



How College Affects Students

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A Third Decade of Research

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college quality (for example, selectivity, student-faculty ratio, percentage of faculty holding Ph.Ds, and the like) had significantly different impacts on early career earnings for individuals who were in different academic fields of study. For example, measures of college selectivity appeared to count more for students majoring in education, mathematics-science, and health-related fields than for their counterparts majoring in engineering, business, and the social sciences. As Rumberger and Thomas (p. 16) point out, "This suggests that it is hard to generalize about what institutional factors are important in explaining between-school differences in college earnings."

Rumberger and Thomas (1993) also report evidence to suggest that the effect of academic performance during college on early career earnings may also vary significantly in magnitude for individuals who were in different academic fields of study. Cumulative grades had a stronger positive impact on earnings for students majoring in business, education, and science-mathematics than for their counterparts majoring in engineering, social sciences, or health-related fields.

Intergenerational Effects. Does parental education influence the careers of children? We uncovered only one study that indirectly attempts to answer this question by estimating the factors influencing choice of a mathematics-science major during college (Maple & Stage, 1991). The results suggest a conditional effect based on race. Analyzing the 1984 follow-up of the High School and Beyond data, Maple and Stage sought to determine if there were differences in the pattern of influences on choosing a math-science major by race and sex. Net of such confounding influences as tested ability, high school grades, school and parental influence, attitudes toward mathematics, and initial choice of major, having a mother who was a college graduate had stronger positive effects on Black men and women majoring in mathematics or science fields than it did for their White counterparts.

SUMMARY

Change During College

The small body of evidence from the 1990s is consistent with our 1991 conclusion that students become more mature, knowledgeable, and focused during college in thinking about a career. Furthermore, there is also evidence to suggest that college seniors have a more accurate perspective about labor market realities and a higher level of overall workplace readiness than do their counterparts with less exposure to postsecondary education. It is hazardous to attribute these changes and class differences to the college experience itself, however. Simple maturation, the increased pressure on seniors to reach closure on career decisions, or the loss of the least able students from upper-division samples may be equally valid as competing explanations for the findings.

Although college seniors appear to have relatively higher levels of workforce readiness than those with less exposure to college, they may often lack an

absolute level of job skills required for above-average performance. From an employer's perspective, college students appeared to be well prepared in their academic and content areas but fell short in areas that were related to the context of work (for example, interpersonal skills, setting priorities) and applying their knowledge in work environments.

Net Effects of College

The evidence from the 1990s would suggest the following general conclusions about the net effects of postsecondary education on career and economic attainment:

1. In general, a bachelor's degree provides a net occupational status advantage over a high school diploma of about .95 of a standard deviation (33 percentile points), an associate degree confers an estimated net occupational status advantage over a high school diploma of between .24 and .44 of a standard deviation (9 to 17 percentile points), and other amounts of postsecondary education or subbaccalaureate credentials such as a vocational degree or a license-certificate provide an estimated net occupational status advantage over a high school diploma of between .12 and .22 of a standard deviation (5 to 9 percentile points).
2. There is generally consistent evidence to suggest that as amount of postsecondary education increases, workforce participation increases and the likelihood of being unemployed decreases. Although sparse, and not totally consistent, there is a modicum of evidence supporting the hypothesis that the positive relationship between amount of formal postsecondary education and different indicators of workforce participation is causal and not simply attributable to the characteristics of individuals who have different amounts of postsecondary education.
3. Consistent with our previous synthesis, the small body of evidence we uncovered suggests that postsecondary education tends to produce conflicting, or at least complex, influences on satisfaction with work. Having a college education tends to have a positive indirect effect on job satisfaction through its impact on such factors as job prestige and earnings, job autonomy, and nonroutine work. Net of those factors, however, the direct effect of having a college degree on job satisfaction tends to be negative, possibly because education functions to raise workers' expectations. Having higher expectations of the intrinsic and extrinsic rewards of one's work may partially explain depressed levels of job satisfaction when college graduates hold jobs that do not generally require a college degree.
4. Some evidence suggests that when college-educated and high school-educated individuals hold the same job, the former display statistically significant advantages in job performance. Such findings,

however, may not reflect the impact of college. Rather, the job performance differences could be attributable to the fact that those with exposure to postsecondary education simply possess more of the personal traits that lead to effective job functioning to begin with.

5. Our synthesis of a large body of evidence, derived primarily from analyses of nationally representative samples, estimates the average net annual earnings premium for a bachelor's degree (versus a high school diploma) to be about 37 percent for men and about 39 percent for women. The hourly wage premium is estimated at about 28 percent for men and about 35 percent for women. Such average estimates fall at the upper end of our 1991 estimates of a net earnings premium for a bachelor's degree of between 20 and 40 percent. This finding perhaps reflects the increase in the size of the earnings premium for a bachelor's degree in the 1980s and 1990s.
6. A significant contribution of the literature of the 1990s is that it also permits us to estimate the net earnings premium for different levels of subbaccalaureate education. We estimate that the average net annual earnings premium for an associate degree (compared with a high school diploma) is about 17.5 percent for men and about 27 percent for women. The hourly wage premium is approximately 13 percent for men and 22 percent for women. Additional evidence suggests that the economic returns to an associate degree are essentially the same for experienced adult workers who return to school and for continuing high school graduates. Although the weight of evidence from a small body of research suggests that the completion of one-year vocational certificates can increase earning power, particularly for women, the average net economic returns to such certificates (versus a high school diploma) appear to be less certain, and likely smaller, than the average net returns to associate degrees.
7. Individuals can potentially increase their earnings by obtaining modest amounts of postsecondary education or vocational training without obtaining a degree or certificate. However, the average economic premium appears to be less certain and smaller in magnitude than the average economic premium yielded by an associate degree or certificate, and the size of the premium depends on what subject matter one takes. A year of full-time enrollment can lead to a net increase in earnings over a high school diploma of about 5 percent or more, and the payoff of completing a year of academic credits at a community college appears to be at least equal to the payoff of completing the same number of credits at a four-year college.
8. Consistent with the conclusion from our previous synthesis, the weight of evidence from the research of the 1990s suggests the presence of credentialing or program effects. The magnitude of these credentialing or program effects are more difficult to determine and may not be par-

ticularly robust. However, we estimate that men with a bachelor's degree earn, on average, about 15 percent more than men with four years of college credits but no degree. For women, the corresponding earnings advantage is about 12 percent. We estimate that men who finish an associate degree earn, on average, about 9 percent more than men with the equivalent of two years of postsecondary education but no degree. For women, the corresponding earnings advantage for completing an associate degree is about 11 percent. The credential-program effect of completing vocational training, although likely real, is less certain, more variable, and smaller in magnitude than the credential-program effect for either the bachelor's or associate degree.

9. Consistent with our previous synthesis, we estimate the private rate of return to a bachelor's degree at about 12 percent, with a typical range from about 9 to 16 percent.
10. The causal mechanisms underlying the relationship between postsecondary educational attainment and both occupational positioning and earnings are complex. They may function differently, and with varying degrees of importance, in different career paths, at different times in one's career, in different jobs or labor market sectors, and with changes in the economy and the nature of work. It may be fruitless to search for a single, dominant explanation. Moreover, how these underlying mechanisms may be influenced by the impact of computers and information technology on fundamental notions of work and career is not yet fully understood.

Between-College Effects

A large body of research conducted during the decade of the 1990s estimated between-college impacts on career and economic returns. The evidence from the body of research suggests the following general conclusions:

1. As with our earlier synthesis, estimations of the net impacts of various indexes of institutional quality formed the largest body of evidence pertaining to between-college effects on career and economic attainment. Although institutional student body selectivity was the most often employed proxy measure for institutional quality, the literature also operationally defined institutional quality in terms of such dimensions as academic expenditures per student, reputational ratings, faculty-student ratio, tuition, percentage of faculty with Ph.Ds, and the like. Consistent with the conclusions from our 1991 synthesis, we found little evidence to suggest that measures of institutional quality have more than a trivial and statistically nonsignificant, direct impact on overall occupational status. However, some evidence suggests that attending an institution in the upper 1 or 2 percent of the selectivity distribution enhances occupational attainment in specific high-status professions such as medicine and law. Attending a selective college confers a

modest advantage in job attainment and career mobility. The evidence is complex, however, and suggests that institutional selectivity positively influences promotion in the middle organizational ranks but has little impact at the highest ranks. The evidence further suggests that institutional selectivity signals the possession of intellectual and related traits that are important for job performance. However, it is not clear from the evidence if the individual acquires these traits from his or her experience in college or essentially enters college with them.

2. The weight of evidence suggests that measures of institutional quality, and particularly student body selectivity, have statistically significant, positive net impacts on subsequent earnings. When quality is defined as selectivity, attending a college with a 100-point higher SAT score or ACT equivalent is associated with a net increase of about 2 to 4 percent higher earnings in later life. However, the effect may not be linear, and only those elite institutions at the very top of the selectivity distribution may have an appreciable impact on earnings. Beyond institutional selectivity, it is difficult to find indexes of institutional quality that have consistent, positive effects on earnings across different studies. Although we are likely in the minority on this issue, we would argue that the body of research we reviewed probably provides an inflated estimate of the impact on earnings of having a bachelor's degree from a selective institution. Measures of individual ambition are almost universally absent in investigations of the impact of college quality on earnings. When a strong proxy for ambition is taken into account, along with other factors, the impact of college selectivity on earnings tends to become chance.
3. There is little empirical support for the hypothesis that attending a private (versus public) college has anything more than a trivial net influence on occupational status. Across all studies that provide requisite information, the average net earnings advantage associated with graduating from a private college (irrespective of its level of selectivity) is estimated at about 3 percent. Were differential tuition costs taken into account, however, the net earnings premium associated with attending a private college would in all likelihood be considerably reduced, at least early in one's career.
4. When institutional selectivity is taken into account, it is questionable that either an institution's Carnegie classification or its doctoral-research orientation has a consistent impact on an individual's subsequent earnings. The one exception to this appears to be graduation from a Carnegie-type specialized institution, and this is likely because such institutions frequently focus on preparing individuals for occupational fields characterized by high economic returns.
5. In contrast to the conclusion from our 1991 synthesis, the research from the 1990s suggests that institutional size has only a trivial and

nonsignificant impact on occupational status. However, consistent with our previous synthesis, the weight of evidence from the literature of the 1990s indicates that, independent of student background characteristics and of both institutional selectivity and private-public control, institutional size confers a small but statistically significant advantage in subsequent earnings. This positive effect of graduating from a large institution probably stems from economies of scale in providing diverse programs and major fields of study as well as a wider range of links with occupational and economic groups in society.

6. Overall, it is difficult to form an unequivocal conclusion about the impact of attending an historically Black college on the career and economic success of African Americans. Historically Black colleges appear to enhance the career aspirations of African-American students, and there is some evidence that a bachelor's degree from an HBC is at least associated with one dimension of career eminence among African-American women. However, the weight of evidence with respect to the influence of graduating from an HBC on occupational status, career mobility, and earnings is not totally convincing.
7. There is reasonably consistent evidence to suggest that non-African-American students, and particularly men, may derive potential benefits from experiences on a racially diverse campus that translate into subsequent earnings advantages. This may be attributable to the tendency for employers to recognize the importance of and to reward recent graduates' experiences with diverse populations, and these experiences are more likely to happen at institutions with diverse undergraduate student bodies.
8. We found only mixed and inconsistent evidence on the net impact of attending a single-sex college on women's acquisition of career-related skills, their likelihood of choosing nontraditional majors and careers, and their workforce participation. Similarly, the overall weight of evidence concerning the net impact of attending a women's college on occupational status and earnings is inconsistent and unconvincing. There is single-study evidence, however, to suggest that graduating from a women's institution may positively influence both women's subsequent career eminence and, interestingly, the likelihood of marrying a high-earning spouse.
9. Although sparse, the evidence from the 1990s indicates that initial attendance at a two-year (versus a four-year) college may decrease the likelihood of high-ability minority students persisting in mathematics, science, and engineering careers. Similarly, even when educational attainment is taken into account, initially attending a two-year college appears to have a very small, negative effect on subsequent occupational status. However, for similar individuals of equal educational attainment, initially enrolling in a two-year college does not necessarily

confer a significant earnings penalty. Moreover, there is evidence from a single study to suggest that students who initially enroll in a community college are able to transfer to more selective four-year institutions than they would have attended directly out of high school, and this effect was most pronounced for students who came from poor families, were of low tested ability, or performed poorly in high school.

10. Consistent with our 1991 synthesis, we found strong evidence from the research of the 1990s that the most consistent college environmental impact on career choice is progressive conformity. Progressive conformity posits that, other things being equal, a student's major field of study and career choice will be influenced in the direction of the dominant peer groups at an institution.

Within-College Effects

The extensive body of literature from the decade of the 1990s with respect to within-college effects on dimensions of career and economic attainment permits the following conclusions:

1. Generally consistent experimental and quasi-experimental evidence indicates that career development courses or related interventions (some of which are computer-based) can significantly enhance dimensions of students' career development and maturity.
2. Undergraduate major field of study appears to have a significant net impact on getting a job and securing employment at a level appropriate to a bachelor's degree early in one's career. The clearest advantage in these areas would appear to accrue to students majoring in fields that have the most direct, functional linkages with specific jobs or occupational sectors (for example, computer science, engineering, social work, nursing, accounting). Unlike the conclusion from our 1991 synthesis, evidence from the 1990s indicated that academic major did, in fact, significantly influence one's occupational status. Net of other factors, students majoring in fields of study that have traditionally been dominated by men (for example, engineering, mathematics, physical science, and technical-preprofessional fields) tend to be overrepresented in high-status occupations.
3. The results of a small body of research in the 1990s challenge our previous conclusion that undergraduate major may have little net impact on career mobility in business. It would appear, however, that the magnitude of this impact depends on the type of company being considered and its unique cultural norms and values, the particular time in one's career, sector of the company in which individuals with certain undergraduate majors tend to be placed, and the level of promotion or advancement being considered. As in our previous synthesis, there is little to suggest that undergraduate major plays a significant role in promotion to the highest levels of corporate leadership.

4. In contrast to our previous synthesis, we found single-study evidence suggesting that the degree of congruence between one's academic major and one's job had a net positive effect on job satisfaction that was similar in magnitude to the impact of salary on job satisfaction.
5. Consistent with our 1991 synthesis, one's undergraduate major leading to a bachelor's degree has a substantial net impact on earnings. With other factors controlled, there is typically a difference in the earnings of individuals in different majors of between 25 and 35 percent. The largest earnings premiums accrue to majors characterized by a relatively specific and well-defined body of content knowledge and skills, an emphasis on quantitative or scientific methods of inquiry, a generally close and direct functional link to occupations with relatively high average earnings, often an applied orientation, and a history of being dominated by men (for example, engineering, business-accounting, physical sciences, mathematics and computer science, and preprofessional majors in health science areas). Although the effect of major appears to be most definitive in starting salary or early in one's career, the same general pattern appears to hold later in one's career. A possible exception to the general pattern of major effects on earnings may occur at particularly selective or prestigious colleges. In these institutions, liberal arts majors may provide an "option value" of potential graduate or professional study that functions to enhance longer-term earnings.
6. Economic returns to associate and bachelor's degrees overlap—largely due to an individual's major field of study. For example, women can generally get a greater earnings return from an associate degree in business or health than from a bachelor's degree in humanities or education. Men can generally realize a larger economic premium from an associate degree in engineering, public service, or vocational-technical areas than from a bachelor's degree in the humanities or education. At both the baccalaureate and subbaccalaureate level, however, starting salary and early career earnings are enhanced by the extent to which one's undergraduate major is related to, or congruent with, one's job.
7. Generally, men tend to be overrepresented in academic majors that are closely linked to the highest-paying occupations, while the opposite tends to be true for women. Moreover, women are more likely than men to enter nonlucrative fields of study even after important background characteristics are taken into account. However, differences in academic major chosen by men and women fail to account for all of the gender gap in earnings among the college-educated.
8. College grades appear to have a net positive impact on the probability of being employed full-time and being employed in a job appropriate to a bachelor's degree in the early career. In contrast, the evidence that grades have a causal effect on either job satisfaction or job mobility is unconvincing. The latter finding calls into question a conclusion from our 1991 synthesis.

9. Consistent with our 1991 synthesis, the evidence from the 1990s suggests that college grades have a positive net impact on both occupational status and earnings. The total effect on occupational status of an increase of one grade group is estimated at between .10 and .20 of a standard deviation. The direct effect on earnings of an increase of one grade group was estimated at about 6.8 percent, whereas the total effect (the net direct effect plus the indirect effect through educational attainment) was estimated at between 8 and 9 percent.
10. Consistent with the conclusion from our 1991 synthesis, there is substantial evidence from the literature of the 1990s to suggest that extracurricular and social involvement during college, including Greek affiliation, has a net positive impact on student self-reports concerning the development of career-related skills. Similarly, both involvement in diversity experiences and voluntary service activities during college appear to enhance individuals' perceptions of how well college fostered their career skills and prepared them for their current jobs. However, evidence with respect to the net impact of extracurricular and social involvement on either securing employment early in one's career or subsequent earnings is unconvincing.
11. Work or internship experiences during college appear to have a positive net influence on the development of career-related skills and the likelihood of being employed immediately after college. The positive impact of work experience during college on securing employment after graduation would appear to be maximized when one's work experience is related either to one's major or to one's chosen career. In contrast, evidence with respect to the net impact of work during college on earnings and earnings growth during one's career is less consistent.
12. A modest body of evidence suggests that specific academic experiences and academic involvement have significant net impacts on dimensions of career development. Net of other factors, cooperative or group learning experiences appear to have a positive influence on self-reported growth in career-related skills such as leadership abilities, public speaking ability, ability to influence others, and ability to work effectively in groups. Similarly, service learning experiences appear to positively influence such dimensions of career development as self-ratings of leadership skills, the importance of a helping career, occupational identity processing, and salient career development tasks.
13. The weight of evidence suggests that extent of student-faculty interaction has a positive influence on the likelihood of students choosing academic and scientific research careers. However, there is some ambiguity about causal direction. Specifically, does interaction with faculty increase the likelihood that students will choose an academic or scientific research career, or are students who have decided on those careers simply more likely to seek out interaction with faculty? Evidence from

a single study suggests that, net of other factors, student-faculty interaction has a positive, indirect influence on an individual's early occupational status, mediated primarily through the direct, positive effect of student-faculty interaction on bachelor's degree attainment.

14. The weight of evidence would suggest that the net within-college effects on career and economic attainment tend to be larger than the corresponding net between-college effects. Put another way, as a general rule, what a student does during college will have a substantially greater impact on his or her subsequent career attainment than where he or she attends college.

Conditional Effects of College

A substantial body of research has estimated the conditional effects of postsecondary education on different dimensions of career attainment. Our synthesis of that research suggests the following general conclusions:

1. The weight of evidence suggests that the net earnings premium (that is, the percent advantage in earnings) for a bachelor's degree (versus a high school diploma) is approximately the same for men as it is for women. However, we estimate that the average net earnings premium linking to an associate degree for women is about 1.5 times as large as the corresponding premium for men. Although the evidence is not as extensive or clear, it would also appear that women may receive a somewhat larger earnings premium from vocational certificates and the completion of vocational training than men.
2. A small body of evidence suggests that the occupational status premium derived from postsecondary degrees (versus a high school diploma) is larger for men than women. The net advantage in occupational status linked to a bachelor's degree was about 1.7 times larger for men than women, while the corresponding advantage linked to an associate degree was about twice as large for men as for women.
3. We estimate that the average net earnings premium for African-American bachelor's degree holders (versus their counterparts with a high school diploma) is about 1.2 times as large as the corresponding premium for Whites. This may, however, be attributable to particularly large returns to African-American women, a finding consistent with the conclusions from our 1991 synthesis.
4. Although individuals clearly derive statistically significant economic advantages from completing associate degrees, such degrees may not always be sufficient to narrow the income equity gap between different socioeconomic status groups.
5. Evidence based on a single study suggests that the earnings premium of a bachelor's degree does not diminish, and may in fact modestly increase, with age. It is likely, however, that the later in one's working

life one completes a bachelor's degree, the smaller the overall private rate of return to that degree.

6. African-American or students of color benefit economically from institutional quality or selectivity just as much as, and quite possibly more than, White students. To the extent the latter condition is true, it would lead us to revise the conclusion of our 1991 synthesis. We found little consistent evidence from the 1990s that would lead us to change the conclusion from our previous synthesis that institutional quality or selectivity has about the same average impact on the earnings of men as on the earnings of women.
7. Attending a selective college may have its largest positive impact on earnings for individuals who have relatively (for selective institutions) low tested academic ability or who come from families with low parental income. Although they await replication, such findings do not support the conclusions of our previous synthesis.
8. Controlling for educational attainment and background characteristics, there is evidence from a single study to suggest that students with relatively low occupational aspirations tend to derive somewhat greater earnings returns from initial attendance at a two-year (versus a four-year) institution. This suggests the possibility that initial community college attendance may play a compensatory role in the later economic success of individuals entering postsecondary education with low career aspirations or plans.
9. We estimate the average net effect of undergraduate grades on earnings for women to be approximately 1.3 times as large as the corresponding effect for men. Although it is difficult to estimate the magnitude of the conditional effect, it would appear that, compared with other students, African-American men and women may derive a particularly large earnings payoff from good undergraduate grades.
10. Net of other factors, earning a bachelor's degree in engineering has an impact on earnings for women that is about 1.5 times as large as the corresponding effect for men. Similarly, majoring in mathematics or the physical sciences in a four-year program has a net impact on the subsequent earnings of women that is about 1.75 times as large as the corresponding effect for men. Thus, although women may be less likely to major in these fields of study, when they do so they appear to derive greater returns (versus other majors) than their male counterparts.
11. Although it is difficult to determine the magnitude of the conditional effect, replicated evidence suggests that African Americans receive a relatively smaller economic return from majoring in the social sciences (versus other majors) than do other students.
12. Other conditional effects suggest that any economic benefits linked to institutional quality or selectivity do not accrue generally to all stu-

dents. For example, institutional selectivity may count for students who transfer to a selective institution but have little impact on the earnings of students who enter a selective institution directly out of high school. Similarly, different measures of institutional quality may have different impacts on earnings for students in different academic fields of study. Such findings call into question generalizations about the impact of institutional quality on earnings.

13. Although based on a single study, there is also evidence to suggest that the positive impact of undergraduate grades on early career earnings differs in magnitude for students in different fields of study. Grades may count more in business, education, and science-mathematics than they do in engineering, social sciences, and health-related fields.
14. Finally, there is single-study evidence to suggest that the intergenerational effect of parental education on the career choices of children may vary by race. Having a mother who was a college graduate had stronger positive effects on African-American men and women majoring in mathematics-science fields than it did for their White counterparts.

Notes

1. The preliminary results of Knox, Lindsay, and Kolb (1993) were presented in a 1988 paper reviewed in our 1991 synthesis. However, we include it in our present synthesis because the 1993 publication reports somewhat different results based on somewhat different samples and analytical models.
2. See also Grubb (1998) for differences among individuals with different levels of formal education in managerial and professional occupations and Kohn, Naoi, Schoenbach, Schooler, and Slomczynski (1990) for evidence indicating a positive relationship between formal education and both job autonomy and nonroutine work.
3. Other estimates of the earnings premium for a bachelor's degree are provided by Boesel and Fredland (1999) and Katz and Autor (1998). The estimates differ somewhat in magnitude because of variations in samples and earnings indicators. For example, Katz and Autor take into account cohort demographic differences and use the Personal Consumer Expenditures deflator to obtain an inflation-adjusted log of weekly earnings for their estimates. However, the clear pattern of a generally steady increase in the college earnings premium over time, with a temporary decline in the 1970s and recovery in the 1980s, appears consistent across estimates (Boesel & Fredland, 1999).
4. Somewhat paradoxically, the increase in the economic premium for a college degree occurred during a demographic period when college-educated individuals were flooding the job market and were taking jobs that have not usually required a bachelor's degree (Boesel & Fredland, 1999; Boylan, 1993; Gray & Chapman, 1999; Heckler, 1992). There have been several attempts to explain this apparent contradiction. One is that it is college graduates who are lacking college-level literacy skills (prose, document, and quantitative) who are taking jobs with lower