

THE RETURN TO ATTENDING A MORE SELECTIVE COLLEGE:
1960 TO THE PRESENT

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1. Introduction

Every year, families are faced with deciding whether a child, who has been admitted to several colleges, should attend a more selective, more expensive college or a less selective, less expensive college. This paper offers empirical evidence relevant to that decision--specifically, estimates of the returns to investing in a more selective college. In order to establish trends in these returns over time, I make calculations for people who entered college in 1960, 1972, and 1982. I also project returns for students who are entering college now. I estimate returns two ways, controlling and not controlling for a student's own measured college aptitude. The estimates that control for aptitude would be relevant to a student who has already been admitted to colleges and is trying to choose among them. The estimates that do not control for aptitude would be relevant to a high school student trying to decide whether to increase his study effort, in order to gain admission to a more selective college.

Computing the return to education is a standard problem in labor economics, and, at least in theory, computing the return to attending a more selective college is particularly simple. The prospective student only needs to consider his costs of attending various colleges and his lifetime earnings conditional on attending various colleges. In the literature on returns to education, there is general agreement that the return to education has been increasing since the early 1970s. There is also general agreement that the return to education has been increasing more for people of higher measured aptitude.¹ To some extent, these trends are external to American colleges--a change in the environment, probably caused by changes in technology and international trade. We should not be surprised to find such external forces affecting the return to graduating from a more selective college, but they would not necessarily do so. There is reason to

¹ See Blackburn and Neumark.(1993), Cawley, Heckman, and Tytlacil (1998), Freeman and Katz (1994), Heckman (1995), Heckman, Cawley, Conneely, and Vytlacil (1996), Juhn, Murphy, and Pierce (1993), Katz and Murphy (1992), Levy, Murnane, Willett (1995), and Murnane, Willett, Duhaldeborde, and Tyler (1998).

think, however, that selective colleges are partially responsible for the fact that the return to education has been increasing more for people of higher measured aptitude.

In other work, I have shown that, from 1940 to the present, the market for college education has become significantly more integrated.² That is, students have become more mobile geographically and better informed about how their own aptitude fits into the national distribution, their college options, and financial aid opportunities. Colleges, symmetrically, have become better informed about the aptitude and finances of students from non-local high schools. The growing integration of the market has generated colleges that are more specialized in educating students of a certain type--for instance, I have shown that the distribution of SAT scores within each college has narrowed and the overlap in SAT scores between colleges has diminished. Market integration has also generated a stronger correlation between the inputs that a college offers (the costliness of its faculty, facilities, and so on) and the aptitude of the student body it attracts. Colleges' policies about tuition and subsidies (a general term that embraces all forms of institutional aid) are increasingly constrained by market forces--that is, by the reaction of students. In this environment, we expect to find changes in the return to attending a more selective college.

In this paper, I consider only the monetary costs of and returns to attending a more selective college, although collegiate education naturally generates non-monetary benefits. In addition, I focus on private costs and returns, not social costs and returns. In this context, the word "private" refers to the personal nature of the costs and returns, not the control of the college. The difference between private and social costs is particularly important for students choosing between publicly-controlled and privately-controlled colleges. A person considers only the tuition paid by him when calculating his private costs, but social costs would include the tax burden he imposes on other people if he chooses to attend a public college.

² In this paragraph, I refer to Hoxby (1997a, 1997b).

In keeping to the question that opens the paper, I focus on baccalaureate-granting colleges that have at least minimal selectivity. This means that I do not analyze the large number of American colleges that are non-selective, in the sense that they admit any student who has a high school diploma and can demonstrate basic readiness for college. Furthermore, I focus on people who actually attain the baccalaureate degree, not on the decision to attend college at all or the decision to persist in college. Elsewhere, there is useful research on non-selective colleges, two-year colleges, and the decisions to attend and persist in college.³

2. The Student's Problem

Consider a student calculating monetary returns to graduating from two alternative colleges, to both of which he has been admitted. To keep the problem simple, let us assume that he will attend full time and graduate with a baccalaureate degree after four years. There are only a few components to the student's calculation because many of the opportunity costs associated with attending college, such as the income he could earn if he worked instead of going to college, will not depend on which college he chooses.⁴ He needs to know the present value of his total cost of attending each college, taking into account its tuition, fees, and any financial aid that has been offered to him. For instance, student would compare:

$$\textit{Present Discounted Cost of College } A = \sum_{t=1}^{t=A} \frac{(\textit{tuition}_{it}^A + \textit{fees}_{it}^A - \textit{institutional grants}_{1t}^A)}{(1 + \delta)^{t-1}}$$

to

³ Kane (1995) is a good starting place in this literature.

⁴ More generally, the choice among colleges generates differences in most components of the opportunity cost that are trivial in comparison to differences in tuition and earnings.

$$\textit{Present Discounted Cost of College B} = \sum_{t=1}^{t=4} \frac{(\textit{tuition}_{it}^B + \textit{fees}_{it}^B - \textit{institutional grants}_{it}^B)}{(1 + \delta)^{t-1}}.^5$$

The most a student can pay is typically the sum of four years of full tuition and fees, but the average student pays less. Below, I show calculations for both full tuition and average tuition paid. The costs shown above have been discounted back to the year in which the student makes his decision. In the empirical work that follows, all calculations are in real (inflation adjusted) dollars, so the appropriate discount rate is a real discount rate (the intrinsic value a person puts on consuming this year versus next year)--a number generally accepted to be between 0% and 3%.

The student also needs to consider the stream of earnings associated with attending each of the two colleges. Of course, only part of a person's future earnings depends on his college choice. Much depends on his aptitude and the education he has already received in primary and secondary school. Career incomes from the two colleges are the presented discounted sums of annual earnings:

$$\textit{Career Discounted Earnings Associated with College A} = \sum_{t=5}^{t=38} \frac{\textit{Earnings}_{it}^A}{(1 + \delta)^{t-1}}$$

and

⁵ The superscripts "A" and "B" indicate the colleges. Years are indexed by the subscript "t", and counting effectively begins at the beginning of the freshman academic year. The subscript "i" indexes individual students, because tuition, fees, and grants can vary across individuals, depending on their undergraduate program, state-of-residence, need, merit, and so on.

$$\text{Career Discounted Earnings Associated with College } B = \sum_{t=5}^{t=38} \frac{\text{Earnings}_{it}^B}{(1+\delta)^{t-1}}. {}^6$$

Earnings are subscripted with the letter "i" to remind us that an individual's earnings do not just depend on his college; they also depend on his individual traits. In other words, we will need to account for individual aptitude if we are to simulate students' opportunities accurately. Accounting for the effects of individual aptitude on earnings is a well-known and only partly remediable problem. In this paper, I am able to control for some of the key measures of aptitude that colleges use to admit students: individuals' college admission test scores, high school grades, and other high school standardized test scores.

3. The Data

In order to compute the return to graduating from a more selective college, it is necessary to have data on income, college attendance, aptitude, and family background for a nationally representative sample of individuals. Such data must be matched to institutional information on colleges, such as tuition and selectivity. In practice, these data requirements can be fulfilled by only a few surveys, all of which are used in this paper. The surveys used are, in chronological order, Occupational Changes in a Generation (a supplement to the 1973 Current Population Survey), the National Longitudinal Study of the Class of 1972, and the National Longitudinal Survey of Youth. These surveys are described in detail in Hoxby and Terry (1998). For this paper, it is only necessary to know that three surveys provide us with information on

⁶ These sums assume that a person has a working life of 34 years. Empirical age-earnings profiles are used for the calculations that follow, and these naturally take account of the low working hours in a person's 20s and 60s. See previous footnote for the definitions of the superscripts and subscripts.

people who entered college in, respectively, 1960, 1972, and 1982. The years of college entry are approximate, since people who started college one or two years off-schedule are included.

To estimate career income, I use individuals' incomes at age 32. 32 is old enough for earnings patterns to be established and young enough to give us reasonably current earnings patterns.⁷ I focus on the earnings of men because comparing their earnings over time is straightforward. Women, in contrast, have changed their working and childbearing behavior significantly over the period of interest, making comparisons difficult. Fortunately, focusing on males does not pose a problem for contemporary females seeking evidence to guide their college choices. A female student who is about to enter a selective college in 1998 can use recent men's earnings to get a reasonable prediction of her own returns.

Colleges are divided into eight rank groups, based on Barron's rating of their selectivity. It is possible to use a finer ranking of colleges (see Hoxby and Terry, 1998), but the precision of earnings estimates falls as the ranking becomes more fine. The Barron's index has two additional merits: it is widely accepted and its construction is external to this paper (it does not take returns or costs into account). Table 1a lists the colleges in each of the top four rank groups and describes the colleges in each of the next four rank groups. Non-selective colleges are omitted because the thought experiment in this paper involves students who have expressed at least some interest in selective colleges.

4. The Background: College Selectivity and Tuition

Table 2 presents average SAT scores for each college rank group in 1960, 1972, 1982, and 1996.

⁷ That is, the people who entered college in 1982 are typically age 32 in 1994 or 1995. If I were to use earnings at age 40, say, the most recent college entrants whom I could examine would have been freshmen in 1974. For an empirical exercise of this kind, it would be a poor idea to use earnings at an age less than 30 because so many individuals with high aptitude have irregular earnings in their 20s, owing to their taking internships, attending graduate and professional school, and so on. The National Longitudinal Study of the Class of 1972 and the National Longitudinal Survey of Youth report several years of earnings for each individual, but Occupational Changes in a Generation reports earnings only in 1972.

Scores have been converted into percentile scores using the national distribution of SAT scores in the relevant years. This conversion is useful for making comparisons over long periods of time because the distribution of SAT scores has shifted down over time.⁸ Since the verbal and mathematics tests have different typical distributions (the verbal test is significantly more discriminating among high scorers), the conversion also aids comparison across the tests. Finally, the conversion is almost a necessity for comparing colleges of widely differing selectivity. The reason is that a 100 point difference near the top of the test score range (between 700 and 800 on an individual test) corresponds to only a few percentiles in the national distribution, but a 100 point difference near the middle of the range (between 450 and 550 on an individual test) corresponds to almost 30 percentiles.⁹

The table demonstrates, first, that Barron's ranking does indeed reflect measured college aptitude and, second, that colleges in the top rank groups have grown more selective over time. Average aptitude in colleges that have minimal selectivity (rank group 8) has fallen over time, as has aptitude in non-selective colleges, which are not shown in the table.¹⁰ These changes reflect the more general increase in the tendency of students to be sorted among colleges on the basis of aptitude.¹¹ I separate public and private colleges in the table because the public-private distinction will be useful for considering tuition differences.

⁸ Also, the dispersion of SAT scores has increased over time. The change in dispersion is, however, of little empirical significance compared to the change in the mean SAT score.

⁹ Each college's reported average SAT scores are converted into percentile scores, and an enrollment-weighted average percentile score is computed for each rank group. It would be preferable (and different) to convert each individual student's SAT scores into percentile scores and then take the average within each rank group. The latter statistic cannot be computed, unfortunately.

¹⁰ Non-selective colleges typically do not report average admissions test scores. However, their draw from the aptitude distribution may be inferred by eliminating the students who attend colleges that fit into one of the eight rank groups.

¹¹ The tendency to sort not only affects differences between rank groups (as shown in the table), but differences between colleges within a rank group. In Hoxby (1997b), I show that the dispersion in SAT scores within each college has fallen over time.

At this point, it is worth noting that there are no publicly controlled colleges in rank group 1.¹²

Tables 2a and 2b show several measures of college tuition, by rank group, for 1960, 1972, 1982, 1997. Because people in the three surveys described above entered college in 1960, 1972, and 1982, these three years are the base years that I use to calculate the returns to investing in a more selective college education. Table 2a shows tuition in dollars of the day; Table 2b shows inflation-adjusted tuition, in 1997 dollars. Comparing tuition over time can be deceptive if it is measured in dollars of the day.¹³ For private colleges, I show both full tuition and average tuition paid. A public college typically charges lower tuition to students who reside in the state that financially supports the college. Thus, for public colleges, I show both in-state and out-of-state tuition, as well as average tuition paid.

Tables 2a and 2b demonstrate that more selective colleges tend to charge higher tuition, regardless of whether we examine full tuition or average tuition paid. One exception to this rule are private colleges in rank group 1, which have lower tuition paid than colleges in rank group 2. Another departure from this rule are the public colleges in rank groups 2 and 3, which have lower in-state tuition than public colleges in rank group 4. It would be a mistake to make too much of this departure since it depends on the policies of just a few colleges.¹⁴ Tables 2a and 2b also show that, although the tuition increase for moving from a rank group 8 to a rank group 5 private college is large, the tuition increase for moving from a rank group 4 to a rank group 1 private college is small. For instance, examining Table 2b, we see that the tuition difference between rank groups 1 and 4 was between 700 and 900 dollars in all three years.

¹² Some of the United States military academies may belong in rank group 1, but, like other specialized colleges, they are omitted from the analysis.

¹³ A good price deflator for incomes also tends to be a good cost deflator for colleges, since salaries form so large a share of their costs. I use the consumer durable goods price index as a deflator because it places less weight than the CPI does on gasoline and other consumer goods that have had significant, *real* price changes between 1960 and the present.

¹⁴ Colorado School of Mines, University of California-Berkeley, College of William and Mary, Georgia Institute of Technology, and University of Virginia.

Table 2b also shows that average college tuition has risen over time, in real terms, for selective colleges. The rise in college tuition is widely recognized, and it has been analyzed elsewhere.¹⁵ It is worth noting, however, that the increase in tuition is sometimes exaggerated in the popular press by, one, using dollars of the day rather than real dollars; two, showing full tuition rather than average tuition paid; and, three, comparing colleges of different selectivity (or an individual college that has significantly raised its selectivity over time).

5. Earnings and Costs Associated with More Selective Colleges

In this section, I show earnings of men who graduate from colleges of differing selectivity, and I present estimates of their lifetime earnings. I compare the differences in lifetime earnings to the differences in total college costs. I do not control for the effects of individual aptitude on earnings--I reserve that exercise for the next section. The results presented in this section are, nevertheless, useful. There is considerable interest in income differences by college rank, regardless of the fact that some of the differences reflect aptitude differences. Also, the results of this section would be the information one would give to a high school student who had the opportunity to improve his college aptitude through increased study effort. Finally, this section illustrates the exercise in a simple form and, thus, provides a good introduction to the more complicated version of the exercise that attempts to account for aptitude.

Table 3 shows the average income at age 32 of a baccalaureate-holding male, by college rank group. The men who entered college around 1960 were age 32 in 1972, those who entered college around 1972 were age 32 in 1986, and those who entered around 1982 were age 32 in 1994 or 1995. The first panel of the table shows incomes in dollars of the day; the second panel shows incomes in inflation-adjusted

¹⁵ See Hoxby (1997b) for an analysis of the tuition rise that focuses on the increasing competitiveness of the market for college education. See Clotfelter (1996) for a contrasting analysis that emphasizes rising demand for education combined with colleges' having market power that allows them to let costs grow without discipline during periods of rising demand.

1997 dollars. In the top 2 rank groups, the incomes reported are close to actual *median* incomes rather than *mean* incomes owing to survey "topcoding," the censoring of reported incomes of high earners. The topcoding should not be considered a problem--it simply means that the analysis is appropriate for predicting the returns of a fairly typical student.¹⁶

Table 3 shows that men who graduate from more selective colleges tend to earn substantially more by age 32 than men who graduate from less selective colleges. Moreover, the income differences between rank groups have been growing over time for post-1972 college entrants. For instance, there is a 55 percent income difference between men who entered rank 1 and rank 8 private colleges in 1972. The corresponding income difference for men entered college in 1982 is 66 percent. The growth in income differences between rank groups is particularly large for more selective colleges. There was a 6 percent income difference between men who entered rank 1 and rank 4 private colleges in 1960, but the corresponding income difference for men who entered college in 1972 or 1982 was about 20 percent.

Table 4 shows the results of using income at age 32 to estimate career incomes. I formed the estimates using empirical age-earnings profiles from two large wage surveys, the Current Population Survey and the Panel Survey of Income Dynamics. There is an appropriate estimation method for each of these surveys, which can be described briefly as follows. I use Current Population Survey data to estimate the relationship, at a given point in time, between the incomes of 32-year-olds and the incomes of similar people who are older and younger. I use Panel Survey of Income Dynamics data to estimate the relationship of a 32-year-old's income to his own previous income and his own later income. Appendix A describes the two methods in detail. They produce similar results. The appendix also explains why both

¹⁶ For instance, the topcode for 1995 income of 32-year-olds is 150,000 dollars, so that high earners have "150,000 or more" reported. In practice, topcoding makes analyses of the mean and median income for the top rank groups very similar. If there were no topcoding, it would be appropriate to analyze median incomes for the top rank groups in order to predict returns for a typical student. It would be appropriate to analyze mean incomes in order to predict other variables, such as future contributions to the endowment.

methods tend to *understate* the incomes of graduates of highly selective colleges, especially for recent years. Readers should be aware that the differences between the career earnings of graduates of more and less selective colleges are systemically understated, especially for men who entered college in 1982.

The estimates in Table 4 were computed under the assumption that people work 34 years (age 22 to age 65 or age 27 to age 70, say) and do not discount the future. These assumptions are relatively innocuous because they can be easily relaxed. For instance, if a person discounts the future at 3 percent per year (a high real discount rate), he should multiply the numbers in the table by about 0.5.¹⁷

Table 4 shows that men who graduate from more selective colleges tend to earn substantially more over their careers than men who graduate from less selective colleges. A typical man who entered a rank 1 private college in 1982 can expect to earn about 2.9 million dollars over his career, while a man who entered a rank 8 private college at the same time can expect to earn about 1.75 million dollars over his career. Note that these are *real 1997 dollars*--inflation makes observed career incomes appear to be larger. Among 1982 college entrants, the career income difference between the typical rank 1 and rank 3 graduate is 400,000 dollars. It is also worth noting that career income differences by college rank are growing over time, especially for men who entered college after 1972 or entered colleges in rank 5 and above.

It is obvious that the career incomes differences just described swamp the differences in the total costs of attending more versus less selective colleges. In Table 5, I make this point more precisely by examining students who attend colleges that are two selectivity levels apart. A difference of two selectivity levels is large enough to be interesting, but small enough to be a plausible thought experiment. Table 5 shows the ratio of the earnings difference to the cost difference for a move of two selectivity levels. For instance, the top left-hand number in the table is

$$\frac{(\text{career income assoc. with rank 1 college}) - (\text{career income assoc. with rank 3 college})}{(4 \text{ years tuition in rank 1 college}) - (4 \text{ years tuition in rank 3 college})}$$

¹⁷ This rule of thumb is based in actual computations for a 3 percent discount rate.

for men who entered private colleges in 1960. The left-hand side of each panel of Table 5 considers moving from a private college to another, more selective private college. The right-hand side considers moving from a public college to a more selective private college. The top panel of Table 5 assumes that students pay full tuition at private colleges and in-state tuition at public colleges. The bottom panel assumes that student pay the average tuition paid at both private and public colleges.

Some of the ratios shown in Table 5 are very large. For instance, among men who entered private colleges in 1982, the ratio of earnings difference to the cost difference between rank 1 and rank 3 colleges is 189.6. This ratio is large not only because there are significant career income differences between the men, but especially because there are very small tuition differences between the colleges. Table 5 shows that the ratios of income differences to cost differences have been growing over time for students in highly selective colleges. For instance, the statistic cited above is 32.7 for 1960 entrants, 101.5 for 1972 entrants, and 189.6 for 1982 entrants.

Table 6 presents the statistics in Table 5 in a more accessible way. It shows the number of years that a graduate from a more selective college needs to earn before he "breaks even"--that is, covers his increased tuition costs. The smallest numbers in Table 6 are less than 1 (only a few months of higher earnings are necessary to break even), and the largest numbers are around 4 (4 years of higher earnings are necessary to break even). Because public college tuition is subsidized by tax dollars, the number of years needed to break even on a public-to-private college move is naturally larger than the number needed to break even on a similar private-to-private college move. I will not dwell on the statistics in Tables 5 and 6 because they are not corrected for aptitude. It would be unwise, for instance, to interpret them in a causal way or as a return on investment.

6. The Return to Investing in a More Selective College

Tables 7 through 9 repeat the exercise of Tables 4 through 6, except that earnings have been

corrected for differences in measured college aptitude. I regressed individuals' earnings at age 32 on their college admissions test scores, standardized test scores in English and mathematics, and high school grade point averages. I then predicted what each individual would earn if he had average measured aptitude and computed earnings by college rank group using the predicted earnings rather than actual earnings.

Appendix B describes this procedure in more detail. The correction can be carried out for men who entered college in 1972 and 1982 because the two recent, longitudinal surveys include the measures of individual aptitude listed above. The correction cannot be carried out for men who entered college in 1960 because the Occupational Changes in a Generation survey lacks similar measures.

Table 7 shows that controlling for aptitude eliminates the majority (between two-thirds and three-quarters), but not all, of the income differences between college rank groups. That is, if we compare two men with the same measured aptitude, the one who graduates from a more selective college still tends to earn more over his career. Among 1982 private college entrants, the career income difference between rank 1 and rank 3 graduates with the same measured aptitude is about 100,000 dollars. The difference between rank 2 and rank 4 graduates with the same measured aptitude is about 200,000 dollars. Most career income differences by college rank are growing over time.

Table 8 presents the ratios of return to investment for a student who hypothetically moves up two selectivity levels. Since the returns have been corrected by aptitude measures that are used for college admissions, it is reasonable to think of a student choosing between colleges, to which he has already been admitted, that are located two ranks apart. That is, the correction for aptitude probably does a reasonably good job of eliminating the effects of selection by colleges. (Self-selection on the part of students is a more open issue, and one to which I will return.) Like Table 5, Table 8 shows estimates for full tuition and average tuition paid and analyses private-to-private college moves as well as public-to-private college moves.

The ratios of return to investment vary widely, depending on which ranks the student is moving to

and from and whether the lower ranked college is public or private. The ratios are growing over time, indicating that attending a more selective college is an increasingly attractive investment. The best investments tend to be moves among highly selective colleges (from rank 3 to rank 1, from rank 4 to rank 2), but moving away from the minimally selective group of colleges (from rank 8 to rank 6) also tends to be a good investment. The very large ratios for moving between rank 3 and rank 1 private colleges (or rank 4 and rank 2 private colleges) are generated not only by the career income differences shown in the previous table, but also by the very small tuition differences between the colleges.

Table 9 presents the statistics in Table 8 in their more accessible form: the number of years it takes a student to break even on his investment in a more selective college. For private-to-private college moves, the number of years needed to break even ranges from 0.3 (rank 3 to rank 1 moves) to 5.8 (rank 6 to rank 4 moves). For public-to-private college moves, the number of years ranges from about 2 (rank 3 to rank 1; rank 4 to rank 2) to 10.6 (rank 5 to rank 3). Most students would earn back their investment in a few years; in no case would a student have to spend work more than a third of a normal working life earning back his investment.

The career incomes corrected for aptitude can be used for a number of additional thought experiments. They can even be used to form predictions of the return to investment for current (1997) college freshmen, although the accuracy of such predictions will naturally be contingent on the United States earnings distribution remaining as it is. In Tables 10 and 11, I offer a few interesting thought experiments and predictions, with the caveat that I have made no attempt to forecast future earnings distributions.

Table 10 shows comprehensive college costs, by rank group, for 1972, 1982, and 1997 (all in 1997 dollars). One must be wary about comparing comprehensive costs across colleges because differences in the typical "package" offered affects reported costs. For instance, board plans tend to be minimal at colleges that have a majority of their students living in off-campus housing. The information in Table 10 is

needed, however, for the thought experiments in Table 11.

Table 11 shows what 1997 freshmen might anticipate gaining by moving up two selectivity levels. Although I must assume that they will have career incomes like those of 1982 college entrants, I use actual 1997-98 tuition. That is, the students are assumed to pay 1997-98 *real* tuition for four years (tuition will rise at the same pace as inflation). The top panel of Table 11 show ratios of returns to investment; the bottom panel shows years needed to break even.

The first thing to observe in Table 11 is the curious fact that rank 3 private colleges tend to charge higher tuition (full tuition and average tuition paid) than rank 1 private colleges, so that a student who moves from a private rank 3 college to a private rank 1 college makes no financial investment at all. Of course, the student might be offered more merit aid at the lower ranked college. To explore this possibility, some of the statistics in Table 11 represent an extreme form of merit aid--a "free ride" at the lower ranked college versus paying full comprehensive costs at the higher ranked college. If a student has a free ride, his college covers his comprehensive costs (tuition, fees, room, and board).

The ratios of returns to investment for moving up two selectivity levels are lower for 1997 entrants than for 1982 entrants. (This is because real tuition is higher; career incomes are identical by assumption.) All of the investments are still, however, attractive. For instance, a person moving from a rank 5 private college to a rank 3 private college can expect to earn his investment back 3 times over during his career. This is one of the lower ratios shown in the table: moves from rank 4 to rank 2 and from rank 3 to rank 1 are much more attractive investments. The predictions that use average tuition paid or comprehensive costs are broadly similar to those that use full tuition.

The column at the far right of each of the subpanels in Table 11 shows the results of the free ride experiment. This represents an extreme choice, rather than a choice that many students are realistically given the opportunity to consider. While offers of free rides are not rare events *per se*, they are rare events for moves of only two selectivity levels. For instance, most students who are admitted to rank 1 colleges

receive free ride offers only from colleges in rank 4 or below (if they receive such offers at all). The surprise of Table 11 is not that *some* offers of free rides are better monetary deals than the alternative of paying full comprehensive costs at a college ranked 2 groups higher. We expect this. Rather, the surprise is that many offers of free rides do not appear to be better deals, and a number of offers are not even "close calls." For instance, the numbers suggest that a student should take the free ride if he has a free ride at a rank 5 private college but would have to pay comprehensive costs at a rank 3 private college. In contrast, the numbers suggest that a student should reject the free ride if he has a free ride at rank 3 private college but would have to pay comprehensive costs at a rank 1 private college; he is predicted to earn his investment back 3.4 times over during his career. It is worth noting that free rides from public colleges are not nearly as attractive as free rides from similarly ranked private colleges. This is because public college tuition is already subsidized by tax dollars so that the free ride is not a very big discount.

7. Comments on Controlling for Aptitude and Some Caveats

It is impossible to know when one has controlled sufficiently for aptitude, so we might worry that the results shown above are too favorable toward more selective colleges because they benefit from their students' unobserved ability--that is, ability that is only weakly correlated with admissions test scores, other standardized test scores, and grades. On the other hand, the estimation methods (especially topcoding and career income estimates based on the Current Population Survey) are unfavorable to more selective colleges because their graduates' incomes are systemically understated. We cannot know exactly where the balance lies between these offsetting biases. However, it is possible to say something more about the adequacy of the controls for aptitude.

The measures I use to control for aptitude are important factors in most colleges' admission processes. This suggests that the correction for aptitude probably does a good job of eliminating the effects of selection on the part of colleges. That is, the moves analyzed in Tables 8, 9, and 11 are realistic in the

sense that we are examining students who probably do have both options open to them (they would be admitted by the higher ranked college). The correction for aptitude does less to eliminate the effects of self-selection on the part of students. That is, some students may refuse admission offers from more selective colleges because they know something about their own abilities or earnings capacity that colleges could not know. For instance, a student might know that he would not thrive in a competitive atmosphere. Or, a student might know that he wants to pursue a career, such as the ministry, that offers unusually low earnings for someone of his ability. (I found no evidence in the data, however, that people who went to low ranked colleges for someone of their ability were more likely to pursue careers in public service. If anything, the data show the opposite pattern.) In any case, some of the apparent returns to graduating from a more selective college may actually be attributable to the self-selection of students who have low earnings potential into less competitive colleges.

In the interests of brevity, I have not shown estimates that I computed for completeness but that would not have altered the overall pattern of results. For instance, career income estimates based on the Panel Survey of Income dynamics are similar to the estimates shown, except that they contain higher earnings growth for graduates from highly selective colleges. Using them increases the income differences by college rank. I have not shown results for different discount rates, but I have indicated the effect of a 3 percent real discount rate in the note that accompanies each table.

8. Summary

The calculations in this paper indicate that people who invest in education at a more selective college generally earn back their investment several times over during their careers. This statement holds across the entire spectrum of colleges, although moving to a more selective college is generally a better investment for students who have the aptitude to attend a rank 1, rank 2, or rank 3 college. In many cases, even students who are offered a "free ride" by a lower ranked college would maximize their monetary worth

by refusing the aid and attending the higher ranked college. Since 1972, the returns to attending a more selective college have been rising over time. For students with the aptitude to attend a rank 1 or rank 2 college, the returns to attending a more selective college have rising over the *entire* period since 1960.

References

- Barron ' s Educational Series. *Barron ' s Profiles of American Colleges*. various editions. Hauppauge, New York: Barron ' s Educational Series, various years.
- Blackburn, M.L. and D. Neumark. "Omitted Ability Bias and the Increase in the Return to Schooling," *Journal of Labor Economics*, Vol 11 (1993), No. 3.
- Blau, P.M., O.D. Duncan, D.L. Featherman, and R.M. Hauser. *Occupational Changes in a Generation, 1962 and 1973* [computer file]. Madison, WI: University of Wisconsin [producer], 1983. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor], 1994.
- Cawley, J., J. Heckman, and E. Tytlacil. "Cognitive Ability and the Rising Return to Education," NBER Working Paper No. 6388, 1998.
- Center for Human Resource Research. *National Longitudinal Surveys of Youth*. Columbus, OH: Center for Human Resource Research, The Ohio State University, 1997.
- Center for Human Resource Research. *National Longitudinal Survey of the Class of 1972, Fifth Follow-Up*. Columbus, OH: Center for Human Resource Research, The Ohio State University, 1986.
- Clotfelter, C.T. *Buying the Best: Cost Escalation in Elite Higher Education*. An NBER Monograph (Princeton: Princeton Univ. Press, 1996).
- Freeman, R. and L. Katz. "Rising Wage Inequality: The U.S. vs. Other Advanced Countries," In R. Freeman, ed., *Working Under Different Rules*. New York: Russell Sage Foundation, 1994. pp. 29-62.
- Heckman, J. "Lessons from the Bell Curve," *Journal of Political Economy*, Vol. 103 (1995), No. 5: pp. 1091-1120.
- Heckman, J., J. Cawley, K. Conneely, and E. Vytlacil. "Measuring the Effects of Cognitive Ability." National Bureau of Economic Research Working Paper No. 5645, 1996.
- Hoxby, C. "The Changing Market Structure of U.S. Higher Education: 1940-1990." mimeo, Harvard University Department of Economics, 1997.
- Hoxby, C. "How the Changing Market Structure of American College Education Explains Tuition." National Bureau of Economic Research Working Paper No. 6323, 1997.
- Hoxby, C. and B. Terry. "Explaining Rising Wage and Income Inequality among the College-Educated." National Bureau of Economic Research Working Paper (no. forthcoming), 1998.
- Juhn, C., K. Murphy, and B. Pierce. "Wage Inequality and the Rise in Returns to Skills." *Journal of Political Economy*, Vol. 101 (1993), No. 3: pp. 410-442.
- Kane, T. "Rising Public College Tuition and College Entry." National Bureau of Economic Research

Working Paper No. 4124, 1995.

Katz, L. and K. Murphy. "Changes in Relative Wages, 1963-1987: Supply and Demand Factors." *Quarterly Journal of Economics* Vol. 107 (1992), No. 1: pp. 35-78.

Levy, F., R.J. Murnane and J.B. Willett. "The Growing Importance of Cognitive Skills in Wage Determination." *Review of Economics and Statistics*, Vol. 77 (1995), No. 2: pp. 251-266.

Murnane, R.J., J.B. Willett, Y. Duhaldeborde, and J.H. Tyler. "The Role of Cognitive Skills in Explaining Recent Trends in the U.S. Distribution of Earned Income," mimeo, Harvard Graduate School of Education, 1998.

Murphy, K. and F. Welch. "Empirical Age-Earnings Profiles," *Journal of Labor Economics*, Vol 8 (1990), No. 2: pp. 202-229.

Table 1a
Colleges by Barron's Selectivity Index*

Colleges in Rank Group 1 (Most Competitive)

Amherst College, Bowdoin College, Brown University, California Institute of Technology, Harvey Mudd College, Pomona College, Columbia College of Columbia University, Cooper Union, Cornell College of Cornell University (private), Dartmouth College, Harvard University, Haverford College, John Hopkins University, Massachusetts Institute of Technology, Mount Holyoke College, Princeton University, Rice University, Smith College, Stanford University, Swarthmore College, University of Pennsylvania, Wellesley College, Williams College, Yale University.

Colleges in Rank Group 2 (Highly Competitive Plus)

Bennington College, Carnegie-Mellon University, Colgate University, Colorado School of Mines, Barnard College, Northwestern University, Reed College, Rose-Hulman Institute of Technology, St. John's College (Maryland), Tufts University, University of California-Berkeley, University of Chicago.

Colleges in Rank Group 3 (Highly Competitive)

Bates College, Brandeis University, Bucknell University, Carleton College, Case Western Reserve University, Colby College, College of William and Mary, Colorado College, Davidson College, Duke University, Franklin and Marshall Colleges, Georgetown University, Georgia Institute of Technology, Grinnell College, Hamilton College, Kalamazoo College, Kenyon College, Lafayette College, Lehigh University, Middlebury College, New College of the University of South Florida, Oberlin College, Occidental College, Polytechnic Institute of New York, Rensselaer Polytechnic Institute, St. John's College (New Mexico), St. Olaf's College, Stevens Institute of Technology, Trinity College, Union College, University of Dallas, University of Notre Dame, University of Rochester, University of the South, University of Virginia, Vassar College, Washington University.

Colleges in Rank Group 4 (Very Competitive Plus)

Bard College, Pitzer College, Scripps College, Clark University, Clarkson College of Technology, Coe College, College of the Atlantic, Connecticut College, Emory University, Gustavus Adolphus College, Hampshire College, Illinois Institute of Technology, St. Lawrence University, University of California-Santa Barbara, University of Michigan (Ann Arbor campus), Vanderbilt University, Washington and Lee University.

Colleges in Rank Group 5 (Very Competitive)

Colleges in this category consider applicants who have grade point averages of B- at least and who rank in the top 50% of their graduating class. These colleges typically report median SAT scores between 525 and 575.

Colleges in Rank Group 6 (Competitive Plus)

Colleges in this category consider applicants who have grade point averages of B- at least and who rank in the top 67% of their graduating class. These colleges typically report median SAT scores between 500 and 525.

Colleges in Rank Group 7 (Competitive)

Colleges in this category consider applicants who have grade point averages of C+ at least and who rank in the top 67% of their graduating class. These colleges typically report median SAT scores between 425 and 500.

Colleges in Rank Group 8 (Less Competitive)

Colleges in this category consider applicants who have grade point averages of C at least and who rank in the top 75% of their graduating class. These colleges typically report median SAT scores below 425.

The remaining colleges in the United States are considered non-competitive or non-selective. These colleges admit many of the students with SAT scores in the lower tail of the distribution.

Specialized colleges (art schools, music schools, U.S. military academies) are not included in the analysis.

* The index is taken from the 1980 Barron's "College Admissions Selector," which also contains the names of the colleges in rank groups 5 through 8. The year 1980 was chosen to correspond with the statistics that follow. The index has changed so little in recent years, however, that none of the statistics would be significantly altered if the 1996 index were

used.

Table 1b
Average SAT Scores - by College Selectivity

Scores are Converted into National Percentile Scores to Facilitate Comparison across Years, Tests, and Colleges

Verbal Scores

	Private Colleges				Public Colleges			
	1960	1972	1982	1996	1960	1972	1982	1996
Rank 1 Colleges	92	95	95	96	nc	nc	nc	nc
Rank 2 Colleges	86	92	92	93	78	80	83	84
Rank 3 Colleges	85	90	90	90	79	87	89	84
Rank 4 Colleges	79	84	86	86	79	84	79	77
Rank 5 Colleges	77	83	81	81	69	79	79	77
Rank 6 Colleges	69	75	79	78	49	58	70	68
Rank 7 Colleges	57	64	62	61	50	62	60	57
Rank 8 Colleges	41	39	37	35	39	36	30	28
Non-Selective/Non-Competitive Colleges absorb the remainder of the SAT score distribution								

Math Scores

	Private Colleges				Public Colleges			
	1960	1972	1982	1996	1960	1972	1982	1996
Rank 1 Colleges	89	91	92	93	nc	nc	nc	nc
Rank 2 Colleges	79	85	88	89	78	81	87	88
Rank 3 Colleges	80	86	86	86	77	84	88	88
Rank 4 Colleges	74	77	77	77	77	77	77	76
Rank 5 Colleges	67	75	73	74	62	71	74	74
Rank 6 Colleges	60	66	66	66	52	52	64	64
Rank 7 Colleges	51	53	52	49	46	52	52	49
Rank 8 Colleges	34	31	29	27	23	23	23	23
Non-Selective/Non-Competitive Colleges absorb the remainder of the SAT score distribution								

The abbreviation "nc" indicates that there are no public colleges in the rank 1 group. Mean SAT scores were converted into national percentile scores using College Board reports of the SAT score distributions for 1960, 1972, and 1982. The conversion is useful because: (1) mean SAT scores vary over time, (2) verbal and math scores are distributed differently at a point in time, (3) 100 points at the extremes, such as between 700 and 800, correspond to only a few percentiles, whereas 100 points at the middle of the distribution correspond to about 30 percentiles. ACT scores were converted into SAT scores using College Board conversion tables.

Table 2a
Average College Tuition in Dollars of the Day - by College Selectivity

Private Colleges

	Full Tuition				Average Tuition Paid		
	1960	1972	1982	1997	1972	1982	1995
Rank 1	\$1,262	\$2,837	\$6,384	\$19,885	\$2,242	\$6,001	\$16,439
Rank 2	\$1,100	\$2,749	\$6,312	\$20,833	\$2,587	\$6,419	\$18,582
Rank 3	\$1,051	\$2,637	\$5,990	\$21,065	\$2,162	\$5,593	\$17,583
Rank 4	\$993	\$2,584	\$5,739	\$20,113	\$2,190	\$5,439	\$15,839
Rank 5	\$835	\$2,306	\$4,895	\$17,532	\$1,939	\$4,702	\$13,912
Rank 6	\$702	\$2,059	\$4,491	\$15,251	\$1,695	\$3,947	\$11,675
Rank 7	\$626	\$1,813	\$3,753	\$12,632	\$1,549	\$3,285	\$9,131
Rank 8	\$456	\$1,391	\$2,950	\$9,414	\$1,232	\$2,638	\$6,735

Public Colleges

	Tuition for In-State Students				Tuition for Out-of-State Students				Average Tuition Paid		
	1960	1972	1982	1997	1960	1972	1982	1997	1972	1982	1995
Rank 1	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Rank 2	\$94	\$595	\$1,277	\$4,684	\$501	\$2,004	\$4,465	\$13,907	\$818	\$2,438	\$6,411
Rank 3	\$176	\$567	\$1,029	\$4,241	\$498	\$1,324	\$2,481	\$13,353	\$745	\$1,239	\$5,234
Rank 4	\$250	\$645	\$1,322	\$4,098	\$600	\$2,135	\$4,430	\$13,082	\$671	\$2,194	\$4,598
Rank 5	\$276	\$683	\$1,157	\$4,019	\$517	\$1,604	\$2,821	\$11,146	\$579	\$1,342	\$4,836
Rank 6	\$160	\$527	\$1,010	\$3,562	\$432	\$1,405	\$2,719	\$9,531	\$496	\$1,064	\$3,679
Rank 7	\$145	\$518	\$950	\$3,244	\$361	\$1,308	\$2,424	\$8,764	\$458	\$966	\$3,085
Rank 8	\$101	\$422	\$749	\$2,439	\$284	\$1,086	\$1,885	\$6,612	\$366	\$722	\$2,236

For private colleges, average tuition paid is approximately equal to tuition minus average institutional aid. The abbreviation "nc" indicates that there are no public colleges in the rank 1 group. Measures of average tuition paid are not available for 1960 or after 1995.

Table 2b
Average College Tuition in 1997 Dollars - by College Selectivity

Private Colleges

	Full Tuition				Average Tuition Paid		
	1960	1972	1982	1997	1972	1982	1995
Rank 1	\$3,865	\$7,615	\$8,567	\$19,885	\$6,018	\$8,054	\$16,625
Rank 2	\$3,369	\$7,378	\$8,471	\$20,833	\$6,944	\$8,614	\$18,793
Rank 3	\$3,220	\$7,078	\$8,039	\$21,065	\$5,803	\$7,506	\$17,782
Rank 4	\$3,042	\$6,935	\$7,701	\$20,113	\$5,878	\$7,299	\$16,018
Rank 5	\$2,559	\$6,189	\$6,569	\$17,532	\$5,204	\$6,311	\$14,069
Rank 6	\$2,150	\$5,526	\$6,027	\$15,251	\$4,549	\$5,296	\$11,807
Rank 7	\$1,917	\$4,866	\$5,037	\$12,632	\$4,158	\$4,409	\$9,234
Rank 8	\$1,398	\$3,733	\$3,958	\$9,414	\$3,307	\$3,540	\$6,811

Public Colleges

	Tuition for In-State Students				Tuition for Out-of-State Students				Average Tuition Paid		
	1960	1972	1982	1997	1960	1972	1982	1997	1972	1982	1995
Rank 1	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Rank 2	\$286	\$1,597	\$1,714	\$4,684	\$1,535	\$5,379	\$5,992	\$13,907	\$2,196	\$3,272	\$6,484
Rank 3	\$538	\$1,522	\$1,381	\$4,241	\$1,524	\$3,554	\$3,330	\$13,353	\$2,000	\$1,663	\$5,293
Rank 4	\$766	\$1,731	\$1,774	\$4,098	\$1,838	\$5,730	\$5,945	\$13,082	\$1,801	\$2,944	\$4,650
Rank 5	\$847	\$1,833	\$1,552	\$4,019	\$1,583	\$4,305	\$3,785	\$11,146	\$1,554	\$1,801	\$4,891
Rank 6	\$490	\$1,414	\$1,356	\$3,562	\$1,322	\$3,771	\$3,648	\$9,531	\$1,331	\$1,428	\$3,721
Rank 7	\$444	\$1,390	\$1,274	\$3,244	\$1,105	\$3,511	\$3,253	\$8,764	\$1,229	\$1,296	\$3,120
Rank 8	\$309	\$1,133	\$1,005	\$2,439	\$870	\$2,915	\$2,530	\$6,612	\$982	\$969	\$2,261

The abbreviation "nc" indicates that there are no public colleges in the rank 1 group. Measures of average tuition paid are not available for 1960 or after 1995. The price deflator used for putting dollars-of-the-day into 1997 dollars is the consumer durable goods price index.

Table 3
Average Income at Age 32 - by College Selectivity

in Dollars of the Day

	men who entered college in 1960		men who entered college in 1972		men who entered college in 1982	
	Private Colleges	Public Colleges	Private Colleges	Public Colleges	Private Colleges	Public Colleges
Rank 1 Colleges	\$19,648	nc	\$42,943	nc	\$57,135	nc
Rank 2 Colleges	\$18,987	\$18,420	\$35,992	\$33,453	\$51,200	\$47,631
Rank 3 Colleges	\$19,014	\$18,266	\$35,864	\$33,222	\$49,263	\$45,011
Rank 4 Colleges	\$18,555	\$17,301	\$35,084	\$32,116	\$47,500	\$42,500
Rank 5 Colleges	\$18,223	\$16,881	\$34,929	\$32,049	\$46,837	\$39,373
Rank 6 Colleges	\$16,327	\$14,753	\$34,381	\$31,925	\$41,176	\$37,085
Rank 7 Colleges	\$15,733	\$14,703	\$33,039	\$31,138	\$38,449	\$35,568
Rank 8 Colleges	\$11,792	\$12,811	\$27,735	\$28,601	\$34,459	\$33,660

in 1997 Dollars

	men who entered college in 1960		men who entered college in 1972		men who entered college in 1982	
	Private Colleges	Public Colleges	Private Colleges	Public Colleges	Private Colleges	Public Colleges
Rank 1 Colleges	\$52,735	nc	\$52,920	nc	\$58,556	nc
Rank 2 Colleges	\$50,961	\$49,439	\$44,354	\$41,225	\$52,473	\$48,815
Rank 3 Colleges	\$51,034	\$49,026	\$44,196	\$40,940	\$50,488	\$46,130
Rank 4 Colleges	\$49,802	\$46,436	\$43,235	\$39,577	\$48,681	\$43,557
Rank 5 Colleges	\$48,911	\$45,309	\$43,044	\$39,495	\$48,002	\$40,352
Rank 6 Colleges	\$43,822	\$39,597	\$42,369	\$39,342	\$42,200	\$38,007
Rank 7 Colleges	\$42,227	\$39,463	\$40,715	\$38,372	\$39,405	\$36,453
Rank 8 Colleges	\$31,650	\$34,385	\$34,178	\$35,246	\$35,316	\$34,497

Income at age 32 is observed in 1972 for 1960 college entrants, in 1986 for 1972 college entrants, and in 1995 for 1982 college entrants. The calculations are based on men who hold at least a baccalaureate degree and are respondents in the Occupational Changes in a Generation survey (1960 college entrants), National Longitudinal Survey of the Class of 1972 (1972 college entrants), or the National Longitudinal Survey of Youth (1983 college entrants). The average incomes are calculated using survey weights so that they are nationally representative. Average incomes for top ranked colleges are underestimated owing to topcoding (censoring of high incomes) in the surveys. The abbreviation "nc" indicates that there are no public colleges in the rank 1 group. The price deflator used for putting dollars-of-the-day into 1997 dollars is the

consumer durable goods price index.

Table 4
 Career Income by College Selectivity - 1997 Dollars
Not Corrected for College Aptitude

	men who entered college in 1960		men who entered college in 1972		men who entered college in 1982	
	Private Colleges	Public Colleges	Private Colleges	Public Colleges	Private Colleges	Public Colleges
Rank 1 Colleges	\$2,615,634	nc	\$2,624,782	nc	\$2,904,332	nc
Rank 2 Colleges	\$2,527,639	\$2,452,158	\$2,199,919	\$2,044,730	\$2,602,639	\$2,421,218
Rank 3 Colleges	\$2,531,234	\$2,431,655	\$2,192,096	\$2,030,611	\$2,504,177	\$2,288,037
Rank 4 Colleges	\$2,470,130	\$2,303,190	\$2,144,421	\$1,963,008	\$2,414,559	\$2,160,393
Rank 5 Colleges	\$2,425,932	\$2,247,278	\$2,134,947	\$1,958,913	\$2,380,857	\$2,001,439
Rank 6 Colleges	\$2,173,528	\$1,963,990	\$2,101,450	\$1,951,333	\$2,093,092	\$1,885,134
Rank 7 Colleges	\$2,094,452	\$1,957,333	\$2,019,425	\$1,903,230	\$1,954,471	\$1,808,021
Rank 8 Colleges	\$1,569,806	\$1,705,460	\$1,695,232	\$1,748,164	\$1,751,647	\$1,711,033

Estimates are based on a working life of 34 years and a 0% real discount rate. Career income estimates are based on the age-earnings profile in the 1995 Current Population Survey. Career income estimates for top ranked colleges are underestimated owing to topcoding (censoring of high incomes) and the method used to estimate career income (see Appendix A). The abbreviation "nc" indicates that there are no public colleges in the rank 1 group. Approximate estimates for a 3% real discount rate may be computed by multiplying the numbers in the table by 0.5. The price deflator used for putting dollars-of-the-day into 1997 dollars is the consumer durable goods price index.

Table 5
Ratio of Earnings Difference to Cost Difference Associated with Moving Up 2 Selectivity Levels
Not Corrected for College Aptitude

$$\text{Ratio} = \frac{\text{Increase in Career Income Assoc. with Moving Up 2 Selectivity Levels}}{\text{Increase in Tuition Cost Assoc. with Moving Up 2 Selectivity Levels}}$$

Based on Student Paying "List Price" for Private Colleges and In-State Tuition for Public Colleges

	Private College to Private College Move			Public College to Private College Move		
	men who entered college in:			men who entered college in:		
	1960	1972	1982	1960	1972	1982
from Rank 3 to Rank 1 College	32.7	101.5	189.6	13.8	16.4	21.4
from Rank 4 to Rank 2 College	44.0	51.3	61.1	21.6	10.5	16.5
from Rank 5 to Rank 3 College	39.8	16.1	21.0	29.9	11.1	19.4
from Rank 6 to Rank 4 College	83.1	7.6	48.0	49.6	8.7	20.9
from Rank 7 to Rank 5 College	129.0	21.8	69.6	55.4	12.1	27.1
from Rank 8 to Rank 6 College	200.7	56.6	41.3	63.5	20.1	19.0

Based on Student Paying Average Tuition Paid (both in Private and Public Colleges)

	Private College to Private College Move			Public College to Private College Move		
	men who entered college in:			men who entered college in:		
	1960	1972	1982	1960	1972	1982
from Rank 3 to Rank 1 College	na	103.8	182.5	na	17.0	24.1
from Rank 4 to Rank 2 College	na	13.0	35.8	na	11.5	19.5
from Rank 5 to Rank 3 College	na	23.9	25.8	na	13.7	22.0
from Rank 6 to Rank 4 College	na	8.1	40.1	na	10.6	22.5
from Rank 7 to Rank 5 College	na	27.6	56.0	na	14.6	28.6
from Rank 8 to Rank 6 College	na	81.7	48.6	na	24.8	22.1

Estimates are based on a working life of 34 years and a 0% discount rate. Career income estimates are based on the age-earnings profile in the 1995 Current Population Survey. Career income estimates for top ranked colleges are underestimated owing to topcoding (censoring of high incomes) and the estimation method used (see Appendix A). The abbreviation "na" indicates that measures of tuition paid are not available for 1960. Approximate estimates for a 3% discount rate may be computed by multiplying the numbers in the table by 0.5.

Table 6
 Years of Earnings Needed to Break Even on Cost of Moving Up 2 Selectivity Levels
Not Corrected for College Aptitude

Based on Student Paying "List Price" for Private Colleges and In-State Tuition for Public Colleges

	Private College to Private College Move			Public College to Private College Move		
	men who entered college in:			men who entered college in:		
	1960	1972	1982	1960	1972	1982
from Rank 3 to Rank 1 College	1.0	0.3	0.2	2.5	2.1	1.6
from Rank 4 to Rank 2 College	0.8	0.7	0.6	1.6	3.2	2.1
from Rank 5 to Rank 3 College	0.9	2.1	1.6	1.1	3.1	1.8
from Rank 6 to Rank 4 College	0.4	4.5	0.7	0.7	3.9	1.6
from Rank 7 to Rank 5 College	0.3	1.6	0.5	0.6	2.8	1.3
from Rank 8 to Rank 6 College	0.2	0.6	0.8	0.5	1.7	1.8

Based on Student Paying Average Tuition Paid (both in Private and Public Colleges)

	Private College to Private College Move			Public College to Private College Move		
	men who entered college in:			men who entered college in:		
	1960	1972	1982	1960	1972	1982
from Rank 3 to Rank 1 College	na	0.1	0.2	na	0.9	1.4
from Rank 4 to Rank 2 College	na	2.6	1.0	na	3.0	1.7
from Rank 5 to Rank 3 College	na	1.4	1.3	na	2.5	1.5
from Rank 6 to Rank 4 College	na	4.2	0.8	na	3.2	1.5
from Rank 7 to Rank 5 College	na	1.2	0.6	na	2.3	1.2
from Rank 8 to Rank 6 College	na	0.4	0.7	na	1.4	1.5

Estimates are based on a working life of 34 years and a 0% discount rate. Career income estimates are based on the age-earnings profile in the 1995 Current Population Survey. Career income estimates for top ranked colleges are underestimated owing to topcoding (censoring of high incomes) and the estimation method used (see Appendix A). The abbreviation "na" indicates that measures of tuition paid are not available for 1960. Approximate estimates for a 3% discount rate may be computed by multiplying the numbers in the table by 2.

Table 7
 Career Income by College Selectivity - 1997 Dollars
Corrected for College Aptitude

	men who entered college in 1972		men who entered college in 1982	
	Private Colleges	Public Colleges	Private Colleges	Public Colleges
Rank 1 Colleges	\$2,240,995	nc	\$2,462,036	nc
Rank 2 Colleges	\$2,096,134	\$2,019,608	\$2,360,878	\$2,138,587
Rank 3 Colleges	\$2,017,529	\$1,970,466	\$2,190,843	\$2,067,522
Rank 4 Colleges	\$2,004,449	\$1,957,691	\$2,166,801	\$1,968,297
Rank 5 Colleges	\$1,972,728	\$1,950,540	\$2,148,551	\$1,921,379
Rank 6 Colleges	\$1,971,566	\$1,925,846	\$2,068,946	\$1,918,786
Rank 7 Colleges	\$1,918,695	\$1,878,721	\$1,992,543	\$1,824,592
Rank 8 Colleges	\$1,878,721	\$1,809,957	\$1,986,344	\$1,815,392

Estimates are based on a working life of 34 years and a 0% discount rate. Career income estimates are based on the age-earnings profile in the 1995 Current Population Survey. Career income estimates for top ranked colleges are underestimated owing to topcoding (censoring of high incomes) and the estimation method used (see Appendix A). The correction for measured college aptitude is based on coefficients from a regression of individuals' earnings on their college admissions test scores, other standardized test scores, and high school grade point averages (see Appendix B). The abbreviation "nc" indicates that there are no public colleges in the rank 1 group. 1960 estimates are not available because the Occupational Changes in a Generation survey does not include individual aptitude measures. Approximate estimates for a 3% discount rate may be computed by multiplying the numbers in the table by 0.5. The price deflator used for putting dollars-of-the-day into 1997 dollars is the consumer durable goods price index.

Table 8
Ratio of Return to Investment for Moving Up 2 Selectivity Levels
Corrected for College Aptitude

$$\text{Ratio of Return to Investment} = \frac{\text{Increase in Career Income for Moving Up 2 Selectivity Levels}}{\text{Increase in Tuition Payments for Moving Up 2 Selectivity Levels}}$$

Based on Student Paying "List Price" for Private Colleges and In-State Tuition for Public Colleges

	Private College to Private College Move		Public College to Private College Move	
	men who entered college in:		men who entered college in:	
	1972	1982	1972	1982
from Rank 3 to Rank 1 College	104.1	128.5	11.1	13.7
from Rank 4 to Rank 2 College	51.8	63.0	6.1	14.7
from Rank 5 to Rank 3 College	12.6	7.2	3.2	10.4
from Rank 6 to Rank 4 College	5.8	14.6	3.6	9.8
from Rank 7 to Rank 5 College	10.2	25.5	4.9	15.3
from Rank 8 to Rank 6 College	12.9	10.0	9.2	12.6

Based on Student Paying Average Tuition Paid (both in Private and Public Colleges)

	Private College to Private College Move		Public College to Private College Move	
	men who entered college in:		men who entered college in:	
	1972	1982	1972	1982
from Rank 3 to Rank 1 College	120.2	123.7	14.8	15.4
from Rank 4 to Rank 2 College	21.5	36.9	6.7	17.3
from Rank 5 to Rank 3 College	18.7	8.8	3.9	11.8
from Rank 6 to Rank 4 College	6.2	12.2	4.3	10.6
from Rank 7 to Rank 5 College	12.9	20.5	5.9	16.2
from Rank 8 to Rank 6 College	18.7	11.8	11.3	14.6

Estimates are based on a working life of 34 years and a 0% discount rate. Career income estimates are based on the age-earnings profile in the 1995 Current Population Survey. Career income estimates for top ranked colleges are underestimated owing to topcoding (censoring of high incomes) and the estimation method used (see Appendix A). The correction for measured college aptitude is based on coefficients from a regression of individuals' earnings on their college admissions test scores, other standardized test scores, and high school grade point averages (see Appendix B). 1960 estimates are not available because the Occupational Changes in a Generation survey does not include individual aptitude measures. Approximate estimates for a 3% discount rate may be computed by multiplying the numbers in the table by 0.5.

Table 9
 Years of Earnings Needed to Break Even on Moving Up 2 Selectivity Levels
Corrected for College Aptitude

Based on Student Paying "List Price" for Private Colleges and In-State Tuition for Public Colleges

	Private College to Private College Move		Public College to Private College Move	
	men who entered college in:		men who entered college in:	
	1972	1982	1972	1982
from Rank 3 to Rank 1 College	0.3	0.3	3.1	2.5
from Rank 4 to Rank 2 College	0.7	0.5	5.5	2.3
from Rank 5 to Rank 3 College	2.7	4.7	10.6	3.3
from Rank 6 to Rank 4 College	5.8	2.3	9.6	3.5
from Rank 7 to Rank 5 College	3.3	1.3	6.9	2.2
from Rank 8 to Rank 6 College	2.6	3.4	3.7	2.7

Based on Student Paying Average Tuition Paid (both in Private and Public Colleges)

	Private College to Private College Move		Public College to Private College Move	
	men who entered college in:		men who entered college in:	
	1972	1982	1972	1982
from Rank 3 to Rank 1 College	0.3	0.3	2.1	2.1
from Rank 4 to Rank 2 College	1.6	0.9	5.1	2.0
from Rank 5 to Rank 3 College	1.8	3.8	8.6	2.9
from Rank 6 to Rank 4 College	5.5	2.8	7.9	3.2
from Rank 7 to Rank 5 College	2.6	1.7	5.8	2.1
from Rank 8 to Rank 6 College	1.8	2.9	3.0	2.3

Estimates are based on a working life of 34 years and a 0% discount rate. Career income estimates are based on the age-earnings profile in the 1995 Current Population Survey. Career income estimates for top ranked colleges are underestimated owing to topcoding (censoring of high incomes) and the estimation method used (see Appendix A). The correction for measured college aptitude is based on coefficients from a regression of individuals' earnings on their college admissions test scores, other standardized test scores, and high school grade point averages (see Appendix B). 1960 estimates are not available because the Occupational Changes in a Generation survey does not include individual aptitude measures. Approximate estimates for a 3% discount rate may be computed by multiplying the numbers in the table by 2.

Table 10
Comprehensive College Costs (Tuition, Fees, Room, and Board) in 1997 Dollars

comprehensive costs are not strictly comparable between colleges
that have different residence patterns (on- vs. off-campus, dormitory vs. fraternity/sorority housing)

	Private Colleges			Public Colleges		
	1972	1982	1997	1972	1982	1997
Rank 1 Colleges	\$10,116	\$11,512	\$27,596	nc	nc	nc
Rank 2 Colleges	\$10,986	\$12,053	\$27,218	\$2,942	\$3,315	\$10,834
Rank 3 Colleges	\$10,084	\$10,761	\$26,388	\$2,722	\$2,971	\$8,873
Rank 4 Colleges	\$9,789	\$10,724	\$25,475	\$5,000	\$4,855	\$10,505
Rank 5 Colleges	\$9,075	\$9,444	\$23,693	\$4,176	\$3,911	\$9,000
Rank 6 Colleges	\$7,717	\$8,239	\$20,568	\$3,095	\$3,100	\$8,230
Rank 7 Colleges	\$7,158	\$7,306	\$18,055	\$3,422	\$3,209	\$7,753
Rank 8 Colleges	\$5,859	\$5,912	\$13,933	\$3,038	\$2,794	\$6,015

Colleges report "typical" room and board charges, which vary with housing patterns, the usual number of meals taken, and so on. Measures of comprehensive cost are not available for 1960. The abbreviation "nc" indicates that there are no public colleges in the rank 1 group. The price deflator used for putting dollars-of-the-day into 1997 dollars is the consumer durable goods price index.

Table 11
Predictions for 1997 College Entrants

predictions use actual 1997-98 tuition
and assume that 1997 college entrants have the same earnings patterns as 1982 college entrants
(the most recent students who have income histories long enough to permit estimation of career income)

Ratio of Return to Investment for Moving Up 2 Selectivity Levels
Corrected for College Aptitude

	Private College to Private College Move				Public College to Private College Move			
	full tuition -to- full tuition	average tuition paid -to- average tuition paid	compre- hensive cost -to- compre- hensive cost	free ride -to- compre- hensive cost	full tuition -to- full tuition	average tuition paid -to- average tuition paid	compre- hensive cost -to- compre- hensive cost	free ride -to- compre- hensive cost
from Rank 3 to Rank 1	not defined (rank 3 costs more than rank 1)				6.3	30.1	5.3	5.0
from Rank 4 to Rank 2	67.4	17.5	27.8	2.3	5.9	17.2	5.9	4.7
from Rank 5 to Rank 3	3.0	2.8	3.9	0.5	4.0	10.2	3.9	3.2
from Rank 6 to Rank 4	5.0	5.8	5.0	1.2	3.7	9.6	3.6	3.1
from Rank 7 to Rank 5	8.0	8.1	6.9	2.2	5.7	15.3	5.1	4.6
from Rank 8 to Rank 6	3.5	4.1	3.1	1.4	4.9	12.2	4.4	4.2

Years of Earnings Needed to Break Even on Moving Up 2 Selectivity Levels
Corrected for College Aptitude

	Private College to Private College Move				Public College to Private College Move			
	full tuition -to- full tuition	average tuition paid -to- average tuition paid	compre- hensive cost -to- compre- hensive cost	free ride -to- compre- hensive cost	full tuition -to- full tuition	average tuition paid -to- average tuition paid	compre- hensive cost -to- compre- hensive cost	free ride -to- compre- hensive cost
from Rank 3 to Rank 1	0	0	0.6	10.0	5.4	1.1	6.5	6.9
from Rank 4 to Rank 2	0.5	1.9	1.2	14.6	5.8	2.0	5.8	7.2
from Rank 5 to Rank 3	11.4	11.9	8.7	67.7	8.6	3.3	8.8	10.6
from Rank 6 to Rank 4	6.8	5.9	6.8	28.0	9.1	3.6	9.5	11.0
from Rank 7 to Rank 5	4.3	4.2	4.9	15.3	6.0	2.2	6.7	7.4
from Rank 8 to Rank 6	9.6	8.2	10.9	25.1	6.9	2.8	7.8	8.2

Appendix A: Estimating Career Earnings Using Empirical-Age Earnings Profiles

I used two methods to estimate career earnings from earnings at age 32. The first is the preferred method for cross-section data, and the second is the preferred method for longitudinal data.

There are three advantages to using cross-section data: the age-earnings profile is up-to-date, the number of survey respondents is large, and the researcher does not have to account for inflation. The disadvantage of using cross-section data is that, while each individual sets his own earnings *level*, all individuals must share the same pattern of earnings *growth*. We know that people who graduate from more selective colleges tend to have higher earnings growth as well as higher earnings levels, so using cross-section data generates career earnings that are underestimates for graduates of highly selective colleges.

The advantage of using longitudinal data (a survey that follows the same individuals over their lifetimes) is that one can model individual earnings growth as well as individual earnings levels. There are three disadvantages of using longitudinal data: a mixture of past and present age-earnings profiles are simultaneously used so that time trends in the profiles are suppressed, the number of survey respondents is small (relative to cross-section data), and the quality of the age-earnings profile depends on the quality of the adjustment for inflation. Because this method suppresses time trends, it generates career earnings that are underestimates for graduates of highly selective colleges during periods when income inequality is rising, like the current period.

Thus, both methods understate the career incomes of graduates of more selective colleges relative to graduates of less selective colleges. This underestimation cannot be avoided without making restrictive assumptions. It is probably best to accept the fact that career incomes for highly selective colleges are *conservatively estimated*.

Murphy and Welch (1986) demonstrate that quartic equations for log earnings capture most of the information in age-earnings data, so I adopt quartic specifications.

The Method for Cross-Section Data

The Current Population Survey is the 1-in-1000 rotating sample of the United States population that is used for computing most common labor force statistics, such as the unemployment rate. I estimated the following quartic equation for males who held baccalaureate degrees and worked full-time in 1995.

$$\ln(\text{Earnings}_i) = \alpha_0 + \alpha_1 \text{Age}_i + \alpha_2 \text{Age}_i^2 + \alpha_3 \text{Age}_i^3 + \alpha_4 \text{Age}_i^4 + \epsilon_i$$

The coefficients from this equation are used to predict career earnings for each individual for whom I have earnings at age 32 in one of the three following surveys: Occupational Changes in a Generation, the National Longitudinal Study of the Class of 1972, the National Longitudinal Survey of Youth. Each individual sets his own earnings level--that is, the prediction incorporates an individual-specific intercept.

The Method for Longitudinal Data

The Panel Survey of Income Dynamics is the largest long-panel survey of the United States population. It covers the period from 1968 to the present. I estimated the following equation for males who held baccalaureate degrees, worked full-time, and were between age 40 and age 65 in 1995. The equation allows both the level and growth rate of earnings to be quartic in age.

$$\begin{aligned} \ln(\text{Earnings}_i) = & \text{Earn32}_i + \beta_1 \text{Age}_i + \beta_2 \text{Age}_i^2 + \beta_3 \text{Age}_i^3 + \beta_4 \text{Age}_i^4 + \\ & \text{Earn32}_i \cdot \text{Age}_i + \text{Earn32}_i \cdot \text{Age}_i^2 + \text{Earn32}_i \cdot \text{Age}_i^3 + \text{Earn32}_i \cdot \text{Age}_i^4 + \epsilon_i \end{aligned}$$

The coefficients from this equation are used to predict career earnings for individuals in the three surveys named above. The predicted level and growth of earnings are specific to each individual.

Appendix B: Correcting for Measured College Aptitude

To correct for college aptitude, I estimated the following regression:

$$\ln(Earn32_i) = \gamma_0 + \gamma_1 SATMath_i + \gamma_2 SATVerbal_i + \gamma_3 StdEnglish_i + \gamma_4 StdMath_i + \gamma_5 GPA_i + \zeta_i$$

separately for the National Longitudinal Study of the Class of 1972 and the National Longitudinal Survey of Youth. I used the estimated coefficients from this regression to predict the earnings each individual would have if he had average aptitude (among people in the relevant survey). That is, I calculated:

$$\ln(Earn32_i) - \hat{\gamma}_1 SATMath_i - \hat{\gamma}_2 SATVerbal_i - \hat{\gamma}_3 StdEnglish_i - \hat{\gamma}_4 StdMath_i - \hat{\gamma}_5 GPA_i + \hat{\gamma}_1 \overline{SATMath} + \hat{\gamma}_2 \overline{SATVerbal} + \hat{\gamma}_3 \overline{StdEnglish} + \hat{\gamma}_4 \overline{StdMath} + \hat{\gamma}_5 \overline{GPA} .$$

These predicted earnings are used to compute the career income, adjusted for aptitude, shown in Table 7.

One could also adjust for demographic, such as race, parents' education, and family income. Such adjustments make the return to attending a more selective college increase more over time. The reason is that highly selective colleges have increasingly admitted students who come from backgrounds that are generally not propitious for earnings.