

RAND

The Return To Increased Public Expenditures On Education

*Richard Krop, Stephen Carroll, Georges Vernez,
C. Peter Rydell*

DRU-2316-CAE

June 2000

Council for Aid to Education

The RAND unrestricted draft series is intended to transmit preliminary results of RAND research. Unrestricted drafts have not been formally reviewed or edited. The views and conclusions expressed are tentative. A draft should not be cited or quoted without permission of the author, unless the preface grants such permission.

*RAND is a nonprofit institution that helps improve policy and decision making through research and analysis.
RAND's publications and drafts do not necessarily reflect the opinions or policies of its research sponsors.*

CONTENTS

Figures iii
Tables..... v
Introduction1
Analytic Approach2
Costs Of Education3
Effects Of Education On Spending For Public Assistance And Social Insurance4
Effects Of Education On Spending For Corrections.....8
Effects Of Education On Government Revenues.....9
Total Benefits10
Net Gains12
Conclusions.....14

FIGURES

Figure 1—Effects of Education on Average Welfare Spending by Age, Native-born Non-Hispanic White Woman	5
Figure 2—Effects of Education on Average Savings in Welfare Spending, by Age, Native-born Non-Hispanic White Woman	5
Figure 3—Effects of Education on Average Lifetime Savings in Welfare Spending, Native-born Women	6
Figure 4—Effects of Education on Average Lifetime Savings in Public Assistance and Social Insurance Payments, Native-born Women	7
Figure 5—Average Lifetime Savings on Incarceration Costs with Increases in Education, Native-born Men	9
Figure 6—Average Lifetime Increases in Government Revenues with Educational Increases, Native-born Men	10
Figure 7—Average Lifetime Total Returns Resulting from Increased Education, Native-born Women	11
Figure 8—Average Lifetime Total Returns Resulting from Increased Education, Native-born Men	11
Figure 9—Net Effects of Increasing a Native-born Asian American Man’s Education from Tenth Grade to College Completion	12
Figure 10—Costs and Benefits of Closing the Education Gap Between the African American and Hispanic Population and the Non-Hispanic White and Asian American Population	14

TABLES

1 - Average Annual Cost of Educating One Student.....3
2 - Annual Spending on Prisons and Jails..... 8

Introduction

The level of education an individual needs to be competitive in the workplace has been increasing for the past 20 years. The high-paying industrial jobs that used to be available to people who had only a high school diploma are dwindling. The service-related jobs taking their place require a level of knowledge and skill that, for the most part, can be gained only through programs offered at colleges and universities. At least some postsecondary education has effectively become a minimum requirement for rewarding employment.

The investments needed to meet anticipated demands and expand access to higher education will be expensive. Quite reasonably, taxpayers and their representatives have been asking why they should contribute more to the support of educational institutions. Shouldn't those who directly benefit from improving educational attainment pay their own way? And if they choose not to invest in their own education, isn't that their problem? Until good answers can be provided to such questions, it will be difficult to convince federal, state, and local policymakers that they should make the investments in high schools and colleges necessary to improve access to higher education.

The research summarized here provides strong arguments for why Americans should invest more in education.¹ We compare the public cost of providing increased education to the benefits that taxpayers will directly realize from such increases. These benefits include both reductions in the costs of government, and therefore in the costs taxpayers incur, and increase in government revenues. Specifically, we estimate the extent to which increased education will result in:

- reductions in public expenditures on public assistance and social insurance programs,

¹The research summarized here is documented in Richard A. Krop, *The Social Returns to Increased Investment in Education: Measuring the Effect of Education on the Cost of Social Programs*, RGSD-138, RAND, Santa Monica, CA, 1998. That work, in turn, was part of a larger study supported by the Andrew W. Mellon Foundation. Georges Vernez, Richard A. Krop, C. Peter Rydell, *Closing the Education Gap: Benefits and Costs*, MR-1036-EDU, RAND, Santa Monica, CA, 1999, presents the results of the entire study.

- reductions in public expenditures on incarceration—the costs of building and operating prisons and jails, and
- increases in federal, state, and local taxes and in contributions to social insurance programs.

Our findings indicate that investing in increased educational attainment at any level—say, providing two more years of high school to those who would have dropped out after tenth grade, or providing two years of college to those with only a high school diploma—leads to remarkable public savings over time. If, for example, the nation were committed to providing all Americans with the average level of education now achieved by non-Hispanic whites, the investment would provide a return to taxpayer’s two-and-one-half times the original cost.

Analytic Approach

Given that different segments of the population reach different levels of earnings and participate at different rates in social programs, it would be misleading to analyze the effects of education on the population as a whole. Because more-highly educated people are less likely than others to participate in welfare programs, an improvement in any segment of the population’s educational attainment will likely result in reduced welfare costs. However, because the largest welfare program is targeted to low-income women with young children, women are the main recipients of welfare. Increasing the education of women will more greatly reduce welfare payments than will an equal increase in the education of men. In contrast, the effect of education on incarceration rates and consequent costs is more marked for men because very few women, regardless of education level, are incarcerated. Analyzing distinct subgroups can only capture such variations in effects. Therefore, we conducted separate analyses for 20 different population groups distinguished by gender, resident status (immigrant or native born), and race/ethnicity (African Americans, Asian Americans, Mexican Americans, other Hispanics, or non-Hispanic whites).² We also assumed that:

²We use the terms *African American* and *Asian American* to refer to people of African and Asian ancestry, respectively, now residing in the United States, whether immigrant or native born. Because the experiences of people of Mexican ancestry differ from those of people of Hispanic ancestry other than Mexican, we distinguish between *Mexican Americans* (people of Mexican descent) and *other Hispanics*, including in

- the public costs of providing a given level of education are approximately the same whether the student is female or male, immigrant or native born, or a member of any particular population group;
- the returns to education will remain constant as the distribution of educational attainment changes; and
- wages are closely tied to educational attainment.

Costs Of Education

The costs of education fluctuate widely by state and even within states. For the purposes of this study, we used costs that are representative of per-pupil spending in California for four levels of schooling: high school, lower division college (freshmen and sophomores), and upper division college (juniors and seniors). Estimates are for the direct costs of school—the capital and operating expenses of providing for an individual’s education. Although families pay for an important fraction of the cost of college, we assumed that taxpayers would have to subsidize all the costs of education for those who would not otherwise finish high school or go on to college.

The annual cost of providing the last two years of high school to one full-time-equivalent student, as shown in Table 1, is about \$6,880³. Annual college costs average \$5,502 for the first two years and \$15,221 for the last two.

Table 1
Average Annual Cost of Educating One Student

Annual cost	High school	College	
		Lower division	Upper division
Operating cost	5,983	4,454	13,143
Capital cost	897	1,048	2,078
Total cost	6,880	5,502	15,221

SOURCES: Calculated from Krop, et. al., 1995; Shires, 1996; and Governor State of California, 1996.

CAE03-T1

both cases all those now living in the United States, whether immigrant or native born.

³1987 dollars.

Effects Of Education On Spending For Public Assistance And Social Insurance

The study focused on nine government programs in which the expected amounts paid out to a person are related to that person's education:

- Federal and state unemployment insurance
- Federal Supplemental Security Income (SSI)
- Food programs, including Food Stamps, Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)
- Low-income energy assistance
- Medicaid
- Medicare
- School breakfast and lunch programs
- Social Security, including railroad retirement
- Welfare, including Aid to Families with Dependent Children (AFDC), General Assistance, and other forms

We estimated per-person spending by age expected in each program for each of the 20 population groups. To illustrate our findings, Figure 1 shows the effect of education on just one of these programs, welfare, for just one group: native-born, non-Hispanic white women, the group with the greatest numbers receiving welfare. The figure shows the average per-person cost of welfare payments at each age between 18 and 50 for every such woman in the country—including the vast majority of those women who receive no welfare payments at all.⁴ As can be seen, there is a striking reduction in program cost as education level increases. For example, for 30 year olds, welfare spending averages about \$620 per year for high school dropouts, about one-third that amount for high school graduates, and virtually zero for college graduates.

⁴The dollar amounts in this figure and in Figure 3 represent average payments made in 1991, adjusted for inflation and expressed in 1997 dollars, for these women at every age from 18 to 50. We used the *Survey of Income and Program Participation* (U.S. Department of Commerce, Bureau of the Census, Longitudinal Microdata File, Washington, D.C., 1993) to estimate expected governmental expenditures for public assistance and social insurance programs by education level, age, and population group.

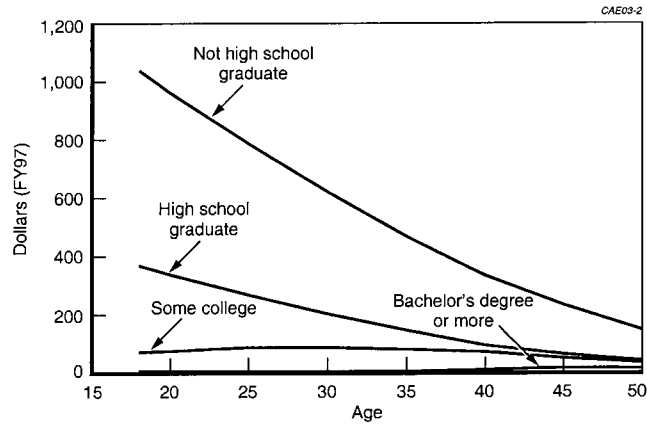


Figure 1—Effects of Education on Average Welfare Spending by Age, Native-born Non-Hispanic White Woman

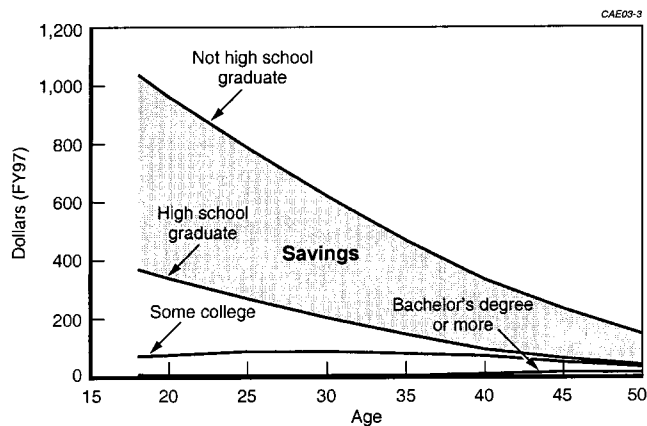


Figure 2—Effects of Education on Average Savings in Welfare Spending, by Age, Native-born Non-Hispanic White Woman

Figure 2 repeats Figure 1, this time using a shaded area to show the savings in welfare payments that would accumulate over 34 years, on average, for each native-born non-Hispanic white woman who stays in high school instead of dropping out. The present value of those savings, discounted to age 16, is \$7,545.⁵

⁵Because a dollar spent or earned in the future is worth less than a dollar spent or earned today, we “discount” future costs and benefits in order to compare them to those of today. For this analysis, we located the present dollar value in the year that the individual was 16 and discounted future costs and benefits at an average annual rate of 4 percent per year.

Figures 2 and 3 focus on individuals from only one of our 20 population groups. However, our findings indicate that the relationship between education and welfare benefits holds true for all 20 groups. Figure 3 provides a snapshot of results for all native-born women included in our study.

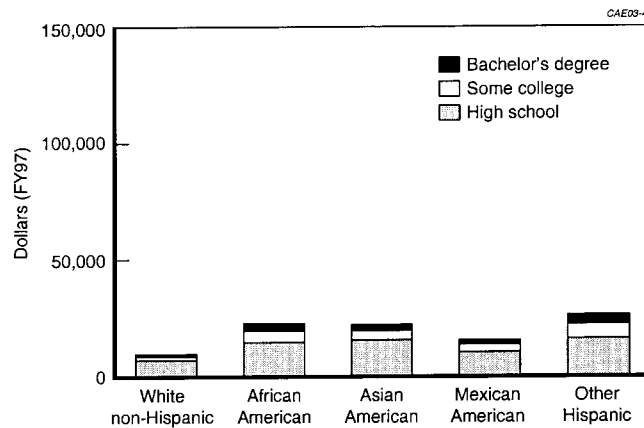


Figure 3—Effects of Education on Average Lifetime Savings in Welfare Spending, Native-born Women

The bars represent the present value of the total lifetime savings in welfare payments that result, on average, when a native-born woman increases her education to high school graduation, two years of college, and college graduation. Although the specific numbers vary from one group to another, more-highly educated people place fewer demands on society's welfare programs than do the less educated. In the following discussion, unless we note an exception, each of the patterns illustrated for a single group holds true for all 20-population groups.

Figure 4 shows the average savings in government spending on all nine programs for increases in the education of an individual native-born woman in each of the five-racial/ethnic groups. For women of all backgrounds, the greatest savings come from high school completion: Those who lack a high school diploma have extremely poor economic prospects and thus tend to be far more dependent on public assistance than are high school graduates. Those with some college have better prospects than do high school graduates, but the difference here is smaller than the one between high school dropouts and high school graduates. Similarly, because women with some college participate in welfare

programs much less frequently than those who are less educated, there is not as much room for further improvement with college graduation.

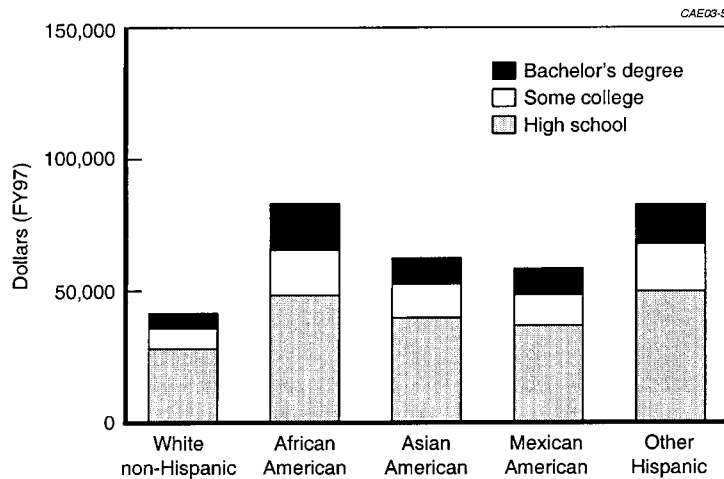


Figure 4—Effects of Education on Average Lifetime Savings in Public Assistance and Social Insurance Payments, Native-born Women

The height differences in Figure 4's bars reflect differences in factors influencing the rates at which the various population groups tend to participate in public assistance programs. For example, native-born Hispanic women not of Mexican descent are more likely to draw on public assistance than are native-born women from other population groups. Therefore, the gray segment of the bar for this group, which shows the return for increasing educational attainment at the high school level, is larger than the gray segments for the other groups.

The exceptions we found to the pattern of higher education equating with declining expenditures for all nine government programs had to do with Social Security and Medicare. Social Security benefits for the elderly tend to increase, rather than decrease, with educational attainment, because more-educated workers make greater contributions throughout their working lives than do the less educated. Medicare benefits appear to be unrelated to educational attainment. But overall, greater education translates to a positive return to taxpayers over an individual's lifetime.

Effects Of Education On Spending For Corrections

To paraphrase an old expression, if you think school is expensive, consider the alternative. Nowhere is this more apparent than in the nation's prisons and jails. On average, it costs about \$29,000 to incarcerate one person for a year. As a nation, we spend over \$36 billion per year on prisons and jails (see Table 2), and with the implementation of three-strikes provisions in certain states, the costs of incarceration will likely increase.

Table 2
Annual Spending on Prisons and Jails

Type of Corrections Facility	Annual Cost per Prisoner (\$)	Average Daily Number of Prisoners	Annual Spending (\$ millions)
Federal prison	37,297	74,388	2,774
State prison	29,020	743,556	21,578
County or municipal jail	26,820	441,889	11,852
Total	28,737	1,259,833	36,204

Source: Maguire and Pastore, 1995.

The educational attainment of inmates 18 and over of state correctional facilities and county and municipal jails is well below that of the general population. Of the general population, under just 80 percent graduate from high school and over 20 percent earn at least a bachelor's degree. Of the prison population, less than 40 percent have high school degrees and less than 5 percent have a bachelor's degree.

Although the relationship between education and criminal behavior is complex, there is evidence that education can play a role in reducing crime.⁶ For example, taxpayers pay an average of \$9,000 per year in prison and jail costs for every male 20-29 without a high school degree. This average cost is calculated across the whole population of male high school dropouts, including the vast majority who never go to jail. This amount drops to about \$1,400 for high school graduates, and to less than \$500 for college graduates. Figure 5 compares the

⁶Greenwood et al., 1996.

total savings on prisons and jails for different racial/ethnic groups of native-born men.⁷

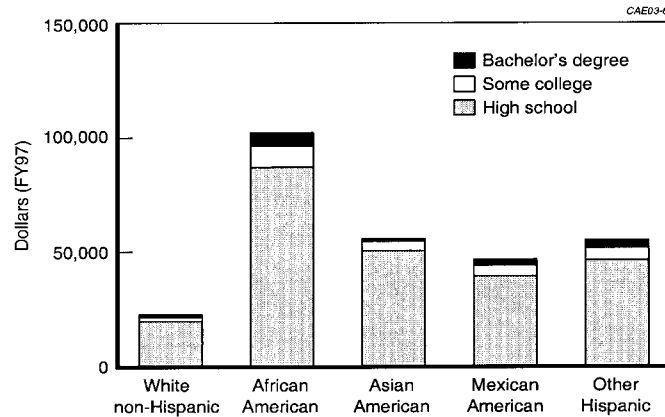


Figure 5—Average Lifetime Savings on Incarceration Costs with Increases in Education, Native-born Men

As for women, they constitute just fewer than 10 percent of the jail population and 5 percent of the prison population.⁸ Average per-person spending on corrections is much lower for women than for men. For women, for example, the spending per year is approximately \$750 for those who do not complete high school and approaches zero for college graduates. Nonetheless, increased educational attainment will result in savings on incarceration costs for all groups of women.

Effects Of Education On Government Revenues

Taxes and contributions to social insurance programs are paid out of income, which tends to increase with educational attainment. Hence, more-

⁷We used the 1993 *Survey of Inmates of State Correctional Facilities* (U.S. Department of Justice, Bureau of Justice Statistics, *Correctional Populations in the United States, 1993*, Washington, D.C., 1995), the 1989 *Survey of Inmates of Local Jails* (U.S. Department of Justice, Bureau of Justice Statistics, ICPSR ed., Inter-University Consortium of Political and Social Research, Ann Arbor, MI, 1993), and population counts from the 1991 *Current Population Survey* to estimate the probability of incarceration by education level, age, and population group.

⁸Bureau of Justice Statistics, *Survey of Inmates of State Correctional Facilities* and *Survey of Inmates of Local Jails*.

highly educated taxpayers tend to pay greater taxes than do others. We estimated the relationship between income and three types of tax contributions: 1) state income, property, and sales taxes; 2) federal income taxes; and 3) federal payroll taxes (Social Security and Medicare contributions). Figure 6 presents the total increase in government revenues (discounted to present value) over the lifetime of native-born men at each level.⁹ Although the increases are substantial at every level of improved education, the greatest payoff in all groups comes from completing college, largely because of the steeper wage growth of college graduates.

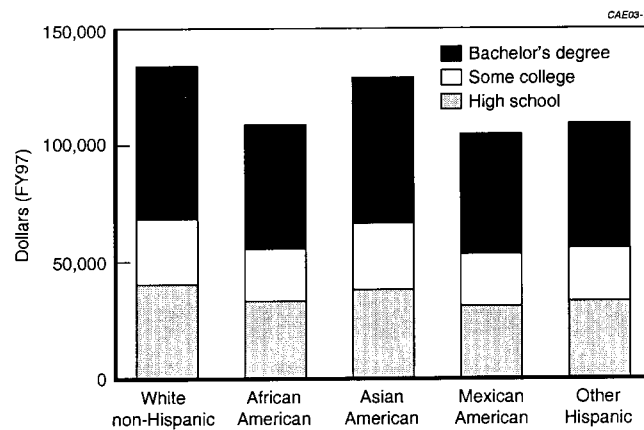


Figure 6—Average Lifetime Increases in Government Revenues with Educational Increases, Native-born Men

Total Benefits

Combining the effects on government spending and revenues that were summarized above, we can estimate the total benefits taxpayers would realize if

⁹To estimate state income, property, and sales taxes, we used data from the 1991 *Survey of Income and Program Participation* (U.S. Department of Commerce, Bureau of the Census, Longitudinal Microdata File, Washington, D.C., 1993), the 1991 Social Security and Medicare tax schedules (U.S. Department of the Treasury, Internal Revenue Service, Statistics of Income—1992 Individual Income Tax Returns, Washington, D.C., 1995), and data published by Citizens for Tax Justice and the Institute on Taxation and Economic Policy (Michael P. Ettinger et al., *Who Pays? A Distributional Analysis of the Tax Systems in All 50 States*, Washington, D.C., June 1996).

educational levels were increased throughout U.S. society. Figure 7 displays the results for native-born women; Figure 8 does the same for native-born men.

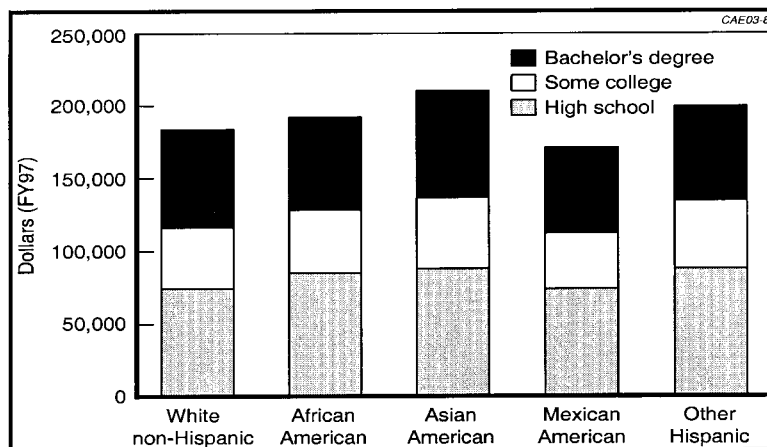


Figure 7—Average Lifetime Total Returns Resulting from Increased Education, Native-born Women

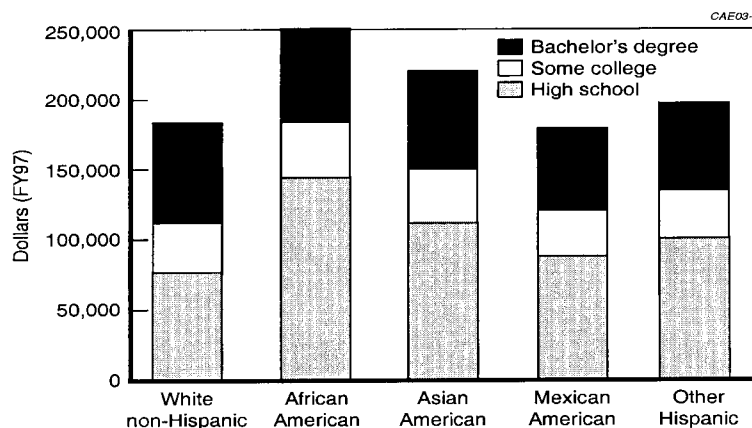


Figure 8—Average Lifetime Total Returns Resulting from Increased Education, Native-born Men

Taxpayers would realize huge benefits if the educational levels of the population were increased. On average, each time a native-born woman who would have dropped out of high school is helped to attain a high school diploma, federal and state treasuries gain \$75,000 to \$95,000 in reduced costs and increased revenues (again, all these amounts are in present-value dollars).

Providing her with two years of college instead of stopping at high school adds \$40,000 to \$45,000 more to federal and state treasuries; going the next step—helping her to graduate from college—adds another \$60,000 to \$75,000.

For native-born men, the numbers are even more dramatic. Because of the high costs of incarceration and the high correlation between incarceration and education, the gains associated with educating native-born men through high school graduation are immense: \$75,000 to 145,000. The first two years of college bring \$30,000 to 40,000 in increased government revenues, and the last two years of college add another \$60,000 to 70,000.

Net Gains

The *net* effect of increasing educational attainment over an individual's lifetime can be calculated by subtracting the present value of the cost of providing additional education from the present value of the total returns. Consider, for example, an Asian American man who would have dropped out of high school after the tenth grade but, instead, is induced to stay in school six more years until he graduates from college. Figure 9 shows what taxpayers would have to spend to provide those six more years of schooling compared to the present value of the total benefits they would realize from increased tax revenues and reduced government spending.

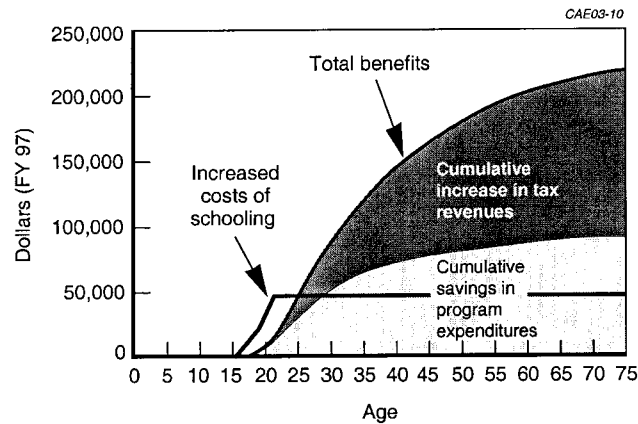


Figure 9—Net Effects of Increasing a Native-born Asian American Man's Education from Tenth Grade to College Completion

The education would cost about \$49,000, an investment that would be made by the time the man reached 22. The benefits—the cumulative savings on

public expenditures plus the cumulative increases in tax revenues—would begin to accumulate at about that age and would match education expenditures by the time he reached 30. (Each point on the curve represents the present value of the cumulative savings that would accrue by that age.) The benefits would continue to rise until they totaled about \$220,000 by the time the man reached 75.¹⁰ Subtracting the cost of his education from this total leaves a net benefit to taxpayers of about \$170,000 for a single individual—more than triple the initial investment.

The next step in the analysis is to calculate the costs and benefits of educating groups of people rather than individuals. We chose to focus on African Americans and Hispanics, groups whose education has lagged that of non-Hispanic whites and Asian Americans. In 1996, for example, about 86 percent of non-Hispanic whites aged 25 and older had attained a high school diploma, whereas only 75 percent of African Americans and 53 percent of Hispanics aged 25 and older had done so.¹¹ Similarly, the proportions of high school graduates who go on to college and, of those, who complete college, are substantially smaller for African Americans and Hispanics than for non-Hispanic whites. Only 14 percent of African Americans and 9 percent of Hispanics aged 25 and older had attained a bachelor's degree in 1996, compared to 26 percent for their non-Hispanic white counterparts.¹² The growing number of immigrants, especially Hispanics, entering the country with low education levels exacerbates these differences.

We focused on a single birth cohort—people born in 1990—and estimated the economic consequences of a policy that succeeded in closing the gap between the African American and Hispanic population and the non-Hispanic white and Asian American population. We considered only the costs of providing the education itself, not the costs of programs needed to motivate individuals to continue their education and to provide whatever additional academic support they may need to progress through school.

¹⁰Because the costs and benefits that accrue at advanced ages are extremely small when discounted back to age 16, we neglected benefits and costs after age 75.

¹¹National Center for Education Statistics, *Digest of Educational Statistics 1997*, Table 8, p. 17, 1998.

¹² National Center for Education Statistics, *Digest of Educational Statistics 1997*, Table 8, p. 17, 1998.

Our results are presented in Figure 10. The cost of closing the educational gap in this cohort would be \$9.3 billion. The benefits to the government—and ultimately the taxpayers—would be \$23.7 billion in present-value dollars: \$10.8 billion in reduced public spending and \$12.9 billion in increased tax contributions. In other words, every dollar spent on closing the education gap would save about \$2.50 in today's dollars.

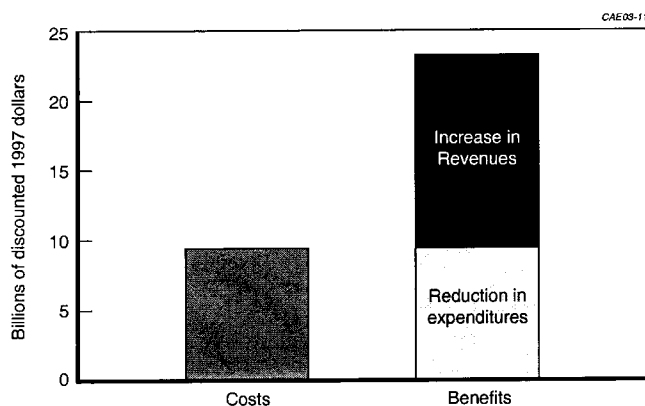


Figure 10—Costs and Benefits of Closing the Education Gap Between the African American and Hispanic Population and the Non-Hispanic White and Asian American Population

Conclusions

There are, of course, significant obstacles to overcome if we as a nation are to make a greater investment in educational attainment. Merely increasing capacity in the nation's schools and colleges will not suffice. The American people need to assign a high priority to developing a greater understanding of why individuals do not continue their education. Effective programs for promoting educational attainment must be based on such an understanding and must operate on a number of fronts—the classroom, the home, and the community. A great deal can be learned from existing programs with a proven track record.

We have not explored the issues connected with these obstacles. But our analysis suggests that the potential gains of increased investment in educational attainment are so great that they justify pursuit of the social and political means

to bring about such an investment. What more is needed to make the educational advancement of Americans a high priority on America's agenda?