Financing College Tuition

Government Policies and Educational Priorities

Marvin H. Kosters, editor

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Contents

CONTRIBUTORS ix

1 INTRODUCTION *Marvin H. Kosters* 1

2 BUDGETS, PRIORITIES, AND INVESTMENT IN HUMAN CAPITAL *Eric A. Hanushek* 8

3 WHERE SHOULD FEDERAL EDUCATION INITIATIVES BE DIRECTED? *Caroline M. Hoxby* 28

4 REFORMING PUBLIC SUBSIDIES FOR HIGHER EDUCATION *Thomas J. Kane* 53

5 CAN TUITION POLICY COMBAT RISING WAGE INEQUALITY? *Stephen V. Cameron and James J. Heckman* 76

TABLES

2–1 Public School Resources, 1961–1991 12
2–2 Population with Upper-Secondary-Level Education, by Age and Country, 1992 16
3–1 Education-Related Appropriations and Tax Expenditures, Fiscal Year 1998 29
3–2 Education-Related Appropriations and Tax Expenditures, Fiscal Year 1999 30
3–3 Education-Related Appropriations and Tax Expenditures, Budget for Fiscal Year 2000 31
3–4 Increasing Competitiveness of the U.S. Market for Baccalaureate Education, 1949–1994 32
3–5 Effects of Competition on Elementary and Secondary Schooling 40
4–1 Probability of Postsecondary Enrollment by State Tuition, Need-Based Grant Spending, and Unemployment Rate for the Class of 1982 62

5
Can Tuition Policy Combat Rising Wage Inequality?

Stephen V. Cameron and James J. Heckman

The recent rise in the economic return to higher education and the decline in the real wages of male high school graduates have stimulated interest in policies that promote skill formation in order to reduce wage inequality. The increase in the college wage premium began in the late 1970s and is especially pronounced among the most recent work force entrants. It is a major contributor to the recent rise in wage inequality.

As often happens in popular discussions of policy problems, a fifteen-year trend of rising wage inequality is now widely assumed to be an immutable feature of the modern economy. This view is held despite a growing body of empirical evidence that the trend toward rising wage inequality has now abated (Krueger 1997). A recent analysis of wage inequality in the American economy demonstrates that without any intervention beyond the large subsidies already in place, the induced increase in the supply of skills to the economy will restore the variance of log wages to its pre-1979 level (Heckman, Lochner, and Taber 1998a). The problem of rising wage inequality in the past fifteen years is localized in the experience of cohorts of low-skill workers in the labor market around the onset of skill-biased technical change. In the long run, workers of all ability levels benefit from technological change. If any policy intervention is warranted, it should be in the form of wage subsidies and income supplements directed toward specific cohorts of low-skill workers caught up in the transition to a new high-

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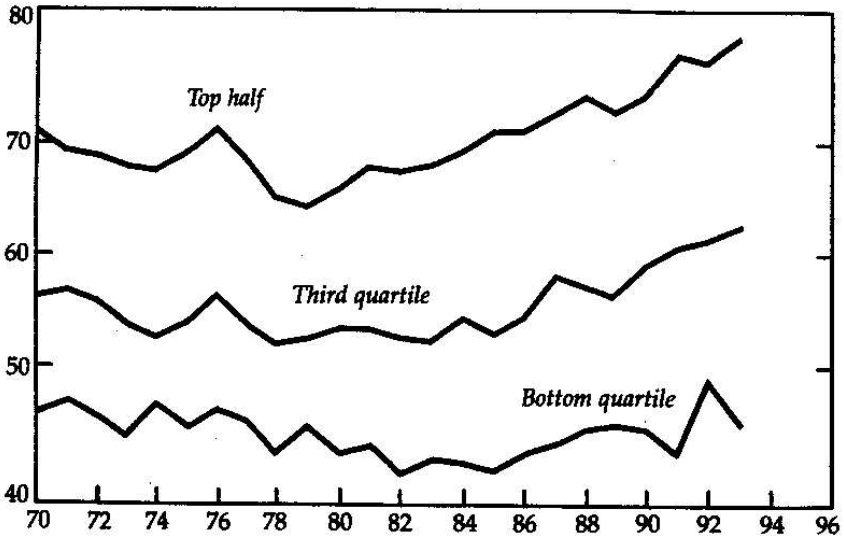
skill economy and not in the form of policies to augment the current large subsidies that promote skill formation.

Despite this evidence, many analysts concerned about rising wage inequality have advocated increases in the already substantial public subsidies to promote enrollment in college. The most popular argument in support of enhanced subsidies is that when more people obtain a college education, a wider group in society benefits from rising skill prices (Reich 1991). An economically more sophisticated version of the argument notes that when a greater proportion of the work force is educated, the high school graduates who choose to remain uneducated become more scarce. This reduction in their relative numbers increases the price of their skill and thus helps to alleviate their plight and to reduce wage inequality (Heckman 1996).

A third argument is intergenerational in character and assumes a particular form of market failure. It is based on a strongly positive empirical relationship between family income and college enrollment. It starts by noting that enrollment in college has been concentrated among persons from higher-income families (figure 5–1). The children of high-income parents responded most to the rise in skill differentials that started in the late 1970s. This response threatens to perpetuate inequality across generations by creating a more stratified society. Many attribute this relationship to short-term credit constraints experienced by families in the years their children are making college enrollment decisions as well as rising tuition costs and suggest that policies should be structured to eliminate a source of bias against the poor that appears to be an important feature of the American educational system. Since minorities are overrepresented in the lower quartiles of the income distribution, tuition and family income policy are advocated to prevent a further widening of the educational gap between majority white and minority groups evident in figure 5–2 and to promote racial and ethnic equality.

This chapter evaluates these arguments and the empirical evidence that supports them. The first two arguments ignore the substantial cost of changing the level of education in society at large to alleviate the problem of rising wage inequality. They further ignore the self-correcting features of the American economy. As relative supplies of skilled labor continue to increase in response to the rising return to skill, inequality is likely to decrease. The third argument has superficial plausibility and is often invoked to justify further subsidies to higher education (see, for example, chapter 4 in this volume). It interprets the empirical correlation between family income and college enrollment in only one of many possible ways.

FIGURE 5–1
COLLEGE PARTICIPATION BY EIGHTEEN- TO TWENTY-FOUR-YEAR-OLD HIGH SCHOOL GRADUATES AND GED HOLDERS, 1970–1993
(percent)

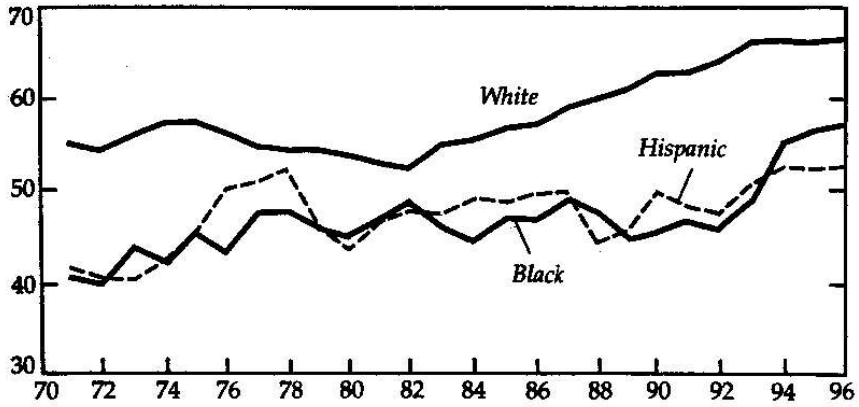


SOURCE: These numbers were computed from 1971–1989 CPS P-20 School Reports and the 1990–1993 October CPS data files.

At a strictly descriptive level, a family income–schooling relationship can arise from short-run credit constraints or long-run family and environmental factors that make some persons better suited to participate in education than others. The weight of the evidence presented in this chapter suggests that family income, as measured by the surveys used to estimate the relationship demonstrated in figure 5–1, is better viewed as a determinant of long-term factors that shape the ability and motivation of children. We offer evidence that quick-fix income or tuition supplements like Hope tax credits or Pell grant money offered to potential college students late in their teenage years are unlikely to do much to ameliorate the observed pattern of schooling enrollment by family income.

Interventions at earlier stages of the life cycle are more likely to be effective in alleviating ethnic and racial schooling gaps. Skill formation is a lifetime affair. A student must finish high school before being able to graduate from college. Much of the gap between minority and majority college enrollment levels can be attributed to gaps in high school attainment and in achievement at earlier stages of the life cycle.

FIGURE 5–2
COLLEGE-ENTRY PROPORTIONS OF TWENTY-ONE- TO TWENTY-FOUR-YEAR-OLD HIGH SCHOOL GRADUATES AND GED HOLDERS, 1970–1996
(percent)



NOTE: Racial-ethnic groups are defined mutually exclusively.
SOURCE: The numbers represent three-year moving averages of March CPS data (two-year averages for 1971 and 1996).

Magnitudes of Subsidies to Reverse Rising Wage Inequality

One approach to evaluating the potential effects of educational subsidies on reducing wage inequality starts with a demand equation relating the changes over time in the relative wages of skilled and unskilled workers to relative quantities of the two factors: (% change over time in skilled wages relative to unskilled wages) = (trend) − b (% change over time in quantities of skilled labor relative to unskilled labor).[1] The thrust of this equation is that the greater the growth in the ratio of skilled to unskilled workers, the slower the growth in the wages of skilled

1. In symbols, where W_s is the wage of skilled labor, W_u is the wage of unskilled labor, Q_s is the quantity of skilled labor, and Q_u is the quantity of unskilled labor,

$$\Delta \ln \left[\frac{W_s(t)}{W_u(t)}\right] = \alpha - \frac{1}{\sigma}\Delta \ln \left[\frac{Q_s(t)}{Q_u(t)}\right]$$

where Δ denotes change and ln denotes logarithm. In this equation, α is the trend rate of relative wage growth, and σ, a positive number, is the elasticity of substitution between the two types of labor. The higher σ, the more substitutable are skilled workers for unskilled workers, $b = 1/\sigma$.

workers compared with those of unskilled workers. The greater the trend, the more the technology is shifting in favor of skilled labor over time and the more likely it is that wage differentials between skilled and unskilled workers will increase over time. Katz and Murphy (1992) estimate this equation for the United States over the period 1963–1987.[2]

With that definition of college and high school skill groups, the 1979–1989 percentage change in relative wages is roughly fourteen percentage points. To reverse the ten-year trend by increasing the relative supply of skilled workers requires a once-and-for-all increase of approximately 20 percent in the number of high-skill persons in the work force. With the definitions of skill groups employed by Katz and Murphy, college equivalents are 40 percent of the work force, and high school equivalents are 60 percent. For a 1990 work force of 120 million, about 5.4 million people need to be transformed to college equivalents to reverse the decade-long erosion of real wages.[3] To maintain this gain in relative wages against the secular trend operating against unskilled labor, about 1 million additional skilled persons need to be added to the work force each year on top of the once-and-for-all change of 5.4 million.[4]

As a benchmark, the annual supply of high-skill equivalents to the U.S. economy in the early 1990s is approximately 1.8 million. Maintenance of existing skill gaps alone would require that the percentage of persons acquiring postsecondary skills would have to rise by 55 percent.[5] To phase in the additional 5.4 million people who are required to restore wage parities to their 1979 levels over ten years would require a total annual expansion of the supply of high-skill persons of 70–80 percent, depending on alternative assumptions about the retirement of unskilled older workers. To engineer such an increase through a tuition policy requires a substantial tuition reduction. With a college attendance tuition elasticity of $-.30$, which is the order of magnitude reported in the literature, the required reduction in tuition is 181

2. They estimate $\sigma = 1/b$ to be 1.41 with a standard error of .150, although they also suggest that a range of estimates with σ as low as .5 is also consistent with the data. Katz and Murphy estimate the trend, α, as .033 (standard error .007). Johnson (1970) reports an estimate of $\sigma = 1.50$ for the elasticity of substitution between college and high school labor. Using different measures of college and high school skill, Heckman, Lochner, and Taber (1998a, b) estimate that $\sigma = 1.44$ and $\alpha = .032$.

3. Even with their lower range estimate of $1/b = \sigma = .5$, 2 million persons need to be shifted from the unskilled to the skilled category to offset the decade-long trend against unskilled labor.

4. 400,000 for the lower-bound case.

5. 22 percent in the lower-bound case.

percent.[6] College tuition would have to be zero, and people would have to be paid to attend school. These large numbers are based on the behavioral assumption widely used in the literature (see, for example, Kane 1994 or in this volume) that prospective students act as if skill prices will not change when national tuition policies change and induce substantial numbers of people to enter college.

A more convincing evaluation of the effectiveness of a national tuition policy allows for skill prices to adjust and for agents to anticipate the adjustment and to respond appropriately. It also accounts for the tax costs of the policy and behavioral responses to the increase in taxes. We discuss such simulations below.

We proceed by first examining the conventional argument in favor of tuition subsidies: we ignore the tax consequences of raising the revenue to support the tuition supplements and ignore how rational agents who anticipate the effect of the tuition policy on skill prices respond in their schooling behavior. When these additional factors are incorporated into the analysis, the estimated effects of tuition subsidies on reducing wage inequality are substantially diminished and make tuition policy an unlikely vehicle for eliminating wage inequality. Even ignoring these factors, however, the case for expanding tuition subsidies is not strong.

The Relationship between Tuition, Family Income, and College Attendance

The empirical association between family income and college enrollment presented in figure 5–1 has attracted an enormous amount of attention in academic and policy circles. The most common interpretation of this evidence is that short-term family credit constraints prevent children from low-income families from attending school. The Pell grant program, the Hope credit program, and many other governmental educational programs are premised on this interpretation of the evidence. It is the most popular explanation for the time series of the ethnic and racial gaps in college enrollment, displayed in figure 5–2. Since minority families are concentrated in the lower quartiles of the

6. McPherson and Schapiro (1991) report an estimated average elasticity (with respect to net tuition) of $-.30$ ranging from $-.14$ for high school (family income $>$ \$30,000 per year in 1978 dollars) to $-.47$ for low income (family income $\leq$ \$10,000 per year). St. John (1993) reports $-.28$ for gross tuition. We estimate a gross tuition elasticity of $-.31$ to $-.33$ for two- and four-year schools, respectively. See Cameron and Heckman (1998b). The lower-bound case is 75 percent. These calculations were first presented in Heckman (1996).

family income distribution, their failure to respond to the increase in the economic returns to schooling is widely viewed as a manifestation of the more general phenomenon of a family income–dependent response to the rising return to skill that is evident in figure 5–1.

The common interpretation of that figure notes that real tuition costs have increased in percentage terms over the past sixteen years. At the same time, family incomes have declined among the bottom quartiles of the family income distribution. The real wages and employment of unskilled males have declined since the late 1970s. More families at the bottom of the family income distribution are headed by females with dependent children. Such families have lower earnings and income levels than families headed by males.

According to this interpretation, the dual impact of rising tuition costs and declining family resources has had a devastating impact on the college attendance decisions of children from low-income families. Based on this interpretation, policies that further subsidize the already substantial subsidies available to educate children from low-income families have been advocated, most notably by Hauser (1991, 1993) and Mortenson (1988).

Certainly, real tuition costs have risen over the past sixteen years. Between 1980 and 1997, average public posted "sticker price" tuition levels rose by 100 percent at public four-year colleges and universities and by 77 percent at public two-year colleges (NCES 1997). At the same time, government subsidies to higher education are already large. For public institutions, nearly half of all expenditures are covered by direct appropriations from state and local governments. Revenue generated by public institutions in 1994 was approximately $87 billion.[7] Tuition and fees accounted for only 25 percent of revenues; direct grants, appropriations, and contracts from local, state, and federal governments to these institutions made up another 66 percent; and the remaining 9 percent came from endowment revenue and gifts.[8] In addition, the federal government spent another $6 billion on direct grants to low-income students and another $7 billion on subsidies to student loan programs.[9] These funds serve to offset some of the remaining 25 percent of total cost of college borne by students. About half this subsidy goes to students in public institutions (NCES 1997). All told, individuals attending public institutions of higher education pay on average less than 20 percent of the total direct cost of attending college. (Direct cost does not include forgone earnings.) Moreover, a substantial fraction of the 20 percent of the total costs borne by individuals is actually paid by private foundations and charities that extend aid directly to students.

Popular discussions of education policy often confuse the question of whether education should be subsidized with the question of whether the already substantial public subsidies to higher education should be increased. The conventional wisdom is that credit constraints are binding for prospective college students from low-income families and have become more stringent as the poor families have become poorer at precisely the same time that tuition costs have risen along with the rise in the return to education.[10] The argument is made that since government policy has contributed to the rising inequity in schooling among different family income groups through expansion of tuition costs, policy can also help to eliminate it. We now present reasons to doubt the received wisdom.

7. On average, revenue and expenditures were about equal. This figure excludes revenue from and expenditures on hospitals and other auxiliary enterprises (NCES 1997).

8. Because college training is produced jointly with research in some cases, the size of the subsidy to higher education may be slightly overstated; because the figures we state are for public and not private institutions, however, the figure understates total governmental support to higher education.

9. Total loan disbursements were about $22 billion, of which approximately one-third was a subsidy.

The Positive Relationship between Family Income and College Enrollment

The argument that family credit constraints are the most plausible explanation for figure 5–1 starts by noting that human capital is different from physical capital. With the abolition of slavery and indentured servitude, there is no asset market for human capital. People cannot sell rights to their future labor earnings to lenders to secure financing for their human capital investments. Even if they could, there would be substantial problems in enforcing performance of contracts on future earnings, given that persons control their own labor supply and the effort and quality of their work. The lack of collateral and the inability to monitor effort are widely cited reasons for current large-scale government interventions to finance education.

If people had to rely on their own resources to finance all their schooling costs, no doubt the level of educational attainment in American society would decline. To the extent that subsidies do not cover the full costs of tuition, persons are forced to pay tuition through private

10. The rise in tuition costs is linked, in part, to the rise in the economic return to college education since college-educated labor is a major input into the educational system.

loans, through work while in college, or through forgone consumption. Children from families with higher income have access to resources that children from families with lower income do not have, although children from higher-income families still depend on the good will of their parents to gain access to funds. Limited access to credit markets means that the costs of funds are higher for the children of the poor, and this limits their enrollment in college.

Current tax law exacerbates these problems. Borrowing costs for education cannot be written off against taxes. Even if they could be itemized, few poor families find it profitable to itemize deductions. Until recently, the only exception to the nondeductibility of interest in the current tax law was mortgage interest. Under the new law, deductions for student loans are available. These deductions benefit persons who itemize and are unlikely to have much effect on college attendance for poor children. All families can itemize mortgage interest payments in declaring their taxes. Poorer families, however, are much less likely to own their own homes, and hence fewer of them are eligible to use mortgages on their homes to finance the schooling of their children.

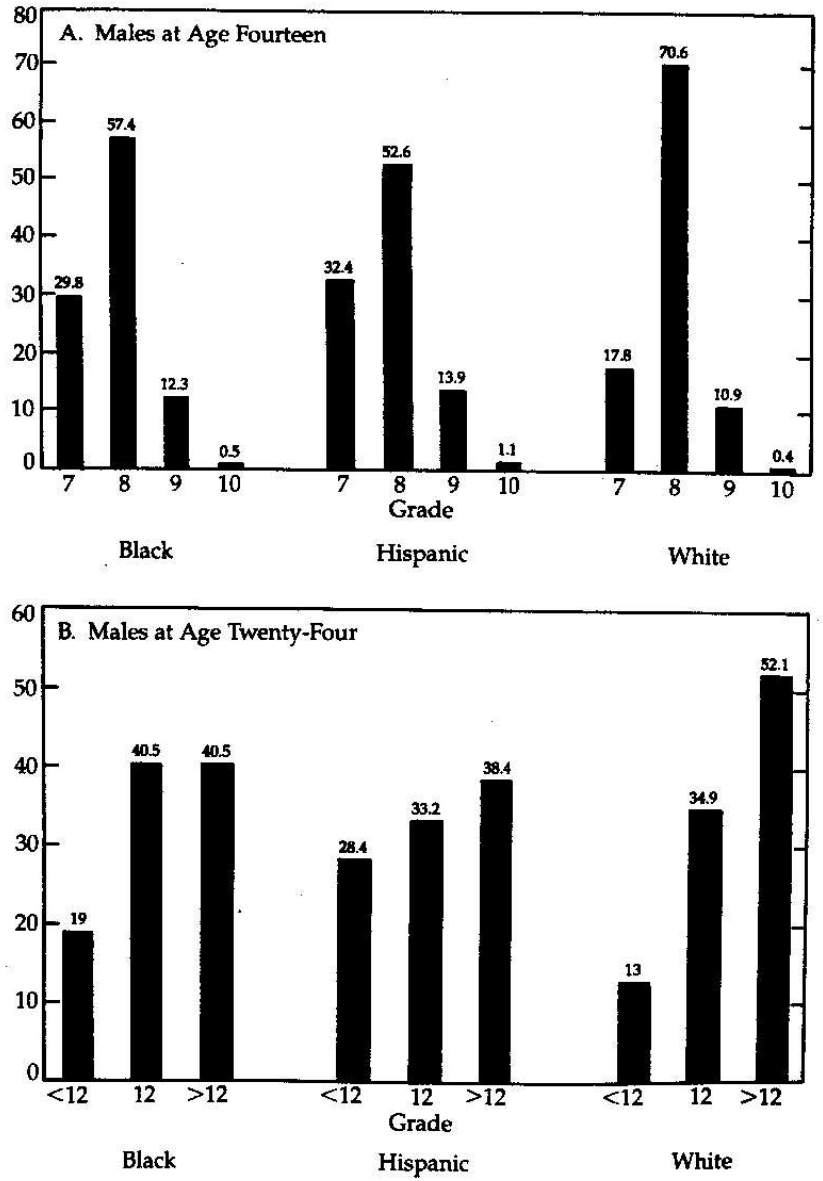
The purchase of education may also be governed by the same principles that govern the purchase of other goods. There is, undoubtedly, a consumption component to education.[11] Families with higher incomes buy more education for their children and buy higher-quality education as well. This factor partly explains the levels of the relationships presented in figure 5–1.

An alternative and not necessarily mutually exclusive interpretation of the evidence is that long-run family and environmental factors play a decisive role in shaping the ability and expectations of children. Families with higher levels of resources produce higher-quality children who are better able to perform in school and take advantage of the new market for skills.

Children whose parents have higher incomes have access to better-quality secondary schools. Children's tastes for education and their expectations about their life chances are shaped by those of their parents. Educated parents are better able to develop the scholastic aptitude in their children by assisting and directing their studies. The influences of family factors that are present from birth through high school completion accumulate over many years to produce ability and college readiness. High school certification is required for college attendance. While there is a racial and ethnic gap in college enrollment among high school graduates, there is also a substantial racial and ethnic gap in high school graduation (figure 5–3). There is already a substantial gap in

11. Lazear (1977) presents some evidence on this question.

FIGURE 5–3
DISTRIBUTION OF SCHOOLING ATTAINMENT



NOTE: Years of schooling are shown at the base. Category <12 represents less than a high school diploma, and category >12 represents college attendance.
SOURCE: National Longitudinal Survey of Youth, 1979–1989.

schooling completion by age fourteen. A large part of the racial and ethnic gap in college attendance can be explained by the gap in high school certification. High school certification depends on completing the eleventh grade, completing the tenth grade is required to attend the eleventh, and so forth. Families play an important role in shaping the performance of children at each stage of the educational process.

In addition, a feedback process may operate. Children who grow up in inferior environments may expect less of themselves and may not fully develop their academic potential because they see little hope for ever being able to complete college or use their schooling in any effective way. There is also the element of uncertainty. People from disadvantaged environments where no one has previously gone to college will face greater uncertainty about their prospects for success and the steps needed to achieve it.

This alternative interpretation, which stresses the role of family and the environment, does not necessarily rule out the importance of short-term borrowing constraints as a partial explanation for figures 5–1 and 5–2. If the finances of poor but motivated families hinder them from providing decent elementary and secondary schooling for their children, however, and produce a low level of college readiness, government policy aimed at reducing the short-term borrowing constraints for the college expenses of those children is unlikely to be effective. Policy that improves the environments that shape ability may be a more effective avenue for increasing college enrollment in the long run. The issue could be settled empirically, although surprisingly little data have been brought to bear on it.

The distinction between long-run family factors that promote college readiness and short-term borrowing constraints can be conceptualized by imagining an experiment in which a random sample of families is drawn and some of the families win a million dollar lottery at different points in the life cycle of their children. Those who win as their children near high school completion have little opportunity to make cumulative long-run family investments that contribute to college-preparedness. There would be little effect of the newly acquired wealth on the college attendance of their children if college readiness and ability are the decisive elements in producing enrollment in college.

For lottery winners with young children, a much larger response to the lottery would be expected in terms of the college attendance of their children if parents invest in better schools and more academic opportunities for their children over a longer horizon. If short-term credit market constraints are the significant factor governing college attendance, then we expect a large response in college enrollments by

children of previously poor families regardless of the age of their children at the time the lottery was won.

If public policy aims to encourage college attendance, a focus on improving the environments of children and improving preparation for college may be more effective than grant or loan programs to economically or cognitively disadvantaged children in their late teenage years. If ability promotes academic progress, then early interventions lead to higher achievement. What is known about ability is that it is formed relatively early in life and becomes less malleable as children age. By age fourteen, basic abilities seem to be fairly well set (see the evidence summarized in Heckman 1995). By the time individuals finish high school and scholastic ability is determined, the scope of public policy for promoting college attendance is greatly diminished.

Only to the extent that the family income of able high school graduates falls below levels required to pay for college will short-term credit market constraints hinder college entry. Given the current college financial support arrangements that are available to low-income and minority children, we now demonstrate that the phenomenon of bright students being denied access to college because of credit constraints is empirically unimportant.

Tuition Costs and College Attendance

Thus far we have focused solely on the role of family income in explaining participation in college. With or without credit market constraints, a rise in tuition will reduce college attendance because it reduces the net returns (labor market payoffs less costs) to college. Moreover, if consumption benefits are important in explaining the demand for a college education, a rise in tuition acts like a rise in the price of any good: higher prices lead to lower demand. Evidence of an enrollment response to tuition changes is not informative about the empirical importance of borrowing constraints.

It is easy to exaggerate the contribution of tuition costs toward explaining the gap in the college attendance of children from rich and poor families. Substantial loan and aid programs already are targeted toward students from poorer families. At public two- and four-year institutions in the United States in 1996, average costs of tuition and fees were about $2,300.[12] For community colleges, where 40 per-

12. These figures are for in-state tuition. The proper concept of cost is based on the marginal room and board cost that arises from attending college, not the total cost, since people have to eat or sleep whether or not they go to college. Unfortunately, we do not know this marginal cost and assume that it is zero.

cent of college students are found, tuitions are even lower. To offset these costs, both the Pell grant and subsidized student loan programs are available to children of low-income families.[13] Eligibility is determined by actual college costs and an estimated parental contribution that depends on travel expenses and allowances for miscellaneous expenses, the student's dependency status, family income and assets, and the number of other children in a family in college or postsecondary vocational training programs. In 1997, a first-year dependent college student was eligible for a maximum of about $8,000 in federal grants and subsidized loans. No minimum contribution toward estimated college costs was required from the student or the parents.[14] In round figures, the $8,000 maximum benefit consisted of $2,500 in Pell grants, $2,500 in Stafford loans, and $3,000 in Perkins loans. The maximum rose to $11,000 for third- and fourth-year college students as subsidized loan limits rise. If a student lived at home, room and board charges were subtracted from the estimated cost figure, but transportation costs were added to determine total aid eligibility.

A host of other federal programs directs money to students in some form or another. These include guaranteed but otherwise unsubsidized Plus loans to parents, campus work-study, Veterans Administration aid, aid to present and past military personnel, and aid from employers who receive federal tax write-offs for underwriting employee college costs. In addition, eligible students have access to many other state and institutional subsidies. In 1996, total institutional subsidies alone approximated the size of the entire Pell grant program (College Board 1997).

Discussions of college tuition policy focus too often on the elite public and private institutions and ignore the broad spectrum of community colleges and public four-year colleges that are available to students. They often overlook the rapid growth of community colleges in the past twenty-five years. More than 40 percent of all current college students are in community colleges. These colleges offer low tuitions (typically about $1,300 per year in 1997 dollars) and flexible schedules that allow students to work and attend college. There are many more community colleges (1,036) than four-year colleges (604), and most prospective students have one nearby so access to them is not a serious problem. Costs of room and board can be avoided by living with parents.[15] Evidence reported by Kane and Rouse (1995) suggests that the economic return to a year at a community college is the same as the economic return at a four-year college. Taken at face value, their evidence suggests that there is no compromise in generating human capital by attending a community college for the first two years of the college experience.

The growth in community colleges is an institutional response to the rigid schedules, high tuition costs, and lack of access characteristic of four-year schools. Many current arguments about the costs of attending college were more valid twenty-five years ago than they are now. In the current environment, with the community college institution in place and with generous loan and grant programs available, the arguments that tuition costs and commuting are major barriers to college attendance by the poor are implausible.

To strengthen this argument, we note that the take-up rate on Pell grants and Perkins loans is low (Orfield 1992). Many more funds are available to potential low-income students than are spent. Binding credit constraints are not a plausible explanation for the underutilization of these resources. It is more likely that many eligible persons perceive that even with a substantial tuition subsidy, the returns to college education for them are too low to pay for the forgone earnings required to attend school.

The Unimportance of Short-Term Credit Constraints

Empirical work on estimating the effects of family income and tuition costs on college attendance has been hindered by a lack of data. Few data sets are available with information on college attendance and parental income. Fewer still have information on college attendance and family income and family wealth. Even fewer follow families over time to enable analysts to examine how unanticipated changes in family income, of the sort envisioned in the hypothetical lottery experiment discussed earlier, change the schooling of children.

Data on unanticipated changes in income would be especially valuable. If families are truly constrained by credit, unanticipated increases and decreases in family income of the same magnitude would affect schooling attainment in an asymmetric fashion. If persons are already not attending college by virtue of being credit constrained, reducing their income further has no effect on their college attendance. Raising their income may increase their schooling. This asymmetry in

13. Stafford and Perkins loans are the principal components of the loan package.

14. Before 1993, students or their families were required to make a minimum contribution of around $800 toward college costs before student aid became available. In 1993, the minimum requirement was eliminated.

15. Callan (1997) presents a useful overview of the American community college system.

the response to positive and negative income innovations is the signature of a credit-constrained position both for education and other investment decisions.

Elsewhere (Cameron and Heckman 1998b), we use the National Longitudinal Survey of Youth (NLSY) data that provide information on ability, family income, and schooling to shed light on the importance and interpretation to be placed on the family income–schooling relationship.[16] We summarize the main findings from a companion paper.[17] A major limitation of these data is that family income is measured at only a few time points. This limitation precludes us from estimating the responses of child education decisions to anticipated and unanticipated changes in family income to operationalize the earlier thought experiment or to test the asymmetry in schooling responses to positive and negative income innovations.[18]

Panel A of figure 5–3 shows the distribution of male schooling attainment at ages fourteen by race and ethnic groups and panel B shows the comparison distribution at age twenty-four. There are large disparities between racial-ethnic groups. The two most important features of panel B are the large differences in college attendance (category >12 on the figure) and high school dropping out (<12).[19] Whites are about 12–14 percent more likely to enroll in college by age twenty-four, and Hispanics are about 17 percent more likely to have not completed high school. Analyses for later ages confirm that there is little college entry or high school completion after age twenty-four.

16. The widely used Current Population Survey data have problems that limit their usefulness in estimating the determinants of college participation. See the discussion in Appendix A.

17. The NLSY is a panel data set, with information on family income and schooling, that annually surveys more than 12,000 young men and women in the United States starting in 1979. Continuous schooling histories are available from January 1978. We use only male samples because their schooling decisions are less complicated by fertility considerations. In addition, to have complete schooling histories beginning at age fifteen as well as test score information on individuals before they completed high school, we restrict our study to young men age sixteen or less in January 1978. Our sample is based on the 1979–1989 waves of the National Longitudinal Survey of Youth (the military subsample and the non-black, non-Hispanic disadvantaged samples are excluded). More details of the data can be found in Cameron and Heckman (1998b).

18. Even if we had a good time series of family income, there is a nontrivial problem in decomposing it into components that are anticipated and those that are not. Statistical decompositions of time series data into predictable and unpredictable components do not necessarily estimate the predictable components as perceived, and acted on, by households. See, for example, the discussion in Browning, Hansen, and Heckman (1999).

19. To accord with census conventions, GED attainment and traditional high school graduation have been combined into the category 12. Minorities take GEDs at roughly twice the rate of whites. See Cameron and Heckman (1993).

Panel A of the figure shows important early differences in the distributions of completed schooling. At age fourteen, the modal grade is eight. While all racial-ethnic groups are about equally likely to be above grade eight, minorities are 12–15 percent more likely to be below the modal grade. Furthermore, individuals at grade levels below the modal grade are much more likely to drop out of high school and more likely not to enter college if they actually go on to complete high school. Later high school graduation and college entry chances are highly correlated with early schooling attainment by age.

Despite these early disparities, most of the difference in final schooling attainment emerges after age sixteen.[20] Most high school certification follows the traditional pattern and occurs by age nineteen. Most first-time college entry, too, follows immediately after high school completion. High school completion rates are higher for whites at age twenty-four than for minorities (87 percent compared with 81 percent for blacks and 72 percent for Hispanics) and certification of a general equivalency diploma is much higher for minorities. Approximately 11 percent of whites earn high school credentials through the GED program compared with 17 percent of blacks and 22 percent of Hispanics. For both GED completers and high school graduates, about 90 percent of college enrollment occurs within two years of high school certification.[21]

Table 5–1 presents differentials in college-entry rates. For cohorts making schooling decisions in the early 1980s, it breaks out two- and four-year college-entry patterns for persons who have completed high school by age twenty-four because two-year and four-year colleges have different costs of attendance. White graduates are more likely to enter college than are blacks (by seven percentage points) or Hispanic graduates (by three percentage points). White GED recipients are more likely to attend college. Whites have the highest four-year college-entry rate and Hispanics the lowest. Hispanics, however, show the highest two-year entry rate, which is partly attributable to the regional concentration of Hispanics in states such as California and Texas with extensive community college networks and low tuition costs during the period of our study.

20. This finding is due in part to compulsory schooling attendance laws and to the lack of labor market opportunities for people younger than sixteen.

21. Patterns of dropping out and college delay are explored in detail by Cameron and Heckman (1998b).

TABLE 5–1
COLLEGE ENTRY BY TYPE OF COLLEGE FIRST ATTENDED FOR HIGH SCHOOL GRADUATES AND GED RECIPIENTS AT AGE TWENTY-FOUR

Group	*Four-year*	*Two-year*	*Never attended*
High school graduates			
Whites	.38	.25	.37
	(.01)	(.01)	(.01)
Blacks	.33	.23	.44
	(.02)	(.02)	(.02)
Hispanics	.29	.31	.40
	(.03)	(.03)	(.03)
GED recipients			
Whites	.12	.22	.66
	(.03)	(.03)	(.03)
Blacks	.08	.15	.77
	(.02)	(.04)	(.03)
Hispanics	.10	.17	.73
	(.03)	(.03)	(.03)

NOTE: Standard errors of the means are in parentheses.
SOURCE: NLSY data (1979–1989); Cameron and Heckman (1998b).

Table 5–2 combines GED recipients and high school graduates and shows the same proportions broken down by the position of family income in terms of quartiles of the white family-income distribution. College attendance rates, for instance, are shown for the children of families in the top quartile of the white family-income distribution. The same income cutoffs in the white distribution are used to categorize blacks and Hispanics. As the table indicates, blacks and Hispanics are underrepresented in the top category because of their lower position in the family-income distribution.[22] As family income increases, youths of all racial and ethnic backgrounds are more likely to enter college.[23]

22. Parental family income is measured between ages thirteen and seventeen. The income distribution used to compute the categories in table 5–2 does not represent the population distribution of white family income in the United States but the population distribution for white families with children who are recent high school completers.

23. The only exception is a curious rise in noncollege attendance for whites as we go from the bottom to the third quartile. This rise, however, is not statistically significant. This fact seems to be due to the large number of white youths from the bottom quartile who attend two-year college.

TABLE 5–2
COLLEGE ENTRY BY AGE TWENTY-FOUR FOR HIGH SCHOOL GRADUATES AND GED HOLDERS BY TYPE OF COLLEGE FIRST ATTENDED AND QUARTILE OF THE WHITE FAMILY-INCOME DISTRIBUTION

	Type of School			*% of*
Group	Four-year	Two-year	Both	*Total Group*
Total college entry				
Whites	.35	.26	.61	100
	(.01)	(.01)	(.01)	
Blacks	.29	.21	.50	100
	(.02)	(.02)	(.02)	
Hispanics	.25	.28	.53	100
	(.02)	(.02)	(.03)	
Top quartile or equivalent				
Whites	.50	.27	.77	25
	(.03)	(.02)	(.03)	
Blacks	.47	.30	.77	5
	(.08)	(.07)	(.07)	
Hispanics	.39	.18	.58	10
	(.08)	(.06)	(.08)	
Second quartile or equivalent				
Whites	.36	.26	.62	25
	(.03)	(.02)	(.03)	
Blacks	.43	.17	.60	9
	(.07)	(.05)	(.05)	
Hispanics	.37	.35	.72	14
	(.07)	(.07)	(.06)	
Third quartile or equivalent				
Whites	.28	.25	.53	25
	(.03)	(.03)	(.03)	
Blacks	.30	.22	.51	17
	(.04)	(.04)	(.05)	
Hispanics	.27	.28	.55	22
	(.04)	(.05)	(.05)	

(Table continues)

TABLE 5–2 (continued)

Group	Type of School: Four-year	Two-year	Both	% of Total Group
Fourth quartile or equivalent				
Whites	.27 (.03)	.25 (.03)	.52 (.03)	25
Blacks	.25 (.02)	.22 (.02)	.47 (.02)	70
Hispanics	.19 (.03)	.30 (.02)	.49 (.03)	54
Families with equal white-family income[a]				
Blacks	.36 (.04)	.23 (.03)	.59 (.04)	100
Hispanics	.30 (.05)	.28 (.04)	.58 (.05)	100

NOTE: Standard errors of the means are in parentheses.
a. The proportion of blacks and Hispanics who would attend college if their family-income distributions were equated to the white distribution with the proportions shown.
SOURCE: National Longitudinal Survey of Youth.

For all race groups, the chance of attending a four-year college rises with family income. All groups are about equally sensitive to income differences. Hispanics have the lowest rate of four-year college attendance in the top quartile and the lowest overall. The gap in four-year attendance rates for Hispanics in the top and bottom quartiles is twenty percentage points. The gap for blacks is seventeen percentage points and twenty-one percentage points for whites. Two-year attendance shows no definite pattern. Moving up the family-income scale, more children enter college, but there appears to be substitution from two-year to four-year colleges as family income increases.

An interesting counterfactual question is how the white-minority gap would differ if blacks and Hispanics had the same family-income distribution as whites. The answer to this question is given in the last two rows of the table,[24] which show the fraction of blacks and Hispanics going to college when family-income distributions are equated to the white distribution. Comparing the data with the actual total enrollment rates shows that, for blacks, nine percentage points of the eleven percentage point gap in total college entry is made up by equalizing

24. This exercise amounts to a simple averaging of the numbers in columns 1–3 of the first through fourth quartiles with the appropriate weights.

family income. For Hispanics, all but three percentage points of the college attendance gap is explained. Hence, these numbers reveal that family income is an important factor for both Hispanics and blacks in determining both college entry and type of college attended.

Table 5–3 summarizes the differences in family background, ability, labor market characteristics, location, and tuition costs among blacks, whites, and Hispanics. Some differences arise from the different geographical distributions of these groups. Family background differences favor whites. Minorities live in geographical areas with lower tuition costs and lower commuting costs. Features of local labor markets tend to be neutral across race groups. Measures of scholastic ability are largest for whites, intermediate for Hispanics, and lowest for blacks. These univariate relationships indicate that tuition costs play a small role in accounting for racial and ethnic differences and that scholastic ability plays a much more substantial role. Appendix B provides a more extensive discussion of these univariate differences. We now summarize a multivariate analysis of the data that confirms the initial impressions obtained from the univariate analyses.

A Life Cycle Analysis. In Cameron and Heckman (1998b), we extend the univariate analysis of the preceding subsection to estimate the contribution of family income, family background, scholastic ability, tuition costs, and opportunities in unskilled labor to schooling attainment by grade for white, black, and Hispanic males. College attendance is analyzed as a sequence of grade-by-grade decisions made at each age about staying in school. Our econometric procedure adjusts for the effects of differential survival of the most able and the most motivated and avoids the bias that plagues previous studies of educational attainment that do not adjust for the differential compositions of samples in terms of the distributions of the unobservables among groups across the various grade transitions (see the methodological discussion in Cameron and Heckman [1998a,b]). From our estimates, it is possible to determine where in the life cycle of schooling ethnic and racial gaps appear and what factors contribute most to creating them.

This section uses the estimates presented in our companion paper to address two questions. First, which variables have the most influence on schooling attainment? Second, is the estimated influence of family income on college attendance a consequence of long-run family effects or short-term borrowing constraints?

We answer the first question, variable by variable, by equating the distribution of the characteristics for blacks, Hispanics, and whites while holding the distribution of the other characteristics at their sample levels and measuring how high school graduation and college en-

TABLE 5–3
MEAN CHARACTERISTICS BY RACE GROUP

	Whites	*Blacks*	*Hispanics*
Number of siblings[a]	2.9	4.7	4.5
	(0.05)	(0.09)	(0.12)
Highest grade, father	12.2	9.3	7.9
	(0.08)	(0.09)	(0.17)
Highest grade, mother	11.9	10.7	7.8
	(0.06)	(0.08)	(0.16)
Family income/1,000	44.8	25.4	30.3
	(0.06)	(0.05)	(0.07)
Broken home	0.13	0.43	0.27
	(0.01)	(0.02)	(0.02)
Urban resident, age 14	0.73	0.82	0.93
	(0.01)	(0.01)	(0.01)
Southern resident, age 14	0.28	0.57	0.26
	(0.01)	(0.02)	(0.02)
County annual average wage/1,000 at age 18[b]	20.1	21.0	22.3
	(0.32)	(0.12)	(0.15)
County unemployment rate at age 18	6.3	6.0	6.9
	(0.12)	(0.12)	(0.16)
Four-year-state-college average tuition at age 18[b]	1,850	1,705	1,528
	(13.6)	(17.3)	(14.3)
Two-year-state-college average tuition at age 18[b]	888	798	580
	(8.9)	(10.6)	(17.0)
Two-year-county-college average tuition at age 18[b]	833	780	572
	(11.2)	(12.5)	(21.4)
Four-year-college Pell grant[b]	548	1,260	1,315
	(12.1)	(27.5)	(22.8)
College proximity	0.82	0.89	0.92
	(.01)	(.10)	(.01)
AFQT score	71.8	46.4	54.4
	(.62)	(1.1)	(1.9)

NOTE: Definitions of variables used in the schooling-transition analysis follow. Number of siblings: Number of living siblings. Family income: A two-year average of total family income measured between ages 14 and 18. Includes all components of income including public assistance, gift income in 1994 dollars. Highest grade, father: Highest grade completed in years by father when respondent was 14. Highest grade, mother: Highest grade completed in years by mother when respondent was 14. Broken home: Absence of one or both parents from the respondent's household at age 14. South, age 14: Whether the respondent lived in the southern census region at age 14. Urban, age 14: Whether the respondent lived in an urban area at age 14. County average annual earnings: The average annual earnings per job in the county of residence as measured by earnings in low-skill industries (retail and wholesale trade, services, and so forth). Measured annually at all ages. County unemployment rate: Annual unemployment rate in county of residence. Measured annually at all ages. College tuition: Two-year or four-year public college tuition for in-state students in the individual's county (if available) or state of residence in 1994 dollars. Measured annually at all ages. Pell grant award: Imputed amount of Pell grant award for both two- and four-year public institutions in the county or state in 1994 dollars. AFQT score: Score on the Armed Forces Qualification Test. Adjusted for age at time-of-test. College proximity: Whether any public two- or four-year school operates in the county of residence. Measured at all ages and broken out by two- or four-year type. Standard errors of the means are in parentheses.

a. The large number of siblings is a consequence of size-biased sampling in the NLSY.

b. Reported in 1994 dollars. Tuition figures are for in-state students at public institutions.

SOURCE: NLSY, 1979–1989.

rollment respond.[25] We address the second question by comparing the estimated effects of family background and family resources on schooling when scholastic ability (the Armed Forces Qualification Test) is included as an explanatory variable and when it is not. We interpret AFQT as the outcome of long-term family and environmental factors produced in part from the long-term permanent income of families. To the extent that the influence of family income measured at a point in time is diminished by the inclusion of AFQT, we can conclude that long-run family factors crystallized in AFQT scores are the driving force behind schooling attainment, and not short-term credit constraints.

Previous analysts have mostly concentrated on the determinants of highest grade completed or college attendance among high school graduates. Our research recognizes that schooling attainment at any age is the outcome of previous schooling choices. The probability that a person enters college depends on high school graduation, which in turn depends on finishing grade eleven and so forth, back to the earliest schooling decisions. Researchers who have studied how family factors affect the highest grade of schooling completed cannot distinguish the influence of family income on the high school attendance decision from its effect on college entry. Family factors and other influences may affect schooling decisions differentially by age and grade level.

To sort out the influence of family income on college entry from its accumulated long-term influence, conventional methods in the educational attainment literature used by Hauser and Kane are inadequate. Our methodology enables us to separate out age-by-age influences in a general way. By analyzing the entire set of age-specific schooling decisions from age fifteen through age twenty-four, we are able to parcel out by age the influences of family income and other variables. Using our estimated econometric model, we can then evaluate the consequences of policies that seek to promote college attendance through raising high school graduation. We summarize our

25. Table 5–2 addressed a counterfactual question of this sort by looking at differences in college attendance across income quartiles. The same method can, in principle, be used more generally. It becomes unwieldy, however, in samples of the size at our disposal, and we use an econometric model based on the estimates reported in Cameron and Heckman (1998b). We use that parametric model to isolate behavioral responses to variables, and we equate the distribution of characteristics by equating means of the distribution, assuming that the variances and covariances of the regressors remain unchanged. Explorations with alternative equating schemes produce similar estimates. For the sake of brevity, we report simulations from the simplest procedures. We elaborate on this procedure below.

evidence and refer the interested reader to our papers for methodological details.[26]

Effects of Family Income, Family Background, and Other Variables. Table 5–4 presents evidence on the two questions posed in the preceding section. It analyzes the sources of schooling differences between whites and minorities by decomposing the gap in educational attainment at different stages of the life cycle into the contributions of the main explanatory variables. It also presents evidence on the robustness of family income and other family factors when AFQT is included as an explanatory variable. Because racial and ethnic groups may vary in their sensitivity to differences in family income or tuition policies, the predictions of schooling attainment displayed in the table are based on estimates of the econometric model that are made separately for each racial-ethnic group.

Panel A of table 5–4 presents counterfactual simulation results for completing ninth grade by age fifteen, the initial condition (or first schooling attainment state) for our model. Panel B presents counterfactual simulation results for completing high school (by graduation or exam certification). Panel C presents counterfactual simulation results for entry into college conditional on completing high school. Panel D presents counterfactual simulation results for entering college *not* conditioning on high school attainment. This final simulation measures the net effects of background on college entry operating through schooling completion at all prior stages and is the central focus of this chapter. The last row in each panel shows the actual white-minority gap in attainment at the stage being analyzed. In all cases, it is close to the gap predicted from the model.

Rows 1–8 present the changes in the schooling gaps when the variable named in the left-hand column is adjusted to the white level while holding the other variables fixed at sample values. The number in column 1 and row 1 of panel A, for example, shows that if the four components of family background listed in rows 1a through 1d are adjusted for blacks to white levels, then the black rate of completing

26. Two other problems that past researchers have generally ignored are also solved in our framework. First is the issue of time-varying explanatory variables, such as indicators of the state of the labor market. Previous frameworks are fundamentally atemporal and accommodate variables that change over time only in arbitrary ways. Second, we control for unobserved characteristics. Our framework builds on the work of Cameron and Heckman 1998a: serious biases in the estimated effects of family income on schooling arise when unobserved variables are not accounted for.

TABLE 5–4

CHANGES IN THE WHITE-MINORITY SCHOOLING GAP WITH MINORITY VARIABLES EQUATED TO WHITE LEVELS

	Without AFQT Score		*With AFQT Score*	
	Blacks	Hispanics	Blacks	Hispanics
A. Probability of being in grade 9 or higher at age 15				
Equating all family background components (1)	.07 (.021)[a]	.08 (.022)[a]	.03 (.022)	.02 (.021)
Individual components				
Number of siblings (1a)	.03 (.009)[a]	.03 (.012)[a]	.02 (.010)[a]	.01 (.013)
Highest grade of father (1b)	.04 (.021)[a]	−.01 (.028)	.01 (.022)	−.03 (.029)
Highest grade of mother (1c)	.01 (.005)[a]	.06 (.021)[a]	.00 (.007)	.04 (.023)[a]
Broken home (1d)	−.02 (.010)	−.003 (.006)	.001 (.010)	.003 (.007)
Equating family income (2)	.09 (.021)[a]	.12 (.021)[a]	.08 (.027)[a]	.04 (.020)[a]
Equating local average wages (3)	−.001 (.002)	.01 (.005)[a]	−.002 (.002)	.008 (.004)[a]
Equating tuition and college proximity (4)	−.01 (.005)[a]	−.02 (.008)[a]	−.02 (.006)[a]	−.02 (.009)[a]
Equating AFQT scores (5)	na	na	.16 (.034)[a]	.17 (.027)[a]
Equating 1 and 2 (6)	.14 (.023)[a]	.18 (.030)[a]	.10 (.025)[a]	.06 (.028)[a]
Equating 1, 2, 3, and 4 (7)	.13 (.021)[a]	.17 (.021)[a]	.08 (.023)[a]	.05 (.027)[a]
Equating 1, 2, 3, 4, and 5 (8)	na	na	.21 (.027)[a]	.20 (.026)[a]
Gap between whites and minorities (9)	.16	.21	.16	.21
B. Probability of high school completion at age 24, high school graduation and GED attainment combined				
Equating all family background components (1)	.06 (.014)[a]	.05 (.021)[a]	.03 (.015)[a]	−.01 (.024)
Individual components (1)				
Number of siblings (1a)	.02 (.007)[a]	.03 (.010)[a]	.01 (.007)[a]	.01 (.010)
Highest grade of father (1b)	.03 (.015)[a]	−.01 (.032)	.02 (.016)	−.04 (.029)[a]
Highest grade of mother (1c)	.01 (.005)	.03 (.020)	−.002 (.005)	.02 (.022)
Broken home (1d)	.01 (.008)	−.005 (.006)	.007 (.007)	−.001 (.005)
Equating family income (2)	.07 (.016)[a]	.08 (.018)[a]	.05 (.018)[a]	.01 (.019)

(Table continues)

TABLE 5–4 (continued)

	Without AFQT Score		*With AFQT Score*	
	Blacks	Hispanics	Blacks	Hispanics
Equating local average wages (3)	.01 (.004)[a]	.01 (.010)	.008 (.004)[a]	.01 (.010)
Equating tuition and college proximity (4)	−.004 (.003)	.006 (.009)	−.007 (.002)[a]	.007 (.008)
Equating AFQT scores (5)	na	na	.11 (.019)[a]	.16 (.019)[a]
Equating 1 and 2 (6)	.12 (.013)	.12 (.021)[a]	.06 (.016)[a]	.002 (.026)
Equating 1, 2, 3, and 4 (7)	.12 (.013)	.13 (.023)[a]	.06 (.017)[a]	.008 (.030)
Equating 1, 2, 3, 4, and 5 (8)	na	na	.15 (.014)[a]	.16 (.026)[a]
Gap between whites and minorities (9)	.08	.14	.08	.14
C. College-entry probabilities at age 24, conditional on high school completion				
Equating all family background components (1)	.10 (.027)[a]	.11 (.026)[a]	.08 (.021)[a]	.05 (.014)[a]
Individual components				
Number of siblings (1a)	.03 (.012)[a]	.03 (.012)[a]	.02 (.011)[a]	.01 (.009)
Highest grade of father (1b)	.08 (.028)[a]	.03 (.032)	.06 (.020)[a]	.02 (.029)
Highest grade of mother (1c)	.003 (.008)	.05 (.025)[a]	−.005 (.006)	.02 (.022)
Broken home (1d)	−.01 (.011)	.01 (.009)	−.002 (.009)	.01 (.008)[a]
Equating family income (2)	.05 (.023)[a]	.03 (.013)[a]	.004 (.020)	−.02 (.019)
Equating local average wages (3)	.004 (.006)	.04 (.013)[a]	.002 (.003)	.03 (.012)[a]
Equating tuition and college proximity (4)	−.03 (.006)[a]	−.05 (.016)[a]	−.02 (.004)[a]	−.05 (.016)[a]
Equating AFQT scores (5)	na	na	.15 (.028)[a]	.12 (.022)[a]
Equating 1 and 2 (6)	.14 (.027)[a]	.13 (.023)[a]	.08 (.027)[a]	.03 (.023)
Equating 1, 2, 3, and 4 (7)	.12 (.029)[a]	.12 (.030)[a]	.06 (.028)[a]	.01 (.030)
Equating 1, 2, 3, 4, and 5 (8)	na	na	.21 (.029)[a]	.13 (.030)[a]
Gap between whites and minorities (9)	.11	.07	.11	.07
D. College-entry probabilities at age 24, unconditional on high school graduation				
Equating all family background components (1)	.13 (.027)[a]	.11 (.026)[a]	.07 (.022)[a]	.03 (.026)

(Table continues)

TABLE 5–4 (continued)

	Without AFQT Score		*With AFQT Score*	
	Blacks	Hispanics	Blacks	Hispanics
Individual components				
Number of siblings (1a)	.04 (.011)[a]	.04 (.013)[a]	.02 (.010)[a]	.01 (.012)
Highest grade of father (1b)	.09 (.026)[a]	.017 (.021)	.06 (.020)[a]	−.01 (.026)
Highest grade of mother (1c)	.005 (.008)	.055 (.028)[a]	−.005 (.006)	.02 (.023)
Broken home (1d)	−.004 (.011)	−.009 (.007)	.003 (.010)	.01 (.007)
Equating family income (2)	.08 (.023)[a]	.06 (.210)[a]	.03 (.022)	−.007 (.018)
Equating local average wages (3)	.008 (.004)[a]	.03 (.013)[a]	.003 (.005)	.02 (.013)
Equating tuition and college proximity (4)	−.03 (.006)[a]	−.03 (.015)[a]	−.02 (.005)[a]	−.04 (.013)[a]
Equating AFQT scores (5)	na	na	.18 (.029)[a]	.19 (.023)[a]
Equating 1 through 2 (6)	.19 (.027)[a]	.17 (.030)[a]	.11 (.028)[a]	.03 (.028)[a]
Equating 1 through 4 (7)	.16 (.029)[a]	.17 (.032)[a]	.09 (.029)[a]	.01 (.030)
Equating 1 through 5 (8)	na	na	.27 (.033)[a]	.21 (.035)[a]
Gap between whites and minorities (9)	.12	.14	.12	.14

NOTE: The simulations were calculated by shifting the mean of the explanatory variables for minorities to the mean of the variables for whites. For example, the number in row 2 of panel D represents the rise in college entry if each black family were given an income transfer equal to the mean difference in black and white family incomes. Standard errors are in parentheses.

a. Significant at the 10 percent level.

SOURCE: Cameron and Heckman (1998b), based on NLSY data 1979–1989.

ninth grade rises by seven percentage points. In adjusting for these factors, blacks would have a ninth-grade completion rate at age fifteen, only nine percentage points lower than the white rate rather than the sixteen percentage point gap actually found in the data.[27] Rows 1a–1d show the change in the gap when the individual components of family background are equated (see table 5–3 for definitions and group means). Row 2 shows the change when minority family income is adjusted to white levels, and row 3 displays the same change when county average wages are equalized. Next, row 4 shows the effect of adjusting tuition and college proximity, and row 5 shows the effect of equalizing ability. Finally, rows 6–8 show combined effects of various incremental simulations. Columns 1 and 2 show the predicted gap between whites and blacks and whites and Hispanics, respectively. Columns 3 and 4 report the corresponding calculations when the AFQT score is included in the set of explanatory variables to proxy long-term family and environmental influences.

From columns 1 and 2 in each panel, we reach several important conclusions. First, row 2 shows that adjusting for family income alone reduces the white-minority gaps in high school completion substantially and some gap in college entry. This confirms the univariate analysis of the preceding subsection. For high school completion, the white-black gap would completely vanish as would most of the white-Hispanic gap (compare rows 2 and 9). A similar conclusion holds for college entry (panel D), though the effect is not quite as dramatic. Adjusting family income raises black and Hispanic college enrollment eight and six percentage points, respectively. The actual gaps are twelve and fourteen, respectively.

Before concluding that family income is the whole story or even the main story in explaining minority-white schooling differences, it is important to notice rows 1a–1d, which show that long-term family background differences play a more powerful role than family income

27. In these simulations, only the means of the variables are equated between the two groups. Consider the adjustment for sibling size. This is accomplished by finding the difference in the mean number of siblings between blacks and whites (see table 5–3 for exact values) and then forming predicted black high school completion probabilities after subtracting that difference from each black person in the sample. Thus, the rise in black schooling due to a decrease in the number of siblings (family size) is reported in the table. Because these models are nonlinear, there are other ways of making these simulations, such as using the marginal distributions of white attributes but preserving the original covariance structure. These more elaborate methods have little impact on the simulations. We report the simplest and most easily replicable results.

in explaining minority-majority differences in grade attainment, especially for the transition to college among high school graduates (panel C) and for total college entry (panel D). The effects of equating family background (holding family income and other explanatory variables constant) are particularly strong for attending college (panel D). For blacks and Hispanics, they explain, respectively, thirteen and eleven percentage points of the twelve and fourteen percentage point gaps.[28] For both college enrollment measures, adjusting for family background and family income (row 6) more than explains the minority-majority gaps. Such adjustments nearly explain the high school gap. Family background and income are the main determinants of all four attainment statuses that we study. Other variables explain little of the white-minority schooling gaps.

Local labor market variables representing the opportunities available to persons with little education are statistically significant in our estimated model but play only a modest role in explaining schooling continuation decisions. They contribute little to explaining white-minority differences (row 3). The reason is that average differences in local labor market conditions among the groups are small (see the means in table 5–3).

Equating tuition and college proximity (row 4) *increases* the white-minority gap for college entry (both unconditional and for high school graduates) and high school completion although the effects are only substantial for college entry.[29] The reason, as revealed by the means in table 5–3, is that blacks and Hispanics face lower average tuition and have more geographic proximity to college than whites. Equating minority to white levels *lowers* college participation for blacks and Hispanics.

Columns 3 and 4 repeat the same simulation exercises when scholastic ability as measured by AFQT is included as an explanatory variable. Comparing the family income and background effects in row 2 when AFQT is in the model (columns 3 and 4) and when it is not demonstrates that the effects of family income for high school comple-

28. These adjustments exclude AFQT scores.

29. College tuition and proximity were included in the explanatory variables for high school completion because college entry may be a primary motivator of high school graduation. Thus, higher college costs could lead to lower high school graduation rates. In our joint work, we find little evidence for such an effect. Both tuition and proximity variables are small in magnitude and statistical significance for all groups. For college entry, by contrast, both college tuition and proximity are statistically significant and numerically important for all race groups, though adjustment widens the white-minority gap slightly.

tion, college attendance given completion, and college attendance are substantially weakened by the inclusion of AFQT scores. The change is most dramatic for Hispanics. For this group, estimated family income effects essentially vanish. They are greatly weakened for blacks. Similar effects appear in a less dramatic fashion when family background variables and income are included in the model rather than the more controversial AFQT variable (see row 6). Introducing AFQT into the model also weakens the estimated effect of family income on grade attainment at age fifteen, but the income effects at earlier transitions remain. If family income is interpreted as a measure of short-term credit constraints, it is the constraints *before* the transition to college that play a more powerful role.

Equating family background and income raises Hispanic high school completion and college entry by 12 and 17 percentage points, respectively, when AFQT is not included in the schooling model (see panels B and D). The corresponding reductions in the gaps attributable to these variables when AFQT is included are only 0.2 and 0.03 percentage points, respectively. If minority AFQT alone were adjusted to white levels, then college entry would rise by 18 percentage points for blacks and 19 percentage points for Hispanics (row 5, columns 3 and 4) (see panel D). The college-entry effects from adjusting AFQT for high school completers are 15 and 12 percentage points. There are also strong effects of introducing AFQT on diminishing the role of family income in explaining racial and ethnic gaps in college attendance among high school graduates (see panel C). Regardless of income and family background, at the same AFQT level, blacks and Hispanics enter college at rates that are substantially *higher* than the white rate. The effects of AFQT on predicting high school completion are also dramatic.

The role of AFQT in explaining racial and ethnic schooling differences is important.[30] It is long-run factors that promote scholastic ability that explain most of the measured gaps in college enrollment and not the short-run credit constraints that receive most of the attention

30. One problem with the AFQT score in these data is that the test was taken in 1980, while the sample was still of high school age. Thus, because AFQT is both a cause and a consequence of schooling, causal statements are difficult. Cameron and Heckman 1998a addresses this problem econometrically and finds little difference in the estimated results when account is taken of the endogeneity. For college-entry decisions, however, the test was taken before virtually all of the sample had reached the age of college entry, so the causal influence of this variable is more clear-cut. Our sample is for persons thirteen to sixteen when they took the AFQT test so none entered college and few graduated from high school. AFQT measures we use are age adjusted.

TABLE 5–5
EFFECTS OF $10,000 INCREASE IN FAMILY INCOME ON COLLEGE ENTRY OF HIGH SCHOOL GRADUATES AND GED HOLDERS BY TYPE OF COLLEGE FIRST ATTENDED

	Whites	*Blacks*	*Hispanics*
A. Combined two- and four-year college effect			
Excluding AFQT	.018[a]	.032[a]	.016[a]
	(.006)	(.012)	(.008)
Including AFQT	.008	.005	−.012
	(.006)	(.012)	(.013)
B. Two-year and four-year effects excluding AFQT			
Two-year college	−.002	.008	.005
	(.005)	(.008)	(.005)
Four-year college	.020[a]	.024[a]	.011[a]
	(.005)	(.008)	(.004)
C. Two-year and four-year effects including AFQT			
Two-year college	−.003	−.002	−.008
	(.005)	(.008)	(.007)
Four-year college	.010[a]	.007	−.004
	(.005)	(.008)	(.010)

NOTE: Standard errors are in parentheses.
a. Significant at the 10 percent level.
SOURCE: Cameron and Heckman (1998b); NLSY 1979–1989.

in popular public discussion. If short-term family income plays any role at all, it is in high school dropout decisions.

Table 5–5 states the major findings just reported in a different way. Rather than showing how schooling gaps change in response to adjustments in the explanatory variables, it shows the predicted change in schooling attainment in response to a substantial $10,000 rise in family income on college entry for each racial-ethnic group, both with and without AFQT included in the estimating equations.[31] Comparing rows 1 and 2 of panel A shows that family-income effects of college enrollment are reduced to about one-third of their size when AFQT is

31. These results do not condition on high school graduation and include the effect of family income on increasing educational attainment at all ages.

included in the model. (Similar results are found for the college enrollment effect not conditioning on high school graduation.)

Panels B and C of the table make an additional point. Even when AFQT is not included among the explanatory variables, family income is only a trivial determinant of two-year college entry.[32] Thus, comparing rows 3 and 4 of the table reveals that the measured effect of family income is largely due to its effect on four-year entry and not to its effect on two-year college entry. Including AFQT among the explanatory variables (panel C) does not reverse this conclusion; it only weakens the estimated effect of family income on four-year college entry. This evidence reveals that, controlling for ability, the estimated relationship between income and college entry is mainly a relationship between income and entry into four-year college. There is virtually no effect of changes in family income on enrollment into two-year schools.

The Effects of College Tuition. We next use our estimates to examine how tuition levels and Pell grants affect two- and four-year enrollments. Table 5–6 shows the effects of a $1,000 increase in tuition on college-entry probabilities. To be consistent with the received literature, these simulations are performed only for high school graduates.[33] A baseline set of estimates for each race group is shown in row 1. The estimates are for entry at two- and four-year colleges combined. The effects for whites, blacks, and Hispanics are shown in columns 1, 2, and 3, respectively. These estimates are close to the median estimate (after an inflation-adjustment) presented by Leslie and Brinkman (1986) in their survey of more than twenty studies of the effects of tuition on college enrollment.[34]

32. Differential tuition costs between two- and four-year schools along with the other variables mentioned above are held constant in these simulations.

33. The table shows how high school graduates would respond to changes in tuition policy. As noted, college tuition has a negligible influence on secondary school completion choices. The results for college entry not conditioning on high school graduation are similar to the estimates reported in the text and, for the sake of brevity, are not reported.

34. In results presented in Cameron and Heckman (1998b), we check the robustness of the baseline estimates. State tuition levels may be correlated with unobserved differences in state-specific factors that explain enrollment due to budget constraints or political pressure by interest groups. Ideally, one would like to control for state effects and tuition effects in the same analysis. Given the limited variation in the state tuition policies over our sample period, we cannot effect such controls. As an alternative, we use controls for region. The addition of dummy variables indicating region reduces the estimated effects by 20–30 percent.

TABLE 5–6

EFFECTS OF $1,000 INCREASE IN GROSS TUITION ON COLLEGE-ENTRY PROBABILITIES OF HIGH SCHOOL GRADUATES AND GED HOLDERS BY FAMILY-INCOME QUARTILE AND BY AFQT QUARTILE

	Whites	*Blacks*	*Hispanics*
A. Gross tuition effects[a]			
No explanatory variables except tuition in the model	−.17	−.10	−.10
Baseline specification (see note at table base, includes family income, background, and so forth)	−.06	−.04	−.06
Adding AFQT to the row 2 specification	−.05	−.03	−.06
B. Family-income quartiles (baseline)			
Top quartile	−.04	−.01	−.04
Second quartile	−.06	−.03	−.05
Third quartile	−.07	−.07	−.08
Bottom quartile	−.06	−.05	−.08
Joint test of equal effects across quartiles (*P*-values)	.49	.23	.66
C. Family-income quartiles (baseline plus AFQT)			
Top quartile	−.02	−.02	−.02
Second quartile	−.06	.00	−.05
Third quartile	−.07	−.05	−.09
Bottom quartile	−.04	−.04	−.07
Joint test of equal effects across quartiles (*P*-values)	.34	.45	.49
D. AFQT quartiles (AFQT plus tuition-AFQT interaction terms)			
Top quartile	−.03	−.02	−.03
Second quartile	−.06	−.01	−.05
Third quartile	−.06	−.03	−.07
Bottom quartile	−.05	−.03	−.05
Joint test of equal effects across quartiles (*P*-values)	.60	.84	.68

NOTES: These simulations assume both two-year and four-year college tuition increase by $1,000 for the population of high school completers. The baseline specification used in row 2 and rows 4–7 includes controls for family background, family income, average wages in the local labor market, tuition at local colleges, controls for urban and southern residence, tuition–family income interactions, estimated Pell grant award eligibility, and dummy variables, that indicate the proximity of two- and four-year colleges. Definitions of the variables are located in table 5–3. The panel D specification adds AFQT and an AFQT-tuition interaction to the baseline specification.

a. Gross tuition is the nominal sticker-price of college and excludes scholarship and loan support.

SOURCE: Cameron and Heckman (1998b); NLSY data, 1979–1989.

Including family background variables (as defined in tables 5–3 and 5–7) greatly diminishes the estimated effect of tuition on schooling. Adding AFQT further weakens the estimated effect. Nonetheless, the effects of tuition on enrollment are substantial, even with AFQT controlled. Given the pattern of a smaller black response to tuition, however, recent tuition increases *reduce* black-white differences in college enrollment. The more negative estimates for Hispanics account for only a small component of the difference between Hispanic and white college enrollment rates. Cameron and Heckman (1998b) report that the estimated effect of the tuition increase operates through its effect on attendance at community colleges. There is essentially no effect of college tuition increases on enrollment in four-year schools.

Panel B shows how estimated responses to tuition vary by family income quartile.[35] For each demographic group, the top quartile is much less responsive to tuition increases than are the other quartiles although these effects are never statistically significantly different from the tuition effects for other quartiles for each demographic group using conventional significance levels. Such differences in response to tuition by income class have been noted in the literature (Kane in this volume) and have been interpreted as evidence that low-income persons are more responsive to tuition because of borrowing constraints. One cannot, however, reject the hypothesis that the tuition coefficients are the same across income classes for each demographic group. With ability controlled, the estimated effects of tuition on enrollment diminish, especially for blacks (see the estimates reported in panel C). Again, one cannot reject the null of equality of the coefficients on tuition across income quartiles. Panel D reports the response to the tuition increase across AFQT quartiles. For all demographic groups, one cannot reject the hypothesis of equality of the estimated effects of tuition on first enrollment into college.

Table 5–7 tests one commonly stated version of the credit-constraint hypothesis. It postulates that if students are severely credit constrained and family income limits their attendance, a $1,000 rise in tuition should have equal and opposite effects on schooling decisions as a $1,000 rise in family income. The estimated effects of family income on schooling are an order of magnitude smaller than the estimated effects of tuition when AFQT is excluded from the model. When AFQT is included, estimated family-income effects decline further by a factor of three–four while estimated tuition effects are barely affected. When AFQT is excluded, for whites and Hispanics one can decisively reject the hypothesis of equality of the effects at conventional significance levels. For blacks, the hypothesis is rejected at the 10 percent level. When AFQT is included, the estimated family-income effects become so imprecisely determined that one cannot reject the hypothesis of equality although the point estimates are dramatically different. The estimated income effects are numerically small. The key result driving this inference is that family-income effects are not statistically significantly different from zero. Tuition and family income play fundamentally different roles in college attendance decisions. This evidence is consistent with the absence of credit constraints.

35. These numbers are calculated from a model that included income-tuition interaction terms.

TABLE 5–7
P-VALUES OF CHI-SQUARE TEST OF EQUAL MAGNITUDE OF $1,000 RISE IN TUITION AND $1,000 RISE IN FAMILY INCOME

	Whites	*Blacks*	*Hispanics*
Excluding AFQT			
$1,000 rise in family income	.0028	.0035	.0026
	(.0009)	(.0012)	(.0011)
$1,000 rise in tuition	−.06	−.04	−.06
	(.02)	(.02)	(.03)
P-values of equality test	.02	.08	.03
Including AFQT			
$1,000 rise in family income	.0009	.0008	−.001
	(.007)	(.002)	(.001)
$1,000 rise in tuition	−.05	−.03	−.06
	(.02)	(.02)	(.04)
P-values of equality test	.07	.18	.08

NOTE: Standard errors of estimates in parentheses.
SOURCE: Cameron and Heckman (1998b); NLSY, 1979–1989.

Cameron and Heckman 1998b also examines the effect of changes in Pell grant schedules on enrollment in college. Our analysis and the analyses of other researchers (see chapter 4) find little evidence of changes in estimated Pell grant benefits on enrollment in college. A $1,000 increase in Pell grant entitlements produces less than a 1 percent increase in enrollments as opposed to about a 6–8 percent response from a comparable change in tuition. Pell grants should offset tuition costs for low-income people and should have effects of equal but opposite magnitude on college enrollment.

Orfield (1992) and Kane (this volume) postulate that poor people

may not have reliable information about their own Pell grant eligibility. This can account for the disparity in response to tuition rates and potential scholarship rates. Heckman, Smith, and Wittekind (1997) show that, among persons eligible for the Job Training Partnership Act program targeted toward the poor, the poorest and least educated are less likely to be aware of Pell grants. Thus, family background factors play a substantial role in making prospective students aware of their Pell grant benefits. It seems unlikely, however, that the magnitude of this informational deficit can explain the estimated 8 to 1 discrepancy in the estimated price effects. It does not seem plausible that children of poor persons who have persevered through high school would be unaware of their eligibility for grants and loans. It seems more likely that able and college-ready students are aware of their eligibility for grants and act on the information. Indeed, Heckman, Smith, and Wittekind find that low-income high school graduates are much more aware of their eligibility for Pell grant programs than are high school dropouts, and their awareness rate is about 60 percent. This high level of reported awareness makes it unlikely that the Orfield explanation is the whole story or even the main story for why the response rate to Pell grants is so low compared with the response to tuition.[36]

Supporting Evidence from Other Studies

Shea's (1996) analysis provides mild support for our analysis. He argues that, to identify the contribution of credit constraints to schooling choice, one needs to look at how unexpected changes in family income influence educational attainment and hence the earnings of children. Using the Panel Study of Income Dynamics data, he estimates the correlation between children's income and variations in the father's labor income due to predictable and unpredictable components. (An instance of the latter is job loss through plant shutdown; an instance of the former is the father's education.) Shea finds that predictable components of family income are positively correlated with the child's income, but components of family income due to "luck" are uncorrelated with the child's income. He finds no evidence that increases in

36. The log odds ratio of a high school graduate with no college education being aware of the Pell grant program is twice as great as the log odds ratio for a high school dropout. The Orfield argument might be salvaged by claiming that persons who were unaware of Pell grants in high school failed to graduate because they were unaware of the grants.

unpredictable components affect children's income, and hence he finds no evidence in support of credit constraints.[37]

Other, though indirect, evidence is provided by Altonji and Dunn (1996). If short-term credit constraints do not hinder college entry and access to credit markets is available to everyone, there should be no relation between the returns to education and family income, provided consumption motives for schooling are unimportant. Once a student graduates from high school, he should invest until the return from another dollar spent on education is the same as the return on physical assets. Altonji and Dunn find that rates of return are more or less constant across individuals and do not vary systematically by family income.[38] Thus, their evidence supports evidence reported in table 5–4 that short-run credit market constraints are not a significant determinant of schooling and college choices.

The research of Duncan, Brooks-Gunn, Yeung, and Smith (1998) supports our general argument. Using data from the Panel Survey of Income Dynamics, they report that completed schooling (and other measures of child well-being) are much more strongly related to family income in early childhood than to income at later years.

Another piece of evidence comes from Cameron and Heckman (1998a), who analyze the determinants of grade-by-grade schooling attainment for five cohorts of American males. While policy makers and economists have focused on the measured effects of family income on college entry, Cameron and Heckman find that family-income and family background factors are powerful determinants of choices at all stages of the schooling process, from the decision to complete elementary school through entry into graduate school. There is a stable behavioral relationship between family background and schooling continuation across all levels of schooling, from elementary school through entry into graduate school. When, however, they condition on AFQT, the effect of family income on college attendance declines and becomes numerically smaller and statistically insignificant. Analysts who have studied only the relationship between college choice and family income have ignored the fact that family income and other measures of family background, such as parental education, are also strong

37. A major problem with Shea's analysis is that he does not justify which components of family income are predictable and which are not. In addition, he does not separate the effects of luck on younger children from the effects on older children. His evidence suggests that unexpected lottery winnings would have no effect on schooling choices regardless of their time of arrival.

38. If there were a strong consumption motive for education, the rate of return to schooling should be lower for children from higher-income families.

determinants of decisions to complete the ninth grade and to attend and graduate from high school where tuition costs are effectively zero. No appeal to borrowing constraints is required to explain the relationship between family income and college attendance decisions.

The importance of family background in determining educational choices is found in other policy environments and other countries as well. The collection of papers in Blossfeld and Shavit (1993) studies data from a variety of countries in different stages of political and economic development with profoundly different institutional organizations for education. They document roughly the same basic pattern found in the U.S. data: family background and family income are important determinants of schooling choices from the earliest grade levels to the highest, regardless of whether college tuition costs paid by students are large or small.

General Equilibrium Effects

Thus far we followed the tradition in the educational policy literature and have ignored the effects of tuition change instituted by a national policy. In response to a nationally instituted tuition policy, more persons enroll in college, and the price of skills declines as college-educated labor becomes less scarce. If prospective students anticipate this labor market adjustment and respond appropriately and if the effects of taxes raised to finance such a policy are accounted for using an approximation to the current U.S. tax system, the estimated effects of tuition on college enrollment are considerably diminished.

Heckman, Lochner, and Taber (1998a, b) develop an overlapping-generations model of skill formation with heterogeneous agents that extends the analysis of Auerbach and Kotlikoff by including two skills that are chosen by agents who differ in ability. When a revenue-neutral tuition subsidy is simulated with their model, they find that the general equilibrium tuition elasticity is about *ten times* smaller than what is estimated with the standard cross-sectional methodology described by Kane in his contribution to this volume and reported in this chapter.

In a world with rational agents, tuition and all forgone earnings of college students would have to be subsidized, and a substantial bonus payment to students would have to be paid to those who attend college to induce them to undertake the 80 percent increase in the annual supply of college equivalents required to eliminate the college–high school wage differential. This would require an unprecedented level of subsidy that would be unlikely to receive political support in the current environment of fiscal stringency. A feasible national tuition policy can

go only a small way toward alleviating wage inequality in the modern economy.

The evidence reported in Heckman, Lochner, and Taber (1998a) suggests that, in the current environment, skill prices movements alone will induce a sufficient supply response to eliminate rising wage inequality. No tuition policy is required. Tuition policy will, at best, shorten the transition time to the stage of lower inequality, but the effects on the transition are slight.

To the extent that income and tuition subsidies promote college attendance, some additional evidence reported by Cameron and Heckman (1998a) is worth mentioning. Students induced into college attendance and graduation by government policies—the marginal students—are of lower quality than those already attending college. The labor market returns to a college education for a marginal student will be smaller than those for the average college graduate. By failing to distinguish between the marginal and the average student, current policy discussions also offer an overly optimistic account of what tuition policy can accomplish in raising the income of the newly educated.

Likely Impact of the Hope Tax Credit

We have conducted a simulation of the recently enacted Hope tax credit. In this volume, Kane provides a comprehensive discussion of this program. The simulation uses the estimates of enrollment response presented by Cameron and Heckman (1998b) to answer two questions. First, with other factors constant, what is the predicted enrollment response to the program? Second, how much of the cost of the program will go to families whose children would have gone to college without the program? The main feature of the program is a tax credit of up to $1,500 for two years of college. We use the estimates from row 2 of table 5–6 (no AFQT and no region controls but with family background, local labor market variables, and other characteristics). This is the traditional specification used in the literature.

Even with the large increases in the real price of public colleges in the United States over the past fifteen years, average annual tuition rates are still relatively low: $1,283 for two-year college and $2,986 at four-year schools. The estimated enrollment response to the Hope program is a 4.2 percentage point increase in two-year enrollments and a 0.9 percentage point decrease in four-year enrollments (3.3 increase for both categories combined). Thus, most response to the program comes in the form of enrollment in two-year schools. At least 91 percent of

the cost of this program will be spent on people who would enter college in the absence of the program.[39]

Summary and Implications for Educational Policy

This chapter examines the evidence on three issues. First, tuition reduction policies that are feasible are unlikely to have much effect on wage inequality. Second, we consider whether short-term borrowing constraints impede college attendance The strong correlation between college attendance and family resources is widely interpreted as evidence that constraints on short-term borrowing impede enrollment. We argue that their importance is greatly exaggerated. The long-term influence of family income and family background as captured by our measure of ability or by parental education explains best the correlation. Family income matters, but its greatest influence is on forming the ability and college-readiness of children and not in financing college education.

Third, this chapter examines racial-ethnic differences in schooling. We find that with family background controlled, minorities are more likely than whites to graduate from high school and to attend college. Again, long-term factors account for this relationship, not short-term cash constraints that can be fixed by Pell grants or Hope tax credits offered to children late in their life cycle of adolescent development.

We raise a number of questions about the empirical and intellectual foundations of current government income-subsidy programs designed to promote college attendance. The edifice in place is generous to minorities and to children from poor families. A main conclusion from our work is that, to raise college attendance and improve the prospects for success in college, policy should focus on ensuring that more students graduate from high school and obtain the skills and motivation required to perform successful college work. Government policies such as Pell grants and other tuition subsidies focus on getting high school graduates into college, but our evidence suggests that the scope for such policies is minimal because most of the problem of disparity in schooling attainment among racial, ethnic, and income groups arises at earlier points in the life cycle of children from poor families.

39. Details of the Hope tax credits are given in chapter 4 in this volume. The enrollment predictions are based on tuition estimates presented in panel B of table 5–6 (controlling for family income but not for AFQT). To simplify the calculation of the enrollment response, the tax credit is assumed to vanish if family income is above $80,000 per year.

Appendix A
Problems with the CPS Data

Influential studies by Hauser (1991) and Kane (1994) use data from the Current Population Survey (CPS) to investigate the role of tuition costs, financial aid, family background, and family income in explaining the time series of black-white college attendance. A major problem with using these data to correlate family income with college entry is that young persons who do not live at home and who do not live in group quarters (that is, dormitories if they attend college) are assigned their own income in the survey rather than that of their parents. This limitation has given rise to a convention in the CPS-based determinants of schooling literature: estimating the determinants of college entry on samples restricted to dependent children who are high school graduates. It also gives rise to a focus on college enrollment rather than on college graduation despite the greater importance of the latter in determining career outcomes. The CPS dependency link between youths and their parents becomes much weaker for youths making postsecondary schooling decisions beyond initial entry decisions since it is unusual for students to stay at home for many years after leaving high school.

This convention creates two distinct problems: (1) excluding nondependents means that the sample is no longer random and may not represent family-income effects on schooling participation for the population more generally and (2) statistical problems arise because the factors that influence the decision to live as a dependent may also govern college attendance decisions.[40] All said, CPS analysts underestimate (in absolute value) the effect of variables that promote schooling on schooling attainment because any variable, such as family income, that moves college attendance and dependency status together will likely overstate (in absolute value) the true effect. If higher family income, for example, is associated with both higher dependency and higher college attendance by children, then the estimated effect of family income on college attendance will be smaller than the true population effect if one only studies samples of dependents.

Cameron and Heckman 1992 demonstrates the impact of this measurement problem on estimating the impact of family income on

40. Conditioning on a choice variable (dependency status) generates a potential simultaneous equations problem since dependency status likely is affected by the same unobservables governing college attendance decisions. By using dependency as a conditioning variable, CPS analysts likely produce biased estimates of the impact of socioeconomic variables on college attendance.

college attendance and show that strong effects of family income are obscured by this convention, particularly for blacks.

Appendix B
Racial and Ethnic Differences in Family Background, Ability, and Access to Schooling and Tuition

The means of the variables used in the multivariate analysis are defined at the base of table 5–3. Variables are divided into five basic categories and include the following: (1) family environmental variables (parental education, whether the person lived with both parents at age fourteen), (2) family resources (family income and the number of siblings), (3) the attractiveness of nonschooling alternatives (wages in unskilled and semiskilled industries measured in the individual's county of residence), (4) college costs (tuition, college proximity—whether a college exists in the county of residence—and Pell grant aid schedules as summarized by average amounts), and (5) scholastic ability (AFQT). Two additional variables—whether the individual lived in a southern state and whether the person lived in an urban area—are also included in the list to be consistent with many previous studies though it is difficult to be precise about the meaning of these variables on schooling decisions.

Comparing the means in table 5–3 across groups shows sizable differences in family background characteristics among blacks, Hispanics, and whites. Family size is much larger for blacks and Hispanics than for whites.[41] Parental education is lowest for Hispanics and highest for whites. Family income is lowest for blacks, almost 20 percent higher for Hispanics, and about 50 percent larger when whites are compared with blacks. Broken homes are much more prevalent among blacks and least prevalent among whites: only 13 percent of whites lived in a broken home at age fourteen compared to 27 percent for Hispanics and a sizable 43 percent of blacks.

County local labor market conditions, by contrast, vary little among the groups. Average county unemployment rates, measured at age eighteen when most people finish high school, were in fact lowest for blacks at 6 percent and highest for Hispanics at 6.9 percent, with whites in between at 6.3 percent. Average county wages in industries with concentrations of unskilled and low-skilled jobs also varied little,

41. All the family sizes overstate the U.S. population averages because the sampling frame in the NLSY is size-biased on family size. See Rao (1965) for a discussion of size-biased sampling.

though they were, in fact, lowest for whites at $18,000 and highest for Hispanics at $19,900.

The next set of means shows that college costs and college proximity favor minority college entry. Since we are interested in any college rather than entry into a specific college, we use measures of tuition that will best reflect whether a person goes to college at all. In particular, if available, we use a tuition measure constructed for two- and four-year public colleges located in the county of residence. Since there is only small variation in the county-level measures compared with state-level tuition measures (which are measured as enrollment-weighted averages across all public institutions in a given state), the table reports two- and four-year averages at the state level and the two-year tuition for the county in which the person lives at age eighteen for completeness. (In the analysis of Cameron and Heckman (1998b), tuition is allowed to vary by age to capture year-to-year differences in college costs that may influence college entry.) Regardless of how tuition is measured, Hispanics face the lowest tuition charges and whites the highest, with blacks falling in between. This finding reflects the fact that, compared with whites, blacks and especially Hispanics are geographically concentrated in states with low-tuition policies.

While the amount of Pell grant aid for which a person is eligible depends on college tuition, we show only the imputed size of the Pell grant award if the person went to the local four-year school. This measure shows important variation among groups. Hispanics and blacks are eligible for the largest awards—$1,210 and $1,154, respectively—and whites the lowest at $501. Taken together, an average white male going to four-year college would need to cover $1,200 in college tuition through his own contribution or some other form of aid, while the average black and Hispanic male would need to cover $414 and $180, respectively.[42]

Another important component of the cost of college is proximity to a school. Students may have an easier time covering transportation costs and providing room and board at home than paying for board and room at a college dorm. College proximity measures the existence of either a two- or four-year college in the county of residence. Again, college proximity favors black and Hispanic college entry. Hispanics and blacks have a 92 and 89 percent proximity rate, respectively, while whites face a rate of 82 percent, which by any measure is still high.

We use AFQT scores as a measure of scholastic ability. The white-

42. These tuition values are for the sample period 1979–1989 and are expressed in 1994 dollars. For both reasons they do not match the tuition figures for 1994–1997 discussed in the text.

minority differences are large and statistically significant. The average Hispanic falls in the middle, and the average white has the highest score. The gap between whites and Hispanics is large and significant, as is the gap between Hispanics and blacks.

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Index

Armed Forces Qualification Test (AFQT), 17, 98, 106–10, 110–13, 115, 121–22

Banking industry, 72
Blacks. *See* Ethnic and minority issues
Bush, George, 10–11

California, 59, 65
Clinton, William, 2, 8, 10, 19, 28, 45
Clinton administration, 8, 19, 28, 44–50, 66–68
Cold war, 3
Colleges and universities
  community colleges, 87–89
  competition, 5
  costs of, 73
  faculty salaries, 42
  graduates, 1, 53
  location and proximity, 107, 121
  public and private, 58–59, 64–65
  rate of return, 47, 48, 50, 73
  revenues, 82
  spending by, 13
  standard setting by, 44
  tax credits and deductions, 2–4
  two-year, 6, 43, 47 n 6, 61, 64–65, 110
  wage premium, 2, 53–55
  See also Education, postsecondary; Enrollment; Tuition
Costs of education
  effects on enrollment, 63 n 9
  forgone earnings, 5–7
  out-of-pocket, 5–6, 7
  postsecondary, 56–59
  primary-secondary, 43
  public and private institutions, 58–59
  tuition and, 58
  variation in, 60–61

Demographic issues, 59, 72, 73
Department of Education, 69

Economic issues
  educational level, 1, 9–10, 15, 38–39, 41, 47, 53, 72, 77
  family income, 54–55
  funds transfers, 6, 20, 21, 22, 68
  human capital, 26, 50, 83
  means-based tuition subsidies, 46
  means testing, 57
  national growth rate and human capital, 9–10, 22
  national tuition policy, 116–17
  public debate on federal policies, 4
  rate of return on education, 47, 48, 50, 73, 76, 77, 87, 89
  standard of living, 1
  tax deduction of interest, 49–50
  tuition and financial aid policies, 76–118
  wage differentials, 1, 17, 20, 53–55, 76, 79–81, 116, 118
  See also Labor issues; Tax issues
Education
  educational attainment, 85, 95
  educational level of work force, 1, 41
  effects of market structure on performance, 39, 41, 50–51
  federal budget issues, 28, 29–31, 44–51
  government involvement in, 10–11
  improvement of, 73
  incentives, 22, 24–25
  as an investment, 9–10
  life-cycle analysis, 95–105, 114, 118