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ABSTRACT

The Survey of Income and Program Participation (SIPP) was used to compare estimates of the benefits of education among different levels of education and thereby identify the returns to education and training in the subbaccalaureate labor market. The study data consisted of information on the educational attainment and income of 14,537 (7,981 males, 6,556 females), 10,384 (5,452 males; 4,952 females); and 20,539 (10,600 males; 9,939 females) SIPP respondents (aged 25-64 years) for calendar years 1984, 1987, and 1990, respectively. Estimating equations describing respondents' earnings as a function of education and other conventional independent variables were constructed, and the results were analyzed. Both certificates and associate degrees were found to increase the earnings of those who received them, albeit not by as much as a baccalaureate degree does. Some kinds of postsecondary education provided no economic advantage at all, and completion of a certificate proved more beneficial than completion of years of college without a credential. As is the case for baccalaureate degrees, the benefits of subbaccalaureate credentials varied substantially by field of study and the effects of having a job related to one's field of study proved substantial. (Sixteen tables are included. Information about the samples and selected independent variables and a field of study-occupation matching algorithm are appended. Contains 44 references. (MN)

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My greatest debt is to Bill Ponicki, who carried out with exceptional diligence the programming of the SIPP data necessary for this monograph. The SIPP data is extraordinarily complex, with changing samples and patterns of missing data that are often bewildering; but Bill was able to both perceive the myriad problems of the SIPP and to fashion reasonable solutions.

Several individuals at the Survey Research Center of the University of California at Berkeley provided help in obtaining the SIPP data, including Fred Grey and Ilona Einowski. Finally, Elliot Medrich and Robert Vergun of MPR Associates, Berkeley, provided us with the 1990 SIPP data as well as with a protocol for matching job titles and fields of study.

This research grew out of an early suggestion to Patty Beatty-Guenther, who received her Ed.D. from the School of Education at Berkeley and is now the director of institutional research at North Island College, British Columbia, that SIPP data might be appropriate for estimating the benefits of community colleges. Her early work with the SIPP was instrumental in clarifying for me the usefulness of this data set.

EXECUTIVE SUMMARY

The value of formal schooling's power to increase employment opportunities, wages, and earnings has been apparent for a long time. However, conventional wisdom regarding the economic benefits of education may not hold true for every type of education or for every group of students. In particular, the value of education in community colleges and technical institutes and, more generally, the effects of accumulating some education beyond the high school diploma but short of a baccalaureate have been unclear due to a lack of appropriate data. Since a slight majority of students receiving postsecondary education are enrolled in community colleges and technical institutes, and since about one quarter of the labor force could be included in a group described as having "some college," the lack of information about the economic effects of a college education below the baccalaureate level is serious for both students and policymakers.

This monograph uses the Survey of Income and Program Participation, or SIPP, to present a comparison of the estimates of the benefits of education among different levels of education, including the group with some college, as well as those with less than a high school diploma, baccalaureate degrees, and graduate education. The SIPP data has some advantages compared to other data sets, particularly due to the fact that it includes individuals of all ages rather than a small range of ages. It suffers from disadvantages as well, particularly in the lack of information on individual ability or academic achievement. Another disadvantage is the fact that educational achievement is reported by individuals themselves rather than by transcripts. The SIPP also provides the information necessary to construct other independent variables that explain variations in earnings, including race and ethnicity, family background, region of the country, certain aspects of family (marriage and number of children), and several measures of labor market experience.

The results of estimating equations describing earnings as a function of education and other conventional independent variables yield the following results:

- First and foremost, it is clear that the critics who claim that community colleges and other two-year institutions provide no economic benefits are incorrect. Both certificates and Associate degrees increase the earnings of those who receive them—not, of course, by as much as a baccalaureate degree, which requires

between two and four times as many credits, but, still, by substantial and statistically significant amounts.

- While there may be substantial economic returns from certificates and Associate degrees, it is equally clear that some kinds of postsecondary education provide no economic advantage at all; therefore, to simply recommend that individuals continue their education in community colleges and technical institutes is unwarranted. Obviously, short periods of time spent in postsecondary education have uncertain effects. Only those women who report that they have completed three or four years of college, but without having received any postsecondary credentials—consistent with substantial attendance at four-year colleges, not community colleges—have higher earnings than high school graduates. Longer durations of enrollment among noncompleters provide larger and more significant benefits among men than among women, but here too, the effects of shorter durations of college attendance—less than one year, which someone entering a community college for a short period of time might have—is usually too little to be statistically significant and is essentially zero for younger cohorts (ages 25-34 and 35-44). Although some men may benefit from small amounts of course-taking, the average effect is quite close to zero.

- There appear to be "program effects." In general, completion of a certificate is more beneficial than completion of one year of college without a credential. An Associate degree is more valuable than two years of college, and a baccalaureate degree increases earnings by more than four years of college without the credential. Once again, this suggests that obtaining credentials is the wisest course for most individuals.

- Over the period 1984 to 1990, many students attending community colleges and technical institutes were older than "traditional" students, and it may seem possible that the economic returns for such older students would be lower than for others. However, this proves not to be true; indeed, for women, there is even evidence that the returns from Associate and baccalaureate degrees are higher for those who earn them at or after age 30.

- As is well-known for baccalaureate degrees, the benefits of sub-baccalaureate credentials vary substantially by field of study. Even though small samples affect

the inferences possible, some fields of study—business and health for women; business, engineering, technical fields, and perhaps public service for men—provide substantial benefits, while others either provide little earnings advantage or provide benefits that are highly variable. The fact that the most beneficial fields of study (except for business) are different for men and women—a result that is not generally true for baccalaureate degrees—suggests the extent of gender segregation in these programs and in the labor market for which they prepare students. It also suggests that the common recommendation to encourage women to enter nontraditional educational programs—in areas like engineering, computers, electronics, and other technical fields—may not benefit them in the ways that proponents of such gender equity imagine, *unless* something is done to reduce the apparent discrimination against women in such fields.

- The effects of having a job related to an individual's field of study are substantial. As one might expect, the returns to related employment are almost always higher than the returns to unrelated employment. This confirms the hypothesis that the job-specific nature of vocational education reduces its value in unrelated jobs. Second, while the returns to unrelated Associate and baccalaureate degrees are lower than to related degrees, they still tend to be significant. The implication is that occupational degrees do have some general components that enhance productivity and earnings, even in occupations unrelated to the field of the credentials. Third, in a substantial number of cases—and particularly among individuals with some college but no credentials—the coefficient for related employment is significant, but the coefficient for unrelated employment is not. These are particularly worrisome cases because they imply that the completion of coursework is necessary but not sufficient to realize economic benefit, and that placement in a related occupation is crucial.

- In addition to information on education, the SIPP also asks individuals whether they have been in various short-term job training programs. By and large, the effects of job training on earnings are zero or even negative: only employer-sponsored training provides a consistent boost to earnings for both men and women, though training in trade schools and community colleges is beneficial to women if they find related employment. In addition, the effects of programs are generally greater if an individual's current employment is related to the training he

or she received—which is what one might expect, since short-term job training is almost, by definition, relatively job-specific. However, the vast array of government-sponsored job training programs do not increase earnings substantially. There are, of course, many explanations for this finding, principally that such programs enroll individuals with substantial barriers to employment—low skill levels, a lack of motivation or initiative, drug and alcohol abuse problems, physical disabilities—not otherwise described by this data but apparent to employers. Nonetheless, it is clear that most short-term job training programs have not been successful in returning their clients to the mainstream of the labor market.

The implications of these results for students are relatively clear. Because there is substantial variation in the returns to postsecondary education—depending on how much a student completes and the field of study—prospective students need to be well-informed about the economic consequences of their decisions. Since it is unclear that sufficient information is currently available, especially at the local level where students make their decisions, a recommendation for improved information about economic effects is warranted.

Similarly, state and federal policy has often operated without information about the effects of sub-baccalaureate education. Both states and the federal government have stressed increasing *access* to postsecondary education, rather than *completion*; yet there has been little attention to the *quality* of that education and its subsequent effects. But since many noncompleters fail to benefit from their education, and individuals in some fields of study do not benefit at all, simple access to postsecondary institutions is insufficient to guarantee *any* advantage in employment. Both state and federal policy should therefore consider the consequences of postsecondary education rather than simple access. Efforts now underway to develop performance measures in vocational education provide one example of the kind of information that would be helpful to state and federal policymakers, as well as to students, in deciding how to improve postsecondary education.

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INTRODUCTION

The economic value of formal schooling has been apparent for a long time. Adam Smith, in one of his earliest statements explaining how capitalism operates, declared that there should be a difference between the wages of skilled labor versus common labor in order to compensate an individual "educated at the expense [sic] of much time and labor" (Smith, 1776/1822, p. 101). In this country, Horace Mann argued for the economic value of education as a rationale for public support in the nineteenth century, describing education as "not only a moral renovator and multiplier of intellectual power, but also the most prolific parent of material riches" (Mann, 1842/1971, p. 147). Particularly since the turn of this century, advocates for schooling have stressed the value of "learning to earn," and vocational purposes have grown in importance relative to moral, political, or purely intellectual purposes. Moreover, empirical research on the relation between schooling and employment has consistently found that additional schooling increases earnings (e.g., reviewed in Leslie & Brinkman, 1988), confirming what earlier advocates have sometimes assumed.

However, the conventional wisdom about the economic value of schooling may not hold for every type of education or for every group of students. For individuals contemplating whether to continue their schooling and for policymakers wanting to know whether to invest public resources in particular types of schooling, the important question is not whether schooling, on the average, generates economic returns, but whether specific types of education benefit individuals and society. In particular, such information has been scarce in what I call the "sub-baccalaureate labor market"—the market for those individuals with at least a high school diploma, but less than a baccalaureate degree. This group includes those individuals who attend community colleges and technical institutes—the fastest-growing segment of higher education—as well as those who attend proprietary vocational schools. Some of these individuals receive sub-baccalaureate credentials—certificates and Associate degrees in either vocational areas or academic subjects—while a much larger number completes some education in these institutions and leaves without completing any credential. In addition, a large (and possibly increasing) fraction of students entering four-year colleges who leave without completing credentials (Grubb, 1989a), also compete in the sub-baccalaureate labor market. For this group, the well-known advantages of a higher education—that is, of a baccalaureate degree—cannot be

assumed. Furthermore, there has been relatively little analysis of returns to sub-baccalaureate schooling because of the lack of detail in most data sets.[1]

In this monograph, therefore, I examine the returns to formal schooling, concentrating on the benefits of sub-baccalaureate credentials and of "some college"—the education individuals receive when they enter postsecondary programs but fail to complete credentials. I use a data set—the Survey of Income and Program Participation, or SIPP—that has more detail about sub-baccalaureate education than most other data sets. The SIPP also contains information about certain kinds of short-term job training, which I also analyze in this monograph. In some respects, as reviewed in the next section, the SIPP data is superior to other data sets that have been used to analyze education, though it suffers from certain deficiencies, too. The results presented here are, therefore, incomplete by themselves; they should be interpreted as part of a larger research effort in which several data sets, with different strengths and weaknesses, are analyzed in order to shed light on the workings of the sub-baccalaureate labor market.[2]

The important questions to pose about the sub-baccalaureate labor market are many and varied, and not all of them can be addressed with the SIPP data. Among the important questions addressed are the following:

- Are there economic benefits to community colleges and technical institutes? Critics of these institutions have charged that there are no returns (e.g., Brint & Karabel, 1989; Pincus, 1980)—a serious charge because an increasing fraction of students (and an especially large fraction of minority students) begin their postsecondary education in community colleges. Community colleges have been promoted by their advocates not only as a low-cost way of gaining access to the benefits of

[1] For some earlier work on returns to community colleges, using institution-specific data, see Pincus (1980) and Heinemann and Sussna (1977). Wilms (1974) examined a data set that he collected; Blair, Finn, and Stevenson (1981) used a National Science Foundation data set confined to scientific and technical personnel; and Breneman and Nelson (1981) used the fourth follow-up of the NLS72 data, at a point seven years after high school graduation, when it is too early to detect the effects of sub-baccalaureate education. For more recent work using the NLS72 data, see Grubb (1992a, 1993a, 1995a, 1995b), Kane and Rouse (1993) and Hollenbeck (1993); for results with the NLS-Youth data, see Kane and Rouse (1993); for results with the High School and Beyond data, see Lewis, Hearn, and Zilbert (1993).

[2] This research is part of a larger study supported by the National Center for Research in Vocational Education, undertaken with Jacob Klerman and Lynn Karoly of the RAND Corporation, to analyze three data sets: the SIPP, the National Longitudinal Study of the Class of 1972, and the National Longitudinal Survey of Youth. This research will lead to a review article of all the various studies about the economic benefits of sub-baccalaureate education.

postsecondary education, but also as "second chance" institutions appropriate for older students, those making career changes, those in job training and welfare-to-work programs, and other nontraditional students who would not normally enroll in four-year institutions. If their benefits are low, or acutely varied, then the claims on behalf of these institutions must be tempered.

- Do the benefits of completing some college depend on receiving a credential—a certificate or an Associate degree—or does attending postsecondary education for short periods of time, but without receiving a credential, provide economic benefits? The importance of this question is—as we will see from the SIPP data itself—that many individuals enter postsecondary education (particularly community colleges) and leave without completing credentials (see also Grubb, 1989a). Particularly for community colleges, there is considerable disagreement about whether these noncompleters are really "dropouts" who have failed to attain the education goals they set for themselves; whether they are "experimenters" (Manski, 1989) who have entered community college as a low-cost way of finding out more about the advantages and disadvantages of higher education, but who have decided that postsecondary education is not for them; or whether they are really "completers" because they have finished just enough coursework to gain an entry-level job or a promotion. If individuals who fail to receive credentials are really "completers" in this sense, then we should expect some economic return to postsecondary education regardless of whether credentials are completed; but if such individuals are dropouts or experimenters, then we should not expect any return.

- If there are benefits to postsecondary education for those who do not complete credentials, are there economic returns to credentials themselves, above and beyond the returns to coursework completed? For example, is the return to a certificate—which in most institutions requires a year of full-time enrollment—greater than the return to one year of postsecondary education? Is the return to an Associate degree greater than the return to two years of postsecondary education? Such benefits attached to credentials are sometimes referred to as "sheepskin effects" (e.g., Kane & Rouse, 1993), since they are connected with the receipt of a credential, or sheepskin. Such a description is somewhat pejorative, implying that there may be unwarranted returns to credentials because employers mistakenly assume that the sheepskin signifies abilities which can just as readily be obtained by earning the

equivalent number of credits.[3] I prefer to call any benefits associated with credentials "program effects" instead. The requirements for certificates and Associate degrees typically specify coherent programs with substantial coursework in a major field, supporting academic coursework, and (often though not always) general education requirements—while students accumulating credits without a credential are more likely to take a hodge-podge of unrelated coursework (Grubb, 1987). If coherent programs are more likely to generate productive capacities than are random courses, we ought to see substantial program effects.[4]

- Are there differences in return to schooling over the 1980s? From other data (particularly the Current Population Survey) and somewhat different analyses, it has become clear that the differentials associated with education increased during the 1980s (Grubb & Wilson, 1991; Levy & Murnane, 1992; Murphy & Welch, 1989). The SIPP data has been available since 1984, making it possible to analyze the returns to schooling for different years since then. In this monograph, I report results for the years 1984, 1987, and 1990, in order to see whether there has been any trend.

- Are there variations in the economic effects of postsecondary education for students of different ages? Many community college students are nontraditional students in the sense that they are older than average and are using the community college as a way of changing careers or re-entering the labor force after a period of time without employment—a practice common among mothers with young children or among those suffering chronic unemployment. This raises the question of whether the returns for these nontraditional students—who receive their credentials when they are older—are as high as they are for conventional students. If not, then the use of the community college as a "second chance" institution is suspect.

- What is the variation in returns to sub-baccalaureate credentials by field of study? As is well known, the returns to baccalaureate degrees vary substantially by field of study (e.g., Grubb 1992b, 1995c; Leslie & Brinkman, 1988; Rumberger &

[3] There is a long debate about whether the returns to schooling reflect real abilities, or whether they are signals of abilities that are not necessarily enhanced by education (e.g., Spence, 1974), or the irrational use of education as a credential for entry into certain employment (e.g., Rawlins & Ulman, 1974). For a recent review of this literature and the empirical tests based on it, see Grubb (1993b), corrected in Grubb (1995b). This paper does not present any tests of the signaling or credentialing hypotheses.

[4] There is, to be sure, a signaling view of program effects: that completion of a credential signals the persistence necessary to complete an externally imposed requirement.

Thomas, 1993), and it seems reasonable that such variation exists for sub-baccalaureate credentials as well. Earlier work with the NLS72 data (Grubb, 1992a, 1995b) confirmed that some fields—especially health occupations and technical fields—have substantial returns, while most others have no benefits on the average. The implication of such variation for students is relatively clear, and they should be made aware of such differences among fields of study if they are to make fully informed career decisions. The implications for policy are less obvious, however, since there may be economic benefits to preparing individuals in certain fields despite the lack of economic returns to individuals.

- Are there differences in returns to education for different cohorts? There are various reasons why returns might vary by cohort, clarified in greater detail in a subsequent section. The SIPP data contains enough observations that it is possible to examine earning patterns for different age groups, or cohorts.

The SIPP data also contains information about short-term job training, like that provided by the Job Training Partnership Act. veterans programs, apprenticeships, employers, and the military. Furthermore, the SIPP asked individuals to report whether job training was related to their current job or not, in order to distinguish the effects of related training from unrelated training. While it is not always possible to be sure precisely to what these kinds of training refer, it is still worth examining the effects of such training, in part, to compare any benefits with those from formal schooling. The penultimate section, therefore, examines the effects of short-term job training.

The final section summarizes the conclusions made possible from the SIPP data. Like earlier results for the sub-baccalaureate labor market, economic returns are quite variable: (1) the benefits vary substantially between men and women, among different credentials, and among fields of study; (2) the benefits of taking courses without completing credentials are quite uncertain, especially for women; and (3) the returns to different types of training are similarly variable (though with patterns suggesting that selection effects are largely responsible). One implication is that the simple faith in formal education as a route to higher earnings needs to be tempered, since economic returns vary substantially among different types of schooling.

DATA AND METHODS: THE SURVEY OF INCOME AND PROGRAM PARTICIPATION

In the search for data to examine the effects of sub-baccalaureate education, there are at least three different *desiderata*. First and most obviously, a data set must have more detailed information than simply years of schooling completed; it is desirable to have information about sub-baccalaureate credentials as well as about uncompleted postsecondary education from different types of institutions. Second, it is necessary to have information about earnings some years after students have completed school so that individuals have settled into relatively permanent employment patterns. Because earnings differences among groups with different levels of schooling typically do not emerge until the early thirties, surveys taken of individuals shortly after they have left school—for example, the High School and Beyond survey of the high school class of 1980, which contained information obtained six years after high school[5]—may not be able to identify such earnings differences. Furthermore, as the results below will clarify, surveys which include many individuals whose schooling is incomplete are likely to be misleading because such individuals are likely to have part-time employment to get them through school—what some counselors call "stay in school" jobs—which distorts earnings patterns. Third, a data set should have sufficient information about an individual's characteristics and abilities aside from their schooling records in order to control for the various other potential influences on earnings.

Not surprisingly, no data set is perfect. One strong advantage of the SIPP is that it includes individuals of all ages, rather than including just one cohort (like the NLS72, or High School and Beyond) or a few relatively young cohorts (like the National Longitudinal Survey of Youth). The SIPP has better information about schooling than most other surveys; however, school attainment is self-reported, with inevitable biases, and details are unavailable about the types of institutions these individuals attended. The range of independent variables is adequate, though some desirable information is missing, particularly on measures of ability and academic achievement. These limitations must be remembered in comparing the results from the SIPP in this monograph with other results.

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[5] A new compilation of data collected in 1992 will provide information twelve years after leaving high school, providing better estimates of the effects of schooling on "adult" employment.

The SIPP was designed principally to examine participation in public programs, particularly those such as Aid to Families with Dependent Children (AFDC) which are related to the welfare system. Because of this goal, and because the patterns of program participation over time are of central interest, the SIPP is structured in ways quite different from most data sets used to examine earnings. For every year starting in 1984 and beyond, a new panel of the SIPP is developed. Each panel includes households who are interviewed every four months; for the 1984 panel, for example, eight interviews covered thirty-two months of these households' experiences. Households in each panel are also divided into four "rotation groups," with only one rotation group given interviews each month; as a result, information from each rotation group differs slightly in its timing. In these results, I have used information given by these individuals regarding earnings for each of the twelve months of calendar years 1984, 1987, and 1990, drawing on three or four different interviews. I then constructed a variable for annual earnings in order to make my results consistent with other analyses using annual earnings. The earnings measure used includes all wage and salary earnings, as well as self-reported earnings from self-employment, but none of the various sources of transfer income included in the SIPP.[6]

In addition to questions asked monthly of rotation groups, the SIPP periodically asks individuals to complete more specific questionnaires, called "topical modules." One of these covers education and training and is the most important for my purposes. Individuals are asked if they have completed various levels of schooling, including a Ph.D., professional degree, baccalaureate degree, Associate degree, vocational certificate, high school diploma, or less than four years of high school. For those enrolling in postsecondary education but not completing credentials, individuals are asked how many years of postsecondary education they completed, ranging from less than one year up to four years. Unfortunately, the type of institution in which individuals received this postsecondary education has not been recorded. It is plausible to infer that those receiving three or four years of postsecondary education attended four-year colleges (perhaps with some attendance at two-year institutions as well), while those with lesser amounts

[6] The reported earnings by the SIPP are monthly earnings, which are cumulated to form annual earnings. The reported monthly earnings are truncated at $8,333, corresponding to a maximum annual earnings of $100,000; for the relatively few individuals with truncated earnings, their earnings are estimated by fitting a Pareto distribution to the individuals with the same education and gender but whose earnings have not been truncated. This procedure, in turn, results in a very few individuals whose estimated earnings seem much too high, but trials including and excluding these individuals indicate that they are too few to affect the results in any significant way. In the reported results, all individuals with earnings estimated by the Pareto method have been retained.

(particularly one year or less than one year) attended community colleges and technical institutes.[7] However, strictly speaking, the information is not available in the SIPP to make this inference. In addition, when individuals report completing "two years" of postsecondary education, for example, it is unclear whether they have attended full time or part time or whether attendance resulted in course credits or represented desultory attendance without completing coursework.

It is crucial to keep in mind—particularly when comparing these results to those available from NLS72 data, which includes transcripts describing postsecondary education—that the measures of educational attainment (and training as well) are self-reported. In the NLS72 data, which includes both self-reported and transcript-reported measures of whether an individual enrolled in postsecondary education, self-reported postsecondary education is invariably higher than that reported on transcripts. Furthermore, the difference is greater for groups such as those with lower grades in high school or those with lower socioeconomic status, who would normally be the least likely to enroll in postsecondary education (Grubb, 1992a). Therefore, self-reported education is likely to be exaggerated even more for those with low levels of education. This pattern, in turn, implies that the estimated return to schooling will be higher for the SIPP data than for results based on transcripts like those from the NLS72 data.[8]

Another topical module, available for 1987 but not 1984 or 1990, describes the family of origin for individuals surveyed in the SIPP. This provides a source of information for variables measuring family background, which has generally been found to influence educational attainment and, at least in some results, subsequent earnings as well. In these results, family background was initially measured by both the education level and the occupation of the head of household when the individual was fifteen years old, plus a dummy variable describing whether the head of household was female. However, because

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[7] Those who attended a proprietary school and received a certificate or (rarely) an Associate degree have presumably reported these credentials. Those who attended a proprietary school without receiving credentials may have reported this either as "some college" or more probably as a form of job training in "vocational schooling." However, there is unavoidable ambiguity as to what "vocational schooling" refers, particularly since the questionnaire did not define this term for respondents.

[8] See Grubb (1992a). If the reported level of education is $Ed^*=Ed + u$, where Ed is the actual level of education and u is measurement error with a positive mean and negative correlation with Ed, then the estimated equation is $Y = a + b(ED + u) + ... + e$, and the estimated coefficient b will be upwardly biased compared to the true b.

parental occupation was never significant, it has been omitted from the results reported here.[9]

Other variables conventionally included in earnings equations are available from the base month questionnaire given to all individuals. These variables include race and ethnicity; whether an individual's job is covered by a union contract; a series of regional variables as well as one describing location in a metropolitan area, to reflect regional differences in salaries and costs of living; and variables describing marital status and disability. In some cases, missing data forced some values to be imputed, and dummy variables were included in such cases.[10]

It is important to note, however, that there is no information in the SIPP on ability or achievement at any level of education, an omission which has the effect of positively biasing the estimated return to schooling since ability and achievement are always positively correlated with educational attainment. Unfortunately, the magnitude of this bias is unclear, since, in other estimates, its importance has ranged from uninfluential to substantial, depending, in part, on the measures of ability available (Leslie & Brinkman, 1988). Therefore, the estimates presented in the next section must be interpreted with care because they may be partly explained by the influence of ability or achievement, rather than by schooling alone.

The most difficult variables to construct from the SIPP data are measures of labor market experience. Individuals interviewed were asked about the starting date of their current job, from which tenure on the current job can be calculated. Interviewees were also asked how long they had been doing work similar to the current job, from which *related* experience on other jobs can be calculated. Finally, information is available to calculate total experience, as well as previous experience *unrelated* to the current job as total

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[9] The unavailability of data on family background for 1984 and 1990 makes these specifications different from those used in 1987. However, because the coefficients on the family background variables in 1987 were not consistently large and significant (see Table A-3), their exclusion does not change the education coefficients very much; for example, the effect of a baccalaureate degree for men increases from .394 to .425 when these background variables are omitted. By extension, then, the exclusion of family background variables in 1984 and 1990 makes little difference to the results or to their comparability across the three years.

[10] There are imputation dummies for union coverage and for family background at age fifteen. In addition, a few individuals are missing data on the highest degree attained, on the amount of job training received, and on the nature of the training sponsor. These also have dummy variables. See Appendix Table A-3 for the coefficients of the imputation dummies.

experience, minus current job tenure, minus related experience on prior jobs. If labor market experience is considered to measure relatively job-specific on-the-job training, an obvious hypothesis is that the effects of tenure on the current job on earnings will be the highest, followed by related prior experience, with unrelated prior experience the least influential. In all cases, quadratic terms are also included, to allow for nonlinear effects of experience. However, because not all questions are asked of all individuals, it is possible that some periods of experience are missed in the SIPP data; therefore, age (and age squared) have been included to cover any potential gaps. Finally, for some groups it is necessary to impute values for various kinds of experience, and dummy variables have been included whenever such imputations are made.[11]

While the SIPP intends to be a nationally representative sample, the sampling method is complex, and the data includes a weight designed to compensate for nonrandom sampling. This weight will influence any statistical results only if the earnings patterns of those oversampled are different from those of other individuals. In early trials, weighted and unweighted results were almost precisely the same; I report unweighted results since they are simpler and do not presume heterogeneity of regression equations.

The results presented below, therefore, correspond to standard earnings equations, using the conventional semi-log form with the log of earnings as a linear function of variables which includes binary variables for formal schooling, job training, various measures of experience and experience squared, and other independent variables described above. With this functional form, the coefficients can be interpreted as reflecting the percent increase in earnings associated with any particular level of education, at least if the coefficients are relatively small. These coefficients can be readily compared to those using other data sets. Education is measured relative to those with a high school diploma only, so that the coefficients describe the advantage as compared to a high school graduate of postsecondary education or, conversely, the disadvantage of completing less than a high

[11] In these results, imputation-related dummy variables are included for the following cases: (1) when a second job becomes a primary job and job experience for the secondary job must be imputed; (2) when total experience was imputed as age minus education minus 6 for those whose previous job ended before 1976, who were not asked experience prior to their current job; (3) when the SIPP imputed a job starting date, and thus current job tenure; (4) when the SIPP imputed total related experience; and (5) when the SIPP imputed total experience for those failing to answer about previous experience. Note that three of these five imputation dummies were created by the SIPP itself. For the coefficients of these dummies for 1987, see Table A-3. The amount of imputed data necessary varied from year to year, as do the coefficients on the imputation dummies. Fortunately, these dummies do not greatly affect the parameters of interest, as can be seen from comparing specifications with and without the imputation dummies.

school diploma. All results are estimated separately for men and women, since both theoretical considerations and prior results indicate that schooling has different labor market effects for men and women. As is conventional, only individuals with positive earnings for a year are included. The coefficients presented in the following sections are estimated for individuals age 25-64, including all individuals still in school. Because the sample of individuals affects certain results—particularly the effects of completing some college coursework without a credential—Appendix A presents coefficients using different samples. Finally, Appendix A also presents the coefficients of all independent variables included in these earnings equations, apart from those of the education and training variables presented in the text.

THE PREVALENCE AND EFFECTS OF FORMAL SCHOOLING

One initial question is how different levels of education—particularly sub-baccalaureate credentials and other amounts of postsecondary education—are distributed throughout the labor force. Table 1 provides the prevalence of the different levels of education reported by the individuals for whom 1987 earnings information is available, for those age 25-64, and for those individuals still enrolled in school, which is the sample used in subsequent regressions. In 1987, for example, 7.3% of men received sub-baccalaureate credentials and another 17.1% accumulated some college without completing credentials. Comparable figures for women are 9.3% with sub-baccalaureate credentials—higher because more women receive vocational certificates, especially in fields like secretarial/clerical work and cosmetology—and 17.1% with some college without a credential. Alternatively, of the 51.2% of men who entered postsecondary education, 14.3% received a certificate or an Associate degree while 34.1% completed some college without receiving a credential. Overall, then, nearly half (48.4%) of the men who enrolled in postsecondary education completed less than a baccalaureate degree. Similarly, of the 48.5% of women enrolling in postsecondary education, 19.2% received certificates or Associate degrees, while 35.3% completed some college without receiving credentials. Thus, slightly more than half (54.5%) of women who began postsecondary education completed less than a baccalaureate degree. If we define the sub-baccalaureate labor market as that which includes individuals with at least a high school diploma but less than a baccalaureate degree (following Grubb, Dickinson, Giordano, & Kaplan, 1992), then 57.8% of men and 66.5% of women were in this segment of the labor market. Of course, these figures do not

Table 1

Educational Attainment:
Individuals Age 25-64 with Earnings

	1984		1987		1990	
	Males	**Females**	**Males**	**Females**	**Males**	**Females**
Ph.D.	1.2%	0.3%	1.4%	0.4%	1.2%	0.4%
Professional degree	2.6	0.7	2.3	0.7	2.3	0.7
Master's	5.8	5.6	5.8	5.2	6.3	6.0
B.A./B.S.	16.0	13.3	17.3	15.8	17.7	15.7
Associate degree	4.4	4.6	5.4	5.9	4.9	5.8
Vocational certificate	1.5	3.0	1.9	3.4	2.3	4.0
Some college, no degree:	17.6	15.6	17.1	17.1	17.3	17.7
4 years	1.1	0.8	1.0	0.6	1.0	0.6
3 years	2.5	1.4	2.1	2.1	2.1	1.9
2 years	5.4	4.6	5.5	4.7	6.1	5.4
1 year	6.0	6.0	5.5	6.7	5.4	6.6
< 1 year	2.6	2.8	3.0	3.0	2.7	3.2
High school diploma	33.8	42.0	33.4	40.1	33.4	38.2
9-11 years schooling	9.5	9.3	9.4	7.6	8.5	7.4
< 8 years schooling	7.6	5.6	6.0	3.8	6.1	4.1
Still in school	10.8	13.2	10.8	14.1	10.2	13.9
N	7,981	6,556	5,452	4,952	10,600	9,939

represent completed levels of schooling, since 10.8% of men and 14.1% of women in the slightly older group which was interviewed were still enrolled in school, potentially decreasing the group with some college or sub-baccalaureate credentials. Still, these figures confirm the importance of the sub-baccalaureate schooling group.

In Table 1, one can see the slow changes in educational attainment that have been taking place in the United States. The proportion of individuals in the labor force[12] with less than a high school diploma has dropped, especially among women. There has been a slow but steady increase in the proportion of individuals with postsecondary credentials of all kinds, among both men and women, though the proportion of women with baccalaureate and graduate degree still lags behind that of men. In the middle of the education distribution, the proportion of men with high school diplomas and some college has been steady, while it has been rising among women. This is part of the longer-term increase in the educational qualifications of the labor force, a phenomenon that has been underway for at least a century and one that is responsible for the increase in the importance of decisions about postsecondary education.

Table 2 presents mean earnings for different educational levels for all three years. With a few anomalies—for example, the low earnings for women with Ph.D.s in 1984—these figures describe an increasing effect of education, with apparently substantial benefits to sub-baccalaureate credentials compared to high school diplomas. However, these simple means are uncorrected for the effects of any explanatory variables.

Table 3 presents the coefficients describing the effects of schooling controlling for various other independent variables (whose coefficients are presented in Appendix Table A-3) for all three years. In general, these results suggest a uniformly increasing effect of

[12] The patterns in Table 1 are a function both of the educational attainment of the population and of the tendency for different education groups to participate in the labor force. Withdrawal from employment, especially among poorly educated women, may be responsible for the decrease in the proportions individuals with less than a high school diploma.

Table 2

Mean Annual Earnings, By Levels of Education: Individuals 25-64

	Males			Females		
	1984 Sample	1987 Sample	1990 Sample	1984 Sample	1987 Sample	1990 Sample
Ph.D.	$38,438	$36,883	$49,911	$14,710	$25,891	$28,614
Professional degree	44,205	46,272	57,030	23,782	24,737	27,695
Master's	26,355	31,238	35,967	15,001	18,994	22,811
B.A./B.S.	24,939	27,601	31,697	11,016	18,260	16,954
Associate degree	20,030	23,904	25,080	9,916	11,005	13,589
Vocational certificate	21,775	20,584	21,664	9,318	10,841	13,568
Some college, no degree:						
4 years	20,066	22,237	27,338	9,835	9,148	15,718
3 years	20,230	22,620	25,086	9,400	9,850	10,537
2 years	18,121	19,922	21,798	7,402	8,713	12,548
1 year	18,574	21,541	22,139	8,063	8,965	10,702
< 1 year	18,396	18,837	22,404	8,070	8,995	10,496
High School diploma	16,815	18,233	19,811	7,322	7,916	9,890
9-11 years schooling	12,647	12,457	13,907	5,573	5,566	6,486
≤ 8 years schooling	10,265	11,661	12,609	4,827	4,430	5,225
N	7,983	5,452	10,601	6,561	4,952	9,940

Table 3

Effects of Postsecondary Education on Annual Earnings
Individuals 25-64, SIPP Data

	1984 Earnings		1987 Earnings		1990 Earnings	
	Men	Women	Men	Women	Men	Women
Ph.D.	.750*	.659*	.676*	.828*	.800*	.881*
	(.074)	(.196)	(.081)	(.220)	(.058)	(.131)
Professional degree	.953*	1.37*	.806*	1.03*	1.01*	.931*
	(.055)	(0.15)	(.067)	(.155)	(.044)	(.099)
M.A./M.S.	.435*	.500*	.442*	.646*	.500*	.576*
	(.038)	(.052)	(.045)	(.065)	(.028)	(.038)
B.A./B.S.	.415*	.355*	.394*	.318*	.437*	.428*
	(.026)	(.037)	(.030)	(.043)	(.019)	(.026)
Associate	.184*	.311*	.215*	.234*	.166*	.205*
	(.041)	(.056)	(.044)	(.060)	(.030)	(.037)
Vocational certificate	.219*	.164*	.146*	.164*	.063	.219*
	(.067)	(.067)	(.071)	(.075)	(.042)	(.044)
Some college, no credential:						
4 years	.298*	.378*	.256*	-.023	.327*	.409*
	(.078)	(.130)	(.095)	(.178)	(.064)	(.108)
3 years	.215*	.249*	.237*	.240*	.197*	.083
	(.053)	(.098)	(.067)	(.095)	(.044)	(.062)
2 years	.135*	.015	.123*	.062	.069*	.200*
	(.038)	(.056)	(.044)	(.065)	(.028)	(.039)
1 year	.123*	.100*	.161*	.090	.093*	.059
	(.036)	(.049)	(.044)	(.056)	(.029)	(.036)
< 1 year	.120*	.030	.041	.063	.072	.030
	(.052)	(.070)	(.057)	(.080)	(.040)	(.049)
Grade 9-11	-.218*	-.175*	-.265*	-.236*	-.224*	-.220*
	(.030)	(.042)	(.035)	(.053)	(.024)	(.034)
< Grade 8	-.353*	-.358*	-.275*	-.226*	-.276*	-.300*
	(.034)	(.052)	(.043)	(.075)	(.029)	(.046)
N	7982	6557	5452	4952	10,600	9939
R^2	.327	.282	.384	.359	.408	.383

*Significant at 5%, conventional 2-tailed t-test. Standard errors are in parentheses.

education, as one might expect.[13] Those with professional degrees—which include medical and law degrees—enjoy the highest premium over high school graduates, followed by Ph.D.s, Master's degrees, and baccalaureate degrees. Associate degrees have significant returns for both men and women, though not surprisingly lower than the returns to baccalaureate degrees[14]—though the difference between the returns for baccalaureate and Associate degrees is smaller for women than for men in all three years.[15] The returns to vocational certificates are smaller still, though statistically significant, and, of course, those with less than a high school diploma earn one-quarter less than those who have completed high school.

In considering the group with some college but no credentials, the results are somewhat less clear. For women, the effects are generally insignificant, though some coefficients that are significant are generally for larger amounts (3 or 4 years) of postsecondary education. I conclude that entering postsecondary education, but failing to complete a credential, does not improve earnings reliably, unless perhaps a woman has three or four years of college. For men, the results are somewhat more positive. A small amount of postsecondary education (less than one year) has no effect in 1987 or 1990, but it does have a small effect in 1984; moderate amounts (1-2 years) have benefits similar to

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[13] Throughout these results, the problem of statistical significance appears over and over. Many of the coefficients in Table 3 are statistically significant at the conventional 5% level, meaning that earnings are higher for an individual with an Associate degree, for example, compared to the omitted group with a high school diploma. But differences between coefficients are often not significant, even when they are part of a clear pattern. For example, for men in 1987, there is a monotonic increase in the coefficients for certificates, Associate degrees, baccalaureate degrees, Master's degrees, and professional degrees—but the *difference* between coefficients for certificates and for Associate degrees is not significant, nor is the *difference* between those for baccalaureate and Master's degrees. However, it seems foolish to conclude that Associate degree holders earn no more than certificate holders—or, strictly speaking, to fail to reject the null hypothesis that both groups earn the same amounts—because the coefficients are part of a larger pattern, and because four of the six comparisons between these two groups show that Associate degree holders earn more (two of which are statistically significant). I conclude, therefore, that the preponderance of the evidence indicates that an Associate degree is worth more than a certificate. In general, I report results in this monograph that are supported by this abundance of evidence, recognizing that individuals who are obdurate about statistical significance will be uncomfortable with some of my conclusions.

[14] Some authors (e.g., Brint & Karabel, 1989) have implied that the less significant benefits of an Associate degree compared to a baccalaureate degree, by themselves, constitute evidence that community colleges and technical institutes provide restricted opportunities to their students. But of course an Associate degree typically takes half as long to complete as a baccalaureate; both the direct costs (tuition) and the opportunity costs (the earnings foregone) are lower, the latter because it is easier to attend community college part-time and not disrupt employment. Thus, the internal rate of return to an Associate degree could be higher than for a baccalaureate, though I have not carried out the calculations necessary for this determination.

[15] Anticipating the results of a subsequent section, this result may be due to the fact that a higher proportion of women at the baccalaureate level are in fields of study with lower returns—the humanities and education, for example, rather than engineering and natural sciences.

certificates, while more substantial amounts (3-4 years) provide benefits about equal to those of an Associate degree. Therefore, noncompleting men may benefit from completing some postsecondary education; but there seem to be 'program effects" (or "sheepskin effects") from completing credentials, since 1-2 years of postsecondary education without a credential are equal to a one-year certificate, and 3-4 years are roughly equivalent to an Associate degree which requires two years of full-time schooling. Finally, very small amounts of college attendence—for example, the amounts that individuals accumulate when they take a few courses for a semester or two—are unlikely to benefit either men or women.

Another way to see the existence of "program effects" is to compare the benefits of a baccalaureate degree with four years of some college, the benefits of an Associate degree with two years of some college, and of a certificate with one year of some college. Of these eighteen comparisons in Table 3, the benefits of credentials are higher than the benefits of the equivalent years of college without credentials in all but three cases;[16] for example, for men in 1987, the return to a B.A. is .394 compared to .256 for those reporting four years of college without a credential, while the return to an Associate degree is .215 compared to .123 for those with two years of college. Within the limits of the self-reported information available in the SIPP,[17] then, there appear to be "program effects" associated with completing postsecondary credentials.

Contrary to expectations, there are no obvious trends in the coefficients across the period from 1984 to 1990. Some patterns are U-shaped; others are monotone decreasing while a few are monotone increasing, but the kind of consistency that would be necessary to establish a trend, given the difficulty of finding any parameter differences significant, is absent. Therefore, these results, which reflect differences among education groups controlling for many other independent variables, do not corroborate the evidence that simple differences among education groups have expanded during the 1980s and are responsible for much of the increasing inequality in earnings (Grubb & Wilson, 1991;

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[16] For men in 1987, the benefits of one year of college (.161) are about equal to the benefits of a certificate (.146); for women in 1984, the benefits of four years of college (.378 percent) are equal to those of a B.A. (.355); and for men in 1990, the benefits of a certificate are lower (.063 and insignificant) than those of one year of college (.093 and significant). To be sure, many of the fifteen differences associated with "program effects" are not statistically significant, but the consistent direction of the difference lends support to the idea that there are program effects.

[17] That is, it is possible that the amount of postsecondary education reported as two years, for example, is generally two years part-time and therefore substantially less than is required for an Associate degree.

Levy & Murnane, 1992; Murphy & Welch, 1989). Whether the disagreement in these results is due to a difference in data sets or in analytic methods is unclear and merits further investigation.[18]

In general, the returns to postsecondary education in these results are comparable to those from data sets constructed in the same way, though other data generates results of quite different magnitudes. For example, in the NLS72 data, where transcripts on education are available, the returns to a baccalaureate degree are about 9.6% for men and 12.6% for women,[19] substantially lower than the returns of about 40% and 30% in Table 3. Similarly, the returns to vocational Associate degrees in the NLS72 data are zero for men and 9.2% for women, compared to SIPP results of 21.5% and 23.4% in Table 3 (with roughly similar returns for younger cohorts in Tables 7 and 8). However, the returns to education in the NLS-Youth data, which depends on self-reported information about education, are, if anything, higher than the returns estimated from SIPP data: Kane and Rouse (1993) estimate returns to baccalaureate degrees of 42% for men and 51% for women, while the returns to Associate degrees are 24% and 31% respectively. There are at least three plausible reasons for these differences: (1) The use of self-reported data with the SIPP and NLS-Youth biases the estimated returns upward as compared to the transcript-reported data of NLS72; (2) The absence of measures describing ability and academic achievement in the SIPP also biases these estimates upward as compared to NLS72 data; and (3) The inclusion of all ages in the SIPP data, rather than as one cohort in NLS72 or a few young cohorts as in NLS-Youth, increases the estimated benefits.[20] However, this last explanation does not appear to be a particularly powerful explanation of the differences because the results in Tables 7 and 8 disaggregated by cohorts—that is, by ten-year age groups—reveal that the estimated returns are relatively constant over age groups, rather than show an increase with advancing age.

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[18] In a subsequent paper, I will compare the results of Theil's measure of inequality, calculated with SIPP data, with the simple and controlled differences in earnings among education groups. One possibility, from recent analysis of Current Population Survey (CPS) data which extended to 1992 and was undertaken with Robert Wilson, is that the increasing inequality in earnings during the 1980s began to reverse itself in 1987 or 1988, so that the 1990 SIPP results reflect a year of *decreased* inequality as compared to 1984 and 1987.

[19] These are taken from unpublished semi-log forms corresponding to the linear functional forms in Grubb (1995a).

[20] An alternative is that the inclusion of all ages increases the error in some of the independent variables, particularly those describing socioeconomic status, whose effects are weaker in the SIPP results than in the NLS72 results due to the survey respondents' failure to remember details when asked about certain educational events of the past.

However, it is plausible that the SIPP estimates are relatively high because of the first two reasons. In turn, this implies that certain parameter estimates—particularly those for certificates and small amounts of some college, which are typically in the range of 12% to 16%—might be much smaller if measures of ability and more accurate transcript-reported measures of schooling were available and might even be small enough to be statistically insignificant. Because these parameters are consistently positive, this does not necessarily imply that benefits to certificates and small amounts of postsecondary education are in fact zero. Instead, a plausible interpretation is that there is sufficient uncertainty in the returns—from differences among fields of study (examined in the next section), from variation in local economic conditions, from the quality of educational institutions and the strengths of their connections with labor markets—that some individuals receive no benefits, while, for others, the benefits are substantial.

A Note on Nontraditional Students: The Effects of "Late" Credentials

During the past two decades, there has been a steady upward trend in "nontraditional" patterns of college attendance—entering college later than the year after graduating from high school, "stopping out" and then returning to college later, starting (or resuming) college after a period of time working or raising children, and taking longer than the conventional period of time to complete credentials. Increasingly, colleges (and especially community colleges) are used self-consciously as "second chance" institutions for those—welfare recipients and the chronically unemployed, for example—who have not managed to find a role in the labor market. These students, too, are likely to be older than average.

In general, these nontraditional patterns have been praised for giving students greater flexibility and for being consistent with the goals of "lifelong learning." However, there are several potential dangers to nontraditional attendance. One is simply that students entering "late," or "stopping out," are less likely to complete credentials than are those going through college in more conventional ways. Moreover, as the results in Table 3 indicate, noncompletion carries a penalty, especially for women. The other is that, even for those who complete credentials, "late" completion may not provide equivalent economic benefits. There are several reasons why this might be true. Given the fact that entering and

completing college programs right after high school is still the norm, those attending in nontraditional ways may lack the motivation, the persistence, or the support of their families, that traditional students have. In addition, employers may consider "late" completion as evidence of weak motivation or persistence. Alternatively, the pattern in which students complete credits over longer periods of time may result in less coherent programs of study (V. Smith, 1993), in turn making these individuals less competent. Older students, more likely to have employment and family responsibilities, may also pay less attention to their studies. On the other hand, one could argue that older students are *more* motivated, since they are more likely than 18-year-olds to know why they want to attend postsecondary education and more focused in their efforts.

It is a simple matter to test whether receiving postsecondary education later than is usual leads to higher or lower returns by creating a series of binary variables for those individuals receiving credentials "late." Table 4 presents the coefficients for these variables, describing the effects of certificates, Associate degrees, baccalaureate degrees, and some college (without a credential) when these are received between the ages of 24 and 30 and later than age 30. If there is a penalty associated with receiving "late" credentials or coursework, then these coefficients should be negative.

For men, the coefficients are uniformly negative but insignificant. There may be a small penalty for "late" postsecondary education, then, but it is too small, on the average, to render reliable information regarding its magnitude, and, in any event, it is much smaller than the earnings differences associated with credentials themselves. For women, however, six of the eight coefficients are positive, and two of them—for Associate and baccalaureate degrees received after age 30—are statistically significant.[21] Furthermore, the magnitude of these effects are quite substantial. The return to an Associate degree is 12.3% for those receiving the credential before age 24,[22] 27.6% for those receiving the credential between 24 and 30, and 47.7% for those receiving it after age 30. Comparable figures for the baccalaureate are 29.8%, 25.7%, and 53.6%.

[21] In these results for women, of the 292 Associate degrees, 65 were earned between ages 24 and 30, and 62 after age 30; of the 784 baccalaureate degrees, 150 were earned between 24 and 30, and 83 after age 30.
[22] This coefficient is lower than that in Table 2, and statistically insignificant (s.e.=.076), once the dummies for late credentials are included.

These results suggest that, in general, there is no economic barrier to using postsecondary education in nontraditional ways. In particular, for women attending college at older ages—often labeled "re-entry" students—there are substantial additional benefits, compared to those available to their conventional-age peers.

Table 4

Effects of "Late" Credentials and Coursework, 1987

	Males	Females
Certificates:		
Age 24-30	-.022	-.045
	(.154)	(.189)
Age 30+	-.062	.335
	(.203)	(.247)
Associate degrees:		
Age 24-30	-.042	.153
	(.091)	(.136)
Age 30+	-.095	.354*
	(.115)	(.140)
Baccalaureate degrees:		
Age 24-30	-.044	-.041
	(.048)	(.085)
Age 30+	-.063	.238*
	(.087)	(.110)
Some college, no credential		
Age 24-30	-.026	.024
	(.056)	(.094)
Age 30+	-.116	.086
	(.068)	(.085)
N	5452	4952
R^2	.3842	.3610

*Asterisks denote coefficients significant at the 5% level.

THE EFFECTS OF CREDENTIALS BY FIELDS OF STUDY

A consistent, but not surprising, finding is that there are substantial differences in the economic returns to baccalaureate degrees in different fields of study (Grubb 1992b, 1995c; Leslie & Brinkman, 1988; Rumberger & Thomas, 1993). Engineering and business, and technical subjects such as math and science, prove to have higher returns than the humanities and poorly paid professional areas such as education and human services. Differences among fields of study for sub-baccalaureate credentials have been less well-studied, however, because of the lack of appropriate data. In earlier analyses using the NLS72 data, I found that Associate degrees in technical subjects and health occupations had the most substantial returns, while in other subjects the returns were essentially zero (Grubb, 1992a, 1995b). The SIPP data also describes the field of study in which an individual receives a credential and so can be used to extend these results.[23]

Table 5 presents the returns to certificates, Associate degrees, and baccalaureate degrees for 1987 and 1990 only, by field of study.[24] This table includes the numbers of each credential in the sample, since certain credentials are sufficiently uncommon that small sample sizes preclude an accurate estimate of their effects.

However, despite problems with small samples, some clear patterns emerge. The modest average return to vocational certificates for men in 1987 of about 15% (in Table 3) may be due to the effects of engineering, computer, and health-related certificates, though small sample sizes preclude much certainty about this result. The insignificant coefficient for 1990 appears to be an average of higher returns for business and engineering/computer-related jobs balanced by lower and possibly negative returns in other fields. For women, health-related certificates (and business and vocational/technical fields in 1990) have significant returns, but other fields do not, including the relatively common fields of business and vocational/technical.

The effects of Associate degrees are somewhat clearer because sample sizes are larger. For men, the returns to Associate degrees are highest in engineering and computer

[23] The SIPP asks respondents to check a box describing the field of study, without any definition of fields or examples, and so some of the fields of study—vocational/technical and "other vocational" in particular—are ambiguous.

[24] The results for 1984 are substantially identical to those of 1987.

Table 5

Effects of Postsecondary Credentials, By Field of Study 1987 and 1990

	1987		1990	
	Men	Women	Men	Women
Certificates:				
Business	.071 (.244) 8	.139 (.213) 19	.141 (.112) 33	.276* (.118) 51
Education	—	.621 (.654) 2	.055 (.371) 3	-.084 (.295)
Engineering/computers	.384 (.282) 6	-.974 (.655) 2	.217 (.151) 18	-.070 (.264) 10
Health	.307 (.308) 5	.286* (.102) 87	-.287 (.286) 5	.288* (.067) 164
Public service	.270 (.262) 7	-.907 (.656) 2	-1.57* (.321) 4	.455 (.279) 9
Vocational/technical	.101 (.087) 65	.074 (.139) 46	.087 (.052) 159	.174* (.075) 130
Other	.187 (.218) 10	.133 (.293) 10	.038 (.132) 24	-.003 (.164) 26
Associate degrees:				
Business	.113 (.082) 73	.375* (.112) 71	.195* (.056) 135	.181* (.068) 157
Education	.286 (.397) 3	-.225 (.231) 16	.115 (.214) 9	-.149 (.146) 33
Engineering/computers	.359* (.098) 51	.299 (.377) 6	.309* (.070) 87	.202 (.192) 19

Table 5 (continued)

	1987		1990	
	Men	**Women**	**Men**	**Women**
Health	.093 (.218) 10	.369* (.102) 87	.139 (.214) 9	.355* (.068) 101
Public service	.444* (.193) 13	.829 (.464) 4	.030 (.144) 20	.474 (.252) 11
Vocational/technical	.211* (.092) 58	-.335 (.249) 14	.085 (.072) 82	.146 (.144) 34
Other vocational	.355 (.209) 11	.462 (.462) 4	-.066 (.151) 18	.199 (.315) 7
Math/science	-.047 (.208) 11	.352 (.378) 6	.294* (.137) 22	.009 (.215) 15
Humanities	.117 (.145) 23	.005 (.145) 42	.132 (.079) 68	.235* (.099) 73
Social Sciences	.326 (.209) 11	-.103 (.249) 14	.186 (.165) 15	.377* (.179) 22
Other	.232 (.122) 32	.373* (.177) 28	.107 (.091) 50	-.075 (.122) 47
Baccalaureate degrees:				
Business	.503* (.046) 269	.509* (.096) 100	.044* (.030) 542	.622* (.057) 233
Education	.126 (.091) 61	.153* (.068) 226	.184* (.059) 123	.316* (.046) 380

Table 5 (continued)

	1987		1990	
	Men	**Women**	**Men**	**Women**
Engineering/computers	.652* (.058) 164	.838* (.250) 14	.633* (.037) 339	.630* (.179) 22
Health	.308* (.173) 16	.445* (.103) 86	.436* (.092) 49	.518* (.061) 200
Public service	.247 (.168) 17	-.314 (.353) 7	.371* (.111) 34	.664* (.232) 13
Vocational/technical	.411 (.244) 8	-.126 (.532) 3	.214 (.137) 22	-.122 (.589) 2
Other vocational	.343* (.108) 42	.136 (.142) 44	.392 (.110) 34	.199 (.126) 44
Math/science	.314* (.081) 75	.572* (.127) 56	.475* (.050) 174	.567* (.091) 87
Humanities	.166* (.068) 112	.226* (.090) 118	.262* (.047) 188	.332* (.050) 303
Social Sciences	.320* (.064) 128	.513* (.102) 88	.433* (.044) 229	.413* (.063) 188
Other	.276* (.096) 53	.141 (.146) 42	.450* (.056) 136	.429* (.091) 88
R^2	.391	.367	.409	.385
N	5452	4952	10,600	9939

*Asterisks denote coefficients significant at the 5% level. Standard errors are in parentheses, and the number below reports the number of individuals with that credential.

fields. Public service[25] and vocational/technical fields have significant returns in 1987, but not in 1990, while business is significant in 1990, but not in 1987.[26] For women, business and health-related occupations have positive returns, while others do not. Indeed, in vocational/technical fields (which may include the low-paid cosmetology area) and in education (which is largely child care) the coefficients are negative if insignificant. Evidently, because of the substantial gender segregation in occupations at this level of the labor market and in the corresponding vocational programs, the results are substantially different for men and women except in business. This finding also suggests that efforts to move women into nontraditional occupations need to not only motivate women to enroll in the appropriate educational programs, but also must change the employment patterns that deny women returns equivalent to those of men.

For Associate degrees in academic subjects, the coefficients are generally insignificant or small, except for women in the "other" category[27] in 1987; in 1990, math for men and humanities and social science for women are significant. This finding suggests that the academic Associate degree, which was historically the path for transferring to four-year colleges,[28] is not necessarily a good investment for those who fail to transfer.

Finally, the results for baccalaureate degrees replicate familiar results: the highest returns come in business, engineering/computer, health, and math/science fields; returns are lower in social sciences (at least for men) and the humanities, and lower still in education. The category of "other vocational" includes such fields as journalism, communications, and library science, and proves significant for men but not for women. In general, however, these results are more consistent between men and women than are the results for Associate degrees—perhaps a reflection that patterns of gender segregation

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[25] In some regions of the country, public service includes fire fighters and police who are prepared through community college programs. Some legal aides and social service workers may be included in this category.

[26] The vocational/technical fields include the trades and construction crafts, which may explain why the coefficient is positive and significant for men in 1987, but not for women.

[27] In community colleges, it is usually possible to major in "liberal studies" or "general studies" programs which typically include a series of academic prerequisites for transferring to four-year colleges. I suspect most of the "other" category includes Associate degrees in liberal studies.

[28] However, there is evidence that the academic Associate degree has been declining in importance as a route to transfer and that as many students from vocational subjects now transfer as do those from the academic subjects (see Grubb, 1991).

are more powerful in sub-baccalaureate occupations than they are in occupations in which a baccalaureate degree is common.[29]

These results confirm earlier findings based on NLS72 data. Evidently, at the sub-baccalaureate level it matters a great deal what field of study an individual enters. Some programs prepare their students for such poorly paid occupations that there is no real advantage to attending a community college or technical institute; others—particularly in technical fields and business for men and in business and health for women—have more consistent and substantial returns. Some relatively common fields of study at the sub-baccalaureate level—education (or child care) for women; certain trades and crafts at the certificate level—provide very little, if any, increase in earnings over those of high school graduates. Finally, for those who fail to transfer to four-year colleges, the returns to academic Associate degrees are often low or uncertain.

What remains unclear is whether students have been educated about these patterns, so that they can make well-informed choices among the occupational alternatives. Of course, earnings are only one factor influencing occupational choice: desirable working conditions influence these decisions, particularly in some low-paid fields such as child care and horticulture, and some students are precluded from well-paid technical fields by their lack of appropriate math and science skills. Still, given numerous complaints about the lack of guidance and counseling in both high schools and community colleges,[30] it seems likely that many students are making poorly informed choices and entering programs in which the economic returns are insubstantial.

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[29] For evidence that gender segregation has been declining more in higher-level occupations than in middle- and lower-level jobs, see Blau and Ferber (1992).

[30] There is a general consensus that career-oriented counseling has all but vanished from most high schools. While there appear to be more resources in counseling and guidance in community colleges, they still appear to be inadequate relative to the need. Some evidence comes from a series of interviews in community colleges in four local labor markets, reported in Grubb et al. (1992); other evidence comes from a series of interviews with about forty community college students in California, who were overwhelmingly dissatisfied with the guidance and counseling resources available.

THE EFFECTS OF RELATED AND UNRELATED EMPLOYMENT

In the case of vocational and professional programs, a potentially important cause of economic benefits is whether an individual finds employment related to his or her education. Because vocational programs in particular are relatively job-specific, with technical and manipulative skills that are useful in only a subset of jobs, the economic returns may be low or even zero if an individual does not find related employment. Therefore, the effects of postsecondary education reflected in Table 3, for example, may represent averages of higher returns for those who have found related employment and lower returns for those with unrelated employment. While there have been only a few studies examining the effects of related and unrelated employment (see Rumberger & Daymont, 1984, for high school programs; see Grubb, 1992a, for postsecondary education), they tend to confirm that the economic benefits in which employment is related are much higher.

Disentangling the effects of related and unrelated employment obviously requires a definition of which occupations are matched with particular fields of study. In this analysis, I use a definition developed by Medrich and Vergun (1994), with few changes.[31] The matching algorithm, presented in Appendix B, links occupational fields of study with Census Occupation Codes contained in the SIPP data. There are relatively few broad fields of study—nineteen, plus an "other" category—of which nine are occupational. Therefore this matching algorithm should, if anything, err on the side of over-inclusiveness, by deciding that a program of study and an individual's occupation are related when in fact they may not be.

Table 6 presents information about the extent of related and unrelated employment. For individuals with baccalaureate degrees, roughly 60% have related employment. For those with Associate degrees, the proportion of related employment is lower for men but higher for women; in examining the extent of matches by occupation, this proves to be due to the especially high rate of available employment in business and health occupations, which tend to be dominated by women. The extent of relatedness among individuals with certificates hovers around 50% to 55%. Among individuals with some college but without

[31] Medrich and Vergun (1994) did not classify education programs, which I then added; and they matched a category of "other" education with a number of particular occupations, while I have categorized individuals with "other" education as simply having an unknown match.

Table 6

Proportion of Individuals in Vocational Areas with Related Employment

	1984		1987		1990	
	Males	Females	Males	Females	Males	Females
B.A./B.S.	63.8%	64.2%	61.0%	56.3%	61.9%	61.2%
Associate	56.7	70.4	47.9	63.9	47.2	63.0
Certificate	59.5	68.6	50.5	54.3	55.3	55.3
Some college, no credential:						
4 years	50.0	34.5	32.1	47.6	39.4	52.6
3 years	53.0	55.4	50.7	44.2	44.1	43.2
2 years	42.4	53.8	40.6	44.6	45.4	44.9
1 year	43.4	56.0	43.7	52.1	35.2	50.2
< 1 year	32.8	51.2	40.6	47.8	33.5	44.1

Note: Individuals with unknown relatedness of employment and with academic credentials are not included.

a credential, the patterns for men suggest that those with more years of postsecondary education are also more likely to find related employment; but the patterns for women are erratic. Overall, individuals with credentials have higher rates of related employment than do those with limited amounts of college. Therefore, part of the higher economic benefits of completing coherent programs is due to the advantage that having a credential provides in finding employment related to one's field of study. Unfortunately, what remains unclear is whether these figures are "high" or "low," since there is no obvious benchmark to establish what appropriate levels might be.[32]

[32] In trials using a matching algorithm developed by Rob Meyer for the NLS72 data, I defined employment as related to one's field of study if, arbitrarily, 50% or more of the courses taken were related to employment. (This matching algorithm matched *courses* taken, not fields of study, with employment.) With this definition, 38% of students with certificates and 33% of those with Associate degrees were in related employment; see Grubb, 1989b, Table 16.) However, differences in the definition of relatedness and

Tables 7 through 12 present the effects of postsecondary education, differentiated by whether an individual had related employment, unrelated employment, employment whose relationship is unknown (because the field of study was "other"), or had an academic field of study for which there was no attempt to match employment. In this profusion of coefficients, several findings stand out. First, the returns to related employment are almost always higher than the returns to unrelated employment; this is true for 44 of the 48 comparisons in these tables. This confirms the hypothesis that the job-specific nature of vocational education reduces its value in unrelated jobs. Second, while the returns to unrelated Associate and baccalaureate degrees are lower than to related degrees, they still tend to be significant; the implication is that occupational degrees do have some general components that enhance productivity and earnings even in occupations unrelated to the field of the credential. Third, in a substantial number of cases (18 of the 48 comparisons)—and particularly among individuals with some college but no credentials—the coefficient for related employment is significant, but that for unrelated employment is not. These are particularly worrisome cases because they imply that completing coursework is necessary but not sufficient to realize economic benefit and that placement in a related occupation is crucial. And, while community colleges do have mechanisms which link their programs to employers, enhancing the prospects for students to find related employment, in many cases these linking mechanisms are quite weak (Grubb et al., 1992).

Overall, these results confirm the importance of finding related rather than unrelated employment. In part, this finding helps explain the variation in returns to different fields of study, since some fields—business and health occupations, for example—have higher rates of related employment than do others; the higher returns associated with completing credentials rather than coursework without credentials is also partly due to this effect. For educational institutions and policymakers, these results confirm the value of efforts to link programs to employers and to help students find jobs related to their programs of study.

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uncertainty about the matching algorithm make comparisons with the SIPP results in Table 6 problematic. What was clear from the NLS72 results is that individuals leaving without a credential and individuals completing fewer courses tended to have fewer courses related to their present employment—roughly corroborating results in Tables 7-12 and indicating that individuals with small amounts of coursework are more likely to be "experimenters" than individuals who know what area of employment they intend to enter.

Table 7

Effects of Postsecondary Education on Annual Earnings, for Related and Unrelated Employment: Males, 1984

	Related Employment	Unrelated Employment	Relationship Unknown	Academic Field
B.A./B.S.	.535* (.035)	.449* (.045)	.535* (.080)	.318* (.039)
Associate	.240* (.062)	.163* (.070)	.111 (.120)	.152 (.089)
Certificate	.258* (.089)	.183* (.108)	.158 (.226)	—
Some college, no credential:				
4 years	.506* (.138)	.367* (.141)	.284 (.217)	.111 (.114)
3 years	.450* (.093)	.103 (.098)	.251 (.191)	.143 (.087)
2 years	.247* (.068)	.135* (.059)	.031 (.106)	.116 (1.70)
1 year	.187* (.064)	.067 (.057)	.129 (.097)	.146* (.068)
< 1 year	.177 (.113)	.133 (.081)	.102 (.136)	.126 (.101)

$N = 7982$, $R^2 = .339$

*Significant at 5%, conventional 2-tailed test. Standard errors are in parentheses.

Table 8

Effects of Postsecondary Education on Annual Earnings, for Related and Unrelated Employment: Females, 1984

	Related Employment	Unrelated Employment	Relationship Unknown	Academic Field
B.A./B.S.	.446* (.054)	.199* (.069)	.199 (.145)	.340* (.054)
Associate	.446* (.074)	.099 (.112)	.349* (.167)	.031 (.128)
Certificate	.272* (.080)	-.079 (.116)	.361 (.316)	—
Some college, no credential:				
4 years	.236 (.284)	.436* (.209)	-.043 (.326)	.414 (.243)
3 years	.276 (.165)	.000 (.181)	.811* (.342)	.269 (.167)
2 years	.067 (.092)	-.040 (.100)	.238 (.171)	-.073 (.095)
1 year	.242* (.078)	.047 (.088)	.275 (.164)	-.120 (.086)
< 1 year	.185 (.114)	-.051 (.118)	-.188 (.207)	-.130 (.142)

$N = 6557$, $R^2 = .308$

*Significant at 5%, conventional 2-tailed test. Standard errors are in parentheses.

Table 9

Effects of Postsecondary Education on Annual Earnings, for Related and Unrelated Employment: Males, 1987

	Related Employment	Unrelated Employment	Relationship Unknown	Academic Field
B.A./B.S.	.496* (.042)	.421* (.050)	.274* (.097)	.259* (.044)
Associate	.198* (.070)	.262* (.067)	.232 (.123)	.128 (.104)
Certificate	.098 (.100)	.202* (.102)	.077 (.281)	—
Some college, no credential:				
4 years	.768* (.230)	.168 (.160)	-.046 (.397)	.124 (.142)
3 years	.617* (.116)	.024 (.118)	.370 (.309)	.063 (.111)
2 years	.296* (.079)	.097 (.066)	.112 (.139)	-.017 (.081)
1 year	.259* (.075)	.080 (.068)	.175 (.129)	.129 (.083)
<1 year	.112 (.109)	.081 (.091)	-.005 (.145)	-.075 (.110)

N = 5452, R^2 = .391

*Significant at 5%, conventional 2-tailed test. Standard errors are in parentheses.

Table 10

Effects of Postsecondary Education on Annual Earnings, for Related and Unrelated Employment: Females, 1987

	Related Employment	Unrelated Employment	Relationship Unknown	Academic Field
B.A./B.S.	.470* (.063)	.075 (.069)	.148 (.145)	.404* (.064)
Associate	.550* (.085)	-.164 (.110)	.375* (.176)	.016 (.119)
Certificate	.295* (.101)	-.017 (.109)	.677 (.375)	—
Some college, no credential:				
4 years	.083 (.298)	-.330 (.282)	1.044 (.649)	-.024 (.352)
3 years	.460* (.180)	.098 (.159)	.603* (.307)	.108 (.164)
2 years	.356* (.119)	.038 (.108)	-.685* (.203)	.041 (.109)
1 year	.349* (.094)	.004 (.098)	.164 (.143)	-.124 (.097)
<1 year	.305* (.140)	-.222 (.133)	.459* (.212)	-.036 (.157)

$N = 4952$, $R^2 = .375$

*Significant at 5%, conventional 2-tailed test. Standard errors are in parentheses.

Table 11

Effects of Postsecondary Education on Annual Earnings, for Related and Unrelated Employment: Males, 1990

	Related Employment	Unrelated Employment	Relationship Unknown	Academic Field
B.A./B.S.	.524* (.027)	.365* (.033)	.449* (.056)	.388* (.029)
Associate	.248* (.051)	.105* (.048)	.106 (.091)	.174* (.063)
Certificate	.039 (.059)	.113 (.065)	-.018 (.144)	—
Some college, no credential:				
4 years	.642* (.127)	.256* (.105)	.098 (.186)	.240* (.114)
3 years	.305* (.079)	.139* (.071)	.240 (.172)	.153 (.081)
2 years	.201* (.048)	-.022 (.044)	.013 (.081)	.064 (.052)
1 year	.228* (.057)	.069 (.043)	-.036 (.084)	.056 (.057)
<1 year	.150 (.084)	.033 (.060)	.051 (.106)	.085 (.080)

N = 10,601, R^2 = .412

*Significant at 5%, conventional 2-tailed test. Standard errors are in parentheses.

Table 12

Effects of Postsecondary Education on Annual Earnings, for Related and Unrelated Employment: Females, 1990

	Related Employment	Unrelated Employment	Relationship Unknown	Academic Field
B.A./B.S.	.594 (.039)	.231 (.047)	.425 (.090)	.396 (.038)
Associate	.387 (.053)	-.034 (.068)	-.073 (.122)	.231 (.080)
Certificate	.348* (.060)	.083 (.066)	.088* (.170)	—
Some college, no credential:				
4 years	.522* (.187)	.322 (.197)	.545 (.587)	.334 (.179)
3 years	.190 (.117)	.179 (.103)	.269 (.209)	-.177 (.110)
2 years	.342* (.068)	.084 (.062)	.095 (.141)	.212* (.070)
1 year	.118* (.058)	-.044 (.058)	.195 (.116)	.063 (.066)
<1 year	.166 (.086)	-.170* (.077)	.129 (.158)	.138 (.099)

$N = 9940$, $R^2 = .394$

*Significant at 5%, conventional 2-tailed test. Standard errors are in parentheses.

COHORT EFFECTS

One advantage of the SIPP data, compared to other data sets that have been used to examine the returns to sub-baccalaureate education, is that they include all age groups. It is therefore possible to examine returns for various cohorts. There are several reasons to be interested in differences among cohorts. One is simply to compare the results in Table 3, for all those 25-64, with the results for a younger cohort, which are comparable to those available in other data sets (such as NLS72 and NLS-Youth). Another is that the amount of postsecondary education—particularly of sub-baccalaureate education—has changed over cohorts and, therefore, its economic return may have changed as well. Table 13 provides the most relevant information on postsecondary education for four cohorts, based on 1987 data. Over time, baccalaureate degrees, Associate degrees, and the accumulation of some college but without a credential have all increased, particularly for women, as their college-going rates have gone up. Only for vocational certificates is there no increase. If increasing rates of postsecondary education over cohorts have been led by increased demand for educated workers, then we would expect to see the returns to postsecondary education higher for younger cohorts.[33] If, on the other hand, increases in postsecondary education have been supply-driven rather than demand-driven—for example, caused by the lower costs and greater accessibility of college, in turn, due to the expansion of higher education during the 1960s, the growth of accessible community colleges, and the expansion of student aid—then returns to postsecondary education may be lower for younger cohorts.

Tables 14 and 15 present the coefficients of schooling variables for men and women in these four cohorts for 1987 data only. For men, the returns to baccalaureate degrees are quite similar across the four cohorts. However, the effects of Associate degrees are higher for younger cohorts, consistent with the finding (in Table 13) that increasing demand (rather than supply) is responsible for the increase in Associate degrees. The effects of vocational certificates are erratic and never statistically significant (probably because of small sample sizes). Once again, while the average effect of certificates may be positive (from 1984 and 1987 results in Table 3), there is a great deal of variation around this average—though such variation is difficult to establish because of sample sizes.

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[33] There is a signaling argument which comes to the same conclusion. If, for example, Associate degrees are relatively rare—as they are in the 45-54 and 55-64 cohorts—then employers may not know what capacities they signal and may not reward them with higher earnings. As a credential becomes more common and better known, then it may become better accepted by employers, and its economic value will increase. This kind of signaling scenario is consistent with community colleges claiming that they have to "sell" or explain their credentials to the employer community.

Table 13

Proportion with Postsecondary Education, for Four Cohorts: 1987

	Cohorts			
	25-34	35-44	45-54	55-64
Males				
B.A./B.S.	19.4%	19.1%	13.2%	14.0%
Associate	6.6	6.6	3.6	2.7
Certificate	2.0	1.8	1.2	2.2
Some college, no credential	19.2	17.9	15.5	12.1
Females				
B.A./B.S.	19.5	16.2	12.0	8.7
Associate	7.6	7.2	3.2	1.7
Certificate	2.8	4.1	3.5	3.5
Some college, no credential	19.8	17.0	15.2	11.3

Table 14

Effects of Education on Annual Earnings for Four Age Cohorts: Males, 1987

	Age 25-34	Age 35-44	Age 45-54	Age 55-64
B.A./B.S.	.375* (.046)	.377* (.051)	.424* (.075)	.430* (.105)
Associate	.266* (.062)	.150* (.070)	.144 (.120)	.080 (.198)
Vocational certificate	.015 (.103)	.144 (.122)	.366 (.202)	.134 (.215)
Some college, no credential:				
4 years	.294* (.127)	.444* (.150)	.359 (.272)	-2.02 (.508)
3 years	.165 (.094)	.374* (.114)	.466* (.173)	-.087 (.247)
2 years	.112 (.069)	.113 (.075)	.243* (.099)	.004 (.152)
1 year	.137* (.063)	.085 (.073)	.256* (.104)	.189 (.178)
< 1 year	.067 (.075)	.002 (.017)	.192 (.153)	-.219 (.261)
9-11 years	-.247* (.059)	-.412* (.065*)	-.304* (.076)	-.154 (.099)
≤ 8 years	-.313* (.095)	-.393* (.082)	-.441* (.088)	-.088 (.109)
N	1891	1657	1085	767
R^2	.388	.402	.411	.480

*Significant at 5%, conventional 2-tailed t-test. Standard errors are in parentheses.

Table 15

Effects of Education on Annual Earnings for Four Age Cohorts: Females, 1987

	Age 25-34	Age 35-44	Age 45-54	Age 55-64
Ph.D.	.588 (.482)	.859* (.311)	1.13* (.421)	.364 (.968)
Professional degree	1.37* (.245)	1.40* (.294)	-.177 (.320)	.659 (.492)
Master's	.660* (.120)	.525* (.105)	.766* (.137)	.540* (.233)
B.A./B.S.	.385* (.070)	.240* (.078)	.190* (.098)	.175 (.154)
Associate	.293* (.091)	.158 (.100)	.031 (.157)	.081 (.315)
Vocational certificate	.277 (.138)	.056 (.125)	.280 (.154)	.237 (.224)
Some college:				
4 years	.050 (.247)	-.236 (.342)	.092 (.431)	-.486 (1.21)
3 years	.357* (.153)	.262 (.189)	-.199 (.184)	.408 (.328)
2 years	.072 (.105)	-.026 (.114)	.126 (.156)	.226 (.233)
1 year	.027 (.089)	.164 (.108)	.097 (.114)	-.078 (.190)
< 1 year	-.052 (.127)	.027 (.137)	.280 (.183)	.140 (.365)
9-11 years	-.288* (.103)	-.163 (.103)	-.289* (.097)	-.061 (.125)
≤ 8 years	-.209* (.177)	-.218 (.167)	-.307* (.123)	-.059 (.153)
R^2	.365	.398	.424	.447
N	1866	1464	970	598

*Significant at 5%, conventional 2-tailed t-test. Standard errors are in parentheses.

The effects of some college without credentials are similarly erratic. One interpretation, however, is that the benefits of moderate college coursework (one to two years) do not materialize until middle age (age 45-54), and this is certainly true for less than one year of coursework. More substantial amounts of coursework, three to four years, are more likely to benefit younger workers. Finally, for older workers in the 55-64 age group, formal schooling below the baccalaureate level seems to make little difference in earnings.

For women, the patterns are quite different. The results for professional, baccalaureate, and Associate degrees all reveal larger returns for younger cohorts—consistent with the hypothesis that the demand for educated workers has grown over time.[34] The benefits to vocational certificates are somewhat erratic and insignificant—perhaps because of small sample sizes (as Table 13 indicates). The coefficients for those with some college but without a credential are quite consistently insignificant, as they were in Table 3; evidently women entering postsecondary education, but failing to complete a credential, have never enjoyed economic benefits as a result.

It is unwise to make too much of the results for different age groups because of small sample sizes, insignificant coefficients, and erratic results. However, for some credentials—particularly Associate degrees among men, and baccalaureate and Associate degrees among women—there appear to be higher returns to schooling for younger cohorts. Such findings are consistent with higher demand for educated workers driving up both economic returns and the numbers of completers. However, these patterns do not hold for college coursework among noncompleters, since there are very few and uncertain benefits for women, and any benefits among men appear not to materialize until middle age.

[34] The results for those with Ph.D.s are erratic because of small sample sizes, and the patterns for professional degrees among women are also erratic for older groups.

RETURNS TO JOB TRAINING: THE EFFECTS OF RELATED AND UNRELATED TRAINING

In addition to asking about formal schooling, the education and training module of the SIPP asked respondents to describe their participation in shorter-term job training.[35] Another question asked whether an individual used this training on his or her current job—an interesting datum because job training, which is more likely than formal schooling to be job-specific, should have no return if it is unrelated to a current job but might have a positive return if it is related.

Table 16 presents the coefficients describing the effects of different types of job training on annual earnings for 1987 only. (Results are very similar for the other two years.) Coefficients are presented both for overall effects and then for the effects of related and unrelated training. In interpreting these results, it is crucial to be aware of uncorrected selection effects. For example, among men, participation in a sheltered workshop or vocational rehabilitation has a large, significant, negative effect on earnings—but individuals in such programs are there because of a significant handicap, the effects of which earnings are evidently not adequately captured by the simple binary variable describing a disability. Similarly, the significant negative coefficient of JTPA training (again for men only) almost surely represents a negative selection effect, since individuals enrolled in JTPA are generally those who have been unemployed for long periods or have other barriers to their participation in the labor market (like limited English proficiency, criminal records, or records of substance abuse); the factors that cause them to be selected for JTPA training are poorly measured by other independent variables.

The most striking finding about these forms of short-term job training is how few of them augment earnings. The only consistent positive effect is that training on the job increases earnings for both men and women; the effects are relatively small for men (6.4%), though for women they are almost as high as the benefits of an Associate degree. (For other positive evidence of firm-based training, see Grubb, 1993a, and Lynch, 1992.) Consistent with the hypothesis that only related training has a positive effect, the

[35] One potential ambiguity in the SIPP data is whether individuals could "double count" some forms of education, for example, by reporting that they received a vocational certificate and also reporting the certificate as a form of job training in a community college; there are no instructions on the SIPP forms to define what "job training" refers to. However, there is very little overlap between responses to questions about education and those about related forms of job training, so such "double counting" is minor.

Table 16

Returns to Job Training: 1987

Type of Job Training	Males	Females
JTPA	-.465* (.119)	-.056 (.148)
Related	-.252 (.170)	.132 (.217)
Unrelated	-.693* (.164)	-.221 (.200)
CETA	-.060 (.083)	-.131 (.107)
Related	.034 (.130)	-.117 (.156)
Unrelated	-.153 (.108)	-.178 (.145)
WIN	-.161 (.148)	-.047 (.200)
Related	-.030 (.284)	-.137 (.270)
Unrelated	-.208 (.175)	.040 (.296)
Veterans' Training	-.074 (.072)	.166 (.378)
Related	-.117 (.108)	.139 (.925)
Unrelated	-.043 (.096)	.097 (.414)
Apprenticeship	.086 (.071)	-.533 (.281)
Related	.102 (.080)	-.645* (.329)
Unrelated	.011 (.156)	-.183 (.534)
Vocational School	.040 (.040)	.095 (.049)
Related	.046 (.048)	.176* (.062)
Unrelated	.014 (.067)	-.033 (.074)
Junior College	-.027 (.073)	.129 (.078)
Related	.067 (.085)	.199* (.090)
Unrelated	-.322* (.145)	.090 (.152)

Table 16 (continued)

Type of Job Training	Males	Females
4-Year College	.108 (.069)	.051 (.096)
Related	.134 (.076)	.044 (.102)
Unrelated	-.042 (.160)	-.040 (.280)
High School Training	.022 (.121)	-.047 (.134)
Related	.150 (.152)	-.156 (.170)
Unrelated	-.234 (.200)	.124 (.213)
Training at Work	.064* (.032)	.198* (.047)
Related	.092* (.035)	.227* (.052)
Unrelated	-.101 (.078)	.067 (.107)
Training on Previous Job	.137 (.087)	.189 (.131)
Related	.120 (.097)	.162 (.161)
Unrelated	.090 (.201)	.208 (.226)
Military Training	-.026 (.071)	.169 (.351)
Related	.052 (.093)	.635 (.465)
Unrelated	-.128 (.109)	-.477 (.534)
Sheltered Workshop	-.563* (.139)	-.068 (.160)
Related	-.601* (.174)	.350 (.218)
Unrelated	-.472 (.231)	-.543* (.233)
Correspondence School	.086 (.112)	-.084 (.172)
Related	.095 (.130)	-.249 (.206)
Unrelated	.041 (.220)	.281 (.314)

coefficients for unrelated on-the-job training are insignificant.[36] The only other positive effects are for women, for related training in a vocational school—presumably a proprietary school—and for related training in a junior college.[37] These effects (.176 and .199 respectively) are about equivalent to that of a vocational certificate (.164).[38] Again, the effects of training unrelated to the current job in such institutions is insignificantly different from zero.[39] The larger effects of short-term training for women compared to men is a related conclusion from these results, consistent with evaluations of other job training programs (e.g., Gueron & Pauly, 1991).

The other interesting result in Table 16 is that, with only a few exceptions, the effects of training related to the current job are consistently algebraically higher than the effects of unrelated training. The differences are not usually statistically significant; but the consistency of this result tends to confirm the hypothesis that the relatedness of training to one's job influences the economic benefits. Of course, the ability to find related employment and, therefore, to benefit from relatively specific training, is itself a characteristic of a training program: if low-quality programs prepare individuals for jobs that don't exist locally, or if employers won't hire from low-quality programs, their enrollees will have lower rates of related employment and therefore lower returns on the average.

It is difficult to make too much of these results because small sample sizes and problems with selection effects make the results difficult to interpret. On the whole, however, it is difficult to find much benefit to short-term job training programs.[40] The one consistent exception is on-the-job training provided by employers, training that proves to be especially beneficial to women. In addition, training in proprietary schools and

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[36] About 9.0% of men and 8.9% of women report that they received on-the-job training, and the overwhelming majority of them—84.3% of men and 82.2% of women—report it to be related to their current job.

[37] It is not clear what such training is in a junior college, but it might be customized training offered by community colleges to employees of specific firms, or short-term noncertificate programs offered by some community colleges and technical institutes.

[38] However, the coefficient for a vocational certificate (.164, from Table 3) averages the effects of both related and unrelated training. The effects of a related vocational certificate (.295, from Table 10) are much higher.

[39] Of the 416 women reporting job training in a vocational school, 59.6% report it to be related to their current job; the corresponding figure for the 153 women with job training from junior colleges is 75.2%.

[40] Again, this result is consistent with the findings of much more rigorous studies using random-assignment experiments. See, for example, Bloom, Orr, Cave, Bell, Doolittle, & Lin (1993) on JTPA; Cave, Bos, Doolittle, and Toussaint (1993) on JOBSTART; and Gueron and Pauly (1991) on welfare-to-work programs.

community colleges benefits women, as long as they have employment related to their area of training. Otherwise, however, the many forms of short-term job training which have proliferated in the past thirty years and which continue to be proposed as solutions to problems ranging from dislocated workers to welfare mothers, provide no real benefits.

CONCLUSIONS AND POLICY IMPLICATIONS: THE VALUE OF SUB-BACCALAUREATE EDUCATION

These results provide some answers to the question posed in the introduction about the value of sub-baccalaureate education for which information has been so sparse. First and foremost, it is clear that the critics of community colleges and other two-year institutions, who claim that they provide no economic benefits—for example, Brint and Karabel (1989), Pincus (1980), and others who have cited their results—are incorrect. Evidently, both certificates and Associate degrees increase the earnings of those who receive them—not, of course, by as much as a baccalaureate degree that requires between two and four times as many credits, but still by substantial and statistically significant amounts. The returns to these sub-baccalaureate credentials with the SIPP data set are larger than the estimates from the NLS72 data reported in Grubb (1992a, 1993a) and Kane and Rouse (1993), but are roughly the same as those from the NLS-Youth data reported in Kane and Rouse (1993).

However, while there may be substantial economic returns to certificates and Associate degrees, it is equally clear that some kinds of postsecondary education provide no economic advantage at all, so simple recommendations for individuals to continue their education in community colleges and technical institutes are unwarranted. Most apparent is that short periods of time in postsecondary education have uncertain effects. For women, only those who report that they have completed three or four years of college without receiving any postsecondary credentials—consistent with substantial attendance at four-year colleges, not community colleges—have higher earnings than high school graduates. Different amounts of college among noncompleters provide larger and more significant benefits among men than among women, but here, too, the effects of small amounts of college—less than one year, the amount that someone entering a community college for a short period of time might have—are usually too small to be statistically significant and are

essentially zero for younger cohorts (age 25-34 and 35-44). Some men may benefit from small amounts of course-taking, then, but the average effect is quite close to zero.

For similar reasons, there appear to be "program effects." In general, completing a certificate is more beneficial than completing one year of college without a credential; an Associate degree is more valuable than two years of college, and a baccalaureate degree increases earnings by more than four years of college without the credential. Once again, this suggests that completing credentials is the wisest course for most individuals.

As is well-known for baccalaureate degrees, the benefits of sub-baccalaureate credentials vary substantially by field of study. Even though small samples affect the inferences possible, some fields of study—health and business for women, engineering, technical fields, and business for men—provide substantial benefits, while others either provide little earnings advantage or, in some cases, benefits that are highly variable. The fact that the most beneficial fields of study are different for men than for women—a result that is not generally true for baccalaureate degrees—indicates the extent of gender segregation in these programs and in the labor market for which they prepare students. It also suggests that the common recommendation of getting women into nontraditional jobs—into jobs in engineering, computers, electronics, and other technical fields—may not benefit them in the ways that proponents of such gender equity imagine. Associate degrees in academic subjects in general fail to increase earnings substantially, suggesting that this credential—which in many states is not intended to be a terminal degree, but rather a credential for transfer students on their way to baccalaureate degrees—does not have a clear role in the labor market. Once again, it matters a great deal what specific kind of education in community colleges and technical institutes an individual chooses.

Another source of variation in the returns to postsecondary education involves the effects of having a job related to an individual's field of study. The returns to related employment are almost always higher than the returns to unrelated employment, confirming the hypothesis that the job-specific nature of vocational education reduces its value in unrelated jobs. Second, while the returns to unrelated baccalaureate degrees and Associate degrees are lower than to related degrees, they still tend to be significant; the implication is that occupational degrees do have some general components that enhance productivity and earnings even in occupations unrelated to the field of the credential. Third, in a substantial number of cases—and particularly among individuals with some college but no

credentials—the coefficient for related employment is significant, but that for unrelated employment is not. These are particularly worrisome cases because they imply that completing coursework is necessary but not sufficient to realize economic benefit and that placement in a related occupation is crucial.

The final set of interesting results describes the effects of short-term job training programs on earnings. By and large, the effects are disappointing: only employer-sponsored training provides a consistent boost to earnings for both men and women, though training in trade schools and community colleges is beneficial to women if they find related employment. In addition, the effects of programs are generally greater if an individual's current employment is related to the training he or she received—which is what one might expect, since short-term job training is almost, by definition, relatively job-specific. However, the vast array of government-sponsored job training programs do not increase earnings substantially. There are, of course, many explanations for this finding, principally that such programs enroll individuals with substantial barriers to employment—low skill levels, a lack of motivation or initiative, drug and alcohol abuse problems, and/or physical disabilities—not otherwise described by this data but apparent to employers. Nonetheless, it is clear that most short-term job training programs have not been successful in returning their clients to the mainstream of the labor market.

What are the implications of these findings for policy? In the first place, it is unclear that prospective students, facing an array of postsecondary education options, have sufficient knowledge to make informed decisions. The benefits of a baccalaureate degree are well-known, and the lower returns to certain fields like education, agriculture, and social welfare are also well-known. It is hard to argue that students elect these fields unaware of the economic consequences of their decisions. However, a majority of new entrants to postsecondary education now enter community colleges and other two-year institutions. To transfer to four-year colleges and to earn baccalaureate degrees is the common goal of these students, but it is unclear whether many of them realize how few students manage to transfer and complete baccalaureate degrees, or what the consequences are of completing some college or of obtaining only sub-baccalaureate credentials. A very different group of students coming to community college are older, many of whom have found themselves unemployed as a result of changes in the economy. Many community college students, both of traditional college age and older, appear to be casting about for

careers, unsure of their own proclivities or of the options open to them[41]—like the "experimenters" described by Manski (1989). The career counseling available to them is usually inadequate, and information about local labor market alternatives is usually either nonexistent or unreliable.[42] Given the variation in the benefits of different postsecondary programs, one obvious recommendation is that information about the effects of various programs be made more widely available to students than is now the case.

Similarly, it is not clear that state policy—which funds the majority of community colleges and technical institutes—has paid sufficient attention to the outcomes of these institutions. Most state funding mechanisms provide incentives for higher *enrollments*, rather than *completion*, since they provide funding on the basis of enrollment or attendance.[43] Similarly, with only a few exceptions, states provide equivalent funding to all programs; this, in turn, means that low-cost programs in fields of study with lagging demand are funded the same as high-cost programs in high demand areas such as health, electronics, and other technical fields.[44] An obvious implication of the results in this monograph, however, is that states should be more concerned about the results of various sub-baccalaureate programs; supporting large numbers of students who fail to complete programs, or who complete programs in areas of low demand and low earnings, may not be a rational policy in the absence of other clear benefits.

Finally, like state policy, federal policy has been more concerned about providing *access* to postsecondary education—particularly through grants and loans—than with the

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[41] A group of researchers headed by Kathy Reeves and myself and sponsored by NCRVE has conducted a series of hour-long interviews with community college students in California, asking them their reasons for enrolling in community colleges and, for those who had dropped out, their reasons for leaving and their intentions. Virtually all students, both those of traditional college age and the older students, reported that they were in a community college in order to "find a life": to find a career (in place of the marginally paid jobs without prospects for advancement that most of them held) that would suit their interests and abilities. The students of traditional college age usually mentioned that guidance and counseling in high school had been inadequate to help them, and only a few students reported that guidance and counseling services at the community college level were helpful.

[42] See especially Grubb et al. (1992), which is based on surveys of community colleges and employers in four local labor markets, and the interviews mentioned in the prior footnote.

[43] To be sure, there are a few exceptions; for example, Florida requires vocational programs to have placement rates in related employment of 70% and eliminates programs which consistently fall below this level, and Tennessee reserves 5% of funding as incentive bonuses for institutions with high placement rates, as described in Hoachlander, Choy, & Brown, 1989.

[44] Again, the interviews in Grubb et al. (1992) reveal that community college administrators are quite sensitive to the marginal costs and the marginal revenues (state aid plus tuition) in different programs and, therefore, are more likely to support low-cost fields of study than high-cost fields, despite labor market conditions.

quality of postsecondary programs, which includes content or coherence, completion rates, or effects on employment. Because student aid has dominated federal postsecondary spending, default rates have tended to drive revisions in postsecondary education policy—but this has tended to focus attention more on proprietary schools than on other sub-baccalaureate institutions such as community colleges, which have lower default rates and much lower amounts of student aid. But default rates are not necessarily the best guides to policy, particularly for institutions such as community colleges and technical institutes in which tuition and student loans are low. The other instrument of federal policy in this arena—federal grants for vocational education, through the Perkins Act—has generally been dominated by secondary concerns and have had little influence on postsecondary vocational programs. Overall, then, federal policy has had little influence on the quality of postsecondary vocational programs; the potential for greater influence has always been present but unrealized.[45]

These three strands of concern—with the well-being of students, with state policy, and with potential federal influences on the quality of postsecondary education programs—all converge in a set of recommendations that are already in the process of implementation. Setting standards for outcomes, operationalizing them in performance standards, and then using the resulting information to provide better advice to students about career options and better information for state and federal policymakers are obvious remedies for the information problems that now exist. The Perkins Act has started this process by requiring all vocational programs to develop performance measures, with most states developing at least some postsecondary standards reflecting labor market outcomes (Rahn, Hoachlander, & Levesque, 1992). To be sure, the implementation of performance measures and standards and the process of devising appropriate rewards and penalties for different levels of performance present both serious conceptual and technical issues. For example, it will be necessary to define who noncompleters are and how they might benefit from brief enrollment; to define "related employment"; to track employment over longer periods of time; and to consider variations in local labor market conditions. But the potential for outcome-related information to generate greater benefits, for students as well as both state and federal taxpayers, is substantial.

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[45] For a similar diagnosis of the failures of federal postsecondary education policy, see Committee on Postsecondary Education and Training for the Workplace, 1993.

In many ways, the increasing concerns with outcomes reflect both the expansion and the maturation of the sub-baccalaureate labor market. As the number of individuals with some college has grown (as reflected in Table 13, for example), the question of what happens to them has become more important. This is particularly the case because of some forecasts that individuals with some postsecondary education, but not necessarily a baccalaureate degree, will face ever-increasing demands in the coming decades because of high-performance workplace requirements. During the same period, expansion has caused postsecondary occupational programs to "mature," to become better institutionalized, and to take a definite shape within community colleges and technical institutes. The ways in which these programs have developed have not always been carefully considered or particularly effective, as the weak ties of many institutions with local employers and the emphasis of state and federal policy on enrollment and access rather than on outcomes all illustrate. But appropriate policies can correct these causes of uneven economic returns and, in the process, help ensure that the promise of the sub-baccalaureate labor market is realized.

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APPENDIX A

DIFFERENCES AMONG SAMPLES AND THE EFFECTS OF OTHER INDEPENDENT VARIABLES

In estimating the effects of small amounts of postsecondary education on earnings, the sample chosen proves to be important, particularly for men. The reason is not surprising: the earnings of individuals who are still in school and who have not completed their schooling differ from those of individuals not in school, who are more likely to have completed their schooling.

Tables A-1 and A-2 present the coefficients of sub-baccalaureate credentials and the benefits of varying amounts of postsecondary education among noncompleters for three samples: (1) individuals 25 to 64, including those still in school at some point during the year (the sample used in the body of this monograph); (2) individuals age 18 to 64, with a relatively higher fraction of individuals still in school; and (3) individuals 18 to 64, excluding all individuals who reported being in school at any time during the year. The coefficients for sub-baccalaureate credentials are relatively stable across these three samples. However, for men, the coefficients of the variables describing some college vary substantially: they are consistently lower, and statistically insignificant, in the second sample, which includes a higher fraction of students. Evidently these students who are over the age of 18 are more likely to be enrolled in college and to not have completed credentials. They are also likely to have poorly paid jobs—what counselors sometimes call "stay-in-school jobs"—designed only to get them through postsecondary education. The lower earnings of these temporary jobs are partly reflected in the coefficient of the dummy variable for those still in school; but even with this controlled variable, the earnings differences associated with larger amounts of postsecondary education are small, erratic, and insignificant—precisely what one would expect if "stay in school" jobs are menial jobs which do not use the skills college students have accumulated. However, when the sample is restricted to nonstudents, or to individuals 25 and older who are more likely to be in more career-oriented jobs, then the returns to one or more years of college prove to be significant. The coefficients are relatively stable between these two samples.

For women, the divergent samples shown in Table A-2 make much less difference because the effects of some college are almost uniformly insignificant. These findings

buttress the conclusion that small amounts of postsecondary education do little to improve the earnings of women.

Table A-1

Effects of Varying Samples on Schooling Coefficients
Males, 1987 Sample

	Ages 25-64 Students included	Ages 18-64 Students included	Ages 18-64 Students excluded
Associate	.215* (.044)	.219* (.043)	.253* (.046)
Vocational certificate	.146* (.071)	.176* (.070)	.170* (.071)
Some college:			
4 years	.256* (.092)	.213* (.094)	.317* (.099)
3 years	.237* (.067)	.039 (.060)	.221* (.069)
2 years	.123* (.044)	.075 (.041)	.148* (.045)
1 year	.161* (.043)	.062 (.040)	.157* (.043)
< 1 year	.041 (.057)	-.095 (.050)	.024 (.057)
Still in school	-.165* (.031)	-.376* (.027)	-
R^2	.384	.464	.413
N	5452	6452	5397
Proportion still in school	10.8%	16.4%	0

Table A-2

Effects of Varying Samples on Schooling Coefficients
Females, 1987 Sample

	Ages 25-64 Students included	Ages 18-64 Students included	Ages 18-64 Students excluded
Associate	.234 (.060)	.276 (.055)	.231 (.063)
Vocational certificate	.164 (.075)	.198 (.071)	.165 (.077)
Some college:			
4 years	-.023 (.178)	.077 (.159)	.041 (.217)
3 years	.240 (.095)	.129 (.076)	.291 (.102)
2 years	.062 (.065)	.051 (.057)	.109 (.695)
1 year	.090 (.056)	.064 (.048)	.109 (.057)
< 1 year	.063 (.080)	.112 (.066)	.084 (.086)
Still in school	-.114 (.039)	-.239 (.033)	-
R^2	.359	.375	.354
N	4951	6014	4788
Proportion still in school	14.2%	16.2%	0

The Effects of Other Independent Variables

Table A-3 presents the coefficients for the other independent variables included in these earnings equations for the 1987 sample only; the results for 1984 and 1990 are quite similar. Of course, some of these coefficients are affected by small sample sizes, even with the relatively large samples (5452 men and 4952 women) included here. However, most of them conform to *a priori* expectations.

The coefficients for the racial and ethnic variables suggest that discrimination is more serious for men—and especially for African American and Asian American men—than for women. In addition, among Hispanics, there appears to be discrimination against Mexican-Americans and Puerto Ricans—though small sample sizes mean that the coefficients for Puerto Rican men and women are not statistically significant—but not for Hispanics of Cuban and South American descent, confirming the findings of DeFreitas (1991).

The effects on earnings of family background in this data is generally erratic. Efforts to include the occupation of the head of household when the respondent was 15 yielded consistently insignificant coefficients; only the education of the head of household provided any explanatory power. For men, the results are roughly consistent with the hypothesis that family background continues to influence earnings directly, as well as indirectly, through its influence on education. The effects of the household head having only elementary education are negative and the effects of a college degree are positive and significant; the other coefficients have the appropriate signs though they are insignificant. For women, however, the coefficients on the education of the household head are consistently insignificant. These results are consistent with a pattern in which high-status families favor sons over daughters: daughters in families of higher socioeconomic status may benefit from having higher levels of education, but there is no further direct effect of family background on earnings.[46]

Most other independent variables have the signs expected of them, and most are significant. Individuals still in school tend to have lower earnings, for reasons explored in the previous section. Those covered by union contracts have higher earnings, especially

[46] These same findings are true of the results based on the National Longitudinal Study of the Class of 1972, reported in Grubb (1993a).

Table A-3

Effects of Other Independent Variables on Earnings
1987 Sample

	Males	Females
African American	-.219* (.040)	-.063 (.048)
Native American	-.253* (.115)	-.310 (.211)
Asian American	-.175* (.062)	.040 (.088)
Mexican American	-.214* (.053)	-.189* (.082)
Puerto Rican	-.162 (.128)	-.330 (.205)
Cuban	.053 (.168)	.260 (.240)
South American	.037 (.134)	.209 (.167)
Head's Education:		
None	-.071 (.080)	-.076 (.113)
Elementary	-.069* (.025)	-.053 (.035)
Some high school	-.023 (.034)	-.061 (.045)
Some college	-.004 (.039)	-.010 (.053)
College education	.091* (.041)	-.014 (.056)
Graduate school	.015 (.048)	-.0124 (.066)
Female head of household	-.051 (.031)	.066 (.042)
Still in school	-.165 (.031)	.114 (.040)
Union contract	.120* (.024)	.310* (.041)
Metropolitan area	.205* (.022)	.190* (.032)
Southern region	-.138* (.027)	-.032 (.038)
North Central region	-.078 (.028)	-.143* (.040)
Western region	-.050 (.030)	-.017 (.043)
Married	.268* (.023)	-.226* (.030)
Number of children	—	-.095* (.013)
Disability	-.468* (.033)	-.385* (.050)
Current job tenure	.077* (.004)	.152* (.005)
Current tenure^2	-.0014* (.0001)	-.0032* (.0002)
Prior related experience	.039* (.004)	.075* (.006)
Prior related experience^2	-.0005* (.0001)	-.0017* (.0002)
Prior unrelated experience	.017* (.003)	.021* (.004)

Table A-3 (continued)

	Males	Females
Prior unrelated experience^2	-.0005* (.0001)	-.0005* (.0001)
Age	.038* (.008)	.029* (.011)
Age^2	-.0005* (.0001)	-.0005* (.0001)
Dummy variable for *imputations*:		
Highest degree	.113* (.050)	.173* (.080)
Any training	-.185 (.095)	.380* (.167)
Training sponsor	.351 (.191)	-.229 (.307)
Training location	-.109 (.073)	-.012 (.099)
Union coverage	.234* (.073)	.247* (.104)
Head at age 15	.252* (.065)	.446* (.092)
Backup job converted to primary job	-.424* (.131)	.072 (.328)
Imputed total experience, prior job ended before 1976	-.181* (.029)	-.333* (.040)
Imputed job start date	-.043 (.056)	-.158 (.083)
Imputed related experience	-.151* (.067)	-.062 (.093)
Imputed total experience given nonresponse	.006 (.031)	-.049 (.049)
R^2	.384	.359
N	5452	4952

women. Earnings are higher in metropolitan areas and lower in the South and North Central regions. Marriage works quite differently for men and women, increasing the earnings of men but decreasing the earnings of women; and women with children have lower earnings than those who do not. Finally, those who report a disability have substantially lower earnings than others.

These results distinguish among three different forms of experience: (1) tenure on the current job; (2) experience on prior jobs that are related to the current job; and (3) experience on prior jobs unrelated to the current job. Because the SIPP data collection leaves unavoidable gaps in the employment record, these specifications also include age

(and age squared), in part to pick up the effects of any omitted periods of experience and in part to see whether there are effects of age independent of experience.[47] If employers value most the kinds of job-specific learning that takes place on the job, then the effects of current job tenure should be the highest of these three forms of experience. Furthermore, related experience in another job should have greater effects on earnings than unrelated prior experience. Alternatively, experience may be important, not because it provides on-the-job learning, but because it allows employers to perceive the real abilities of employees; in this kind of signaling model, the effect of current job tenure should still be highest while the effect of prior unrelated experience should be lowest.

Indeed, the results are consistent with this hypothesis for both men and women. While the quadratic form means that the effect of a year of schooling declines over time,[48] these effects are still dominated by the linear term; this declines monotonically across these three types of experience, for both men (from .077 to .039 to .017) and women (from .152 to .075 to .021). It is worth noting that the effects of experience are consistently larger for women than for men. Finally, age still has a statistically significant influence even after these three kinds of experience are included, though it is impossible to know whether this reflects simply the effects of age, independent of experience, or periods of experience unmeasured by the other three experience variables.[49]

The remaining coefficients in Table A-3 reflect the influences of dummy variables which are included whenever certain values are imputed for the other independent variables. Several of these coefficients are significant; several of them are highly so. In general, imputations are made for relatively small numbers of individuals—ranging from 0.5 to 3.7% among the 5,452 men and 0.2 to 4.4% among the 4,952 women—and so their inclusion or exclusion does not change parameter estimates by much. These imputations are included to reflect the presence of unavoidable error when such imputations are made. The exception is that total experience is imputed as age minus education minus 6 for 31%

[47] Several experiments with other variables which are designed to reflect missing spells of experience—particularly the one often included in human capital formulations, age minus years of schooling minus 6—proved to be inferior, in terms of both explanatory power and effects on other coefficients, to the simple inclusion of age.

[48] The maximum effects of experience come at levels of experience ranging from 17 to 39 years for men and from 21 to 24 years for women—all sufficiently high enough that the effects of experience never decrease in these samples.

[49] The positive effect of age reaches a maximum at 38 for men and 29 for women and becomes zero and turns negative at 76 for men and 58 for women. Over the sample used—those 25 to 64—increasing age generally decreases earnings.

of men and 25% of women; the negative coefficients of the associated dummies indicate that the experience thereby imputed is too high. By and large, the imputation dummies affect only the coefficient of the specific variable to which they pertain—for example, the dummy reflecting missing data on union coverage affects only the coefficient describing whether an individuals was covered by a union contract—and so their influence on the education variables that are of principal concern are slight. Therefore there is little chance that the results in this monograph are distorted by the need to include imputed values for certain independent variables.

APPENDIX B

FIELD OF STUDY—OCCUPATION MATCHING ALGORITHM

Each entry describes the Census Occupation Codes considered to be related to the fields of Study Codes in the SIPP data.

Agriculture or Forestry (01)

(473-476) Farm Occupations
(477-489) Other Agriculture & Related Occupations
(494-496) Forestry & Logging Occupations

Business or Management (03)

(003-037) Executive, Administrative, & Managerial Occupations
(064, 229) Computer Systems Analysts, Scientists, & Programmers
(166) Economist
(243-285) Sales Occupations
(303-389) Administrative Support Occupations, including Clerical
(413-415, 433, 448, 456, 477, 485, 494, 503, 553-558, 613, 633, 803, 843, 863) Supervisors, not in other categories
(475-476) Managers, not in other categories

Education (05)

(113-154) Postsecondary Teachers
(155-162) K-12 & Other Teachers
(163) Counselors
(406, 468) Child Care
(175) Recreation Workers
(014) Educational Administrators

Engineering, including Computers & Computing (06)

(044-059, 258) Engineers
(064, 229) Computer Systems Analysts, Scientists, & Programmers
(065) Operations and Systems Researchers and Analysts
(213-218, 235) Engineering & Related Technologists & Technicians
(308-309) Computer Equipment Operators

Home Economics (08)

(403-407) Private Household Occupations
(433-444) Food Preparation & Service Occupations
(468) Child Care Workers, except private households

Law and Legal Services (09)

(145) Law Teachers
(178-179) Lawyers & Judges
(234) Legal Assistants

Health Professionals (12, 13)

(015) Managers, Medicine, & Health
(084-106) Health Diagnosing Occupations
(203-208) Health Technologists & Technicians
(445-447) Health Services Occupations

Protective Services (15)

(413-415) Supervisors, Protective Services Occupations
(416-417) Fire Fighting & Fire Prevention Occupations
(418-424) Police & Detectives
(425-427) Guards

Vocational or Technical Studies (19)

(023, 337) Bookkeepers, Accountants, & Related Clerks
(213) Electrical & Electronic Technicians
(313) Secretaries

(457-458) Barbers, Hairdressers, & Cosmologists

(503-699) Precision Production, Craft, & Repair Occupations

(703-905) Operators, Fabricators, & Laborers