.848** (1.47)	**-.286** (1.26)	**.019** (.637)	**-13.7** (1442)
TESTCOMP	**.00082** (.00057)	**-.0014** (.0011)	**.0013** (.0010)	**.0014** (.0008)
EXTRACUR	**.105** (.021)	**.007** (.043)	**.127** (.027)	**.143** (.024)
HSEMP1	**-.056** (.113)	**-.054** (.224)	**.123** (.155)	**-.172** (.135)
HSEMP2	**.168** (.189)	**-.057** (.238)	**.056** (.160)	**-.098** (.142)
HSEMP3	**.164** (.130)	**-.350** (.270)	**-.421** (.189)	**-.314** (.164)
HSEMP4	**-.049** (.166)	**-.490** (.381)	**-.003** (.748)	**-.713** (.231)
WRKEXP	**.136** (.107)	**-.014** (.235)	**-.208** (.173)	**.303** (.144)
HSEOP	**.165** (.305)	**.234** (.345)	**.860** (.331)	**.507** (.366)
GENTRCK	**-.697** (.110)	**-.826** (.217)	**-.888** (.147)	**-1.39** (.123)
VOCTRCK	**-.776** (.110)	**-1.11** (.212)	**-1.13** (.151)	**-2.21** (.138)
HSAG	**.246** (.134)	**-.007** (.427)	**.207** (.227)	**.175** (.227)

	pr(CC)	pr(TI)	pr(PRI)	pr(4YR)
HSBUS	**-.074** (.045)	**-.056** (.096)	**-.018** (.064)	**-.156** (.060)
HSDE	**.014** (.039)	**-.092** (.100)	**.011** (.043)	**-.097** (.078)
HSHLTH	**.008** (.038)	**.030** (.057)	**.070** (.053)	**.0005** (.0476)
HSHMEC	**-.083** (.022)	**-.108** (.047)	**-.103** (.035)	**-.118** (.029)
HSTI	**.005** (.034)	**-.056** (.087)	**-.106** (.082)	**-.057** (.048)
PRIHS	**-.321** (.170)	**-.133** (.309)	**.226** (.189)	**.373** (.167)
AREAVOC	**.347** (.252)	**-.0008** (.460)	**-.596** (.407)	**.204** (.339)
Measures of P*				
PSABIL1	**.335** (.107)	**.362** (.225)	**.325** (.139)	**.457** (.127)
PSABIL2	**-.366** (.121)	**-.427** (.272)	**-.752** (.197)	**-.739** (.168)
PSABIL3	**-.867** (.230)	**-.222** (.433)	**-1.40** (.428)	**-1.02** (.346)
PSABIL4	**-1.04** (.290)	**.162** (.407)	**-18.1** (1870)	**-1.97** (.539)
MDPSABIL	**-.654** (.190)	**.417** (.352)	**-.939** (.302)	**-.860** (.244)
PSDOUBT1	**-.639** (.153)	**-.932** (.351)	**-1.57** (.253)	**-2.11** (.288)
PSDOUBT2	**.411** (.127)	**-.322** (.321)	**-.363** (.241)	**-1.07** (.183)
LOCON	**.042** (.061)	**.066** (.123)	**.186** (.085)	**.202** (.077)

	pr(CC)	pr(TI)	pr(PRI)	pr(4YR)
SLFCON	**.071** (.062)	**.247** (.124)	**.199** (.084)	**.215** (.076)
WRKVAL	**.080** (.085)	**-.005** (.175)	**-.184** (.116)	**-.020** (.105)
Labor Market Variables				
ROR13(F)	**3.88** (1.31)	**9.66** (2.72	**-.527** (2.25)	**-1.67** (1.62)
RORC (F)	**-.090** (.245)	**-.811** (.431)	**-.077** (.765)	**-.128** (.373)
Y1824(F)	**.0014** (.0003)	**.0016** (.0005)	**-.00001** (.00040)	**.00073** (.00036)
UE	**-.070** (.053)	**-.348** (.147)	**-.202** (.109)	**.066** (.081)
PROF (F)	**-.240** (.042)	**-.494** (.086)	**-.143** (.056)	**-.028** (.051)
PROF GRO	**-.199** (.229)	**-1.21** (.337)	**-.550** (.222)	**-.566** (.283)
FLFPART	**.108** (.024)	**-.195** (.041)	**.016** (.029)	**-.001** (.030)
Postsecondary structure				
TUICC	**1.96** (.520)	**-4.28** (1.16)	**-.408** (.773)	**-.565** (.559)
TUIPVR	**-.663** (.254)	**1.98** (.369)	**.851** (.256)	**-3.97** (.483)
TUIPRI	**-.230** (.181)	**1.02** (.329)	**-.382** (.261)	**-.272** (.217)
PUB2YR	**37.5** (3.95)	**-6.49** (6.72)	**7.32** (6005)	**3.57** (6.15)

	pr(CC)	pr(TI)	pr(PRI)	pr(4YR)
PUB4YR	**25.52**	**4.97**	**3.07**	**13.80**
	(2.79)	(5.34)	(3.28)	(3.49)
VOCED	**.151**	**.007**	**.577**	**.172**
	(.096)	(.037)	(.368)	(.522)
PCTRUR	**.016**	**-.029**	**-.012**	**.008**
	(.007)	(.010)	(.009)	(.011)
N	**3941**	**2817**	**3364**	**4477**
Log likelihood	**-1959**	**-609**	**-1077**	**-1401**
Percent correct	**75.9**	**94.1**	**76.3**	**86.5**

after self-reported track is included, certain vocational courses have further effects on postsecondary enrollment. Among males, trade and industry courses tend to reduce enrollment in four-year colleges, health courses significantly *increase* the likelihood of enrolling in a four-year college, and business courses increase the probability of enrolling in a private vocational school. For women, home economics courses are the obvious culprits, lowering postsecondary enrollment rates in every type of institution, but especially in four-year colleges; in addition, business courses tend to keep women out of four-year colleges (but do not increase their enrollments in the vocationally-oriented technical institutes or private vocational schools). To be sure, these patterns may have moderated somewhat since the early 1970s, since the results in Table I-1 indicate that increasing numbers of students from the general and vocational tracks are enrolling in postsecondary education Nonetheless, as many others have documented, a student's track in high school is one of the most important determinants of his or her postsecondary activities.

Just as general and vocational tracks appear to steer individuals away from postsecondary education, so too does large amounts of employment during high — over 30 hours per week — which reduces the probabilities of enrolling in every type of postsecondary education for males, and reduces pr(4YR) for females. However, smaller amounts of work seem not to affect postsecondary enrollment (replicating a finding from Greenberger and Steinberg, 1986). Similarly, work experience programs generally reduce postsecondary enrollment, and significantly so for pr(CC) and pr(4YR) among men; while these programs may benefit participants by giving them greater work experience prior to going onto the labor market, they also encourage men to think more seriously about immediate employment rather than postsecondary education when they complete high school. The one exception is that WRKEXP increases the likelihood of enrolling in a four-year college for women,[30] perhaps by orienting them toward careers rather than familial roles.

Among other high school experiences, equal opportunity programs — Talent Search and Upward Bound — have positive signs, but they are not significant except for the influence on the probability of enrolling in private vocational schools among women.[31] Participation in extracurricular activities does increase the probabilities of postsecondary enrollment (except for enrollment in technical institutes), among both men and women. Since these effects are present even for non-selective community colleges and private vocational schools, they may reflect the tendency for some students to derive enjoyment from school-based activities — that is, a positive

---

[30] However, the t-statistic is 2.11, which considering the reduced variance of the NLS72 sample might be considered too low if the standard error needs to be inflated by some design effect.

[31] The effect is almost significant for pr(4YR) among women, though this finding must be interpreted with caution because of the sampling design of NLS72.

assessment of the consumption value of being in postsecondary education, U_c — rather than the effects of an admissions process which rewards more active students.

The effects of type of high school are somewhat erratic. The only powerful and consistent effect is that students from private high schools are more likely to enroll in four-year colleges. In addition, attending a private high school increases pr(PRI) for males and attending an area vocational school decreases pr (PRI) among women. But there is no tendency for students who enrolled in area vocational schools to be steered to community colleges for their vocational programs, or to technical institutes or private vocational schools. When combined with the evidence about the effects of high school track and vocational courses, it appears that decisions to enroll in postsecondary vocational programs are not especially influenced by any high school experiences.[32]

One striking result is the power of the variables measuring P*, or the expected probability of completing college programs. Given evidence in Chapter III that completion of credentials is worth much more than completion of a few postsecondary courses, completion does influence the economic value of postsecondary education, and therefore subjective estimates of this probability should affect enrollment. Doubts about ability to complete college (measured by the "postsecondary ability" variables denoted PSAB) are especially powerful in influencing the decision to enroll in community colleges and four-year colleges, among both men and women, but these variables also influence pr(TI) among men and pr(PRI) among women. The two variables measuring differences between educational aspirations and expectations of completion, PSDOUBT1 and PSDOUBT2, both reduce pr(4YR), and PSDOUBT1 reduces the likelihood of attending all other institutions among women and the likelihood of enrolling in a community college among men. Interestingly, women who would like to complete a B.A. degree but don't think they can (PSDOUBT2) are *more* likely to enroll in community colleges. Thus students' enrollment decisions suggest that the purpose of postsecondary enrollment is to complete specified programs, and their subjective assessments of whether they can complete or not powerfully affect their enrollment decisions; they certainly do not act as if postsecondary enrollment might be valuable regardless of whether they can complete a program.

In contrast to the results presented so far, whose effects are quite consistent and powerful, the influence of labor market variables on enrollment decision are erratic and somewhat inconsistent. The measures of rates of return, ROR13 and RORCOL, are not generally significant except that enrollments by women in community colleges and technical institutes respond

[32] One possible implication from these findings is related to 2+2 programs, or tech-prep programs, in which students take two years of academic coursework related to an occupational area during the last two years of high school, and then continue to a community college or technical institute for two years of more job-specific education. Evidently, based on these results, there is no real need to structure these programs carefully because there appears to be no "natural" progression from certain high school programs into specific types of postsecondary institutions.

positively to higher returns to one to three years of college. Contrary to hypothesis, a higher return to some college *reduces* the probability of males entering private vocational schools. The two variables generally associated with opportunity cost, the unemployment rate and the earnings of young workers Y1824, have signs opposite to what one might expect: a higher unemployment reduces pr(CC) and pr(4YR) among males, and reduces pr(TI) and pr(PRI) among women. Earnings of young workers, Y1824, increases pr(CC) among males (but decreases pr(TI))and increases pr(CC), pr(TI), and pr(4YR) among females. These variables suggest that students rely on earnings to finance a substantial part of the postsecondary expenses, and therefore low unemployment and high earnings increase their ability to enroll, rather than reducing it because of increasing the opportunity cost associated with full-time schooling.

In regions where there are more professional workers, one would expect higher enrollments in four-year colleges which prepare for these positions and perhaps lower enrollments in other institutions. In fact, higher values of PROF reduce pr(CC) among males, and lower pr(CC), pr(TI), and pr(PRI) among females; but curiously pr(4YR) does not appear to be associated with variations in PROF. Similarly, the growth rate of professional occupations — a variable which might better reflect student projections of future opportunities — reduces pr(TI) and pr(PRI) among women, but fails to increase pr(4YR) as expected; indeed, its effect on pr(4YR) for women is negative.[33]

Finally, where female labor force participation are high, enrollments should be higher in those postsecondary institutions that enhance earnings. In results from Chapter III, receiving a B.A. clearly increases earnings for women, but certificates and Associate degrees also lead to greater earnings — especially certificates from technical institutes and four-year colleges, and Associate degrees (both academic and vocational) from community colleges.[34] Consistent with this, FPART increases pr(CC); but it also decreases pr(TI) even though certificates from technical institutes appear to provide entry to better-paid positions. Finally, the effect of FPART on enrollment in four-year colleges is completely insignificant, even though this kind of postsecondary education provides the greatest earnings advantage.

These results suggest that students are not especially sensitive to long run projections of earnings and employment opportunities (at least, professional employment opportunities) when they make their decisions about college; they seem more sensitive to current economic conditions affecting their ability to earn money to pay for college expenses. What explains the relative unimportance of labor market variables in enrollment decisions, and the inconsistency of their effects? One explanation is a measurement problem: for individuals who don't consider themselves

---

[33] Again, the t-statistic is 2.00, which might be too low if standard errors were estimated with some method which considers the sample design.

[34] These are effects on earnings without controlling for experience, in column 4 of Table III-5.

mobile, the state as a unit for measuring economic conditions may be too large; but for those who are relatively mobile — especially college graduates who are likely to operate in a national labor market — the state is too small a unit. Another possibility is that students are uninformed about labor market conditions, so that they fail to consider variations in labor markets in weighing their postsecondary options. Another is that labor market conditions may not affect the returns to different types of schooling enough to make a difference to even rational enrollment decisions; or there may be so much uncertainty associated with variation in labor market conditions — given that the benefits of schooling extend over forty or fifty years, during which labor market conditions may change dramatically and individuals may migrate to more robust areas of the country — that the effects of any variations are severely discounted; or that prospective students are simply ignorant of the effects labor market conditions may have on the returns to schooling.[35] Still another reason may be that non-economic factors dominate the enrollment decision — particularly a set of "cultural" issues surrounding college-going, in which certain individuals expect to continue to college and fail to consider the economic factors carefully.

Finally, the effects of the structure of postsecondary education are largely consistent with expectations, though a few are not. In particular, in the equations describing pr(CC), the signs of community college tuition (which should be negative[36]) are insignificant for men and positive for women; and the sign of tuition in public four-year colleges (TUIPUB), which measures a cross-price effect and should be positive, is instead significant and negative for both men and women. However, the other price effects are mostly as expected. For both males and females, the effects of four-year college tuition (both in public and private colleges) are negative and significant, with the effect of tuition in public institutions much greater than the effect of tuition in private institutions.[37] The probability of enrolling in technical institutes is generally insensitive to these tuition levels, except that for women the cross-price effect of TUIPUB is positive and significant (and the own-price effect of TUICC is negative as expected). Finally, pr(PRI) responds negatively to TUIPRI, as might be expected,[38] and positively to TUIPUB, but not to community college tuition. These results suggest that the private vocational schools are substitutes for four-year colleges, rather than

---

35 Indeed, there has been very little analysis of cross-section differences in returns to schooling; for some examples see Hanushek (1973) and (1981).

36 In previous work (Grubb, 1988), I calculated a price (or tuition) elasticity of demand for community college of -.56, close to Sulock's estimate of -.44 and larger in absolute value than the price elasticity of demand for four-year colleges which was insignificantly different from zero.

37 If students considering private colleges generally have higher-income parents, then their enrollment decisions will be less price-sensitive than will the enrollment decisions of student from somewhat lower-income families considering public institutions.

38 TUIPRI measures the average tuition in private four-year colleges, and does not necessarily describe state-to-state variation in tuition in private vocational schools. However, if the tuition levels of all private institutions vary together, then TUIPRI may be a good proxy for the tuition charged in private vocational schools

two-year institutions; it may be, for example, that many of them are private business colleges that are quite similar to the business programs of many undergraduate college.

The effects of PUB2YR and PUB4YR — the relative size of public two-year and four-year enrollments among the states — are important to deciding the effects of community colleges on educational attainment. Not surprisingly, PUB2YR increases the probability of enrolling in community colleges, for both males and females; that is, in states where there are relatively numerous community colleges, then *ceteris paribus* more students enroll in these institutions.[39] (This variable may operate either as a measure of access — since states with higher values for PUB2YR are likely to have community colleges more geographically accessible to prospective students — or as an element of a states' educational "culture" where high school student in states with more community colleges are more accustomed to the idea of enroling in a community college.) However, PUB2YR does not reduce enrollments in four-year colleges (or in technical institutes or private vocational schools). The implication is that the increases in enrollments in community colleges have come from individuals who would otherwise have remained high school graduates, rather than from those who would have enrolled in four-year colleges, and so the general expansion of community colleges during the 1960s and 1970s contributed to increasing education levels rather than a decline.

Similarly, the effect of PUB4YR on the probability of enrolling in four-year colleges is positive, but its effect on female enrollment in two-year colleges is insignificant, and for males its effect is actually positive. (One explanation of a positive sign is that individuals in states with large and accessible public four-year sectors may be more willing to enroll in two-year colleges as a mechanism of access to four-year college.) In addition, PUB4YR does not affect enrollments in either technical institutes or private vocational schools. One implication is that, aside from the limited cross-price effects reviewed above, the different types of institutions do not complete with one another: enrollments in one type of institution do not come at the expense of another type of institution.

Finally, the effect of VOCED — measuring the vocational orientation of community college programs — increases enrollment in community colleges for males but not for females (at least, not significantly so), indicating that vocationalizing the community college as a strategy for attracting students (Brint and Karabel, forthcoming) has been partly successful. Strangely enough, however, VOCED also increases the likelihood of enrolling in private vocational schools, for both men and women, whereas one might expect that a vocationally-oriented community college system would

---

[39] It is important to note that the effect of this variable is not tautological. That is, it may be that states with higher proportions of their population enrolled in community colleges have lower tuitions, or prospective students of higher socio-economic status, or more parents who can afford to send their students to college. However, all these potential explanatory variables are controlled in these enrollment equations, so the effects of PUB2YR on individual enrollment must reflect other institutional or cultural effects.

be a substitute for private vocational schools and would therefore reduce enrollments in these institutions. Finally, among men VOCED also increases enrollments in four-year colleges as well as enrollments in two-year colleges. Thus men are sensitive to the vocational orientation of community colleges, though women are not.

In summation, many of these results confirm what is already well-known about the causes of postsecondary enrollment. High school performance, ability as measured by standardized achievement tests, and track influence postsecondary decisions powerfully; and socio-economic status affects the likelihood of enroling in four-year institutions in particular. Other findings are more novel. Direct measures of whether students think they can complete postsecondary programs affect the probabilities of enrolling in community colleges, four-year colleges, and private vocational schools. Among labor market variables, unemployment generally reduces postsecondary enrollment and the earnings of 18- to 24-year-olds — a measure of the opportunity cost of schooling — increases enrollment. This suggests that students, who increasingly combine schooling and employment, rely on earnings to allow them to continue in postsecondary education and therefore reduce their enrollment where economic conditions are poor. Other labor market variables have erratic and often insignificant effects, however, especially the rate of return to some college and to four years of college, indicating that students respond more to costs and short-term employment opportunities than to long-run earnings effects and employment — and suggesting that the standard human capital model of enrollment is quite incomplete.

IV. Enrollment in Different Types of Four-Year Colleges

Given the classification of four-year colleges into the Carnegie classification (as described in Chapter I), it is also possible to estimate enrollment equations for the probabilities of entering different types of four-year colleges. This exercise generates an mind-numbing number of parameters, too many to absorb easily. Many of these coefficients show relatively consistent patterns, and provide very little additional information beyond that available in earlier results. In addition, as the classification of four-year colleges becomes finer, the number of individuals attending each one decreases and the efficiency of the bivariate logit estimates deteriorates (that is, the standard errors increase and the t-statistics fall). Still, there are some interesting patterns across the different types of four-year colleges revealing some clear differences in the kinds of institutions these are.

Table II-3 presents the parameters of *selected* variables for enrollment equations differentiated by type of four-year college for men, and Table II-4 presents similar results for

Table II-3

Selected Parameters for Enrollment Equations for Different Types of Four-Year Colleges: Males

	(1) PUBRES	(2) PRIRES	(3) PUBDOC	(4) PRIDOC
SES	**.554** (.162)	**.741** (.348)	**.451** (.222)	**.580** (.257)
TESTCOMP	**.0023** (.0011)	**.0018** (.0025)	**.0034** (.0012)	**.0013** (.0021)
UE	**.309** (.093)	**-.702** (.245)	**.012** (.143)	**-.897** (.187)
TUICC	**-.316** (.749)	**1.79** (1.82)	**-1.02** (1.20)	**1.46** (1.22)
TUIPUB	**-.041** (3.93)	**2.79** (.84)	**.366** (.530)	**.102** (.582)
TUIPRI	**.597** (.234)	**-1.19** (.747)	**.201** (.337)	**-4.59** (.645)
PUB2	**-13.1** (.679)	**44.6** (12.7)	**27.3** (9.02)	**71.0** (11.1)
PUB4	**9.06** (4.25)	**5.23** (11.3)	**5.04** (5.90)	**8.24** (6.94)
VOCED	**-1.74** (.500)	**4.47** (.708)	**-1.43** (.671)	**2.38** (.637)

	(5) PUBCOMP	(6) PRICOMP	(7) LIBARTS1	(8) LIBARTS2
SES	**.051** (.139)	**.276** (.241)	**.595** (.353)	**.311** (.331)
TESTCOMP	**.0008** (.0009)	**.0013** (.0014)	**.0012** (.0023)	**.0024** (.0018)
UE	**.259** (.081)	**-.227** (.165)	**-.107** (.209)	**.443** (.224)
TUICC	**.677** (.648)	**1.99** (1.40)	**1.33** (1.88)	**-2.12** (2.01)
TUIPUB	**-1.01** (.341)	**.298** (.675)	**2.62** (.791)	**-.906** (.897)
TUIPRI	**-1.20** (.242)	**.437** (.501)	**.579** (.660)	**.206** (.591)
PUB 2	**-1.25** (5.17)	**4.25** (11.2)	**20.3** (12.8)	**-36.2** (16.5)
PUB4	**5.12** (3.59)	**-11.4** (7.15)	**-8.96** (10.4)	**6.18** (9.97)
VOCED	**-.344** (.374)	**-.172** (.758)	**1.24** (.857)	**-2.36** (1.08)

Table II-4

Selected Parameters for Enrollment Equations: Females

	(1) PUBRES	(2) PRIRES	(3) PUBDOC	(4) PRIDOC
SES	**.491**	**1.16**	**.179**	**.129**
	(.179)	(.400)	(.237)	(.274)
TESTCOMP	**.0011**	**.0017**	**.0021**	**.0064**
	(.0014)	(.0037)	(.0015)	(.0019)
UE	**.304**	**-.333**	**-.0002**	**-.785**
	(.106)	(.267)	(.152)	(.261)
TUICC	**-1.30**	**4.30**	**-.147**	**-1.05**
	(.894)	(2.11)	(.968)	(1.47)
TUIPUB	**.094**	**1.98**	**-.268**	**1.72**
	(.500)	(.715)	(.764)	(.470)
TUIPRI	**.654**	**-1.73**	**.893**	**-2.85**
	(.289)	(.670)	(.327)	(.627)
PUB2	**-15.1**	**36.5**	**-13.7**	**22.3**
	(8.24)	(16.2)	(11.2)	(10.6)
PUB4	**-1.06**	**7.82**	**15.8**	**12.9**
	(5.24)	(9.57)	(6.37)	(6.81)
VOCED	**-1.99**	**3.68**	**.131**	**2.32**
	(.671)	(1.09)	(.968)	(.529)

	(5) PUBCOMP	(6) PRICOMP	(7) LIBARTS1	(8) LIBARTS2
SES	**.062** (.133)	**.159** (.235)	**.865** (.405)	
TESTCOMP	**.0014** (.0009)	**-.0002** (.0017)	**.0027** (.0030)	
UE	**-.026** (.076)	**.094** (.143)	**-.053** (.266)	
TUICC	**-.300** (.580)	**-.530** (1.30)	**-3.97** (2.73)	
TUIPUB	**-.666** (.648)	**.918** (.601)	**1.85** (1.15)	
TUIPRI	**-1.12** (.232)	**.922** (.464)	**.672** (.874)	
PUB2	**6.31** (5.07)	**-23.0** (10.4)	**11.9** (18.1)	
PUB4	**5.32** (3.14)	**-7.22** (6.80)	**-41.7** (13.1)	
VOCED	**-.183** (.373)	**-.657** (.745)	**3.16** (1.23)	

women. (The complete specifications are those of Tables II-1 and II-2.) The variables included in this table are those for which there are distinctive differences among types of institutions. In particular, these institutions vary by their selectivity, as reflected in the parameters on SES and TESTCOMP, measuring class selectivity and ability selectivity respectively.[40] These parameters clarify that the institutions which tend to favor individuals of higher class status, *ceteris paribus*, include both public and private research institutions, doctorate-granting institutions (for men only), and Liberal Arts I institutions, while Comprehensive and Liberal Arts II institutions do not select on the basis of class. In terms of selectivity on the basis of ability, Research institutions (for men only) and Doctoral-granting institutions are selective, but Comprehensive and Liberal Arts institutions are not. [41] Furthermore, the magnitude of these coefficients indicates that private institutions are in general more selective than their public counterparts, and that private Research institutions and Liberal Arts I colleges are the most selective.

The coefficient of UE reveals that enrollments in different types of institutions respond very differently to economic conditions. The sign of UE tends to be positive for public institutions but negative for private institutions; it is also positive (for males only) for enrollments in non-selective Liberal Arts II institutions. (The overall effect of UE on pr(CC) in Tables II-1 and II-2 is negative and significant, for both males and females.) One interpretation of these results is that student plans to enroll in private institutions, which are much more expensive than public institutions, depend more on current earnings, and high unemployment reduces the chances of being able to earn enough to afford these institutions. For public institutions, however, tuition is a less important barrier, and the need for earnings as a way of staying in postsecondary education is less serious; in public institutions, therefore, UE operates as a true opportunity cost, with prospective students reducing their attendance when unemployment is low and jobs — the competing alternative — are plentiful. In sum, cyclical patterns affect various types of four-year colleges quite differently, expressing once again the point from the model of Section I that current wages can either increase or depress postsecondary enrollment, depending on the mechanism which this variable describes.

The remaining coefficients reported in Tables II-3 and II-4 describe the effects of postsecondary education institutions on each other, both through the effects of their tuition policies and through their relative sizes. The coefficients on TUIPUB indicate that only enrollment in public

---

[40] These are in a sense summary variables: variation in the coefficient of SES is similar to variation in the parental education variables, and variation in the coefficient of TESTCOMP is similar to variation in high school grade variables.

[41] In these results it is important to recognize that some low t-statistics may be due to low n rather than true insignificance. For example, the coefficient on TESTCOMP for public research institutions is statistically insignificant (t=.73), but the coefficient is relatively high and the sample size is quite small, so insignificance may be an artifact of small sample size. Similarly, these results indicate that enrollment in Liberal Arts I institutions — which by construction are supposed to be selective — are not a function of grades, TESTCOMP, SES, or parental education, but these results are almost surely due to small sample sizes.

Comprehensive institutions (by both males and females) is sensitive to tuition in these institutions. However, enrollments in private institutions generally decline as private tuitions increase, suggesting that student enrollment decisions are sensitive to the relatively higher prices charged at private colleges, but not to the relatively low tuition in public colleges.

There are some important cross-price effects as well. Higher tuition in community colleges drives more individuals into private institutions, significantly so in the case of pr(PRIRES) for females. This is a strange result, since private research institutions are the most selective and community colleges the least selective of postsecondary colleges, and they would not normally be considered close substitutes. Higher tuition in public four-year colleges increases enrollments of both males and females in private research institutions, and and increases male enrollments in Liberal Arts I institutions (almost all of which are private). Higher tuition in private four-year college increases enrollments in public Research institutions (for both men and women) and Doctoral-Granting institutions (for women only). The point is that prospective students are often sensitive to the tuition levels of other institutions in deciding where to go to college.

The competition among institutions extends more directly to enrollment patterns rather than responses to tuition. Unfortunately, the sign of PUB4 can be variously interpreted, since this variable can pick up the effects of unmeasured factors in different states — like the "culture" and expectations surrounding postsecondary enrollment. Consistent with this interpretation, a larger fraction in PUB4 actually increases pr(PUBRES) for males, and pr(PUBDOC) for females. But this variable may reflect competition among institutions as well, an interpretation which explains the negative coefficient of PUB4 in the equations for pr(LIBARTS1) for females. To be sure, many of the coefficients for these variables describing the state structure of postsecondary education are insignificant (partly due to relatively low n's); but the remainder indicate that both the tuition levels and the relative sizes of postsecondary institutions affect enrollments in colleges which can be considered competitors.

V. Some Conclusions

The model of enrollment presented in this chapter has performed relatively well. The variables which are well-known to influence postsecondary enrollment — like high school performance and family background — all behave as expected, though their effects vary considerably among different types of postsecondary institutions. The detail available in the NLS72 data also allows us to see the effects of such variables as employment during high school, EOP programs, and the particular types of vocational courses in which individuals enrolled. In

addition, student assessments of their ability to complete a college program — a crucial variable in the model presented in this chapter — prove to have strong and consistent effects on postsecondary enrollment.

The only finding contrary to expectations is that variations in labor market conditions across states have weak and inconsistent effects. Indeed, for most students two variables usually considered to reflect the opportunity cos of attending college — the unemployment rate and the earnings of young high school graduates — have the opposite signs from those expected, suggesting that many students rely on current employment to stay in school and therefore *increase* their enrollment when unemployment falls and earnings rise. Other labor market variables, including rates of return to some college and to four years of college, the dominance of professional occupations, and (for women) the female labor force participation rate, all have weak and inconsistent effects. Evidently prospective students pay less attention to the long-run effects of college in making their postsecondary decisions than to the present costs, including their projected difficulties in completing programs.

The results in the next chapter suggest a possible economic reason for the weak effects of labor market conditions. The economic returns to a B.A. degree are so large and so robust that regional variations in returns to a college degree may not be enough to influence enrollment patterns. Another interpretation, consistent with the model of Section I above, is that the differences in earnings between completers and non-completers is so great — because of the almost total lack of any economic benefits to coursework among non-completers — that what counts in the enrollment decision is P*, the projected probability of completing a program; this interpretation is consistent with the strong effects of the variables directly measuring P*, as well as the significance of high school performance and family background. Of course, a completely different interpretation of these results is that the college enrollment decision not especially an economic decision, but is dominated instead by family effects and the opportunities and barriers associated with varying abilities, which influence enrollments even in non-selective institutions like community colleges.

There is evidence enough to support all of these interpretations, and each of them may be true to varying degrees. However, one clear implication is that the human capital model of enrollment — in which enrollment decisions respond quickly to differences in rates of return to schooling, and therefore to earnings differences associated with different levels and types of postsecondary education — may not be accurate. Instead shorter-run concerns and the economic and non-economic costs of attending college seem to dominate, so that the "market" in higher education may not respond very well to changes in economic conditions.

Chapter Three

THE EFFECTS OF POSTSECONDARY EDUCATION ON ADULT OUTCOMES

In this chapter I examine the effects of postsecondary education on a variety of adult outcomes, including wage rates and earnings, occupational status, job satisfaction, unemployment, and social and political participation, using the enormous detail available from the NLS72 data on the amount of postsecondary education individuals have completed, the type of institutions they attended, and their fields of study. These data allow me to describe the effects of different kinds of postsecondary education on various adult outcomes, rather than simply investigating the value of a B.A degree, and they allow me to address a number of important questions which have previously been ignored or have been analyzed only with limited data sets (often generated by a single institution).[42] Among these questions are the following:

1. What are the effects, including the economic returns, to sub-B.A. credentials like vocational Associate degrees, academic Associate degrees, and certificates? How do these effects compare to the effects of B.A. degrees?

2. For those students who enter postsecondary education, but fail to complete credentials, what are the effects on adult outcomes (including earnings) of the coursework they have completed?

3 What are the effects of credentials in different fields of study, including vocational versus academic fields? This is the subject of Section III.

4. What are the effects of credentials (and course credits) from different types of institutions? This issue is examined in Section IV.

The result of this analysis is a much more finely detailed description of the effects of

---

[42] Studies of the rate of return to schooling are numerous, of course; for reviews see Rosen (1976), Hill (1981) and Leslie and Brinkman (1988). However, almost all of the studies look at the differences among high school (and lower levels of education), "some college", B.A. completers,and sometimes those with graduate degrees, without any detail about types of degrees or the attainment of the "some college" group. However, it is noteworthy, given results in Section II below, that Rumberger (1980) and (1986) finds no statistically significant return to "some college" in conventional human capital equations. Eckaus (1973) found positive returns to some college in some occupations, but his results are simple earnings averages uncontrolled for other variables. Heinemann and Sussna (1977) and Blair, Finn, and Stevenson (1981) have found positive effects for community college programs, but both of them use samples for single institutions, of limited generalizeability. Belanger and Lavallee (1980) find substantial internal rates of return to community college degrees in computer science, nursing, nutrition, and social work, but these returns are not standardized for experience or any other explanatory variables, and they describe within-occupation returns. Similarly the positive returns found by McMahon and Wagner (1982) for Associate degrees for electrical technicians and accountants are uncontrolled and within-occupation. For earlier results examining the NLS72 data to see whether community college enrollment increases earnings and wages, see Breneman and Nelson (1981). However, their results examine students in 1979, much too early to consider the effects of schooling; and they used self-reported education rather than transcript-reported education.

postsecondary education than is conventionally available. Some of the results confirm what is already well known; for example, a B.A. degree has substantial economic value, no matter what corrections are made. Other results are less well-known but still unsurprising: B.A.degrees and some other kinds of postsecondary academic education (but not vocational education) increase the political participation of individuals. However, the value of even B.A. degrees varies considerably, and sub-B.A. credentials — vocational and academic Associate degrees and certificates — prove to have little economic value for both men and women, once experience has been considered, though these credentials do provide access to jobs where individuals can accumulate labor market experience. In addition, postsecondary coursework for individuals who do not complete credentials has no systematic value. These results are inconsistent with many of the claims made on behalf of higher education, and they are inconsistent with the human capital vision — at least in its strongest version — that education increases the capacities and therefore the productivity of individuals, leading to higher wages and earnings. Chapter IV therefore presents various alternative explanations of some of the puzzling results of this analysis.

I. Data and Specifications

Because of the timing of the postsecondary transcript collection, the NLS72 data contain two different kinds of information about postsecondary education. For education up to summer of 1979, transcript-based information is available. However, for the period between 1979 and 1986, when the fifth follow-up was administered, only self-reported education is available, because the transcript study was able to collect transcripts only for those institutions attended up through 1979. The self-reported education data for the 1979-86 period is not strictly comparable to transcript-reported information not only because of the bias in self-reported education, which will tend to bias the estimated return to schooling upward, but also because the education an individual receives "late" — that is, beginning in the middle or late twenties — may be quite different from education right after high school. On the one hand, such education may be undertaken with better information about an individual's preferences, about labor market conditions, and about the specific requirements of particular occupations. Community college educators often claim that older students are more likely than younger students to know exactly what coursework they need for their jobs and for promotion; they are more likely to take a few courses relevant to their existing jobs and leave without a formal credential. If this is true, then we might expect the economic returns to such "late" coursework to be higher than the returns to coursework right after high school. On the other hand, the individuals who return to school in the their twenties and thirties may be those who have failed in their earlier efforts to establish careers; and they may have

employment and family obligations which prevent them from paying close attention to their studies. It is plausible, then, that returns to "late" schooling may be lower than the returns to schooling right after high school graduation.

In these results, the solution to the existence of non-comparable transcript-based and self-reported information about education is to estimate results with two samples. The first sample — call it Sample 1 — includes all individuals with information in the fifth follow-up. For these individuals, two sets of variables describing education are included: one describes credits and credentials earned by summer 1979, and is based on transcripts; the second includes self-reported education between 1979 and 1986. This sample maximizes the sample size and the use of available information. However, if there is systematic error in reporting education, this may bias the coefficients of transcript-reported education as well as self-reported education.[43] Therefore Sample 2 excludes those individuals who reported any education subsequent to summer of 1979, and equations using this sample include only information about transcript-reported education, free of error in self-reported education. This sample is smaller, and suffers from the possibility of bias because the sample of individuals who pursued education after 1979 (after they were about 25 years old) is almost surely not random. Use of both samples provides a check on whether the returns to transcript-reported education are sensitive to the choice of sample.

In both samples those with any graduate education have been excluded. The transcript-reported information about graduate education is quite incomplete, because most students would have had only three years beyond college reported on transcripts, too short a period of time for many to enroll and complete graduate programs; and self-reported information about education appears unreliable (as results presented below indicate).

There are several other technical issues in the use of these data, most of which are relegated to a technical appendix; they include the weights used in this analysis, the method used for estimating variances, and the treatment of zero earnings along with some experiments with Tobit estimates. Of these issues, the most important is the use of a jackknife technique — Balanced Repeated Replication, or BRR — to estimate parameter variances, because of the two-stage sampling procedure used for the NLS72 data.

In analyzing earnings, the following functional form has become conventional:

$$\log(Y) = a + b\,Ed + c\,Exp + d\,Exp^2 + \ldots + e \qquad (1)$$

---

[43] That is, the estimated equation is $LogY = a + bEd_1 + c(Ed_2 + u) + \ldots + e$, where Ed_1 is transcript-reported education free of measurement error and Ed_2 is self-reported education with measurement error u. Non-random u will bias c, but if u and Ed_1 are correlated then it will bias b as well. The most likely case is that u and Ed_1 are negatively correlated, so that b will be upwardly biased.

where Y indicates wages or earnings, Ed is self-reported years of education in years, Exp is experience included in quadratic form to allow the marginal influence of experience to decline, and e is an error term assumed uncorrelated with the independent variables as well as homoskedastic. Other variables conventionally included, depending on their availability in any particular data set, included race and ethnicity, to reflect the effects of discrimination as well as unmeasured aspects of other variables; gender; measures of ability, important to prevent bias in the parameter b because of positive correlation between education and ability; measures of socio-economic status or family background, also potentially important in order to eliminate possible bias; measures of school quality ; and sometimes measures of personality, including proxies like marital status, or regional variables.

In these results I follow this specification, with some important elaborations. First, the benefits of education may take several forms. Economists have tended to emphasize wages rates and earnings, but postsecondary education has substantial other political, moral, familial, and avocational benefits (Leslie and Brinkman, 1988). Therefore the dependent variables used in this analysis include a vector of adult outcomes, including wages and earnings but also several variables reflecting non-economic outcomes. The dependent variables include:

WAGE86: the hourly wage rate in the last job held in 1986.

TEARN85: total earnings in 1985, from wages, salaries, and self-employment income.

AVEARN: average earnings in 1984 and 1985, included to eliminate some transitory elements in 1985 earnings.

UE8485: weeks of unemployment during 1984 and 1985.

OCCSTATUS: the Duncan occupational status score of the most recent job in 1986. In addition to describing the prestige of different occupations, occupations with higher status usually have greater opportunities for advancement and earnings growth over time.

SATISFAC: an overall measure of job satisfaction, devised by summing up responses to 4-point Likert scales about satisfaction with the challenge, working conditions, opportunities for advancement, relations with co-workers and supervisors, and other aspects of an individual's current job aside from pay.

VOTE: a binary variable demoting whether an individual voted in any election since 1984.

POLPART: a 20-point scale, devised by summing up responses to questions about discussing public issues and working with political candidates, parties, and campaigns.

SOCPART: a 26-point scale reflecting the extent of participation in community organizations, unions and political clubs, volunteer work, sports teams, educational and service organizations, and the like.

To be sure, the specifications for the variables describing social and political participation and job satisfaction may be somewhat crude because some potentially powerful variables are

missing from the data set. For example, social participation should be a function of a spouse's participation and children as well as of aspects of personality, but such variables are either missing or difficult to construct with the NLS72 data. In this sense, the specifications for these adult outcomes represent reduced form equations, summarizing the effects of postsecondary education via many different possible paths.

Second, while the semi-log functional form in earnings equations has become traditional, there is no powerful justification for it in these results, and linear as well as semi-log specifications are used. The semi-log form can be derived from an argument that, under certain assumptions, the coefficient on years of schooling represents a rate of return (Mincer, 1974). However, in these results years of schooling is replaced with a vector of binary and continuous variables describing schooling, so the original justification for the semi-log form vanishes. The semi-log form can also be justified by the conventional shape of the distribution of wages or earnings, which tends to be positively skewed; the log of wages or earnings is therefore more likely to be symmetric and normal, and thus the error term in equations (1) above is more likely to be normally distributed. However, if log(Y) is not positively skewed, then this rationale also disappears. For women — for whom the distribution of earnings is less skewed by the presence of very high earnings than it is for men — the linear and the semi-log form diverge in some important respects, and there is no theoretical reason for preferring the semi-log form. In some of the results that follow, both linear and semi-log forms are presented.

Third and most importantly, the single variable for education is measured by a vector of variables describing postsecondary education in great detail. For the results presented in Section II, those who have completed credentials are described by four binary variables: CERT describes those who have received a vocational certificate; VOCAA describes those with vocational Associate degrees; ACAA describes those with academic Associate of Arts degrees; and BA designates individuals with B.A. degrees.[44] (The definition of vocational and academic subjects used in this research is presented in the appendix.) For those who have enrolled in postsecondary education but have not completed credentials, their postsecondary education is described according to the number of credits they have earned, by field of study (vocational versus academic) and by type of institution.[45] I distinguish five types of institutions: public community colleges (CC), which offer

---

[44] Those who have completed several credentials are coded according to their highest credential; for example, an individual who has earned an A.A. degree or certificate on the way to a B.A. is coded as having a B.A. degree only.

[45] The transcripts collected by the transcript study include credits received for each course, but these credits as reported by the different institutions are unstandardized. For some courses, especially some vocational courses which include laboratory and work experience components, the credits per course are ridiculously high. Therefore credits are standardized by an algorithm, described in the technical appendix, which is intended to make credits in academic and vocational programs, and in institutions with different types of semesters, comparable. I use credits earned rather than courses taken because since course counts fail to consider the intensity of courses taken, and include many remedial and avocational courses as well as those which students have begun but either dropped before completion or failed.

both academic and vocational programs; public technical institutes (TI), which specialize in vocational subjects but also offer related academic subjects; private vocational schools (PRI), which are entirely vocational; four-year colleges (4YR), again with both academic and vocational coursework; and private junior colleges(PJC), which are comparatively rare and dominated by academic work. (For private junior colleges, only total credits are included.) The use of credits earned by non-completers is an attempt to reflect the intensity of postsecondary education, since courses not passed and non-credit courses — including large numbers of remedial and avocational courses — are not included. The algorithms for calculating credits are presented in the Technical Appendix.

It is important to note that this specification — where those with credentials are represented with dummy variables, and those entering postsecondary education and failing to complete credentials are given values for the credits they earned — assumes that the value of any credential is independent of the number of credits needed to earn that credential. In previous work (Grubb 1987), it became clear that those who earn credentials have little variation in the numbers of credits they earn; in addition, other specifications allowing different assumptions[46] proved empirically inferior to those reported here.

In addition, for those who have continued their education past 1979 (i.e., Sample 1), self-reported education between 1979 and 1986 are described by seven additional variables: self-reported certificates, vocational and academic Associate degrees, and B.A.'s, parallel to the transcript-reported variable between 1972 and 1979; and for those who did not report completing any credentials between 1979 and 1986 variables describing months enrolled in community colleges, in four-year colleges, and in vocational programs are included.[47] This specification exhausts the information available about postsecondary education received, though — as mentioned earlier — the interpretation of self-reported education is difficult because it may be affected both by exaggeration and by powerful selection effects.

In addition to these variables describing formal postsecondary education, three variables are included to reflect on-the-job training. OJTFOR is a binary variable with a value of one for those reporting formal training "during working hours on employer premises" in their latest job; OJTINFOR designates those reporting "informal" on-the-job training; and OTHEMPTR indicates individuals who reported "employer-provided education or training during working hours away from employer premises", a kind of training which may differ from OJTFOR only in the location

---

[46] Another specification, for example, is to include dummy variables for credentials and credits earned for all individuals; then the dummies for credentials describe the "sheepskin" effect, above and beyond the value of the credits earned. However, quite apart from the fact that this specification proved empirically inferior, it constrains the marginal effects of credits to be the same for completers and non-completers.

[47] The fifth follow-up did not distinguish among different types of vocational programs.

of training.[48] The formal and informal training described by these variables may be quite heterogeneous since the the questionnaire did not, for example, define what "informal" on-the-job training means. In addition, these variables may capture powerful selection effects if, for example, firms select only their most diligent employees for formal training.

Fourth, the conventional human capital description of experience is elaborated slightly in these results. Work experience is divided into SPECEXP or specific experience, the experience accumulated in the individual's current job; and OTHEXP, experience accumulated in previous jobs. Both are entered in quadratric form, to reflect the possibility of declining marginal returns to each type of experience. In addition, an interaction term, SPECEXP•OTHEXP, is included. If experience in the current job and other experience are complements — that is, if the effect of SPECEXP is higher when an individual has had more prior experience in the labor market — the coefficient on the interaction term will be positive. If SPECEXP and OTHEDXP are substitutes for each other, however, the coefficient on the interaction term will be negative, and the effect of SPECEXP will be greater when OTHEXP is lower. Finally, a binary variable DISCEXP, is included which takes the value of one if current work experience (that is, SPECEXP) has been discontinuous; its sign will be negative if periods out of the labor force cause skills to deteriorate or if employees take discontinuous experience as an indicator of lack of commitment.

The equations described in the next section are estimated separately for men and women. Binary variables are included for blacks, Hispanics, Asian-Americans, and Native Americans; the sample sizes are not large enough to estimated separate equations for other racial and ethnic groups.

In addition, several variables are included to capture the continuing effects of family background. SES is an overall measure of socio-economic status included in the NLS72 data, calculated as a weighted sum of responses about parental education, father's occupation, family income, and the presence in the house of various consumer goods (newspapers, encyclopedia, record player, two cars, and the like). Family income is also included as a vector of five dummy variables:

FAMY1: parental income under $6,000;

FAMY2: parental income between$6,000 and $9,000;

FAMY3: parental income between $9,000 and $12,000;

FAMY4: parental income over $18,000.

The reference group is therefore those whose parental incomes were between $12,000 and and $18,000. Those with missing information about parental incomes are included in the reference

[48] This category does not include employer subsidy for attending educational institutions, since such forms of education should appear on transcripts.

group and coded with a dummy variable MDFAMY.

For purposes of estimating earnings equations, the greatest omission in the NLS72 data is the lack of good independent measures of ability. While it is standard practice to include measures of ability to avoid bias in the coefficient of schooling, there is a serious issue in this research of when ability should be measured. If it is measured contemporaneously with the dependent variables, the ny transformations in ability caused by post-secondary education will be captured in the ability variable, and the variables measuring postsecondary education will only capture effects (i.e., "irrational" credentialing effects) unrelated to ability, or imperfections in the measurement of ability. If the purpose of including ability is to reflect selection processes into different types of postsecondary education, then ability measured at time of initial enrollment would be the most appropriate variables — that is, the measures of high school performance described in Chapter II. However, on purely empirical grounds, these measures fail to have any statistically significant influence on adult outcomes. Another possible measure of ability — grade point average during postsecondary education — is objectionable both because it is censored (that is, available only for those with postsecondary education) and because its range is restricted by the tendency of students to avoid courses in which they might do poorly or to drop courses which they are failing. Again, purely on empirical grounds, grade point average proves to have an erratic effect on earnings, often statistically insignificant, and its inclusion does not affect the coefficients on schooling.

Thus there are no direct measures of ability in these equations, though family background has sometimes been claimed to be a proxy for ability and the different measures of education in different institutions may also reflect ability differences. Unfortunately, the bias due to the lack of ability measures varies considerably from study to study,[49] and cannot be extrapolated from other studies to this one.

II. Initial Results

Table III-1 presents results from the NLS72 sample on the average wage rates and earnings, of men and women, at various levels of education.[50] They indicate the tremendous

---

[49] At one extreme, Griliches and Mason (1972) reported little bias from omitting an ability variable; at the other extreme, up to 35 percent of the simple earnings differences among schooling levels have been attributed to ability (Taubman and Wales, 1974). For reviews of this issue see Leslie and Brinkman (1988), Hill (1981), Rosen (19768), and Griliches (1975).

[50] These results are based on simple linear regressions including education variables only, presented in columns (1) and (4) of Tables III-4 and III-5.

Table III-1

Mean Wages and Earnings,
NLS72 data

	Men		Women	
	WAGE 86	TEARN85	WAGE 86	TEARN85
High School only	$8.19	$23,983	$6.21	$13,234
Some college*	8.22	24,718	6.42	13,833
Certificate	8.08	24,039	7.40	16,569
Vocational Associate	9.14	27,536	8.15	17.444
Academic Associate	8.99	27,580	6.96	18,398
B.A.	10.26	33,996	8.68	20,003
Total sample	$8.86	$26,784	$7.26	$15,906

* Excluding those with a self-reported certificate, Associate degree, or B.A. after 1979.

Table III-2
Mean Earnings in 1985, by Years of Schooling
Current Population Survey Data

	Men (age 30-34)	Men (total)	Women (age 30-34)	Women (total)
Education				
< 8 years	$10,934	$11,070	$5,873	$6,136
8 years	12,951	13,957	low n	6,583
9-11 years	15,663	13,610	8,672	7,117
12 years	19,194	18,575	11,212	10,115
1-3 years college	23,266	20,698	13,874	11,504
4 years college	28,793	31,433	16,681	16,114
5 + years college	34,163	39,768	20,754	21,202

Source: Money Income and Earnings in 1985, Current Population Reports, Series P-60, No. 156, 1986, table 36.

Table III-3
Annual Earnings by Level of Education, 1984,
SIPP (Survey of Income and Program Participation) Data

	Men	Women
Not high school graduate	$7,980	2,424
High School graduate	15,624	5,952
Some college, no degree	15,695	7,296
Vocational credential	18,888	8,436
Associate	18,924	9,828
B.A.	25,428	10,632
Master's degree	30,048	15,864
Professional	45,708	20,940
Doctorate	36,876	low n

Source: What's It Worth? Educational Background and Economic Status: Spring 1984, Current Population Reports, Series P-70, No. 11, September 1987, table 2.

advantage, for both men and women, of earning a B.A. degree. For men a vocational Associate degree increases wages, and both vocational and academic Associate degrees increase annual earnings. However, non-co :pleters as a group do not earn more than high school graduates.

For women the patterns are slightly different. Both certificates and vocational Associate credentials increase wages significantly, and in fact a vocational Associate degree confers almost as much advantage as does a B.A. In terms of annual earnings, women with certificates, vocational and academic Associates, and B.A. degrees all have significantly higher annual earnings than do those with high school diplomas only; and again the earnings advantage of a B.A. degree ($6,769) is not that much greater than that of a vocational Associate degree ($4,210) or an academic Associate degree ($5,064). As is the case for men, non-completers as a group do not earn more than high school graduates. These preliminary results confirm that, while the advantage of a four-year college degree is unquestionable, the group with some college — either a sub-B.A. credential or credits earned without completing a program — varies greatly in the economic benefits they derive from postsecondary education.

As a check on these results, Table III-2 presents the available data on earnings from the Current Population Survey, and Table III-3 presents SIPP (Survey of Income and Program Participation) data by level of education. While the earnings reported in the NLS72 data are generally higher than those in either the CPS or the SIPP data, the patterns are similar: the advantage of a B.A. is clear, the results for those with some college are quite varied, and (in the SIPP data) those who complete some college but fail to obtain a credential do not have earnings substantially higher than high school graduates.

However, the results in these three tables are simple averages of earnings, without considering the effects of variables other than education. Table III-4 presents the basic regression results for males, including the effects of employer-based training, labor force experience, and demographic variables in addition to those describing formal schooling. In these results both conventional standard errors and standard errors estimated by BRR are presented. The BRR standard errors are in some cases considerably higher, and make it even more difficult to find variables significant; since their use constitutes a highly conservative approach to significance, and since BRR calculations themselves are subject to unknown error, conventional standard errors are included as well. These two standard errors can be interpreted as lower and upper bounds on the "true" standard errors.

In terms of wages and earnings, the value of a B.A. degree is again substantial and significant. However, among men sub-B.A. credentials have no significant effects on either wages or earnings, once firm-based training, experience, and demographic characteristics have been considered. What explains the contrast between the results in Table 1 (and columns (1) and (4) of Table III-4), which suggest substantial advantages for vocational Associate degrees, and those

Table III-4
Wages Rates and Earnings: Males

	(1) WAGE 86	(2) WAGE 86	(3) log(WAGE86)	(4) TEARN85	(5) TEARN85	(6) log(TEARN85)
CERT	**-.115**	**-.171**	**-.059**	**56.4**	**-1609**	**-.071**
	(.581)	(.598)	(.057)	(1419)	(1450)	(.060)
	(.802)	(.826)	(.079)	(1960)	(2002)	(.083)
VOCAA	**.953**	**.569**	**.046**	**3553**	**-25.6**	**-.059**
	(.452)	(.470)	(.045)	(1189)	(1215)	(.050)
	(.557)	(.579)	(.055)	(1465)	(1497)	(.062)
ACAA	**.799**	**.273**	**.032**	**3957**	**-78.4**	**-.024**
	(.603)	(.613)	(.058)	(1633)	(1638)	(0.68)
	(.781)	(.794)	(.075)	(2116)	(2123)	(.088)
BA	**2.067**	**1.178**	**.101**	**10,013**	**5733**	**.149**
	(.213)	(.265)	(.025)	(550)	(671)	(.028)
	(.308)	(.384)	(.036)	(796)	(972)	(.041)
VOC Credits:						
CC	**.505**	**.568**	**.047**	**-25.7**	**-42.4**	**-.0040**
	(.162)	(.173)	(.016)	(453)	(466)	(.0193)
	(.190)	(.203)	(0.19)	(532)	(547)	(.023)
TI	**-0.35**	**-.026**	**-.0055**	**-71.7**	**-100.5**	**-.0042**
	(.023)	(.023)	(.0021)	(55.2)	(53.0)	(.0022)
	(.029)	(.029)	(.0027)	(70.0)	(67.2)	(.0023)
PRI	**.019**	**-.012**	**-.0024**	**-157.5**	**-217**	**-.0150**
	(.032)	(.031)	(.0029)	(76.8)	(78.7)	(.0033)
	(.074)	(.072)	(.0067)	(177)	(182)	(.0076)
4YR	**.017**	**.014**	**.0018**	**144.1**	**124.5**	**.0049**
	(.010)	(.0092)	(.0009)	(25.3)	(23.9)	(.0010)
	(.009)	(.0086)	(0008)	(23.6)	(22.3)	(.0009)

	(1) WAGE 86	(2) WAGE 86	(3) log(WAGE86)	(4) TEARN85	(5) TEARN85	(6) log(TEARN85)
AC Credits:						
CC	**-.051** (.044) (.050)	**-.039** (.042) (.047)	**-.0026** (.0040) (.0045)	**126.0** (136) (153)	**41.3** (127) (143)	**.00003** (.0053) (.0059)
TI	**-.004** (.035) (.038)	**-.279** (.035) (.038)	**.0004** (.0038) (.0033)	**127.1** (89.0) (95.9)	**85.5** (84.1) (90.6)	**.0032** (.0035) (.0038)
4YR	**.00064** (.0054) (.0050)	**-.0078** (.0056) (.0052)	**-.0010** (.0005) (.0005)	**5.33** (14.3) (13.3)	**-29.3** (14.5) (13.5)	**-.0200** (.0006) (.0006)
Credits:						
Priv. J.C.	**.011** (.006) (.008)	**.0036** (.0064) (.0085)	**.0001** (.0006) (.0008)	**35.9** (15.1) (20.0)	**10.0** (17.1) (22.6)	**-.0002** (.0007) (.0009)
Self reported:						
CERT	**.291** (.039) (.049)	**-.038** (.387) (.483)	**-.024** (.037) (.046)	**-1903** (985) (1229)	**-2577** (950) (1186)	**-.0719** (.039) (.049)
ACAA	**-.938** (.695) (1.47)	**-1.14** (.682) (1.44)	**-.079** (.065) (1.37)	**-3024** (1862) (3929)	**-2484** (1803) (3804)	**-.148** (.075) (.158)
VOCAA	**-.682** (1.461) (2.832)	**-1.208** (1.424) (2.761)	**-.053** (.135) (.262)	**-6593** (3687) (7149)	**-2686** (3504) (6794)	**-.068** (.145) (.281)
B.A.	**-.121** (.474) (.636)	**-.775** (.468) (.678)	**-.073** (.045) (.060)	**-4328** (1240) (1664)	**-2414** (1193) (1601)	**-.086** (.049) (.066)

	(1) WAGE 86	(2) WAGE 86	(3) log(WAGE86)	(4) TEARN85	(5) TEARN85	(6) log(TEARN85)
Months in:						
CC	**-.021**	**-.035**	**-.0026**	**3.98**	**-9.2**	**.00001**
	(.024)	(.023)	(.0022)	(59.9)	(59.6)	(.00247)
	(.032)	(.031)	(.0025)	(67.0)	(66.6)	(.0028)
4 YR	**-.013**	**-.026**	**-.0018**	**-147.8**	**-132**	**-.0051**
	(.0097)	(.010)	(.0009)	(25.2)	(24.3)	(.0010)
	(.017)	(.017)	(.0016)	(43.7)	(42.1)	(.0017)
VOC	**-.059**	**-.063**	**-.0042**	**-145.5**	**-186**	**-.012**
	(.039)	(.037)	(.0036)	(104.7)	(98.5)	(.004)
	(.090)	(.085)	(.0083)	(240.9)	(227)	(.0092)
OJTFOR	--	**.132**	**.035**	--	**1313**	**.0935**
	--	(.225)	(.021)	--	(579)	(.024)
	--	(.270)	(.025)	--	(695)	(.029)
OJTINFOR	--	**-.711**	**-.065**	--	**-1422**	**-.018**
	--	(.225)	(.021)	--	(654)	(.027)
	--	(.270)	(.025)	--	(914)	(.038)
OTHEMPTER	--	**-.201**	**-.004**	--	**2873**	**.128**
	--	(.228)	(.022)	--	(59[illegible])	(.024)
	--	(.326)	(.031)	--	(843)	(.034)
BLACK	--	**-.944**	**-.095**	--	**-2036**	**-.101**
	--	(.380)	(.036)	--	(972)	(.040)
	--	(.542)	(.051)	--	(1386)	(.057)
HISP	--	**.599**	**.092**	--	**1129**	**.036**
	--	(.529)	(.050)	--	(1280)	(.053)
	--	(.622)	(.059)	--	(1505)	(.062)
ASIAN	--	**.073**	**.057**	--	**-1395**	**-.085**
	--	(.952)	(.091)	--	(2444)	(.101)
	--	(1.64)	(.157)	--	(4218)	(.300)
AMIND	--	**.091**	**-.034**	--	**1854**	**.111**
	--	(.874)	(.083)	--	(2444)	(.101)
	--	(1.07)	(.101)	--	(3650)	(.123)

	(1) WAGE 86	(2) WAGE 86	(3) log(WAGE86)	(4) TEARN85	(5) TEARN85	(6) log(TEARN85)
SES	--	**.529**	**.051**	--	**1665**	**.044**
	--	(.196)	(.018)	--	(502)	(.021)
	--	(.230)	(.021)	--	(588)	(.025)
FAMY1	--	**-.517**	**-.066**	--	**-1647**	**-.155**
	--	(.354)	(.034)	--	(896)	(.037)
	--	(.412)	(.040)	--	(1042)	(.043)
FAMY2	--	**-.814**	**-.084**	--	**-1992**	**-.117**
	--	(.287)	(.027)	--	(737)	(.031)
	--	(.445)	(.042)	--	(1147)	(.048)
FAMY3	--	**.027**	**.008**	--	**-168**	**-.012**
	--	(.258)	(.025)	--	(662)	(.027)
	--	(.452)	(.044)	--	(1159)	(.047)
FAMY4	--	**.659**	**.506**	--	**5967**	**.145**
	--	(.284)	(.027)	--	(727)	(.030)
	--	(.525)	(.050)	--	(1343)	(.055)
MDFAMY	--	**.321**	**.045**	--	**-89.4**	**-.026**
	--	(.249)	(.024)	--	(634)	(.026)
	--	(.671)	(.065)	--	(1709)	(.070)
SPECEXP	--	**-.0028**	**.0011**	--	**154.6**	**.0099**
	--	(.0087)	(.0008)	--	(20.8)	(.0009)
	--	(.0177)	(.0016)	--	(42.2)	(.0018)
SPECEXP^2	--	**-.000024**	**-.000007**	--	**-.376**	**-.000025**
	--	(.000028)	(.000003)	--	(.067)	(.000003)
	--	(.000057)	(.000006)	--	(.136)	(.000006)
OTHEXP	--	**.017**	**.0030**	--	**69.1**	**.0052**
	--	(.0078)	(.0007)	--	(18.9)	(.0008)
	--	(.0158)	(.0014)	--	(38.4)	(.0016)
OTHEXP^2	--	**-.000032**	**-.000007**	--	**-.096**	**-.000008**
	--	(.000025)	(.000002)	--	(.061)	(.000003)
	--	(.000051)	(.000004)	--	(.124)	(.000006)
SPECEXP • OTHEXP	--	**.00010**	**-.000019**	--	**-.334**	**-.000036**
	--	-(.00005)	(.000005)	--	(.120)	(.000005)
	--	(.00010)	(.000010)	--	(.244)	(.000010)

	(1) WAGE 86	(2) WAGE 86	(3) log(WAGE86)	(4) TEARN85	(5) TEARN85	(6) log(TEARN85)
DISCEXP	--	**-.366**	**-.0009**	--	**-818**	**-.044**
	--	(.224)	(.0214)	--	(515)	(.021)
	--	(.512)	(.049)	--	(1177)	(.048)
Constant	8.19	9.59	1.99	23,983	13,845	9.29
R^2	.030	.098	.098	.083	.198	.211
N	4118	4008	4008	4522	4206	4206

The first number in parentheses is the conventional standard error; the second number in parentheses is the BRR standard error.

from the better-specified equations in columns (2), (3), (5) and (6) of Table III-4? The answer is that Associate degrees are correlated with experience, whose inclusion in the regressions diminishes the influence of the credentials themselves. That is, men with vocational Associate degrees manage to accumulate more labor market experience than do most men with high school diplomas, and so they earn more on the average; but much of their advantage appears to come from their additional experience, and they do not earn significantly more than high school graduates who have accumulated as much experience as they have. Another way to state this conclusion is that Associate degrees appear to help men find careers where they can gain considerable experience and progress steadily up occupational ladders associated with experience; for this group without B.A. degrees what seems to matter the most is gaining access to such careers, rather than the influence of formal credentials once an individual has found such a career.

For males who did not complete credentials, only vocational credits in four-year colleges (many of which come in business) confer any significant advantage in earnings or wages. Each additional credit increases total earnings by about .38 percent (about $108), so that the average dropout from a four-year college, who earned on the average 14 vocational credits along with about 37 academic credits (Table I-5), earned an additional $1,512 per year as a result (and those who concentrated in business, engineering, or some other vocational field could have earned substantially more). However, course credits in community colleges, technical institutes, private vocational schools, and private junior colleges, and academic credits in four-year colleges among non-completers provided no advantage in terms of wages or earnings. Indeed, those non-completers who earned a few credits in private vocational schools, and a few academic credits in four-year colleges, tended to earn *less* than high school graduates. Since it is implausible that such courses themselves made these men less knowledgeable, it seems likely that they steer individuals into low-paying occupations, or that (in the case of private vocational schools) there is a negative selection effect associated with enrolling in a private vocational school.

Consistently, in these results, self-reported education past 1979 fails to have a positive effect on either wages or earnings; indeed, most of these effects are *negative* (even though they are insignificant). Because experience is controlled in these equations, negative coefficients cannot be due to "late" schooling reducing labor market experience.[51] However, it is likely that the individuals who return to school after their mid-twenties are those who have not been successful in their first occupational attempts, possibly because of low ability, motivation, or other personal attributes related to performance. If so, then these coefficients indicate selection effects, or possibly the negative signaling associated with "late" enrollment, rather than negative effects of schooling

[51] It is possible that the quality of that experience suffers if individuals return to schooling in their late twenties and early thirties and neglect their occupational performance while they concentrate more on schooling.

per se.

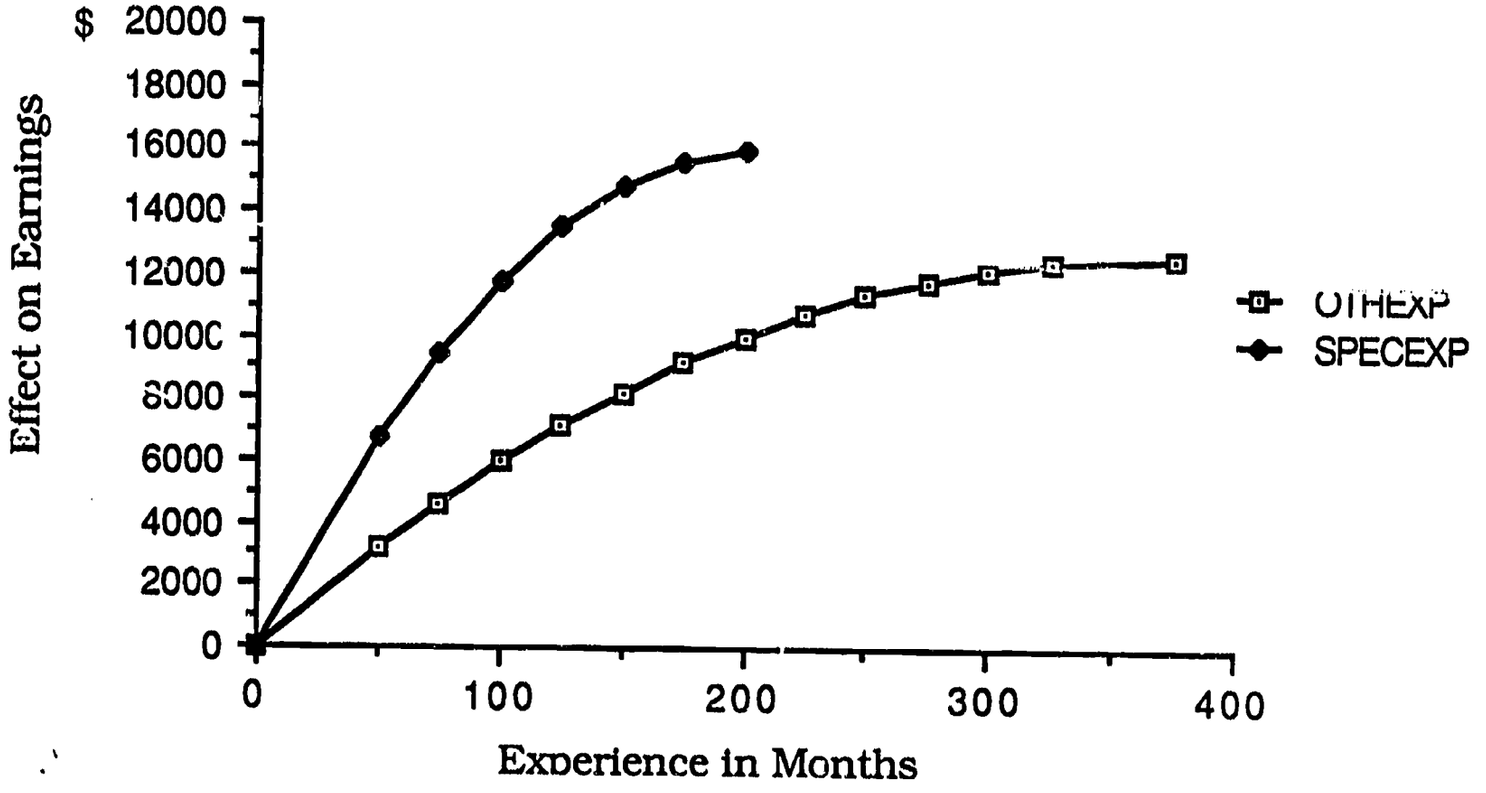
The other human capital variables included in these equations describe various forms of employer-based training. While this training has little effect on wage rates (except for informal training whose effect is negative), both formal on-the-job training and "other" training (formal training off the premises) have significant positive effects on total earnings, with effects of 9.4 percent ($1,312 per year) and 12.8 percent ($2,873) respectively. However, informal on-the-job training tends to depress both wage rates and earnings. Because there can be so much variation is what is reported as informal training — ranging from the kinds of initial orientation sessions that every employee goes through to extensive training that others might report as formal training — it is inappropriate to make too much of this result.

The other coefficients in the equations for wages and earnings behave as expected. Consistently, both experience on the current job and other experience are significant, with the squared terms negative and generally significant so that the marginal returns to experience decline. Figure 1 portrays the effects of SPECEXP and OTHEXP on annual earnings; he effect of a marginal month of SPECEXP on wages is higher than the effect of a month of OTHEXP, and reaches a higher maximum effect (of about $15,900 compared to $12,450) sooner (in 206 months compared to 361 months for OTHEXP). The coefficient on the interaction term SPECEXP•OTHEXP is consistently negative and significant, indicating that experience on an individual's current job and prior experience are substitutes for each other, rather than complements. Finally, discontinuous experience does reduced earnings, though its influence on earnings is only marginally significant (and is insignificant using BRR standard errors).

In these results, blacks consistently earn less than other racial and ethnic groups — about 9.5 percent (or 94 cents per hour) less in terms of wages, and 10.1 percent less (or $2,037 per year) less in annual earnings, *ceteris paribus*. However, the coefficients of the other racial and ethnic variables are statistically insignificant. While the coefficient for blacks might be explained by the quality of education available to blacks, a more plausible explanation consistent with earlier results (e.g., Masters 1974) is that black men suffer more from employment discrimination than do other groups. To be sure, the wages and earnings of Hispanics and Native Americans are lower than those of whites, but these differences are accounted for by differences in education and family background. That is, there is certainly discrimination against these ethnic groups, but much of it takes place in the process of accumulating education rather than in the process of employment.

One surprising result is that the effects of family background persist, even after a relatively detailed description of education is included in these equations. The effect of SES is consistently positive and significant. The coefficients of the four dummy variables describing family income indicate that individuals from low-earning families tend to earn less (about 12 percent less) while those from the highest-earning families earn about 14 percent more than men whose parents were

Figure 1
The Effect of Experience on Earnings



in the middle of the earnings distribution. The overall advantage associated with coming from high-earning rather than low-earning parents therefore amounts to about 26 percent. To be sure, some of this difference could be attributed to variation in the quality of education, if high-income parents are able to send their children to more expensive and higher quality colleges; but subsequent results (in Section IV below) indicate that differences associated with socio-economic status and parental income remain strong even after the quality of postsecondary institutions is considered.[52]

The results for women, presented in Table III-5, are different than those for men in several ways. The benefit of a B.A. degree is still substantial: the effect on wage rates is 18 percent ($1.50 per hour), higher than the effects for men of 10.1 percent ($1.18 per hour); the effect on earnings is 9.4 percent ($2,794 per year), somewhat lower than the effects for men (14.9 percent or $5,733 per year). Women with certificates and vocational Associate degrees have higher wage rates than high school graduates, and these effects persist for vocational Associate degrees even after experience and other variables are included (columns 2 and 3 of Table III-5); indeed, the advantage of a vocational Associate degree (13.2 percent or $1.36 per hour) is almost as high as the advantage of a B.A. degree (18 percent or $1.50 per hour), despite requiring only half the time in postsecondary education. However, the effects of sub-B.A. credentials on total earnings, shown in Table III-1 (and columns 5 and 6 of Table 4) do not persist once experience has been considered. As for men, therefore, the effects of certificates and Associate degrees is to gain women access to positions where they can accumulate experience; but when experience is held constant, there are no further advantages to credentials other than a B.A.

Similarly, among non-completers, the positive effects of vocational credits earned in private vocational schools vanish once experience is included (comparing columns 4 and 5 of Table III-5). However, as for men vocational credits in four-year colleges significantly increase earnings, even once experience has been considered.

As for men, self-reported education after 1979 has no positive effects on either wages or earnings. However, both formal on-the-job training and "other" employer-sponsored training are beneficial, particularly in increasing earnings where the effects are relatively more powerful than they are for males: the effect of OJTFOR is 19.8 percent (or $2,103 per year) and of OTHEMPTR is 23.5 percent ($2,765 per year), compared to effects for men of 9.4 percent ($1,312 per year) and 12.8 percent ($2,873) respectively. Informal on-the-job training tends to reduce wage rates but not earnings. The effects of experience are quite similar to the pattern for men, presented in Figure 1 above, with experience on the current job having a greater marginal effect and a larger maximum

---

[52] For example, the coefficient of SES is 1,408 in the linear form for TEARN85 when different types of colleges are distinguished, and this is significant even with the BRR standard error of 589; this coefficient is only slightly lower than its value (1,665) in Table III-4.

Table III-5
Wage Rates and Earnings: Females

	(1) WAGE 86	(2) WAGE 88	(3) log(WAGE86)	(4) TEARN85	(5) TEARN85	(6) log(TEARN85)
CERT	**1.19**	**.750**	**.074**	**3335**	**-388**	**-.241**
	(.466)	(.490)	(.050)	(1078)	(1087)	(.093)
	(.645)	(.677)	(.069)	(.489)	(1501)	(.128)
VOCAA	**1.94**	**1.36**	**.132**	**4210**	**454**	**-.031**
	(.385)	(.407)	(.041)	(894)	(905)	(.077)
	(.474)	(.501)	(.051)	(1101)	(1115)	(.095)
ACAA	**.746**	**-.175**	**.025**	**5064**	**1792**	**-.035**
	(.538)	(.551)	(.056)	(1255)	(1226)	(.104)
	(.697)	(.714)	(.073)	(1626)	(1589)	(.135)
BA	**2.47**	**1.50**	**.180**	**6769**	**2794**	**.0943**
	(.202)	(.251)	(.025)	(458)	(543)	(.046)
	(.292)	(.363)	(.036)	(663)	(786)	(.067)
VOC Credits:						
CC	**.097**	**-.021**	**.0039**	361)	(349)	(.030)
	(.178)	(.181)	(.018)	(424)	(410)	(.035)
TI	**-.0049**	**-.017**	**-.0095**	**21.4**	**-56.9**	**-.0021**
	(.020)	(.020)	(.0020)	(45.4)	(42.9)	(.0036)
	(.025)	(.025)	(.0025)	(57.6)	(54.4)	(.0046)
PRI	**.018**	**-.0112**	**.0020**	**96.3**	**36.1**	**.0032**
	(.015)	(.016)	(.0016)	(34.3)	(33.3)	(.0028)
	(.035)	(.030)	(.0037)	(79.2)	(76.9)	(.0065)
4YR	**.037**	**.0355**	**.0038**	**59.6**	**45.7**	**-.0002**
	(.011)	(.011)	(.0011)	(25.5)	(33.9)	(.0021)
	(.010)	(.010)	(.0010)	(23.8)	(22.6)	(.0020)

	(1) WAGE 86	(2) WAGE 86	(3) log(WAGE86)	(4) TEARN85	(5) TEARN85	(6 lo,(TEARN85)
AC Credits:						
CC	**-.105**	**-.0492**	**-.0099**	**319**	**364**	**.021**
	(.087)	(.0907)	(.0092)	(217)	(214)	(.018)
	(.098)	(.102)	(.0010)	(245)	(241)	(.020)
TI	**-.013**	**-.024**	**-.0030**	**-11.1**	**20.6**	**-.0009**
	(.036)	(.036)	(.0036)	(84.1)	(78.5)	(.0067)
	(.039)	(.039)	(.0039)	(90.6)	(84.5)	(.0072)
4YR	**.0076**	**-.0030**	**-.00076**	**23.4**	**-10.3**	**-.0012**
	(.0057)	(.0061)	(.00062)	(13.1)	(13.5)	(.0012)
	(.0053)	(.0057)	(.00058)	(12.2)	(12.6)	(.0011)
Credits:						
Priv. J.C.	**.0073**	**.0040**	**-.00015**	**51.5**	**-12.8**	**-.0036**
	(.0062)	(.0069)	(.00070)	(14.7)	(16.3)	(.0014)
	(.0087)	(.0091)	(.0009)	(19.4)	(21.6)	(.0019)
Self reported:						
CERT	**.118**	**.0505**	**.0137**	**-1372**	**-1059**	**-.0467**
	(.348)	(.355)	(.036)	(779)	(752)	(.0637)
	(.434)	(.443)	(.045)	(972)	(938)	(.079)
ACAA	**.843**	**.402**	**.141**	**992**	**1457**	**.294**
	(.586)	(.603)	(.061)	(1413)	(1403)	(.119)
	(1.24)	(1.27)	(.129)	(2981)	(2960)	(.251)
VOCAA	**.558**	**-.423**	**-0337**	**-1008**	**-1798**	**-.139**
	(1.59)	(1.57)	(.159)	(3087)	(2878)	(.244)
	(3.08)	(3.04)	(.308)	(5986)	(5580)	(.472)
B.A.	**1.06**	**.681**	**.135**	**-73.3**	**-51.2**	**-.066**
	(.465)	(.466)	(.047)	(1089)	(1030)	(.087)
	(.624)	(.625)	(.063)	(1461)	(1382)	(.117)

Months in:	(1) WAGE 86	(2) WAGE 86	(3) log(WAGE86)	(4) TEARN85	(5) TEARN85	(6) log(TEARN85)
CC	**.0335**	**.0156**	**.0028**	**71.3**	**42.9**	**.0049**
	(.0147)	(.0147)	(.0015)	(34.8)	(33.0)	(.0028)
	(.0164)	(.0164)	(.0017)	(38.9)	(36.9)	(.0031)
4 YR	**.0102**	**.0091**	**-.0014**	**15.2**	**5.94**	**.0025**
	(.0091)	(.0091)	(.0009)	(20.5)	(19.56)	(.0017)
	(.016)	(.016)	(.0016)	(35.5)	(33.9)	(.0029)
VOC	**-.0091**	**-.0218**	**-.0020**	**-65.6**	**17.5**	**.0048**
	(.039)	(.0393)	(.0040)	(89.8)	(84.6)	(.0032)
	(.090)	(.090)	(.0092)	(206.6)	(194.7)	(.0074)
OJTFOR	--	**.472**	**.063**	--	**2103**	**.198**
	--	(.208)	(.021)	--	(459)	(.039)
	--	(.250)	(.025)	--	(551)	(.047)
OJTINFOR	--	**-.401**	**-.0440**	--	**-438**	**.016**
	--	(.231)	(.0234)	--	(513)	(.043)
	--	(.323)	(.0327)	--	(717)	(.047)
OTHEMPTER	--	**.663**	**.0892**	--	**2765**	**.235**
	--	(.220)	(.0223)	--	(492)	(.042)
	--	(.314)	(.0319)	--	(703)	(.060)
BLACK	--	**-.202**	**-.0369**	--	**251**	**.069**
	--	(.297)	(.030)	--	(647)	(.055)
	--	(.424)	(.043)	--	(923)	(.078)
HISP	--	**.0622**	**.0006**	--	**2101**	**.223**
	--	(.464)	(.047)	--	(1001)	(.085)
	--	(.546)	(.055)	--	(1177)	(.100)
ASIAN	--	**-.350**	**.0029**	--	**2162**	**.229**
	--	(.796)	(.0807)	--	(1682)	(.142)
	--	(1.374)	(.139)	--	(2903)	(.245)
AMIND	--	**-1.16**	**-.103**	--	**-2967**	**-.886**
	--	(.806)	(.0817)	--	(1695)	(.144)
	--	(984)	(.100)	--	(2071)	(.176)

	(1) WAGE 86	(2) WAGE 86	(3) log(WAGE86)	(4) TEARN85	(5) TEARN85	(6) log(TEARN85)
SES	--	**.240**	**.011**	--	**234**	**-.051**
	--	(.191)	(.019)	--	(418)	(.035)
	--	(.224)	(.022)	--	(489)	(.041)
FAMY1	--	**.056**	**-.059**	--	**-1226**	**-.114**
	--	(.317)	(.032)	--	(692)	(0.59)
	--	(.369)	(.037)	--	(805)	(.069)
FAMY2	--	**-.034**	**-.046**	--	**-725**	**-.063**
	--	(.273)	(.028)	--	(601)	(.051)
	--	(.425)	(.044)	--	(935)	(.079)
FAMY3	--	**-.139**	**-.026**	--	**-913**	**-.075**
	--	(.248)	(.025)	--	(547)	(.046)
	--	(.434)	(.044)	--	(957)	(.081)
FAMY4	--	**.739**	**.069**	--	**1291**	**.063**
	--	(.248)	(.029)	--	(622)	(.053)
	--	(.526)	(.054)	--	(1149)	(.098)
MDFAMY	--	**-.142**	**-.024**	--	**-425**	**-.051**
	--	(.197)	(.020)	--	(438)	(.037)
	--	(.531)	(.539)	--	(1181)	(.100)
SPECEXP	--	**-.0035**	**.0017**	--	**133**	**.016**
	--	(.0057)	(.0006)	--	(12.2)	(.001)
	--	(.0117)	(.0012)	--	(24.8)	(.002)
SPECEXP^2	--	**-.000021**	**-.000007**	--	**-.328**	**-.000041**
	--	(.000020)	(.000002)	--	(.044)	(.000004)
	--	(.00004)	(.000004)	--	(.089)	(.000008)
OTHEXP	--	**.0183**	**.0035**	--	**78.1**	**.0099**
	--	(.0048)	(.0005)	--	(10.6)	(.0009)
	--	(.0097)	(.0010)	--	(21.5)	(.0018)
OTHEXP^2	--	**-.000008**	**-.000004**	--	**-.111**	**-.000016**
	--	(.000018)	(.000002)	--	(.041)	(.000003)
	--	(.000037)	(.000004)	--	(.084)	(.000006)
SPECEXP • OTHEXP	--	**-.000080**	**-.000017**	--	**-.364**	**-.000049**
	--	(.000034)	(.000003)	--	(.074)	(.000006)
	--	(.000069)	(.000006)	--	(.151)	(.000012)

	(1) WAGE 86	(2) WAGE 86	(3) log(WAGE86)	(4) TEARN85	(5) TEARN85	(6) log(TEARN85)
DISCEXP	--	**-.0283**	**.011**	--	**-73.0**	**-.042**
	--	(.186)	(.019)	--	(370)	(.031)
	--	(.425)	(.043)	--	(846)	(.071)
Constent	7.26	5.86	1.59	13,234	5270	8.17
R^2	.056	.100	.172	.064	.174	.228
N	3536	3437	3437	3946	3662	3662

The first number in parentheses is the conventional standard error; the second number in parentheses is the BRR standard error.

effect than experience in previous jobs.[53] Discontinuous experience does not significantly affect either wage rates or earnings. This finding indicates that one explanation sometimes advanced for the lower earnings of women relative to men — their tendency to work discontinuously as they leave the labor market for child-rearing and other purposes related to their roles as wives and mothers — cannot be valid because women working continuously earn no more than other women.

Racial and ethnic patterns are different for women compared to men. There are no significant differences in wage rates among racial and ethnic groups, and in particular the black-white differences in earnings which are so prominent for men do not exist for women — confirming a little-known tendency for the earnings of black and white women to converge even as differences have remained substantial for men.[54] The results in Table III-5 indicate that Hispanic women have *higher* earnings than other racial and ethnic groups, once other variables have been considered, even though they do not have higher wage rates, indicating that Hispanic women who work are employed more consistently, for more weeks or more hours per week, than other women. This result contradicts the common notion that Hispanic women work less than Anglo and black women.

Finally, the direct effects of family background on the wage rates and earnings of women are smaller than they are for men. While women from the highest-income families tend to higher wage rates and earnings than others, the effects are smaller and erratic, and the overall measure of socio-economic status SES is not significant. This result is consistent with a world in which parents try harder to pass on their class and income advantages to their sons than to their daughters.[55]

These results indicate that while earning a B.A. degree certainly increases both wage rates and earnings, the effects of other forms of postsecondary education are much more uncertain. Associate degrees, and certificates for women, do lead to higher wages rates and earnings, but they do so principally by allowing individuals to gain access to occupations where they can accumulate labor market experience; once experience has been considered, there are no further

---

[53] The effect of SPECEXP among women reaches a maximum of $13,401 after 202 months, compared to a maximum for men of $15,582 after 206 months; the effect of OTHEXP for women reaches a maximum of $13,752 after 352 months, compared to a maximum of $12,468 after 361 months for men.

[54] On convergence for women between 1960 and 1980, see the figures in Grubb and Wilson (1989); this convergence has been analyzed more carefully in Smith (1978) and Christian and Shoup (1981).

[55] One problem in examining the results for women is that the linear and semi-log functional forms yield different patterns of significance. For example, FAMY4 is significant in the linear form only, AMIND is significant in the semi-log form only, and the significance of BA plummets in the semi-log form. Since the distribution of earnings is more symmetric for women than for men, the log of earnings may even be *negatively* skewed; the semi-log form will then take relatively high earnings among women and move them closer to the mean. Therefore variables that tend to be associated with relatively high earnings may have less explanatory power in the semi-log form — consistent with the observation that the significance of FAMY4 and BA fall.

advantages to completing these degrees. Students who enroll in postsecondary education but fail to complete credentials are in a similarly uncertain position: vocational courses in four-year colleges increase both wage rates and earnings, but other kinds of coursework do not, and indeed certain kinds of courses may lead individuals into occupations where they earn less than high school graduates. Furthermore, education which individuals accumulate relatively late — in the late twenties and early thirties — provides no advantages in the labor market. These results contradict the claim among community colleges educators that many students enroll for only two or three courses which they need for their current employment or for advancement. Many students (especially many older students) may do so, and they may become more productive as a result; but they do not benefit from such course-taking in terms of higher wages or earnings.

To be sure, these results describe the average effects of credentials and courses, and more detailed results in subsequent sections will indicate that certain types of Associate degrees and certain types of credits are clearly beneficial. However, the notion — sometimes promoted by postsecondary institutions — that all forms of higher education lead to increased earning power is clearly incorrect.

Other Labor Market Effects: Occupational Status, Job Satisfaction, and Unemployment

The effects of education on other adult outcomes are presented in Table III-6, for men, and Table III-7, for women. In these tables only the coefficients for transcript-reported education are reported, since the purposes of these equations is to see whether there are effects of formal schooling which are overlooked in the usual emphasis on wages and earnings. In general, these equations are not as well specified as the wage equations and earnings functions (and they have considerably lower R^2s), because some independent variables which are *a priori* important have not been included.

Occupational status may be intrinsically valuable to individuals, but it may also be valuable because higher status occupations tend to have better working conditions, greater intellectual challenges, and more chances for promotion and earnings increases over time.[56] The results describing variations in the occupational status of the most recent job, presented in column 2, confirm the importance of a B.A. degree, particularly for men: a B.A. degree on the average increases occupational status by about 24 points for men and by 5 points for women. As a comparison, the status score of engineers tend to be around 85, and most college teachers have scores of 84; occupations with scores 24 points lower, around 60, include health record

[56] For example, in a prior analysis of the NLS72 data, up to and including the fourth follow-up, Breneman and Nelson (1981) use occupational status as a proxy for longer-run earnings patterns, since they had available only earnings seven years after high school.

Table III-6
Effects of Postsecondary Education on Other Outcomes: Males

	(1) AVEARN	(2) OCC STATUS	(3) UE	(4) SATISFAC	(5) VOTE	(6) POLPART	(7) SOCPART
CERT	**-2138**	**.0053**	**.042**	**.040**	**.055**	**-.172**	**-.428**
	(1332)	(10.1)	(.234)	(.072)	(.044)	(.323)	(.321)
	(1839)	(13.9)	(.323)	(.099)	(.061)	(.466)	(.443)
VOCAA	**-380**	**6.43**	**-.023**	**.031**	**.007**	**.019**	**-.119**
	(1131)	(7.95)	(.193)	(.059)	(.036)	(.267)	(.266)
	(1393)	(9.79)	(.238)	(.073)	(.044)	(.329)	(.328)
ACAA	**-976**	**18.9**	**.093**	**-.074**	**.095**	**1.03**	**1.06**
	(1516)	(10.4)	(.255)	(.080)	(.048)	(.353)	(.350)
	(1965)	(13.5)	(.330)	(.104)	(.062)	(.457)	(.454)
BA	**5099**	**23.9**	**-.153**	**.087**	**.147**	**.827**	**.858**
	(626)	(4.5)	(.107)	(.033)	(.020)	(.148)	(.147)
	(906)	(6.5)	(.155)	(.048)	(.029)	(.214)	(.213)
Voc Credits:							
CC	**-229**	**5.56**	**-.023**	**.025**	**.018**	**.261**	**.108**
	(434)	(2.92)	(.075)	(.023)	(.014)	(.104)	(.103)
	(738)	(3.42)	(.088)	(.027)	(.016)	(.122)	(.121)
TI	**-103**	**.085**	**-.0021**	**-.0018**	**-.0029**	**-.029**	**-.011**
	(50)	(.386)	(.0087)	(.0027)	(.0016)	(.012)	(.012)
	(63)	(.489)	(.011)	(.0034)	(.0020)	(.015)	(.015)
PRI	**-208**	**.440**	**.020**	**.0005**	**-.0017**	**.005**	**.011**
	(74)	(.518)	(.013)	(.0040)	(.0024)	(.018)	(.018)
	(171)	(1.20)	(.030)	(.009)	(.0055)	(.042)	(.042)
4 YR	**121**	**-.039**	**.0033**	**.0013**	**.0005**	**-.005**	**.004**
	(22)	(.156)	(.0039)	(.0012)	(.0007)	(.005)	(.005)
	(21)	(.149)	(.0037)	(.0011)	(.0006)	(.005)	(.005)
Ac. Credits:							
CC	**81.4**	**.112**	**-.0035**	**.0025**	**.0015**	**-.020**	**-.003**
	(119)	(.714)	(.018)	(.0056)	(.0034)	(.025)	(.025)
	(134)	(.805)	(.020)	(.0063)	(.0038)	(.028)	(.028)

	(1) AVEARN	(2) OCC STATUS	(3) UE	(4) SATISFAC	(5) VOTE	(6) POLPART	(7) SOCPART
TI	**94.5**	**-.356**	**.0064**	**.0025**	**.0016**	**.045**	**.025**
	(78.6)	(.600)	(.014)	(.0043)	(.0026)	(.019)	(.019)
	(84.7)	(.646)	(.015)	(.0046)	(.0028)	(.020)	(.020)
4 YR	**-32.0**	**.165**	**.0009**	**-.00007**	**.0013**	**.018**	**.0073**
	(13.5)	(.095)	(.0023)	(.00072)	(.0044)	(.003)	(.0032)
	(12.6)	(.089)	(.0021)	(.00067)	(.0041)	(.003)	(.0030)
Credits:							
Pri. J.C.	**4.92**	**-.098**	**-.00096**	**-.00001**	**-.0002**	**.002**	**-.0002**
	(15.9)	(.110)	(.00261)	(.0008)	(.0005)	(.004)	(.0036)
	(21.0)	(.146)	(.00345)	(.0011)	(.0007)	(.005)	(.0048)
R^2	**.200**	**.047**	**.042**	**.041**	**.074**	**.052**	**.048**
N	**4232**	**3998**	**4495**	**4418**	**4493**	**4495**	**4495**

Table III-7
Effects of Postsecondary Education on Other Outcomes: Females

	(1) AVEARN	(2) OCC STATUS	(3) UE	(4) SATISFAC	(5) VOTE	(6) POLPART	(7) SOCPART
CERT	**-685**	**5.52**	**-.045**	**-.012**	**.022**	**.031**	**1.037**
	(972)	(4.77)	(.315)	(.065)	(.038)	(.027)	(.297)
	(1342)	(6.59)	(.435)	(.090)	(.052)	(.037)	(.041)
VOCAA	**-16.3**	**-2.14**	**.166**	**-.037**	**.068**	**.104**	**.129**
	(817)	(3.96	(.267)	(.056)	(.032)	(.228)	(.252)
	(1006)	(.488)	(.329)	(.069)	(.039)	(.281)	(.310)
ACAA	**1441**	**5.78**	**-.147**	**-.0006**	**.067**	**.824**	**.459**
	(1127)	(5.35)	(.385)	(.080)	(.046)	(.329)	(.363)
	(1453)	(6.93)	(.499)	(.104)	(.060)	(.426)	(.470)
BA	**2694**	**5.05**	**-.020**	**.022**	**.125**	**.842**	**1.115**
	(491)	(2.45)	(.164)	(.034)	(.020)	(.140)	(.154)
	(711)	(3.54)	(.237)	(.049)	(.029)	(.203)	(.223)
Voc Credits:							
CC	**-577**	**.499**	**-.098**	**-.041**	**-.029**	**.027**	**.043**
	(265)	(1.50)	(.095)	(.020)	(.114)	(.081)	(.089)
	(311)	(1.76)	(.112)	(.023)	(.133)	(.095)	(.104)
TI	**-44.2**	**-.097**	**-.012**	**.0024**	**.0017**	**.003**	**.021**
	(39.2)	(.190)	(.014)	(.0029)	(.0017)	(.012)	(.013)
	(49.7)	(.216)	(.018)	(.0037)	(.0022)	(.015)	(.016)
PRI	**30.5**	**-.071**	**-.011**	**.0065**	**.0008**	**-.005**	**.016**
	(30.4)	(.151)	(.011)	(.0022)	(.0013)	(.009)	(.010)
	(70.2)	9.349)	(.025)	(.0051)	(.0030)	(.021)	(.023)
4 YR	**32.7**	**.049**	**-.003**	**.0009**	**.0010**	**.003**	**.010**
	(21.6)	(.107)	.007)	(.0015)	(.0009)	(.007)	(.007)
	(20.6)	(.102)	(.007)	(.0014)	(.0009)	(.007)	(.007)
Ac. Credits:							
CC	**291**	**-.509**	**.046**	**.0204**	**.013**	**-.006**	**.030**
	(155)	(.881)	(.054)	(.011)	(.007)	(.046)	(.051)
	(175)	(.994)	(.061)	(.012)	(.008)	(052)	.058)

	(1) AVEARN	(2) OCC STATUS	(3) UE	(4) SATISFAC	(5) VOTE	(6) POLPART	(7) SOCPART
TI	**3.5**	**.327**	**.030**	**-.0083**	**.0027**	**.026**	**-.028**
	(72)	(.349	(.026)	(.0054)	(.0032)	(.022)	(.025)
	(78)	(.376)	(.028)	(.0058)	(.0034)	(.023)	(.027)
4 YR	**-10.2**	**0.010**	**.004**	**-,.0016**	**.0010**	**.006**	**.006**
	(12.1)	(.060)	(.004)	(.0008)	(.0005)	(.003)	(.004)
	(11.3)	(.056)	(.004)	(.0007)	(.0005)	(.003)	(.004)
Credits:							
Pri. J.C.	**-11.6**	**-.045**	**.006**	**.00006**	**.0014**	**-.0014**	**.0015**
	(14.8)	(.067)	(.005)	(.00094)	(.0005)	(.0039)	(.0043)
	(19.6)	(.089)	(.007)	(.00124)	(.0007)	(.0052)	(.0057)
R^2	**.206**	**.048**	**.038**	**.035**	**.050**	**.044**	**.037**
N	**3764**	**3429**	**4561**	**4500**	**4561**	**4561**	**4561**

technicians, embalmers and funeral directors, electronics technicians, and secretaries; those with status scores of the mid- to low fifties include mail carriers, typesetters, and art, drama, and music teachers. Given this comparison, a 24 point difference is substantial, but a 5-point difference seems both trivial and smaller than the unavoidable error involved in measuring anything as subjective as status.

The only other kind of transcript-reported education associated with significantly higher status is the academic Associate degree, although its effect is erratic and significant only for Sample 2.[57] In addition, a self-reported academic Associate degree increases occupational status for men only, as does self-reported time in a four-year college. Formal on-the-job training increases status for men, and "other" employer-sponsored training is equally powerful for women — suggesting that these forms of employer-sponsored training lead to promotions into different types of occupations, not just to promotions within job titles. SES has a positive effect for men, though very few other variables have much influence and the explanatory power of these equations is quite low. The well-known importance of a B.A. degree is confirmed, but the possibility that other types of postsecondary credentials and coursework confer benefits in terms of higher status occupations does not appear to be true.

Another consequence of education is that it might provide access to occupations which are more satisfying overall, because they provide individuals with challenges, opportunities for continued development, positive rather than stressful interactions with co-workers and customers, or good working conditions. Unfortunately, measures of job satisfaction suffer from a tendency of most individuals to report that they are satisfied, so that we might expect regression coefficients to have high standard errors and to be biased toward zero. The results describing job satisfaction (SATISFAC) in Tables III-6 and III-7 indicate again that the effects of postsecondary education are not at all consistent and predictable. Earning a B.A. degree increases reported satisfaction among men but not women, while women who earned certificates after 1979, as well as those non-completers with more vocational coursework from private vocational schools (and *less* vocational coursework from community colleges) were more satisfied with their jobs. Employer-based training increased satisfaction among both men and women, and women with more labor market experience (in the form of experience in the current job) were also more satisfied. Men from higher-status backgrounds were more satisfied, and not surprisingly (given the prevalence of discrimination) blacks were less satisfied than other racial and ethnic groups. However, the explanatory power of these equations is quite low, suggesting both a large amount of randomness in responses about satisfaction and the importance of variables (such as personality traits and the

[57] For men the coefficient is 38.2 with a standard error of 13.06; for women it is 14.3 with a standard error of 6.3. In both cases these are larger effects than those for B.A. degrees.

conditions of family life) that have not been included here.

Another potential benefit of education comes in reducing the amount of unemployment an individual experiences. In the fifth follow-up of NLS72, unemployment is measured by asking individuals how much unemployment (defined as "without a job, available for work, and looking for work") they experienced; in this analysis months of unemployment during 1984 and 1985 are combined. This measure is of course subject to problems of recall and the tendency to underestimate unemployment; as a result, the measure of unemployment may be quite inaccurate. Consistent with this possibility, the equation describing variation in unemployment (equation 3) have very low explanatory power, with R^2 on the order of 4 percent, and very few independent variables are significant. The most powerful finding is that more labor market experience decreases unemployment, among both men and women. However, neither education nor employer-based training influences unemployment very much, with the exception that those with self-reported Associate degrees after 1979 have *more* unemployment. Not surprisingly, black men report more unemployment than others, as do Native American women. The lack of any powerful findings suggest that the dependent variable is flawed, with such substantial and potentially biased[58] reporting error as to make these results useless.

Political and Social Participation

The final set of dependent variables to consider includes measures of political and social participation. Aside from the measure of voting, which is presumably objective, these variables are inherently subjective because the meaning and intensity of participation are left to each individual's definition. In addition, they are subject to misstatement because no one likes to admit, for example, that they have failed to vote, or have few social contacts. Therefore the estimated coefficients are likely to be biased toward zero.

The results describing voting and political participation, in columns 5, 6, and 7, confirm the importance of education. Men with B.A. degrees and academic Associate of Arts degrees are more likely to vote, and report a higher degree of political participation. Among women, a B.A. degree enhances both voting and political participation; the vocational Associate degree increases the likelihood of voting while an academic A.A. degree increases political participation. Academic coursework, particularly in four-year colleges, increases both voting and political participation. In addition, self-reported time in postsecondary education after 1979 increases the likelihood of voting for men as well as women, though political participation is enhanced only by time in four-

[58] If the reporting of unemployment were biased in the same way that the reporting of education is biased, as described in Table 1, then those with lower levels of education would under-report unemployment, biasing the expected positive coefficients on lower levels of education toward zero.

year colleges for women. Employer-based training also has some positive effects, though the specific variables that prove significant vary. These results confirm what supporters of education often assert: that more education, especially more academic education, has political benefits as well as economic consequences.

Other effects on voting and political participation are weak and erratic. Family background has little effect, although SES increases political participation among both men and women.[59] There are some racial and ethnic effects, though they form no regular pattern. Asian-American and Native American men and Hispanic women are less likely than others to vote; blacks (both men and women) report more political participation than whites, and Asian-American men report less.

Many of the results describing social participation are similar to those for political participation, suggesting that there is a single dimension of participation that both these variables reflect. Men who have earned B.A. degrees and academic Associate of Arts degrees,who have earned more academic credits in four-year colleges, who have received informal on-the-job training and "other" employer-sponsored training, and who continued to a vocational school after 1979 report more social participation. A B.A. degree and enrollment in a four-year college after 1979 also enhance social participation among women, but somewhat surprisingly those who have earned certificates also have higher levels of participation. The only other striking finding is that more labor market experience — both SPECEXP and OTHEXP — tends to *decrease* social participation. This suggests that women who have established relatively clear careers, and have accumulated a great deal of experience as a result, are less likely to have time for other activities outside work and family life.

By and large, the results of using dependent variables other than wage rates and earnings are not particularly illuminating. The findings generally confirm the value of a B.A. degree, and they indicate that other forms of academic schooling and employer-based training enhance political participation and voting as well. But many of the results are erratic, and so on empirical grounds — as well on the theoretical basis that self-reported measures of participation and satisfaction are likely to be biased — the extension of this analysis beyond the conventional economic effects of schooling did not prove especially fruitful.

Differences Among Samples

The difference in the sources of data about schooling in the NLS72 data, with both transcript-reported and self-reported information included, makes the analysis of schooling

[59] One bizarre finding is that women from the highest-income families are less likely to vote than others. Without knowing more about marriage patterns and the influences of husbands, it is useless to speculate about what this might mean.

somewhat awkward. I have so far reported the results from Sample I, which includes , which includes all individuals in the NLS72 sample who do not have graduate education. However, the possibility arises that bias in self-reported education after 1979 biases the coefficients on transcript-reported education between 1972 and 1979. To test this possibility, equations can be estimated using Sample 2, which excludes all those who reported any education after 1979. Table III-8 presents the results of such regressions for log(TEARN85), for both men and women.[60] The estimated coefficients do not vary significantly between the two samples, and in most cases they are remarkably close. The sole exception is the coefficient on BA for women, which is significant for Sample 1 but not for Sample 2. However, this reflects a consistent problem with the semi-log form for women; the coefficients for the linear form are quite close.[61] Thus I conclude, from these and other comparisons of Sample 1 and Sample 2, that there is no particular danger of bias in one sample or the other. Since Sample 1 contains the more complete information, I rely on this sample for most results in this analysis.

III. The Effects of Postsecondary Education by Field of Study

The results presented in the previous section describe the average effects of different types of credentials and of course credits for those who fail to complete credentials. However, one possibility is that the effects of credentials depends on the specific field of study, and that the average effects presented so far mask substantial differences among fields. In this section I present the effects of different credentials on wage rates, earnings, and other adult outcomes, differentiating credentials into the following fields:[62]

Certificates: agriculture (AG), business and marketing (BUS), technical and engineering (TECH), trades and industrial (TI), and other fields (OTH).

Vocational Associate degrees: Agriculture (AG), business (BUS), marketing (MKT), health occupations (HLTH), technical and engineering (TECH), trades and industry (TI), education (ED), public service (PS), and other fields (OTH).

Academic Associate degrees: Letters (LET), humanities (HUM), math and science (MTHSCI), social sciences (SOCSCI), and liberal studies (LIBSTUD), a field which allows

---

[60] In these results the BRR standard errors are omitted, as they add little to understanding. In almost all cases BRR standard errors are larger, so that coefficients which are not significantly different from each other using conventional standard errors will obviously not be different using BRR errors.

[61] For sample 1 the coefficient is 2,793 (s.e.=543); in Sample 2 it is 2,426 (s.e.=738).

[62] The method of categorizing credentials, which are described by CIP codes in the NLS72 data, is presented in the Technical Appendix.

Table III-8
The Effects of Postsecondary Education on log Earnings

	Men		Women	
	Sample 1	Sample 2	Sample 1	Sample 2
CERT	-.071	-.070	-.241	-.177
	(.060)	(.069)	(.093)	(.127)
VOCAA	-.059	-.120	-.031	-.069
	(.050)	(.059)	(.077)	(.101)
ACAA	-.024	-.019	-.035	-.125
	(.068)	(.086)	(.104)	(.153)
BA	.149	.187	.094	.024
	(.028)	(.034)	(.046)	(.066)
Voc Credits:				
CC	-.004	-.012	-.039	-.091
	(.019)	(.020)	(.030)	(.177)
TI	-.004	-.003	-.002	-.0034
	(.002)	(.002)	(.004)	(.0060)
PRI	-.015	-.010	.003	.0035
	(.003)	(.004)	(.003)	(.0035)
4 YR	.0049	.0038	-.0002	-.0009
	(.0010)	(.0012)	(.0021)	(.0028)
Ac Credits:				
CC	.00003	.0018	.021	.035
	(.0053)	(.0062)	(.018)	(.060)
TI	.0032	-.012	-.0009	-.007
	(.0034)	(.006)	(.0067)	(.016)
4 YR	-.0020	-.0009	-.0012	-.0037
	(.0006)	(.0009)	(.0012)	(.0019)

	Men		Women	
	Sample 1	Sample 2	Sample 1	Sample 2
Credits:				
Pri. J.C.	-.0002	.0008	-.0036	-.0067
	(.0007)	(.0009)	(.0014)	(.0021)
R^2	.211	.246	.228	.242
N	4206	2711	3662	2212

community college students to receive a degree without much specialization.

B.A. degrees: Agriculture (AG), Business and marketing (BUS), health occupations (HLTH), technical and engineering (TECH), education (ED), public service (PS), communications (COMM), letters (LET), humanities (HUM), sciences (SCI), mathematics (MATH), and social sciences (SOCSCI).

Effects on Wage Rates and Earnings

Table III-9 present the effects of credentials by field of study on earnings.[63] (Only the coefficients on the variables describing credentials are included, since other coefficients differ in only trivial and insignificant ways from those in Tables III-4 and III-5.) In earlier results, it became clear that individuals with both vocational and academic Associate degrees have higher earnings than high school graduates, but that this effect comes from gaining access to occupations in which individuals are able to accumulate more experience, and the influence of Associate disagrees disappears once experience is considered. The results in Table III-9 clarify that the positive effect of vocational Associate degrees in gaining access to careers comes largely from the heath, technical, and public service fields among vocational programs, and from programs in the social sciences and liberal studies, among academic fields. Once experience is considered (in columns 2 and 3), then only Associate degrees in health continue to increase earnings — by almost $12,400 per year — and in fact degrees in agriculture and in marketing tend to *decrease* earnings significantly, by directing individuals into fields where pay is relatively low. The effects of certificates are almost uniformly negative, significantly so in the case of trade and industrial fields.

The results for different types of B.A. degrees are quite consistent with conventional assertions and previous findings about which fields of study pay the most.[64] Among the

---

[63] While there are some interesting results for wage rates, this variable is less comprehensive than annual earnings. From the results not presented here, it becomes clear that, even though certificates in general fail to increase wages for men, certificates in "other" fields (which include education, public service, and communication) do increase wage rates significantly, and business certificates also increase wages substantially (by about $5.19 per hour) even though the coefficient is significant at only the 5.3 percent level. (The field of business at the sub-B.A. level is particularly heterogeneous: some programs are designed for secretaries and data entry clerks, while others are intended for administrative assistants and lower-level managers. This may explain why the coefficient on a certificate is business is so high and its variance is also so large.) Similarly, the positive effect of receiving a vocational Associate degree on wages, in the absence of controls for experience and demographic characteristics (in column 1 of Table III-4) can be explained by the positive effects of degrees in technical and health-related fields. In fact, even after experience and demographic characteristics are controlled, an Associate degree in a technical field increases wages by $2.16 per hour, while a health-related degree increases wages by $3.14. Again, this coefficient is very high, but its standard error is also high so that the coefficient is significant at only the 8.8 percent level. As in the case of business, the health field is quite heterogeneous, with some programs preparing specialized and well-paid health technicians while others prepare poorly-paid nurses (like LPN's).

[64] For other evidence about the effects of different fields of study, see the published results from the SIPP data, in U.S. Bureau of the Census (1987); and see also McMahon and Wagner (1981).

Table III-9
Effects of Postsecondary Education, by Field of Study

	Males			Females		
	(1) TEARN85	(2) TEARN85	(3) log(TEARN85)	(4) TEARN85	(5) TEARN85	(6) log(TEARN85)
Certificates:						
AG	-2154	-2885	-.017	-8524	-9809	-1.43
	(12472)	(11890)	(.800)	(7161)	(6871)	(.584)
BUS	9407	5477	.221	3401	-1945	-.215
	(6937)	(6623)	(.279)	(2018)	(2007)	(.171)
TECH	-493	-5053	-215	10685	4996	.478
	(2270)	(2191)	(.092)	(5164)	(4971)	(.422)
TI	-1242	-5053	-.055	1285	1481	.478
	(2015)	(2191)	(.085)	(2343)	(2270)	(.422)
OTH	1142	-2433	-.146	1843	-2003	-.349
	(3215)	(3083)	(.130)	(1532)	(1574)	(.129)
Associate:						
AG	-4138	-7582	-.388	-2822	-6421	-.562
	(3365)	(3215)	(.135)	(3560)	(3421)	(.291)
BUS	3099	-1585	-.114	-87	-2723	-.404
	(2327)	(2247)	(.096)	(1659)	(1625)	(.138)
MKT	-4900	-11381	-.432	-2615	-5049	-.511
	(5138)	(4909)	(.207)	(3828)	(3672)	(.311)
HLTH	16658	12694	.215	8208	4013	.229
	(4709)	(4500)	(.180)	(1348)	(1328)	(.112)
TI	2996	-1044	-.215	-500	-3832	-.156
	3782)	(3616)	(.152)	(16956)	(16236)	(1.38)
TECH	4748	1419	.016	9077	4297	.175
	(2012)	(2009)	(.085)	(4729)	(4542)	(.386)
ED	-6901	-8657	-.619	6027	2916	.266
	(7604)	(7249)	(.305)	(2617)	(2533)	(.215)
PS	8354	1190	.052	-2543	-6605	-.655
	(3796)	(3648)	(.154)	(4827)	(4631)	(.393)

	Males			Females		
	(1) TEARN85	(2) TEARN85	(3) log(TEARN85)	(4) TEARN85	(5) TEARN85	(6) log(TEARN85)
OTH	**1267**	**-4343**	**-.138**	**-899**	**-3442**	**-.655**
	(6150)	(5866)	(.247)	(4280)	(4107)	(.349)
LET	**7392**	**3075**	**.135**	**10671**	**7523**	**.371**
	(7029)	(6707)	(.282)	(3891)	(3905)	(.332)
HUM	**-6017**	**-7744**	**-.362**	**5825**	**3411**	**-.011**
	(4040)	(4090)	(.172)	(3765)	(3613)	(.307)
MTHSCI	**2351**	**-1961**	**-.080**	**7858**	**2949**	**-.336**
	(3438)	(3301)	(.139)	(3428)	(3299)	(.280)
SOCSCI	**7729**	**4123**	**.083**	**6520**	**3162**	**-.047**
	(3824)	(3861)	(.163)	(2384)	(2300)	(.195)
LIBSTUD	**6450**	**1035**	**.015**	**3090**	**-676**	**.067**
	(2695)	(2592)	(.109)	(2655)	(2572)	(.218)
B.A.'s:						
AG	**1366**	**-2896**	**-.134**	**3144**	**-1269**	**-.636**
	(2289)	(2207)	(.093)	(2937)	(2832)	(.241)
BUS	**12869**	**7637**	**.170**	**12127**	**7671**	**.299**
	(923)	(950)	(.040)	(1224)	(1208)	(.103)
HLTH	**16619**	**12396**	**.371**	**7072**	**3078**	**.138**
	(2319)	(2254)	(.095)	(1025)	(1024)	(.087)
TECH	**18039**	**12187**	**.405**	**15831**	**9399**	**-.022**
	(1353)	(1346)	.057	(6613)	(6343)	(.539)
ED	**1671**	**-1671**	**-.060**	**4901**	**1368**	**.044**
	(1422)	(1403)	(.059)	(746)	(755)	(.064)
PS	**6392**	**2646**	**.114**	**4562**	**67**	**.035**
	(2669)	(2608)	(.110)	(1918)	(1869)	(.159)
COMM	**6658**	**1282**	**-.072**	**10449**	**6149**	**.270**
	(2685)	(2635)	(.111)	(1960)	(1900)	(.161)
LET	**9692**	**4752**	**.010**	**4255**	**613**	**.032**
	(2630)	(2578)	(.109)	(1631)	(1626)	(.138)

	Males			Females		
	(1) TEARN85	(2) TEARN85	(3) log(TEARN85)	(4) TEARN85	(5) TEARN85	(6) log(TEARN85)
HUM	**3998**	**-1044**	**-.115**	**4966**	**1612**	**-.062**
	(1670)	(1634)	(.069)	(1787)	(1766)	(.150)
SCI	**11659**	**7524**	**.170**	**9252**	**5301**	**.238**
	(1242)	(1235)	(.052)	(1438)	(1421)	(.121)
MATH	**12726**	**7182**	**.264**	**10307**	**6052**	**.199**
	(3313)	(3180)	(.134)	(3066)	(2952)	(.251)
SOCSCI	**8626**	**4197**	**.082**	**5731**	**1656**	**-.006**
	(1136)	(1149)	(.048)	(1015)	(1022)	(.087)
Other variables controlled	**No**	**Yes**	**Yes**	**No**	**Yes**	**Yes**

BRR design effects to apply: Certificates 1.248; Academic Assoicate degrees 2.110; Vocational associate degrees 1.939; B.A.'s 1.342.

vocational fields, the returns to business, health-related programs, and technical fields are especially large, and they persist even after other variables are included. Individuals with degrees in public service and communications earn about $6,500 more than high school graduates (but well below those with degrees in business, health, and technical fields), but these advantages vanish once experience is considered. Those with degrees in agriculture and education, not surprisingly, earn less than their peers with B.A. degrees; the only surprise is that they earn no more on the average than individuals with high school diplomas. Among academic B.A.'s, those with math and science degrees earn the most, followed by social science graduates, those in the field of letters, and lastly individuals with humanities degrees who (like those with agriculture and education degrees) earn no more than high school graduates. The choice of a field of study is therefore crucial to future earnings in well-known ways: certain professional fields (engineering, health, and business) have the highest returns, followed by the "hard" academic fields in math and science; and vocational programs directing students to low-paying occupations (agriculture and education) and academic programs in the humanities provide little advantage to college graduates.

For women, the results are somewhat different because sub-B.A. credentials have greater effects, relative to the B.A. degree, compared to men. The generally positive effects of certificates on earnings (in Table III-1 and column 4 of Table III-5) prove to come primarily from the effects of certificates in technical subjects (in column 1 of Table III-10), and secondarily from business certificates. Similarly, the increased earnings associated with vocational Associate degrees prove to come from health-related credentials, from technical Associate degrees, and — somewhat surprisingly — from educational Associate degrees. To be sure, the effects become insignificant once experience is included — except for health-related Associate degrees, which increase earnings by about 23 percent or $4,000 per year, *ceteris paribus* — but they indicate that certain kinds of certificates and vocational Associate degrees including those in technical subjects prepare women for occupations in which they manage to accumulate enough experience to increase their earnings substantially over those of high school graduates. On the other hand, certain fields of study at the Associate level direct women into occupations where their earnings are lower than those of high school graduates once experience is considered; these include business (which in the community colleges often prepares secretaries) and agriculture, and probably marketing as well.[65]

One earlier result was that the academic Associate degree was associated with higher earnings for women (Table III-1 and column 4 of Table III-5), more so than for men for men. The results in Table III-8 indicate that most academic Associate degrees except those in liberal studies increase earnings, again by leading women into careers where they accumulate more experience.

---

[65] This is another case where the linear and semi-log forms differ from each other, and these negative coefficients are more significant in the semi-log form.

Once experience has been considered, only Associate degrees in letters might have a positive influence on earnings.[66]

When we consider different B.A. degrees, the effects on overall earnings are particularly large — in the range of $10,000 per year and over — for degrees in business, technical fields, math, science and communications, most of these traditionally dominated by men. Earnings differences are also large for those with degrees in health, education, public service, letters, and the humanities; only those with degrees in agriculture fail to earn more than high school graduates. However, in these simple results there is considerable overlap among different types of credentials: women with technical certificates average $23,685 and those with health and technical Associate degrees average around $22,000, while those with B.A.'s in humanities, letters, education, and public service average around $18,000. While the *average* return to a B.A. degree is higher than the average return to a two-year Associate degree, then, the substantial overlap means that women who complete B.A.'s appropriate for low-paying occupations earn less than those who complete certificates or Associate degrees in high-paying fields.

The pattern of generally uniform returns to B.A. degrees among women disappears once experience is considered (in columns 5 and 6 of Table III-9). *Ceteris paribus*, those with B.A. degrees in business, health, communications, science, and math — the same fields that reward men — earn significantly more than high school graduates. Those with degrees in technical fields and in education may earn more, though the results are less certain.[67] Again there is some overlap among credentials of different types; for example, women with Associate degrees in health appear to earn more than those with B.A. degrees in health, and more than several other kinds of B.A. degrees.[68]

Effects on Other Adult Outcomes

The equations in Section II describing other adult outcomes — occupational status, job satisfaction, unemployment, voting, and political and social participation — proved to have little explanatory power and few interesting causal results, except for the well-known effect of earning a

---

[66] The t-statistic is 1.925, significant at the 5.1 percent level in the linear form, but drops to 1.49 using the BRR standard error. The t-statistics are much lower in the semi-log form.

[67] The coefficient for a B.A. in education is significant at the 6.6 percent level in the linear form. The coefficient on B.A.'s in technical fields is very large and positive in the linear form, but with a high standard error; and the coefficient is actually negative in the semi-log form. This is consistent with large positive skew in the distribution of earnings for those with technical B.A.'s; that is, it seems likely that a small number of women with these degrees gain access to traditionally "male" occupations with high earnings, while many of them fail to gain this access and find themselves with earnings not much above those of high school graduates. In the semi-log form the high earnings of the relatively few women who have been the most successful will be closer to the mean of the distribution, and therefore this group will not have as much influence on the coefficient.

[68] However, the differences are not statistically significant.

B.A. degree on occupational status (particularly for men) and on political and social participation. The results differentiated by field of study provide additional confirmation of these results, but not many new insights.

The effects of sub-B.A. credentials on these adult outcomes are almost uniformly statistically insignificant, and the exceptions are difficult to interpret. Among men, a certificate in business is almost statistically significant in the equations for job satisfaction; and the effect of a certificate in trades and industry on the probability of voting is positive and significant. The only robust finding is that a humanities Associate degree increases the probability of voting as well as both social and political participation; an Associate degree in letters also increases social participation. Thus, even at the Associate degree level, there is some truth to the view that humanistic fields of study have social and political consequences, even when they have no vocational consequences.

Among women, an Associate degree in math or science increases occupational status, and one in the social sciences increases job satisfaction; certificates uniformly have no influence. Associate degrees in business increase the probability of voting, and marketing A.A.'s increase political participation, but there are no signs that academic or humanistic credentials increase political or social participation. It is difficult to find any pattern in these results; given large numbers of coefficients, these findings may simply represent random findings of significance.

The effects of different types of B.A. degrees on these other adult outcomes are more robust. Among men, B.A.'s in technical subjects, in public service, in mathematics and science increase occupations status; three of these fields (all except public service) are subjects which also increase earnings, but some degrees which increase earnings — including those in business, health, and the social sciences — fail to affect occupational status. Only a B.A. in science increases job satisfaction. In terms of political and social participation, the results do not suggest that only academic or humanistic fields of study enhance participation, since several vocational fields do as well: B.A.s in agriculture, business, and health increase the probability of voting, as do those in the humanities, the sciences, and the social sciences; B.A.s in business, education, and public service increase political participation, as do those in the humanities and social sciences; and B.A.s in agriculture, business, health, and education all enhance social participation, as do academic degrees in the humanities and the sciences. Some fields of study — particularly communications (largely journalism and advertising) and mathematics, which significantly decrease political participation — have no positive effects on these dimensions of adult life, but otherwise the benefits of B.A. degrees are spread across both academic and vocational subjects.

Among women, roughly similar patterns hold, at least with respect to political and social participation. Only B.A.'s in the social sciences increase occupational status, and only B.A.'s in education increase job satisfaction — one of the few compensations for those entering education.

However, voting is enhanced by B.A.'s in business, health, education, letters, humanities, and social sciences; political participation is increased by B.A.'s in education, communications, letters, humanities, and the social sciences; and social participation is higher among women with B.A.'s in agriculture, health, technical subjects, education, and the social sciences. As was true for men, a variety of both vocational and academic fields of study enhance political and social participation.

These results confirm, if confirmation is necessary, how tenuous the benefits to sub-B.A. credentials are. Certificates have almost no value in enhancing any of the variables which attempt to measure adult outcomes aside from wage rates and earnings; and Associate degrees have a few effects which appear, especially for women, to be almost random, though there are indications that Associate degrees in humanistic areas increase political and social participation. The benefits of B.A. degrees are much more widespread and uniform, however, especially in terms of political and social participation.

IV. The Effects of Postsecondary Education by Type of Institution

Still another way to disaggregate the results in Section II is to investigate effects of different types of institutions on adult outcomes. If there are systematic differences in the quality of different types of institutions, then there may be systematic variation in their effects on adult outcomes, especially on wage rates and earnings.[69] Of course, there may be important selection effects as well, if more able types of individuals select certain types of institutions, or if individuals self-select themselves into the kinds of colleges where they will do best.

In previous results in Tables III-4 and III-5, course credits earned by non-completers were distinguished by whether the credits were earned in a community college, technical institute, private vocational school, or four-year college, but credentials were not differentiated. In this section the different types of credential earned are differentiated according to the types of institutions from which an individual received a credential More specifically, certificates may come from community colleges (CC), technical institutes (TI), private vocational schools (PRI), or (relatively rarely) four-year colleges (4YR); vocational Associate degrees may come from any of these four types of institutions; academic Associate degrees may come from community colleges, four-year colleges, or (in relatively few cases) from other institutions (OTH) which in this case refers to technical institutes and private vocational schools. Sub-B.A. credentials from four-year

[69] For other effects to examine the effects of school quality, see Behrman and Birdsall (1983); Johnson and Stafford (1973); Link and Ratledge (1975); Reed and Miller (1970); Ribich and Murphy (1975); Rizzuto and Wachtel (1980); Solmon (1975); Solmon (1985).

colleges may result from the fact that in some states community colleges are organized as branch campuses of the four-year college system; thus these credentials should be like those from community colleges. The classification of B.A. degrees follows the Carnegie classification (Carnegie Commission, 1973) described in Chapter I.

Effects on Earnings

Table III-10 presents present the effects of credentials earned in different types of institutions on annual earnings. Again, the coefficients of racial, ethnic, family background, and experience variables are omitted because they change in only trivial ways. The differentiation of credentials in these results increases the explanatory power of the regressions in a way that is statistically significant but practically trivial, since the increase in R^2 is about 0.6 percentage points.

The results for men indicate that certificates from community colleges, technical institutes, and four-year colleges have no significant effect on annual earnings.[70] Indeed, after controlling for experience, most of the coefficients for certificates are negative (though insignificant). For women, certificates from technical institutes and four-year colleges are associated with higher earnings (in column 4), but as usual these effects vanish once experience is considered.[71] The insignificance of certificates from private vocational schools is somewhat surprising because many such schools — which are concentrated in secretarial and cosmetology programs — provide training directly linked to specific (albeit low-paid) occupations; in fact, the effect of a certificate from a private vocational school significantly *reduces* annual earnings of women by about $3,900 per year.

The simple results in Table III-1 indicate that vocational Associate degrees do increase both wage rates and earnings for men. From columns 1 and 4 of Table III-10, the positive effect on earnings is due to positive influences of vocational Associate degrees from community colleges. (The effects of vocational Associate degrees from technical institutes and four-year colleges are also substantial, but their standard errors are too high for statistical significance at the conventional five percent level.). The coefficient for these credentials from private vocational schools is substantial and *negative*, though again this result is not statistically significant. These positive

---

[70] There are a few effects on wage rates, however, Certificates from private vocational schools increase wage rates significantly, by about $1.87 per hour (compared to a mean of $8.87 for this sample of men), even after experience and demographic variables have been considered, though they do not increase annual earnings. Many of these certificates are in the trades, indicating that private trade schools provide access to higher-paying jobs — though to jobs in which employment may be relatively unstable so that annual earnings are no higher even though wage rates are.

[71] However, certificates from four-year colleges increase wage rates by relatively large amounts — $3.78 per hour, compared to a mean of $7.27 per hour for this sample — even after experience is controlled although the effect on annual earnings is insignificant. This is another case where the coefficient is statistically significant in the linear form though not in the semi-log form.

Table III-10
Effects of Postsecondary Education, by Type of Institution

	Males			Females		
	(1) TEARN85	(2) TEARN85	(3) log(TEARN85)	(4) TEARN85	(5) TEARN85	(6) log(TEARN85)
Certificates:						
CC	-1542	-3081	-.109	2021	-1114	-.111
	(3570)	(3547)	(.149)	(2126)	(2097)	(.178)
TI	-1114	-2036	-.089	4717	411	-.336
	(2059)	(2025)	(.085)	(1938)	(1881)	(.160)
PRI	777	-2901	-.131	1476	-3868	-.435
	(2115)	(2065)	(.087)	(1789)	(1802)	(.153)
4YR	268	-3106	-.136	7987	2635	-.430
	(6401)	(6183)	(.259)	(3077)	(2962)	(.251)
Voc. AA:						
CC	3643	-999	-.130	5171	1308	-.021
	(1655)	(1629)	(.068)	(1219)	(1206)	(.102)
TI	2509	-1682	-.119	-1333	-4260	-.267
	(2549)	(2490)	(.104)	(2235)	(2154)	(.183)
PRI	-4922	-7026	-.345	-7465	-9372	-1.33
	(5120)	(4883)	(.204)	(3538)	(3566)	(.303)
4YR	-4502	-781	-.075	7734	3420	.124
	(2427)	(2335)	(.098)	(1782)	(1730)	(.147)
Ac. AA:						
CC	5329	1105	.032	3773	166	-.150
	(2055)	(2024)	(.085)	(1630)	(1591)	(.135)
4YR	3099	-1959	-.062	9530	6379	.016
	(3425)	(3445)	(.144)	(2321)	(2276)	(.193)
OTH	-4347	-6997	-.394	399	-2691	.007
	(3966)	(3792)	(.159)	(3291)	(3164)	(.268)

	Males			Females		
	(1) TEARN85	(2) TEARN85	(3) log(TEARN85)	(4) TEARN85	(5) TEARN85	(6) log(TEARN85)
RES. I	**11552** (1060)	**5976** (1027)	**.139** (.046)	**8690** (897)	**4480** (929)	**.160** (.079)
RES. II	**11157** (1301)	**5080** (1315)	**.113** (.055)	**7593** (1145)	**3766** (1155)	**.065** (.098)
DOCT. I	**10474** (1295)	**5405** (1283)	**1.12** (.054)	**5134** (1313)	**1460** (1299)	**-.091** (.110)
DOCT. II	**13151** (1947)	**8409** (1901)	**.209** (.080)	**7255** (1734)	**2869** (1706)	**.125** (.145)
COMP. I	**7831** (812)	**2918** (841)	**.074** (.035)	**5715** (653)	**1699** (688)	**-.017** (.058)
COMP. II	**4610** (1783)	**898** (1753)	**-.066** (.073)	**7102** (1225)	**2559** (1228)	**.002** (.104)
Lib Arts I	**16536** (2232)	**11946** (2191)	**.246** (.092)	**6993** (2055)	**3292** (2009)	**-.126** (.170)
Lib Arts. II	**7842** (1828)	**3804** (1786)	**.010** (.075)	**5291** (1411)	**1178** (1378)	**.065** (.117)
Other variables controlled	**No**	**Yes**	**Yes**	**No**	**Yes**	**Yes**

BRR design effects to apply: Certificates 1.248; Academic Assoicate degrees 2.110; Vocational associate degrees 1.939; B.A.'s 1.342.

effects do not persist after controlling for other variables, however, though (as in earlier results) the effects on earnings do not.

For women, the effects of vocational Associate degrees are more pronounced. These credentials from community colleges and four-year colleges increase wage rates, even when experience and demographic variables have been considered; these credentials also lead to significantly higher earnings (in column 4 of Table III-10), again through the mechanism of increasing experience. Vocational Associate degrees from technical institutes and private vocational schools have no effects whatsoever on wages; and in terms of earnings the vocational Associate degree from private vocational schools *reduces* earnings by about $9,400 per year, while that from technical institutes reduces earnings by about $4,300. For women, then, vocational Associate degrees from community colleges and four-year colleges provide substantial advantages, directly and indirectly; but those from technical institutes and private vocational schools appear on average to lead to earnings lower than those of high school graduates.

In earlier results (e.g., Table III-1), the academic Associate degree — a credential of dwindling importance as community colleges become dominated by their vocational purposes and the transfer function declines (Grubb, 1989) — leads to higher annual earnings for men, again through the mechanism of enhancing experience. The more detailed results in Table III-10 clarify that this positive influence is true only of academic Associate degrees from community colleges; indeed, once experience is considered, the effect of Associate of Arts degrees from technical institutes and private vocational schools — is *negative* and significant (column 3 of Table III-10). For women the academic Associate from both community colleges and four-year colleges increases earnings (column 4 of Table III-10), though only the degree from a four-year college has an effect once experience is controlled.[72]

The results for B.A. degrees from different types of institutions are relatively complex, but they fall into a few patterns. For men, the effects on earnings of most types of four-year colleges is relatively consistent: attending most colleges increase earnings over those of high school graduates by about $10,000 to $13,000, or from $5,000 to $8,000 once other variables are considered. The exceptions are Liberal Arts I institutions, which increase earnings by almost $12,000 per year even after other variables are considered; Comprehensive I and Liberal Arts II institutions, which have smaller (but still significant) effects compared to other colleges; and Comprehensive II institutions, whose effects after considering experience and demographic characteristics are essentially zero. These results parallel the selectivity of four-year colleges, with Liberal Arts I the most selective and Comprehensive II colleges (and many Liberal Arts II institutions) the least selective.

For women the results are quite different. There is little question that, among women who

---

[72] Again, this effect is present only in the linear form, not in the semi-log form.

work, those with B.A.degrees earn substantially more than high school graduates. The difference ranges between $5,000 and $8,700, with those attending Research Universities I having the greatest advantage. But once experience is considered, then only Research Universities I and II and Comprehensive I and II institutions have significant positive effects (column 5 of Table III-10). The powerful advantage of attending a selective Liberal Arts I institution is not present, nor are the effects of attending a Comprehensive II college much worse than for other types of institutions.

To be sure, the effects of different types of four-year colleges may be due to any number of factors including unmeasured differences in ability, since the NLS72 data does not contain adequate ability measures; and variation among institutions in fields of study, since liberal arts colleges by definition do not include the professional fields that have the greatest economic returns (as the previous section clarified).[73] Nonetheless, it is clear in the results for both men and women that, while the benefits of a B.A. degree are more uniform than the benefits of sub-B.A. credentials, substantial differences remain in the returns to different types of four-year colleges.

Other Adult Outcomes

In previous sections the results for other adult outcomes — occupational status, job satisfaction, unemployment, political and social participation — had low explanatory power and, aside from the finding that recipients of B.A. degrees have significantly higher political and social participation than others, led to no special insights. The results when postsecondary institutions are differentiated into various types of institutions are similar: while there some differences among types of institutions, they are erratic, inconsistent between men and women, and hard to interpret.[74] Among males, the effect of receiving a degree from a Liberal Arts I institution on political participation is especially high, but the effect of this institution on social participation is essentially zero; recipients of Liberal Arts II degrees have higher social participation than other college graduates. Otherwise the effects of different types of four-year colleges, especially on the tendency to vote and on political participation, are relatively uniform.

Among women, a certificate from a four-year college or an academic Associate degree from a four-year college both increase occupational status, while other sub-B.A. credentials have no significant effects on other adult outcomes. The effects of four-year colleges are erratic: B.A.

---

[73] Of course, it would be possible with these data to develop a set of dummy variables reflecting the receipt of B.A. degrees for different fields of study and different types of institutions. However, this analysis would start with 8 types of institutions and 12 fields of study yielding 96 possible variables, many representing relatively few individuals. Merely to pose this option is to abandon such an approach.

[74] The low explanatory power of these equations increases the standard errors of estimated parameters. In the results for credentials by type of institutions, the smaller numbers of individuals with each type of credential increases the standard errors of the estimated parameters and makes significance all the harder to achieve.

degrees from Research II, Doctoral-Granting II, and Liberal Arts I institutions significantly increase occupational status, but B.A.'s from other institutions do not; B.A.'s from Doctoral-Granting II institutions fail to have any influence on the probability of voting, political participation, or social participation, while the effects of other colleges are relatively uniform.

As in previous analyses, the results of analyzing adult outcomes are disappointing. The explanatory power of these equations is poor; the erratic results are affected by high standard errors, and it is impossible to see any clear pattern in these results aside from the general benefits of B.A. degrees on occupational status and participation.

V. Some Conclusions

Although the results presented in this chapter are complex, they still fall into some relatively clear patterns. Among the important conclusions are the following:

1. Some certificates and Associate degrees lead to higher wage rates and earnings. Certificates increase wage rates and earnings for women only, though these effects are limited to certificates in business and technical subjects, and certificates from technical institutes and four-year colleges. Vocational Associate degrees increase wage rates and earnings for both men and women, and academic Associate degrees benefit women. Almost uniformly, however, these effects disappear once labor market experience is considered. That is, these sub-B.A. degrees provide individuals with access to occupations — "careers" — where they can accumulate more labor market experience, compared to the average high school graduate, but individuals with these credentials tend not to earn more than high school graduates of equivalent experience.

2. It is difficult in these results to find much support for private vocational schools. Community colleges, public technical institutes, and the four-year institutions that provide sub-B.A. credentials (in many cases branch campuses of four-year colleges) confer some benefits, but private vocational schools often reduce wage rates or earnings, presumably by directing individuals into low-paying occupational areas.

3. The value of a B.A. degree is much more consistent, and in general its influence persists after controlling for experience and other variables. However, even in the case of the baccalaureate there is considerable variation, with the greatest returns to B.A.'s in certain professional fields — business, health, and technical subjects — and the "hard" academic areas of math and science (and, for men, social sciences), while degrees in agriculture and education and academic degrees in the humanities lead to no advantages over high school graduates. In addition, some institutions of low selectivity — particularly Comprehensive and Liberal Arts II institutions — have low rates of

return.

4. Those who enroll in postsecondary education but leave without completing a credential do not increase their wages or earnings over those of high school graduates. The only exception is that both men and women who complete credits in vocational subjects in four-year colleges — in areas like engineering, business, health-related fields, and the like — do benefit.

5. The greatest benefits of postsecondary education come from those credentials earned directly after graduating from high school. Those who report earning credentials "late" — in these results, between 1979 and 1986, between about 25 and 32 years old —do not increase their wage rates or their earnings, and the same is true for those who accumulate some time in postsecondary education at this stage without earning credentials. Indeed, if anything the effects of such "late" education are negative. If advancement is the motive — as many postsecondary educators claim about older students returning to college with clear ideas of what they need, and completing a few courses necessary for promotion or job changes — these hopes are not realized, at least not by age 32.

6. While no one would argue that the benefits of postsecondary education extend well beyond wage rates and earnings, it is difficult to find much influence of postsecondary education on other adult outcomes — in this case, on job satisfaction, occupational status, unemployment, voting behavior, and political and social participation. Aside from strong and consistent effects of earning B.A. degrees, which tend to increase occupational status and political and social behavior, the only other effects were those of certain academic programs — including academic Associate degrees and academic coursework in four-year colleges — on political and social participation. In particular, then, there are no compensating differentials in the returns to postsecondary education — that is, no patterns in which the lack of higher earnings as the result of sub-B.A. degrees is compensated by greater job satisfaction or higher status.

Above all, these results indicate a great difference between the experiences of those who complete a B.A. degree, and those who complete a different postsecondary credential or who enroll in postsecondary education without completing any credential. Rather than a continuum of results, with sub-B.A. credentials providing some of the benefits of a B.A. degree, there are distinct differences between those with baccalaureate degrees and everyone else enrolling in postsecondary education. The final chapter of this report will investigate some possible reasons for this finding.

Chapter IV

ALTERNATIVE EXPLANATIONS OF LABOR MARKET OUTCOMES FOR POSTSECONDARY STUDENTS

The results in the previous chapter, particularly those describing wage rates and earnings, are puzzling in several respects. They indicate that many forms of postsecondary education fail to increase either wage rates or earnings, and others — especially vocational Associate degrees for men, and certificates and Associate degrees (both academic and vocational) for women — increase earnings not directly but indirectly, by allowing individuals to gain access to occupations where they can accumulate considerable experience. Those individuals who attend postsecondary education but fail to complete a credential generally do not benefit from their time in higher education, with the exception of those who take vocational courses in four-year colleges. Clearly, the promise of higher education in its strongest form — that all who enter will benefit — is incorrect. A much more varied and complex of view of the benefits of higher education needs to be developed, and the past emphasis with simple *access* to postsecondary education education needs to be joined by a new emphasis on *completion of appropriate programs.*

In general, the results of the previous section indicate sharp differences between B.A. degrees and all other forms of postsecondary attainment, since the benefits of B.A. degrees are strong and relatively uniform — though there are differences among fields of study, and some differences among types of four-year colleges. In this chapter I develop several possible explanations of this result, both as a way of understanding the effects of postsecondary education and as a way of suggesting future possibilities for research. I divide the possible explanations into three categories: measurement problems; hypotheses that depend on the content of educational programs; and explanations rooted in the nature of labor markets.

I. Measurement Problems

One obvious set of problems involve various measurement problems that have not been resolved in the NLS72 data. One of these includes ability differences, not directly measured (at least at the postsecondary level) in the NLS72 data but potentially pervasive in their effects. In particular, the variation in the returns to different fields of study (in section III of the previous chapter) and among types of four-year colleges (in section IV) might be explained entirely by

ability differences among fields of study and types of colleges. However, other patterns are much less easily explained by ability differences. In particular, the finding that most non-completers do not benefit, relative to those with high school diplomas only, from the postsecondary credits they earn cannot readily be explained. Since those who enroll in postsecondary education are with few exceptions[75] of higher ability than those who don't (as the results in Chapter II indicate), one would expect unmeasured ability differences to inflate the wages and earnings of postsecondary non-completers, as well as those completing all types of certificates and Associate degrees, over those of high school graduates. Evidently, then, ability differences do not explain away this particular finding.

A second measurement problem involves the structure of the NLS72 data and the fact that it is limited to a single cohort with wages and earnings measured fourteen years after high school graduation — at approximately age 32. As the age-earnings profiles in Figure 1 indicated, the maximum variation in earnings due to education differences does not emerge (at least for males) until later, and the differences at age 32 are considerably smaller. As a result the returns to education estimated from a sample of individuals of all ages will be considerably higher than the return estimated from a relatively young cohort, or than the returns calculated in terms of the present value of the entire earnings stream. It may be, then, that all sub-B.A. credentials, and postsecondary coursework among those who fail to complete postsecondary credentials, have substantial returns in terms of lifetime earnings that don't emerge by age 32.

While this explanation is quite plausible,[76] this argument is not persuasive from the viewpoint of an 18-year-old deciding which path through postsecondary education to take (or whether to enroll at all). From the vantage of age 18, differences in earnings that have not materialized by age 32 are not especially valuable; at even a modest discount rate of 4 percent, the present value of a dollar at age 32 is $0.58, and the present value of a dollar at age 40 falls to $0.42. If differences in earnings have not materialized by age 32, it is likely that earnings differences that develop later would not be enough to attract most individuals into postsecondary education.

Still other measurement problems, in the sense of missing independent variables, involve possible variation due to local labor market conditions and to saturation in local labor markets, and will be discussed in the third section.

---

[75] One of the exceptions is that those entering technical institutes seem in general not to be of higher ability.

[76] However, it is not necessarily the case. In the earnings equations estimated by Rumberger (1980) and (1986), using samples of individuals of all ages, the coefficient of the binary variable describing "some college" is positive but insignificant.

II. The Quality of Postsecondary Education

Still another possible explanation for the lack of substantial economic returns to certain kinds of postsecondary education involves the quality of that education. In the usual human capital formulation of the relationship between education and earnings, schooling leads to various capacities (which may be cognitive, manipulative, or behavioral) which in turn make individuals more productive on the job; but if there is no content in a particular form of schooling, then individuals who enroll will develop no additional capacities, will not be any more productive, and will not earn any more. The charge that schools at all levels have deteriorated in terms of their content — usually expressed in laments over declining standards — has been quite common during the 1980s, for both K-12 education and higher education, and this phenomenon might explain the lack of any returns to some forms of postsecondary education.

From this viewpoint what counts in comparing the earnings of individuals of different levels of schooling is not the absolute content of any one kind of schooling, but its content relative to other levels. If, for example, the substance of both high schools and college have deteriorated at approximately the same rate, then the differential between earnings of high school graduates and college graduates should remain about the same. The question, then, is whether there are some forms of postsecondary education which are empty of any content even while others teach their students quite a bit. One possibility, given the results in the previous chapter, is that community colleges and technical institutes are particularly likely to have seen their content eroded during the past two decades, especially as they have expanded rapidly and have been faced with more and more poorly-prepared students. Because community colleges and technical institutes have no admissions criteria, and often involve low direct and opportunity costs, they are more likely to attract "experimenters" (Manski, 1988) — those student who have little idea what they want to do or what their abilities are, who enroll as a way of clarifying their options and abilities, and who are (relative to student entering four-year colleges) not strongly committed to higher education. The process of unprepared (and often unmotivated) students facing overworked and unprepared teachers often leads to an erosion of content as teachers reduce their demands on students in exchange for minimal compliance with reduced demands.[77] The same erosion of content may also have taken place in the bottom tier of four-year colleges, especially some of the state colleges included in Comprehensive II category and in the unselective Liberal Arts II category

---

[77] For this kind of "social contract", see Powell, Farrar, and Cohen (1985) and Sizer (1984) for the K-12 level, and Richardson, Fisk, and Okun (1983) for the community college level.

While this explanation is plausible, it indicates that even information about the kinds of courses individuals take is insufficient; it becomes necessary to know whether specific courses have any content — an insuperable task. Furthermore, if this explanation were true, then we would expect that the effects of certain forms of postsecondary education — especially community colleges — would be uniformly zero. However, this is clearly not the case, since Associate degrees and certain certificates have some value in gaining individuals access to occupations where they can accumulate experience. In addition, it is difficult to argue that the quality of teaching in these institutions is generally inferior to that in four-year colleges, which have always been torn between research and teaching while the two-year institutions have been able to concentrate more on teaching.[78]

For several reasons, then, arguments which turn on the quality of instruction in different postsecondary institutions are extremely difficult to test, though they should remain subjects for further examination.

III. The Nature of Postsecondary Labor Markets

A third set of explanations of the earnings patterns described in the previous chapter revolves around the nature of labor markets and the role of formal schooling in labor markets. One important question is whether there are clear differences between those occupations for which B.A. programs prepare students and those for which community colleges, technical institutes, and private vocational schools prepare their students. There are at least six aspects of labor markets which may be important in determining the returns to different types of postsecondary education.

1. The Nature of Skills and Methods of Skill Acquisition

One possibility is that the skills required in occupations for which B.A. programs prepare individuals (largely professional and managerial positions) are those which are more readily learned in formal schooling, while the skills in lower-level occupations can either be learned in a variety of different ways, or are actually better learned in informal settings. Confirmation of this view comes from interviews with workers about the most important sources of their training (U.S. Department of Labor, 1985). Those in occupations for which B.A.'s are normally required (particularly professional and managerial occupations) are the only workers who report in

[78] For example, the recent report of the Commission on the Future of Community Colleges (1988) argued that these institutions could define their comparative advantage over other postsecondary institutions in terms of the quality of their teaching.

substantial numbers that formal school-based training is important to their job performance, and very few — about nine percent — report that postsecondary sub-B.A. schooling is important. Those in middle- and lower-level positions generally report that company training and informal on-the-job training are the most important source of training.

If the skills necessary for middle-level positions — the occupations for which community colleges and technical institutes train — are more readily obtained on the job than in school, then the returns to formal schooling for individuals in those jobs will be zero. There will in this case be substantial returns to labor market experience, since experience provides the time necessary for on-the-job training. Indeed, this view is consistent with many of the results in the previous chapter, where experience (particularly in an individual's current job) strongly affects wages and earnings while formal schooling at the sub-B.A. level usually does not.

2. The heterogeneity of education and occupations at the sub-B.A. level

The postsecondary institutions below the level of four-year colleges — particularly community colleges — are literally squeezed between the high school and the four-year college, and they take on some aspects of both types of institutions. This tension influences the variety of occupational programs found in community colleges, technical institutes, and private vocational schools: some prepare individuals for quite menial work, or very poorly-paid work (for example, programs in horticulture for gardeners, programs for child care workers, lower-level nurses, and secretaries), while others are highly technical, very specialized, and almost at the level of four-year college programs. (Indeed, the community colleges sometimes find four-year college poaching on their territory by offering four-year programs to provide vocational training roughly equivalent to what community colleges offer in two-year programs.) To be sure, there is tremendous heterogeneity in the occupations for which four-year colleges training, from well-paid engineers to poorly-paid teachers and social workers; but the likelihood is that there is greater heterogeneity in the sub-B.A. labor market because of the presence of occupations close to those for which high school train. Some confirmation of this possibility comes from examining the variation in earnings within levels of education: using data from the Current Population Survey, such variation is substantially higher for the group with "some college" than for the group with four years of college.[79]

Heterogeneity in occupations for which a particular institution prepares its students increases the variance of earnings, making it difficult to detect patterns and making the results

---

[79] These results are based on a methodology reported earlier in Grubb and Wilson (1989). Using measures of inequality developed by Henri Theil, the within-group variation in wage and salary income for males in 1984 with "some college" was .295, compared to .228 for those with four years of college; for females, with Theil for the "some college" group was .317, compared to .253 for those with four years of college.

highly sensitive to precisely which occupations are included in any given institution. In theory this problem can be eliminated by examining the returns to specific fields of study, as was done in Section III of Chapter III. However, in practice the occupational groupings in any particular field of study are still too varied: preparation in business includes both secretaries and low- to middle-level managers, for example, and health occupations include both nurses' aides as well as specialized technicians, and so even finer categorization of fields of study — too fine even for an extensive data set like NLS72 — would be necessary to disentangle those with with substantial returns from those which provide no advantage in terms of earnings.

The existence of postsecondary vocational programs with zero returns, for positions like child care workers, gardeners, data entry clerks, and nurses' aides, constitutes a puzzle: why should individuals enroll in programs which require both time and money costs (even if the tuition and opportunity costs are relatively low) if they will not benefit at all? One answer, of course, is ignorance about occupations and their prospects for future earnings and employment. Another involves non-pecuniary aspects of work, impossible to detect in Chapter III but nonetheless present; for example, individuals who want to work with children will enroll in programs for child care workers, work for several years in that occupation until the burden of low earnings becomes too great, and then leave for more lucrative employment. When individuals search for occupations which fit them, they may be searching over many dimensions of occupations; if the intangible aspects of jobs are more important than wage rates and earnings, the human capital model of occupational choice in response to earnings differences and costs will be incorrect.

3. The distribution of benefits from education and training

In the conventional human capital model of education, the competencies imparted through education make workers themselves more productive, and therefore better paid. However, many of the middle-level occupations for which community colleges and technical institutes train make *other employees* more productive; thus technicians support engineers, nurses help doctors, and administrative assistants and lower-level managers support higher-level managers. In more formal terms, there are strong complementarities in production, and it is possible for the benefits from middle-level training to accrue not to the individual trained but to others — either to superordinate workers, or to firms themselves in the form of higher productivity and profits (Stern and Grubb, 1988). In these cases training may generate real benefits, but they will not be captured in the earnings of the individuals who have been trained and so the returns to schooling as reflected in earnings may be essentially zero.

4. Saturation in middle-level labor markets

If markets operate smoothly and efficiently, then at any particular level of the schooling system, any program or field of study that confers higher earnings than other programs at the same level should attract additional students; the supply of individuals to that occupation will increase, and earnings will fall until any extraordinary returns to that field vanish (Gustman and Steinmeier, 1982; Blau and Robins, 1987; Farkas, Hotchkiss, and Stromsdorfer, 1988). Thus it should be possible to find variations in the returns to different types of certificates, or Associate degrees, or B.A. degrees (like those presented in Section 3 of Chapter III) only if the conditions for efficient markets fail — if, for example, students are poorly informed about the returns to different fields, or if there are non-economic barriers to entering certain fields, like prerequisites in math and science for technical fields or professional limitations on entry. Indeed, the variation among fields of study presented in the previous chapter is entirely consistent with this view, since most of the fields which show especially high returns either involve technical material or are in professions (like the health professions and engineering) which are subject to professional regulation.

At least in theory, the mechanism of drawing students into areas of study with high returns should reduce or eliminate variation in returns for particular levels of the schooling system, but should not eliminate returns to superior levels of the school systems over other levels — e.g., returns to the Associate degree over a high school diploma — since prospective students will require higher earnings to compensate for the additional direct and opportunity costs they incur in the process of education. However, the development of low-cost public institutions, and the development of patterns where students combine schooling and work, have reduced both the direct and the opportunity costs of achieving sub-B.A. credentials, so that the additional costs of schooling are close to zero and the earnings premia necessary to lure students into these programs may be quite small too. Then it is possible for enough students to enter fields of study for which there are substantial returns to bid earnings down to the point where returns are almost zero. One test of this hypothesis is to examine variations in returns to education across labor markets which are saturated — that is, where there are relatively many graduates of programs compared to the jobs available — and those which are unsaturated.[80]

5. The density of the distribution of earnings and queuing models of labor markets

Still another characteristic of the sub-B.A. labor market is its position in the distribution of earnings. Unlike college graduates, who are more likely to be in the upper tail of the distribution, those with "some college" are in the part of the distribution which is most "crowded" — that is, where there are the most individuals. For example, in the distribution of earnings taken from the

[80] For examples applied to secondary vocational education, see Blau and Robins (1987) and Farkas, Hotchkiss, and Stromsdorfer (1988).

Current Population Survey, median earnings for all males with "some college" in 1985 was $26,950, almost precisely equivalent to the median income for all males of $26,365,[81] but there are fewer males with "some college" with either high or low earnings, compared to males of all education levels. Therefore males with "some college" are concentrated in the middle of the earnings distribution.

One model of the labor market which is quite different from the neo-classical model is a queuing model (Thurow and Lucas, 1972). We can think of the labor market as a a queue of workers facing a queue of jobs, with workers ranked in terms of the skills and abilities and job ranked in terms of their earnings, status, possibilities for promotion, and working conditions. Then the labor market matches workers near the top of the queue of workers with jobs near the top of the job queue. In this model, the earnings of jobs are established by employers, rather than by the supply and demand mechanisms of the conventional neo-classical model. The purpose of obtaining more education is that it promotes individuals in the queue of workers, making them more qualified for particular kinds of jobs than others seeking those jobs. However, if an individual is competing in a job market where there are large numbers of individuals, but not much dispersion in earnings, then he or she can jump ahead of a large number of individuals but without increasing earnings by very much. Thus, in the middle of the earnings distribution where there are large numbers of individuals with roughly equal earnings, the advantage which some postsecondary education may confer on individuals may not lead to large earnings increases. In comparison, those with B.A.'s operate closer to the upper tail of the earnings distribution, where advancement in the queue implies relatively large gains in earnings.

The results in the previous section provide some indirect confirmation of the queuing model. The finding that certain Associate degrees lead to higher earnings, not directly but by providing access to jobs where individuals can accumulate greater experience, suggests that jobs are ranked in part by their prospects for stability and the ability to accumulate experience in them; then those with postsecondary vocational training have an edge over high school graduates in gaining access to these "better" jobs, and over the long run earn more because of their accumulated experience. However, apart from gaining access to these better jobs, these sub-B.A. credentials tend to have no additional effects.

6. Signaling and credentialing models

---

[81] These comparisons are based on total money income, from Table 35, rather than total money earnings, in Table 36, because only the former figures have published distributions. However, comparing means for earnings yields the same result. It is inappropriate to use NLS72 results for this comparison because those data eliminate both the bottom of the distribution — the earnings of those with less than a high school diploma — as well as some of those at the top, those with graduate degrees.

The conventional human capital specification describing earnings describes a relationship between earnings and education, but it does not specify the nature of this relationship. In the "strong" form of human capital theory, schooling develops cognitive, manipulative, and behavioral capacities in individuals that improve productivity and therefore increase earnings. However, two other models of this relationship include the signaling view, in which schooling is not directly productive but is an effective signal of higher ability because only high-ability individuals are able to complete more schooling (Spence, 1973; Arrow, 1973; Stiglitz, 1973); and models of credentialing in which employers used more educated labor than seems rational for a variety of different reasons (Rawlins and Ulman, 1974). With the "strong" version of human capital theory, finding no returns to substantial amounts of time in postsecondary education is quite puzzling; but if signaling or credentialing models are more appropriate, then the results may be easier to interpret.

In the signaling model, it is necessary to reach a signaling equilibrium, in which employers expect that a given level of schooling conveys information about individual abilities, only individuals of higher ability levels complete that level of schooling, and individuals who do complete are rewarded for their efforts. There are no mechanisms in the signaling model to move toward such an equilibrium, so it is possible for a particular level of schooling not to become an effective signal. In the case of postsecondary education, a B.A. has come to be a relative stable signal of ability, with the content of most baccalaureate programs well-established and even the reputations of most institutions relatively well-known. However, for those who have not completed a B.A. — both non-completers, and those who have earned lesser-known degrees like certificates and Associate degrees — the information value of postsecondary education may be uncertain. The intensity of programs for these programs may be difficult to determine, the content of programs is unstandardized and varying, and the institutions providing such education may have unknown reputations. If so, then employers will be unable to rely on these forms of postsecondary education as signals in the same way they can rely on B.A. degrees, and we would expect there to be a disproportionately lower returns to sub-B.A. credentials than to baccalaureate degrees.

Several theories of credentialing can also be interpreted as distinguishing college graduates from others in higher education. For example, in one version of credentialing, employers hoard educated labor against uncertainties (including cyclical fluctuations); but in this case it seems more appropriate to hoard the most broadly-educated kinds of labor, whose supply is most inelastic in the short run — an argument for hoarding those with B.A.'s and graduate degrees rather than sub-B.A. credentials. Another argument is based on ignorance and asserts that employers hire educated labor mistakenly thinking that college graduates will be more productive; but while the B.A. degree may have an inflated reputation, it seems unlikely that sub-B.A. credentials have similarly developed reputations which overstate their effects on productivity, since many are relatively recent

and (at least compared to B.A. degrees) comparatively rare. Still another version of credentialing assumes that firms hire more educated labor as a kind of consumption benefit, since educated people are more stimulating to be with. This can again be interpreted as favoring college graduates over those who have completed lesser amounts of postsecondary education. To be sure, the validity of the different conceptions of credentialing is generally untested and unknown, and so the models may mistake the relationship between formal schooling and employment; but to the extent they are valid, credentialing models suggest a difference in employment opportunities and earnings for college graduates as distinct from those with some college.

There are, then, many reasons to think that the market for B.A. recipients is quite different from the market for individuals with some college. Confirming the importance of those differences is quite difficult, since many of them involve aspects of occupations and labor markets which are quite difficult to measure, or entail general equilibrium effects that are hard to detect. Still, they provide some potential explanations for the earnings pattern of those with postsecondary education, and therefore a way of understanding somewhat better the paths individuals can take to adult status.

IV. Concluding Comments

In light of the effects of postsecondary education on earnings and other adult outcomes, presented in the previous chapter, the trends in higher education presented in Chapter I are not especially comforting. They suggest that, while enrollment in postsecondary education has been stable, and has even increased somewhat among groups of students who traditionally did not enter postsecondary education, the probability of completing a B.A. degree — the only postsecondary credential with clear and ambiguous positive effects — has declined, while certificates and vocational Associate degree with less consistent effects have increased. Furthermore, for many complex reasons the tendency to drop out of postsecondary education has increased, and is particularly high among certain groups often considered at risk of failure in the labor market, including minority students, those of lower socio-economic status, and those with poor academic records in high school; but most non-completers fail to gain anything from their postsecondary education in terms of future wage rates or earnings. Finally, the rate at which adults — those older than traditional students — are enrolling in higher education has apparently increased, but here too it is difficult to detect much benefit, either in economic or non-economic terms. The trends in postsecondary education are operating in directions *contrary* to the self-interest of students.

Clearly, for many of these students, the great promise of postsecondary education has failed to materialize.

One reason for this result is that, in many ways, the "market" in postsecondary education fails to behave according to the standard neo-classical model. Evidently enrollments do not respond much, or very precisely, to future benefits as measured by earnings, since trends in enrollments and completions have been contrary to student self-interest, and since there is such a weak response of enrollments to labor market conditions. Prospective students seem to respond more to variations in cost. (One measure of this is that variables usually thought to measure the opportunity cost of schooling — unemployment and the earnings of young high school graduates — have the opposite effects of those conventionally hypothesized, as students have increasingly combined school and work and increase their enrollment when economic conditions improve.) In addition, there are clear differences in the market for B.A.'s and those with some college — a difference which is antithetical to the neo-classical conception of a relatively homogeneous labor market, but much more consistent with theories based on segmented labor markets.

Yet in many ways higher education policy pretends that the postsecondary market works perfectly smoothly, with well-informed and rational students facing a labor market that can absorb all its graduates The promotion of all levels of education as mechanisms of economic development, the extensions of federal student aid to all students in postsecondary education (including those in private colleges and vocational schools), the constant emphasis of past policy on simple access to higher education (rather than th completion of coherent programs), and the promises made about all forms of higher education to many generations of students all treat postsecondary education as an undifferentiated enterprise. But this is clearly not the case. The challenge over the next few years will be both to learn more about the reasons and consequences of this differentiation, and then to craft federal (and state) policies which are more responsive to the current realities in postsecondary education.

TECHNICAL APPENDIX

Samples and Weights

The NLS72 sample is intended to be used with a series of weights designed to compensate for different probabilities of being selected for the sample and then for non-response to different follow-ups. In addition, a weight is constructed (called WT1) to compensate for non-response of institutions to the requests for transcripts. These weights are the inverses of the probabilities of being included in different samples, calculated for different groups of individuals. Therefore individuals who belong to a group with low probability of inclusion — a group with a great deal of non-response, for example — are relatively overweighted to compensate for the lack of those not included; in effect, individuals within a group who are included are assumed to represent those who for various reasons are not included. Because the data used in this analysis comes from several different follow-ups and sources, different weights must be devised for specific analyses.

In the enrollment figures reported in Chapter I, as well as the enrollment equations in Chapter II, only those individuals who responded to the base-year questionnaire and all four-follow-ups through 1979 are included; the reason is that individuals who did not respond to one of the follow-up questionnaires would have an incomplete record of postsecondary education, and the requests to postsecondary institutions for transcripts as part of the transcript study would also be incomplete. The weight used in these analyses initially compensates for non-response to the base year questionnaire plus the first four follow-ups (called WT26 in the NLS72 data tapes). However, information on the type of institution in which individuals enrolled is taken from transcript records, not self reports, and so for those individuals who report any postsecondary education the final weight must compensate for non-response to the transcript study as well. Therefore the final weight used is WT26 for those individuals who reported no postsecondary education, and a combination of WT26 and WT1 for those who reported postsecondary education. The resulting weights are normalized separately for each of the two groups so that the final weight has the correct proportion of individuals enrolling in postsecondary education.

For the results on earnings and other adult outcomes in Chapter III, the fifth follow-up must be used, so that a weight compensating for inclusion in the fifth follow and response to this questionnaire must be devised. The weight used is in effect a multiplication of the weight devised for the enrollment equations and the weight (FU5WT) included on the fifth follow-up tapes designed to compensate for non-response to the fifth follow-up.

Credits

The credits included on the NLS72 transcript files are those reported by the various institutions, but since the transcript requests did not ask institutions to standardize their methods of

calculating credits, the meaning of these credits vary considerably. The simplest form of this variation is that a credit under a semester system is not the same as a credit under a trimester or quarter system. The most difficult problems arise in the case of vocational credits, where very large numbers of credits — up to 500 — are reported for some courses which are especially intensive (e.g., where an individual takes only one course for an entire semester), or where courses are internships, practica, extensive laboratories, or other practice-based approaches.

In order to examine credits earned, it is therefore first necessary to adjust the credits reported in the transcript study. Vocational courses are especially likely to report very high numbers of credits, suggesting that contact hours rather than credits were being reported by schools. For the NLS72 data, contact hours in semester institutions were converted into semester credits with a ratio of 15:1 for lecture courses, and 30:1 for non-lecture courses (e.g., those practice-oriented vocational courses in which there is no homework. For institutions on the quarter system, the conversion rates were 10:1 and 20:1. (These conversion rates were taken from the Association of Trade and Technical Schools and from the Association of Independent Colleges and Schools.) Credits for courses with more than 90 credits, most of which were practice-oriented vocational courses, were divided by 45 on the assumption that full-time academic students put in 600 hours (15 weeks times 40 hours per week) to earn 12 to 15 credits, or an average of 45 hours per credit (=600/13.5). Fortunately, given the unavoidable error in this procedure, the numbers of courses with large reported credits that must be adjusted is very small: in the NLS72 data 0.65 percent reported twelve credits or more. In previous work for the Center for Educational Statistics (Grubb, 1987) there were no real differences between results based on counting courses and those based on counting credits, suggesting that these credits conversions are not a source of error. In addition, credits earned were included only for courses with passing grades, or designated as "pass" or "credit". In particular, this means that many remedial courses taken on a non-credit basis do not appear as credits earned.

Vocational and Academic Fields

Fields of study in the NLS72 data are reported according to CIP codes (Malitz, 1983) describing fields like agriculture, business, mathematics, and the like. In this study these fields are distinguished as academic or vocational fields, with vocational fields of study being more job-specific than academic fields. The classification of CIP codes is given in at the end of this appendix; the same classification is used for all institutions including four-year colleges.

The Treatment of Zero Earnings and Experiments with Tobit Analysis

In analyzing wage rates and earnings, the problem arises of how to treat wage rates and earnings reported to be zero. (This issue also arise in examining unemployment, occupational

status, and job satisfaction since they are also connected with employment.) The conventional approach is to include in earnings functions only those with non-zero earnings; that is, the regression answers the question of what the effects of independent variables are on earnings among those with earnings. However, the group with zero earnings (or wages) is composed of two groups: those who have been in the labor market but have been unemployed and therefore have zero earnings; and those who have not been in the labor market. Failing to include the first group results in an over-estimate of earnings among those in the labor force; failing to include the second group results in a potentially biased sample, since those not in the labor force may not participate if their potential earnings are low (or, in the case of women, because their potential earnings are lower than the value of their staying home).

In the NLS72 data, there are very few individuals — only 1.4 percent of those in the fifth follow-up — who reported that they were working voluntarily. The variables on earnings are collected in such a way that it is impossible to distinguish "true zeros" — zero earnings among those who were trying to work — from zero earnings among those who were not in the labor force. Therefore the results reported in Chapter III follow the usual practice of excluding individuals with non-zero wages and earnings.

However, another approach is to treat zero earnings, or non-employment, as a problem of a censored sample, with those reporting zero earnings as having unobserved earnings because of their decision not to participate in the labor force. Then the probability of observing any level of positive earnings is the probability of participation times the probability of earning that level of income among those who participate; the probability of observing zero earnings is one minus the probability of participating. If each probability is a function of the same vector of independent variables, then the resulting estimate earnings as a function of these variables is conventionally referred to as a Tobit analysis, after Tobin (1958); see also Maddala (1983) and Amemiya (1984).

The Tobit estimates for men consider both lower truncation at zero and upper truncation at $199,986, since the NLS72 arbitrarily truncated earnings above this level. Not surprisingly, given that non-employment is probably close to random among men, the OLS and Tobit results are remarkably close. However, the Tobit estimates for women are quite different, and in particular the coefficients for most of the schooling variables (including BA) are significant and negative — all of which is quite implausible. The reason is that, while earnings among women with earnings are higher for those with B.A. degrees, a higher fraction of college graduates have earnings, compared to high school graduates. When these patterns of non-participation are considered, then in the Tobit analyses it appears that earning a B.A. degree leads to lower levels of earnings once the positive effect on participation has been considered. The flaw is the use of the Tobit model itself, which uses the same vector of independent variables to predict participation and then earnings contingent on participation. The correct procedure would be to follow Cragg (1971), using a different set of

variables (including husband's income and the presence of children) to estimate an equation for participation and then using these results to correct for the truncation effect in earnings functions.

Parameter Variances and Balanced Repeated Replication

The NLS72 data were collected with a two-stage sampling procedure which first sampled schools and then sampled students within schools. The two-stage sampling technique results in a sample with smaller variance than the population, because individuals randomly sampled within schools have less variance than individuals randomly sampled in the population. Therefore variances of sample parameters calculated with conventional formulas, designed for calculating variances of samples drawn randomly, will underestimate sample variances. There are various solutions to this problem, including Taylor series methods, jackknife techniques, and bootstrap methods (Kish and Frankel, 1970; Kish and Frankel, 1974; Rust; 1983, Wilson, 1983). In this analysis I have used a jackknife technique called Balanced Repeated Replication (BRR), because the NLS72 sample perfectly follows the sampling method — with two schools sampled within each of about 600 strata — for which BRR was devised. The method involves drawing a series of random half-samples, with one school per stratum included, and estimating means and regression parameters for each of the half-samples. Then variances across the half-samples are consistent estimates of sample variances.

For these results 20 half-samples were drawn, and regressions for males for log(TEARN85) were estimated for each half-sample. The results indicate that the square root of design effects, often denoted as √deff — the ratio of BRR standard errors to standard errors estimated in the conventional way — range from .93 to 2.70, and vary considerably among variables. The √deff are as follows:

BLACK	1.426	CERT	1.381
HISP	1.176	VOCAA	1.232
AMERIND	1.222	ACAA	1.296
ASIAN	1.726	VOCCRCC	1.174
SES	1.171	VOCCRTI	1.268
FAMY1	1.164	VOCCRPRI	2.309
FAMY2	1.556	VOCCR4YR	0.952
FAMY3	1.750	ACCRDCC	1.128
FAMY4	1.847	ACCREDTI	1.077
MDFAMY	2.696	ACRED4YR	0.932
SPECEXP	2.031	CREDPJC	1.323
OTHEXP	2.121	SRCERT	1.248

OTHEXP2	2.040	SRACAA	2.110
DISCEXP	2.286	SRVOCAA	1.939
OJTFOR	1.200	SRBA	1.342
OJTINFOR	1.397	MOCC	1.118
OTHEMPTR	1.429	MO4YR	1.733
		MOVOC	1.118

Evidently there are some patterns to these design effects: they are relatively lower for transcript-reported credits and credentials than for self-reported credentials and months in postsecondary institutions; they are relatively high (around 2) for experience variables.

Because other studies reveal that design effects are relatively consistent for particular variables, the conventional recommendation is to apply these design effects to the parameters of particular variables, no matter what the dependent variable. (Evidently, estimating BRR variances for all parameters would be immensely time-consuming.) In addition, I have applied these design effects to more detailed variables; for example, the design effect for B.A. degrees is applied to all types of B.A. degrees in Tables III-9 and III-10, and similarly for other types of credentials. Given the fact that BRR-estimated variances and design effects are themselves stochastic variables, subject to unknown variance, this procedure should be viewed as an approximation.

Revised December 2, 1987

CLASSIFICATION OF POSTSECONDARY COURSES

The following classification groups courses, described in the NLS-72 transcripts by a six-digit CIP code, into ten vocational areas, eight academic areas, and remedial/avocational.

I. VOCATIONAL COURSES

1. Agriculture

Agribusiness and agricultural production 010101 - 019999
Agricultural sciences 020101 - 029999
Renewable natural resources 030101 - 039999

2. Business and management

2.1 Business management and finance

Business and management 060101 - 069999 except insurance and risk management, (060801), marketing management and research (061401-061499), real estate (061701-061799), small business management (061801-061899)
Arts management 500704

2.2 Business support

Business and office, 070101 - 079999 except 070305 (business data programming) and 070306 (business systems analysis)

3. Marketing and distribution

Marketing and distribution 080101 - 089999
Insurance and risk management 060801
Marketing management and research 061401 - 061499
Real estate 061701 - 061799
Small business management 061801 - 061899

4. Health

4.1 Nursing

Nursing 181101 - 181199
Nursing-related services 170601 - 170699

4.2 Other health

Allied health 170101 - 179999 except 170601-170699
Health sciences 180101 - 189999 except 181101 - 181199

5. Occupational home economics

Home economics 190101 - 199999
Vocational home economics 200101 - 200699
Personal services 120101 - 129999
Interior design 040501

6. Trades and industry

6.1 Construction trades 460101 - 469999

6.2 Mechanics and repairers 470101 - 479999

6.3 Precision production 480101 - 489999 plus industrial arts (210101 - 210199)

6.4 Transportation and material moving 490101 - 499999

7. Technical and engineering

7.1 Computer and information sciences 110101 - 119999 plus 070305 (business data programming) and 070306 (business systems analysis)

7.2 Engineering 140101 - 149999, 300301, 300601 (systems sciences)

7.3 Engineering technologies and other technologies

Engineering-related technologies 150101 - 159999
Science technologies 410101 - 419999
Communication technology 100101 - 100199

8. Education

Education 130101 - 139999
Library science 250101 -259999

9. Public service

Protective services 430101 - 439999
Public affairs 440101 - 440301, 440601 - 449999
Military science 280101 - 289999
Military technologies 290101 - 290199
Parks and recreation 310101 - 319999
Public administration 440401
Law 220101 - 220199

10. Communications

Communications, general and other 090101, 099999
Journalism 090401
Radio/television news broadcast and general 090601, 090701
Advertising 090201
Communications research 090301
Public relations 090501

II. ACADEMIC

1. Letters

1.1 Literature 230101, 230201, 230301, 230701, 230801,

1.2 Writing 230401, 230501, 231101

1.3 Speech and linguistics 230601, 230901, 231010, 239999

2. Foreign languages

7.1 Spanish 160905

7.2 French 160901

7.3 German 160501

7.4 Other languages 160101 - 169999 except 160901, 160905, 160501

3. Humanities

3.1 History 450801

3.2 Other humanities

Philosophy 380101 - 389999
Theology 390101 - 399999
Humanities and social sciences 300401
Peace studies 300501

4. Sciences

4.1 Biological and life sciences 260101 - 269999, 300101

4.2 Physics 400201,400301, 400401, 400801-400899, 400901

4.3 Chemistry 400501- 400599

4.4 Other sciences 400101, 400401, 400601 - 400799, 409999

5. Mathematics 270101 - 279999

6. Social sciences

6.1 Psychology 420101 - 429999, 300201

6.2 Economics 450601

6.3 Political science 451001, 450901 (international relations), 050101 - 050199 (area studies)

6.4 Sociology 451101, 450401 (criminology), 4505011 (demography), 451201 (urban studies)

6.5 Other social science

General and other 450101, 459999
Anthropology 450201
Archeology 450301
Geography 450701
Public affairs 440501
Ethnic studies 050201 - 059999
Women's studies 300701

7. Fine arts

Visual and performing arts 500101-500999 except 500704
Architecture and environmental design 040101 - 049999 except 040501

8. Liberal studies/general studies 240101, 240199, 309999

III. REMEDIAL/AVOCATIONAL

Basic skills 320101 - 329999
Citizenship 330101 - 339999
Health-related 340101 - 349999
Interpersonal skills 350101 - 3539999
Leisure and recreational activities 360101 - 369999
Personal awareness 370101 - 370199

BIBLIOGRAPHY

Amemiya, Takeshi, "Tobit Models: A Survey", *Journal of Econometrics* 24 (1984): 3-61.

Arrow, Kenneth, "Higher Education as a Filter", *Journal of Public Economics* 2 (July 1973):193-216.

Becker, Gary, *Human Capital*, Second Edition (New York: Columbia University Press for the National Bureau of Economic Research, 1975).

Behrman, Jere, and Birdsall, Nancy, "The Quality of Schooling: Quantity Alone is Misleading", *American Economic Review* 73 (December 1983): 928-946.

Belanger, Charles, and Lavallee, Lise, "Economic Returns to Schooling Decisions", *Research in Higher Education* 12 (1980): 23-35.

Bird, Carolyn, *The Case Against College* (New York: David McKay, 1975).

Bishop, John, "The Effect of Public Policies on the Demand for Higher Education", *Journal of Human Resources* 7 (1977): 283-307.

Blair, Larry, Finn, Michael, and Stevenson, Wayne, "The Returns to the Associate Degree for Technicians", *Journal of Human Resources* 16 (Summer 1981): 449-458.

Blau, David, and Robins, Philip, "Training Programs and Wages: A General Equilibrium Analysis of the Effects of Program Size", *Journal of Human Resources* 22 (Winter 1987): 113-125.

Blaug, Mark, "The Empirical Status of Human Capital Theory: A Slightly Jaundiced Survey", *Journal of Economic Literature* 14 (September 1976): 827-855.

Breneman, David, and Nelson, Susan, *Financing Community Colleges: An Economic Perspective* (Washington D.C.: Brookings Institution, 1981).

Brint, Steven, and Karabel, Jerome, *The Triumph of Vocationalism: The Community Colleges and the Politics of Organizational Change* (Cambridge University Press, forthcoming).

Bureau of the Census, U. S. Department of Commerce, *Money Income of Households, Families, and Persons in the United States: 1985*, Current Population Reports, Series P-60, No. 156, 1987.

Bureau of the Census, U.S. Department of Commerce, *What's It Worth? Educational Background and Economic Status: Spring 1984*, Current Population Reports, Series P-70, No. 11, 1987.

Campbell, R., and Siegel, B., "The Demand for Higher Education in the United States, 1919-1964", *American Economic Review* 57 (1967): 482-494.

Carnegie Commission on Higher Education, *A Classification of Institutions of Higher Education* (Berkeley: Carnegie Commission on Higher Education, 1973).

Christian, Virgil, and Shoup, Robert, "The Effect of Education on Relative Earnings of Black and White Women", *Economics of Education Review* 1 (Winter 1981): 113-122.

Christensen, S., Melder, J., and Weisbrod, B., "Factors Affecting College Attendance", *Journal*

of Human Resources 10 (1975): 174-188.

Commission on the Future of Community Colleges, *Building Communities: A Vision for a New Century* (Washington D.C.: American Association of Community and Junior Colleges, 1988).

Corazzini, A., Duggan, D., and Grabowski, H., "Determinants and Distributional Aspects of Enrollment in U.S. Higher Education", *Journal of Human Resources* 7 (1972): 39-59.

Corman, Hope, "Postsecondary Education Enrollment Responses by Recent High School Graduates and Older Adults", *Journal of Human Resources* 17 (1983): 247-267.

Corman, Hope, and Davidson, Paul, "Economic Aspects of Post-secondary Schooling Decisions", *Economics of Education Review* 3 (1984): 131-139.

Cragg, J., "Some Statistical Models for Limited Dependent Variables with Application to the Demand for Durable Goods", *Econometrica* 39 (1971): 829-844.

Eckaus, Richard, *Estimating the Returns to Education: A Disaggregated Approach* (Berkeley: Carnegie Commission on Higher Education, 1973).

Farkas, George, Hotchkiss, Larry, and Stromsdorfer, Ernest, "Vocational Training, Supply Constraints, and Individual Economic Outcomes", paper presented at the American Educational Research Association, April 1988.

Feldman, Paul, and Hoenack, Steven, "Private Demand for Higher Education in the U.S.", in *The Economics of Financing of Higher Education in the U.S.*, U.S. Congress, Joint Economic Committee, 1969.

Freeman, Richard, "Over-investment in College Training", *Journal of Human Resources* 10 (1975): 287-311.

Galper, Harvey, and Dunn, Robert, "A Short-run Demand Function for Higher Education in the United States" *Journal of Political Economy* 77 (1969): 765-777.

Griliches, Zvi, "Estimating Returns to Schooling: Some Econometric Problems", *Econometrica* (1975): 237-252.

Griliches, Zvi, and Mason, William, "Education, Income, and Ability", *Journal of Political Economy* 80 (May-June 1972):S74-S103.

Greenberger, Ellen, and Steinberg, Laurence, *When Teenagers Work: The Psychological and Social Costs of Adolescent Employment* (New York: Basic Books, 1986).

Grubb, W. Norton, "The Bandwagon Once More: Vocational Preparation for High-Tech Occupations", *Harvard Educational Review* 54 (1984): 429-451.

Grubb, W. Norton, *The Postsecondary Vocational Education of 1980 Seniors*, LSB-87-4-10, MPR Associates for the Longitudinal Studies Branch, Center for Education Statistics, Office of Educational Research and Improvement, U.S. Department of Education, April 10, 1987.

Grubb, W. Norton, *The Postsecondary Education of 1980 Seniors Completing Academic A.A. Degrees*, LSB-87-5-7, MPR Associates for the Longitudinal Studies Branch, Center for Education Statistics, Office of Educational Research and Improvement, U.S. Department of Education, May

26, 1987.

Grubb, W. Norton, "Vocationalizing Higher Education: The Causes of Enrollment and Completion in Public Two-Year Colleges, 1970-1980", *Economics of Education Review* 7 (1988):301-319.

Grubb, W. Norton, *Access, Achievement, Completion, and "Milling Around" in Postsecondary Vocational Education* MPR Associates for the National Assessment of Vocational Education, April 1989.

Grubb, W. Norton, "The Effects of Differentiation on Educational Attainment: The Case of Community Colleges, *Review of Higher Education*, forthcoming, 1989.

Grubb, W. Norton, and Wilson, Robert, "Sources of Increasing Inequality in Wages and Salaries, 1960-1980", *Monthly Labor Review* 112(April 1989): 3-13.

Gustman, Alan, and Steinmeier, Thomas, "Labor Markets and Evaluations of Vocational Training Programs in the Public High Schools — Toward a Framework for Analysis", *Southern Economic Journal* 49 (1982): 185-200.

Hanushek, Eric, "Alternative Models of Earnings Determination and Labor Market Structures", *Journal of Human Resources* 16 (Spring 1981): 238-259.

Hanushek, Eric, "Regional Differences in the Structure of Earnings", *Review of Economics and Statistics* 55 (May 1973): 204-213.

Heinemann, Harry, and Sussna, Edward, "The Economic Benefits of a Community College Education", *Industrial Relations* 16 (October 1977): 345-354.

Hill, C. Russell, "Education and Earnings: A Review of the Evidence", *Economics of Education Review* 1 (Fall 1981): 403-420.

Hoachlander, E.Gareth. and Choy, Susan, *Classifications of Secondary Vocational Education Courses and Students*, MPR Associates for the Center for Educational Statistics, LSB-87-11-14, 1987.

Hoenack, Steven, and Weiler, William, "The Demand for Higher Education and Institutional Enrollment Forecasting", *Economic Inquiry* 17(1979): 89-113.

Jackson, Gregory, and Weathersby, George, "Individual Demand for Higher Education", *Journal of Higher Education* 46 (1979): 623-652.

Johnson, George, and Stafford, Frank, "Social Returns to Quantity and Quality of Schooling", *Journal of Human Resources* 3 (Spring 1973):139-155.

Jones, Calvin, et al., *High School and Beyond 1980 Senior Cohort Second Follow-up (1984) Data File User's Manual*, National Center for Education Statistics, August 1985.

Jones, Calvin, et al., *High School and Beyond Postsecondary Education Transcript Study Data File User's Manual*, Center for Statistics, U.S. Department of Education, May 1986.

Jones, Calvin, et al., *National Longitudinal Study of the High School Class of 1972, Postsecondary Education Transcript Study Data File User's Manual*, Center for Statistics, U.S. Department of Education, August 1986.

Kohn, M., Manski, C., and Mundel, D., "An Empirical Investigation of Factors Which Influence College-Going Behavior", *Annals of Economic and Social Measurement* 5/4 (1976): 391-419.

Kish, Leslie, and Frankel, Martin, "Balanced Repeated Replication for Standard Errors", *Journal of the American Statistical Association* 65 (September 1970): 1071-1094.

Kish, Leslie, and Frankel, Martin, "Inference from Complex Samples", *Journal of the Royal Statistical Society* 36 (1974): 1-22.

Lehr, D., and Newton, J., "Time Series and Cross-sectional Investigations of the Demand for Higher Education", *Economic Inquiry* 16 (1978): 411-422.

Leslie, Larry, and Brinkman, Paul, *The Economic Value of Higher Education* (New York: American Council on Education and Macmillan Publishing, 1988).

Link, Charles, and Ratledge, R.C., "Social Returns to Quantity and Quality of Education: A Further Statement", *Journal of Human Resources* 10 (Winter 1975):78-79.

Maddala, G.S., *Limited-Dependent and Qualitative Variables in Econometrics* (Cambridge: Cambridge University Press, 1983).

Malitz, Gerald, *A Classification of Instructional Programs*, National Center for Education Statistics, U.S. Department of Education, February 1981.

Manski, Charles, "Schooling as Experimentation: A Reappraisal of the College Dropout Phenomenon", Discussion Paper #865-88, Institute for Research on Poverty, University of Wisconsin, Madison, September 1988.

Manski, Charles, and Wise, David, *College Choice in America* (Cambridge: Harvard University Press, 1983).

Masters, Stanley, "The Effect of Educational Differences and Labor Market Discrimination on the Relative Earnings of Black Males", *Journal of Human Resources* 9(1974): 342-360.

Mattila, J.P., "Determinants of Male School Enrollments: A Time-series Analysis", *Review of Economics and Statistics* 6 (1982): 242-251.

McMahon, Walter, and Wagner, Ann, "Expected Returns to Investments in Higher Education", *Journal of Human Resources* 16 (1981):274-285.

McMahon, Walter, and Wagner, Ann, "The Monetary Returns to Education as Partial Social Efficiency Criteria", in Walter McMahon and Terrence Geske, *Financing Education: Overcoming Inefficiency and Inequity* (Urbana: University of Illinois Press, 1982).

Meyer, Robert, "The Labor Market Effects of Vocational Education", The Urban Institute, August 1981.

Mincer, Jacob, *Schooling, Experience, and Earnings* (New York: Columbia University Press, 1974).

Osterman, Paul, *Getting Started: The Youth Labor Market* (Cambridge: MIT Press, 1980).

Parnes, Herbert, and Kohen, Andrew, "Occupational Information and Labor Market Status: The

Case of Young Men", *Journal of Human Resources* 10 (1985): 44-55.

Pindyck, Robert, and Rubinfeld, Daniel, *Econometric Models and Economic Forecasts*, Second Edition (New York: McGraw-Hill, 1981).

Powell, Arthur, Farrar, Eleanor, and Cohen, David, *The Shopping Mall High School: Winners and Losers in the Educational Marketplace* (Boston: Houghton Mifflin, 1985).

Psacharopoulos, George, *Returns to Education: An International Comparison* (Amsterdam: Elsevier, 1973).

Rawlins, V. Lane, and Ulman, Lloyd, "The Utilization of College-Trained Manpower in the United States", in Margaret Gordon, *Higher Education and the Labor Market* (New York: McGraw-Hill, 1974).

Reed, R.H., and Miller, H.P., "Some Determinants of the Variation in Earnings for College Men", *Journal of Human Resources* 5 (1970): 177-190.

Ribich, T.L., and Murphy, J.L., "The Economic Returns to Increased Educational Spending", *Journal of Human Resources* 10 (1975): 56-77.

Riccobono, John, et al., *National Longitudinal Study: Base Year (1972) Through Fourth Follow-up (1979) Date File Users Manual*, National Center for Education Statistics, June 1981.

Richardson, Richard, Fisk, Elizabeth, and Okun, Morris, *Literacy in the Open-Access College* (San Francisco: Jossey-Bass, 1983).

Rizzuto, Ronald, and Wachtel, Paul, "Further Evidence on the Returns to School Quality", *Journal of Human Resources* 15 (Spring 1980): 240-254.

Rosen, Sherwin, "Human Capital: Relations Between Education and Earnings", in Ronald Ehrenburg, ed., *Research in Labor Economics* (Greenwich: Johnson Associates, 1976).

Rouche, John, and Baker, George, *Access and Excellence: The Open-Door College* (Washington D.C.: Community College Press, 1987).

Rumberger, Russell, "The Economic Decline of College Graduates: Fact or Fallacy?" *Journal of Human Resources* 15 (1980): 99-112.

Rumberger, Russell, "The Changing Industrial Structure of the U.S. Economy: Its Impact on Employment, Earnings, and the Educational Requirements of Jobs", Stanford Education Policy Institute, Stanford University, 1986.

Rust, Keith, "Variance Estimation for Complex Estimators in Sample Surveys", *Journal of Official Statistics* 1 (1983): 381-397.

Schultz, Theodore, "The Value of the Ability to Deal with Disequilibria", *Journal of Economic Literature* 13 (1975): 827-846.

Sizer, Theodore, *Horace's Compromise: The Dilemma of the American High School* (Boston: Houghton Mifflin, 1984).

Smith, James, *The Convergence of Racial Equality in Women's Wages* (Santa Monica: Rand Corporation, 1978).

Solmon, Lewis, "The Definition of College Quality and Its Impact on Earnings", *Exploring Economic Research* 2 (1975): 536-587.

Solmon, Lewis, "Quality of Education and Economic Growth", *Economics of Education Review* 4 (1985): 273-290.

Spence, Michael, *Market Signaling* (Cambridge: Harvard University Press, 1974).

Stern, David, and Grubb, W. Norton, "Factor Complementarity, Skill Specificity, and the Distribution of Benefits from Vocational Education", paper presented at the American Economics Association, December 1988.

Stiglitz, Joseph, "The Theory of 'Screening', Education, and the Distribution of Income", *American Economic Review* 65 (June 1975): 283-300.

Sulock, J., "The Demand for Community College Education", *Economics of Education Review* 2 (1982): 351-361.

Taubman, Paul, and Wales, Terrence, *Higher Education and Earnings* (New York: McGraw-Hill, 1974).

Thurow, Lester, and Lucas, Robert E.B., *The American Distribution of Income: A Structural Problem*, Joint Economic Committee, March 17, 1972.

Tinto, Vincent, "Dropouts from Higher Education: A Theoretical Synthesis of Recent Research", *Review of Educational Research* 45 (1975): 89-125.

Tinto, Vincent, "Theories of Student Departure Revisited", in J. Smart, ed., *Higher Education: Handbook of Theory and Research*, Vol. 2 (New York: Agathon Press, 1986).

Tinto, Vincent, *Leaving College: Rethinking the Causes and Cures of Student Attrition* (Chicago: University of Chicago Press, 1987).

Tobin, James, "Estimation of Relationships for Limited Dependent Variables", *Econometrica* 26 (1958): 24-36.

Tourangeau, Roger, et al., *The National Longitudinal Study of the High School Class of 1972 (NLS-72) Fifth Follow-Up (1986) Data File User's Manual*, National Opinion Research Center, University of Chicago for the Center for Education Statistics, U.S. Department of Education, December 1987.

Tuma, Nancy, and Hannon, Michael, *Social Dynamics: Models and Methods* (New York: Academic Press, 1984).

Willis, Robert, and Rosen, Sherwin, "Education and Self-Selection", *Journal of Political Economy* 87 (1979): S7 - S36.

Wilms, Wellford, "Proprietary Schools: Strangers in Their Own Lands", *Change*, January/ February 1987.

Wilson, Mark, *Adventures in Uncertainty*, Occasional Paper No. 17, Australian Council for Educational Research, April 1983.

Wise, David, "Academic Achievement and Job Performance", *American Economic Review* 65 (1975): 350-366.

U. S. Department of Labor, *How Workers Get Their Training*, Bureau of Labor Statistics, Bulletin 2226, February 1985.