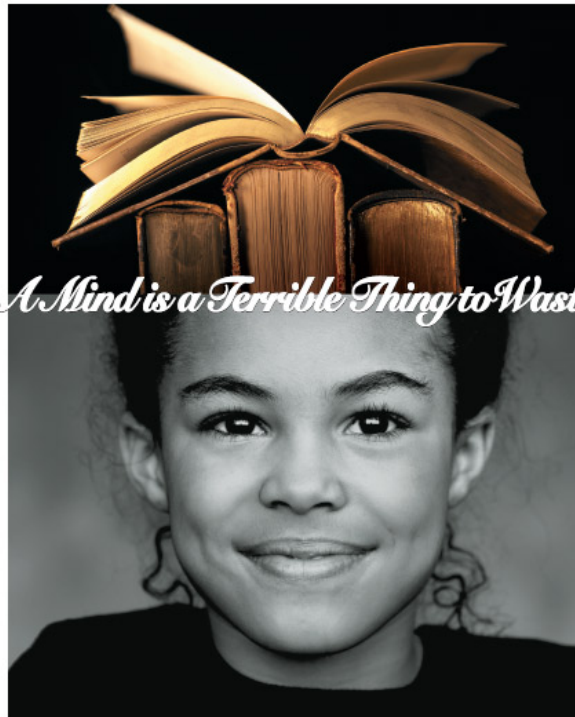


What the Government Gets from Investing in College Students

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Introduction

- Remember “A mind is a terrible thing to waste”?
- In addition to its emotional appeal, the slogan is rationally true probably even more than they realized.
- A mind deterred from a college education is huge waste in many dimensions:
 - higher income
 - lower unemployment
 - better health
 - longer life
 - faster technology creation and adoption
 - reduced crime
 - greater tolerance
 - increased civic involvement
 - etc.

Introduction

- College creates benefits in another important, but frequently overlooked, dimension: it creates substantial government fiscal benefits.
- Unlike public investments in, say, fire protection or disease prevention, investment in college students creates *direct* fiscal payoffs to governments (in addition to the various other social benefits) .
- Even from just our own narrow interest as taxpayers, a mind is indeed a terrible thing to waste.

Introduction

- This study complements the growing literature on the various private and social values of higher education.
- The huge literature on the private monetary rate of return to education have generally found a return near 10% (in the US).
- But there is relatively little work quantifying the returns to government investments in higher education.
- The fiscal impacts of college attainment have been quantified in a rather piecemeal and superficial way.
 - Mortenson (1994), Trostel (1997 and 2003), Krop (1998), Vernez et al. (1999), Baum and Payea (2004), Institute for Higher Education Policy (2005), and Brady et al. (2005).

Introduction

- This study:
 - systematically quantifies almost all of the important direct fiscal benefits of college attainment,
 - accounts for the timing of the fiscal effects,
 - uses a better dataset,
 - separates state fiscal effects from federal fiscal effects and provides estimates for individual states,
 - estimates separate effects from different levels of college attainment (i.e., associate's, masters, etc.),
 - carefully examines the public cost,
 - calculates the fiscal internal rate of return to government investment in college students.

Introduction

- This project only quantifies the direct government fiscal benefits from college attainment.
- Indirect effects on tax revenues and expenditures through higher education's effect on growth are not included.
- The estimates do not include any benefits from:
 - publicly sponsored university research,
 - from university public service and extension activities,
 - from graduates of private colleges,
 - or from the effect of public colleges and college education on entrepreneurial activity and job creation.
- Various social benefits such as higher civic involvement, lower crime, etc. are not quantified either.

Methodology - Data

- This study primarily uses the Current Population Survey.
- Age is truncated at age 80, thus only observations from those 79 and younger are analyzed.
- The CPS contains about 138,000 observations each year of those within the ages of 19 and 79.
- All dollar values are expressed in 2005 dollars.
- College attainment is measured in terms of degrees.
- Professional and doctorate degrees are small percentages (1.4% and 1.2%), thus they are lumped together to reduce the problem of small cell sizes in individual states.

Methodology – Basic Approach

- The typical approach in the literature is to first calculate average income differentials across education categories.
- For example, the following figure shows average annual earnings within the ages of 25 and 64 across education categories.

Figure 1
Average Labor Earnings and Degree Premia in 2005



Methodology – Basic Approach

- State and local tax revenues are 11.0% of personal income in FY 2005.
- Thus, first approximations of the annual college premia in state and local tax revenues are:
 - \$621 for some college,
 - \$1,011 for associate's degrees,
 - \$2,665 for bachelor's degrees,
 - \$1,282 for master's degrees,
 - and \$6,185 for professional and doctorate degrees.
- These add up substantial sums over a 40-year work career – much more than the government contributions per degree.

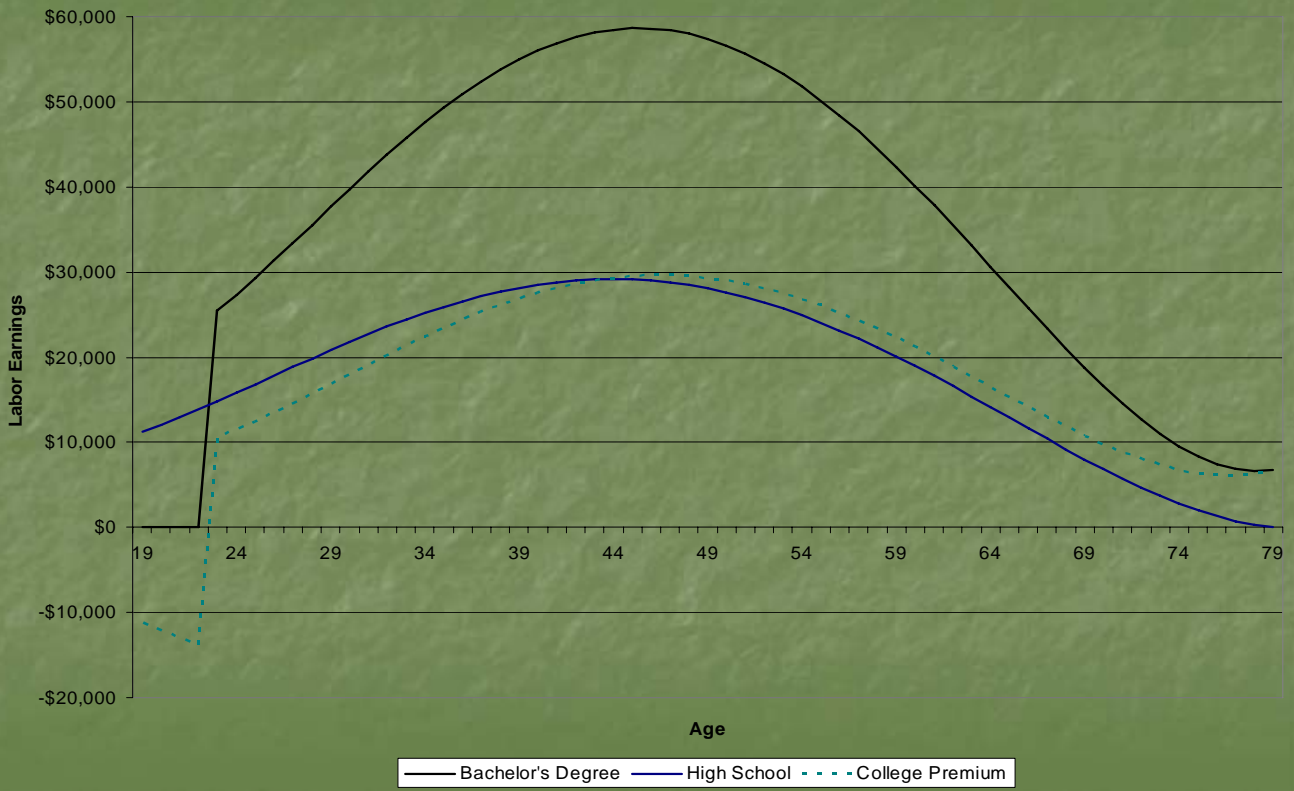
Methodology – Basic Approach

- This is only one of the fiscal benefits from college attainment.
- This is a simplistic approach to quantifying the fiscal effects of public investment in higher education.
- There are numerous factors that could cause this basic approach to be misleading.

Methodology – Timing

- The differential in state and local tax revenues per bachelor's degrees sums to \$106,600 over a 40-year work career, but this is \$63,450 in present value when using a 3% discount rate.
- Moreover, this is the PV at age 25, it is less still when college starts and the costs are incurred.
- College students also pay less in taxes while they are in college, and this fiscal opportunity cost occurs upfront.
- In addition, the college earnings premium is not constant over the lifecycle. It is the smallest immediately after graduation, and then increases gradually at a decreasing rate.

Figure 3
Estimated Life-Cycle Profile of Labor Earnings in 2005



Methodology – Timing

- This study assumes that the average career paths of graduates are those of “traditional” students.
- The work career is assumed to begin at age:
 - 19 for high school graduates,
 - 21 for associate’s graduates,
 - 23 for bachelor’s graduates,
 - 25 for master’s graduates,
 - and 27 for professional and doctorate graduates.
- Associate’s and master’s degrees are assumed to take two additional years, while bachelor’s, professional, and doctorate degrees are assumed to average four additional years.

Methodology – Timing

- Students are assumed to create no fiscal impact while in college other than the direct public cost of higher education.
- College students are assumed to pay no taxes, and to receive the average level of social-insurance payments during college as before and after college.
- To be specific, degree holders are assumed to receive the level of social-insurance benefits received by average graduates with:
 - high school diplomas at age 19,
 - associate's degrees benefits at age 21,
 - bachelor's degrees at age 23,
 - master's degrees at age 25,
 - and the interpolated values at ages 20, 22, 24, and 26.

Methodology – Timing

- Obviously many college (and high school) students take more than the usual numbers of years to graduate (and some take less).
- Thus, for many college graduates the benefits of college occur later than assumed above, and the assumption that students are traditional on average overstates the fiscal benefits in PV.
- On the other hand, many students work part-time while in college and/or work full-time while taking time out from college, and hence pay at least some taxes before college graduation.
- Thus, the assumption that students are traditional on average also understates the PV of the fiscal benefits.

Methodology – Timing

- For three reasons the above assumptions are conservative in showing the fiscal benefits of college.
- The fiscal benefits from those with some college but no degree are ignored (recall that they pay \$621 more in state and local taxes per year).
- The effect of college education on mortality rates is ignored.
 - Compared to high school graduates, college graduates live longer and hence create greater total fiscal benefits.
- Intergenerational effects of college education are ignored.

Methodology – Tax Rates

- The basic approach assumes that taxes are a constant percentage of personal income.
- Beginning in 2005 the CPS has included estimates of federal income and payroll taxes and state and local income and property taxes.
- State and local sales tax rates across education categories are computed using data generated by the Institute on Taxation and Economic Policy.
 - Their estimates of average sales and excise tax burdens for each income quintile in each state are matched with individual's incomes in the CPS.

Methodology – Causation

- Earnings are highly correlated with education attainment, but this does not prove that more education causes higher earnings.
- Higher-ability and/or higher-motivation individuals could obtain more education and have greater earnings independent of their educations.
- The same is true for the numerous other outcomes that are correlated with higher education.
- The observed correlations may be largely the result of omitted-variables bias (also often referred to as ability bias or endogeneity bias in this context).

Methodology – Causation

- The data used in this project are insufficient to allow for causality testing.
- Previous research on several different outcomes, suggests that this may not be an important limitation.
- A large literature has developed to try to identify the causal effect of education on earnings.
- A growing literature has also developed trying to identify the causal effect of education on health, mental health, and mortality.
- Lochner and Moretti (2004) identify the causal effect of education on criminal behavior and incarceration.
- Despite the plausibility of the ability-bias hypothesis, these literatures have generally demonstrated that the observed correlations are indeed causal effects.

Methodology – College Earnings Premia

- The approach outlined earlier implicitly assumes that college premia are constant.
- A simple supply-and-demand framework, however, suggests that this assumption may be problematic (Freeman, *The Overeducated American*, 1976).
- Contrary to the predictions in the 1970s, the return to higher education did not fall as more Americans got college degrees.
- Although the issue is not yet settled and is the subject of ongoing research, the effect of the relative supply of college-educated labor on the college earnings premium appears to be no larger than a small second-order effect.

Methodology – Interstate Migration

- Interstate migration of college graduates can cause some state investments to end up creating fiscal benefits in other states.
- A state's production of college graduates does not necessarily have corresponding impact on the state's college attainment.
- Thus, the fiscal return on a state's investment in higher education is reduced by the extent of the net migration of its graduates.

Methodology – Interstate Migration

- Trostel (2007) estimates the extent of this interstate spillover of college graduates and thus quantifies the extent that fiscal return to individual states needs to be adjusted downward.
 - The average net loss of a state's new bachelor's degrees to other states is about 7%.
 - For new associate's degrees, the net interstate leakage is estimated to be about 3%.
 - For new master's degrees, the net leakage appears to be about 8%.
 - The net leakage of professional and doctorate degrees to other states is roughly 10%.
- Unfortunately, the data were not sufficient to identify the net interstate effects for individual states.

Methodology – Interstate Migration

- The net interstate leakage of new graduates is less for public colleges.
- With the exception of professional and doctorate degrees, there appears to be no net interstate loss of new graduates from public colleges.
- To be conservative, though, this study applies the point estimates mentioned above.

Methodology – The Effect of Public Support

- Perhaps the most problematic issue is the causal effect of public support on college attainment.
- Many college graduates take advantage of public financial support, but would have gotten their college educations without the public support.
- Because public higher education subsidies are generally not well targeted at those on the margin of college attendance, the marginal fiscal effect per public dollar invested in higher education may be substantially less than the average fiscal effect.

Methodology – The Effect of Public Support

- Bound and Turner's (2006) results suggest a roughly proportionate marginal causal effect of state support on bachelor's degree production in the state.
- To be specific, they find that exogenous increases in the number of potential college students in a state (high school graduates four years earlier):
 - increases state funding for higher education by about 60% of the increase in the number of potential students (i.e., funding per student falls by 40%),
 - and it decreases the number of bachelor's degrees awarded in the state by roughly 40%.
- Thus, it appears that the average correlation between public support and college attainment is not misleading about the causal impact.

Table 1
Estimated Lifetime State and Local Taxes across Education Categories

	High School	Associate's Degree	Bachelor's Degree	Master's Degree	Professional & Doctorate Degree
<u>Income Taxes</u>					
Sum	\$34,044	\$50,241	\$89,667	\$119,138	\$168,449
Present Value	\$15,898	\$23,378	\$39,760	\$49,146	\$70,521
Degree Premium - Sum		\$16,197	\$55,624	\$29,470	\$78,782
Degree Premium - PV		\$7,480	\$23,862	\$9,386	\$30,761
<u>Property Taxes</u>					
Sum	\$88,536	\$112,789	\$123,078	\$147,270	\$146,109
Present Value	\$37,549	\$46,791	\$50,256	\$58,025	\$55,632
Degree Premium - Sum		\$24,253	\$34,542	\$24,192	\$23,031
Degree Premium - PV		\$9,242	\$12,707	\$7,768	\$5,375
<u>Sales Taxes</u>					
Sum	\$57,266	\$71,554	\$85,307	\$93,802	\$120,907
Present Value	\$29,398	\$35,427	\$40,431	\$42,921	\$52,261
Degree Premium - Sum		\$14,288	\$28,042	\$8,494	\$35,600
Degree Premium - PV		\$6,029	\$11,033	\$2,490	\$11,830
<u>Total State and Local Taxes</u>					
Sum	\$179,845	\$234,584	\$298,053	\$360,209	\$435,465
Present Value	\$82,845	\$105,596	\$130,448	\$150,092	\$178,414
Degree Premium - Sum		\$54,739	\$118,208	\$62,157	\$137,413
Degree Premium - PV		\$22,751	\$47,602	\$19,645	\$47,967

Present values are calculated using a 3 percent real interest rate.

Table 2
Estimated Lifetime Federal Taxes across Education Categories

	High School	Associate's Degree	Bachelor's Degree	Master's Degree	Professional & Doctorate Degree
<u>Income Taxes</u>					
Sum	\$111,132	\$194,896	\$367,132	\$466,111	\$733,428
Present Value	\$47,255	\$82,866	\$155,699	\$190,303	\$300,808
Degree Premium - Sum		\$83,764	\$255,999	\$98,980	\$366,297
Degree Premium - PV		\$35,611	\$108,444	\$34,604	\$145,109
<u>Social Security Payroll Taxes</u>					
Sum	\$169,398	\$223,516	\$289,111	\$322,247	\$482,088
Present Value	\$86,642	\$110,896	\$138,423	\$148,746	\$209,136
Degree Premium - Sum		\$54,118	\$119,713	\$33,136	\$192,977
Degree Premium - PV		\$24,254	\$51,781	\$10,323	\$70,714
<u>Total</u>					
Sum	\$280,531	\$418,412	\$656,243	\$788,358	\$1,215,517
Present Value	\$133,896	\$193,761	\$294,122	\$339,049	\$509,945
Degree Premium - Sum		\$137,882	\$375,712	\$132,115	\$559,274
Degree Premium - PV		\$59,865	\$160,225	\$44,927	\$215,823

Present values are calculated using a 3 percent real interest rate.

Government Expenditures

- CPS data are used to quantify the effects of college attainment on the receipt of Medicaid, Medicare, Social Security benefits, Supplemental Security, unemployment compensation, worker's compensation, cash public assistance, food stamps, housing subsidies, energy assistance, and school lunches.
- Participation in WIC, transportation assistance, child-care assistance, and work programs are also shown, but not quantified in dollar amounts.
- Medicaid and Medicare health insurance are measured as the market value.

Table 3
 Estimated Lifetime Welfare Receipts across Education Categories

	High School	Associate's Degree	Bachelor's Degree	Master's Degree	Professional & Doctorate Degree
<u>Food Stamps</u>					
Sum	\$8,601	\$4,188	\$1,513	\$1,458	\$1,472
Present Value	\$5,401	\$2,489	\$934	\$935	\$873
Degree Premium - Sum		-\$4,413	-\$7,088	-\$54	-\$40
Degree Premium - PV		-\$2,912	-\$4,468	\$2	-\$61
<u>Total Welfare Receipts</u>					
Sum	\$14,852	\$8,433	\$3,240	\$2,774	\$3,059
Present Value	\$9,193	\$4,906	\$1,858	\$1,625	\$1,698
Degree Premium - Sum		-\$6,418	-\$11,612	-\$466	-\$180
Degree Premium - PV		-\$4,288	-\$7,335	-\$233	-\$160

Present values are calculated using a 3 percent real interest rate.

Table 5
 Estimated Lifetime Market Value of Medicaid across Education Categories

	High School	Associate's Degree	Bachelor's Degree	Master's Degree	Professional & Doctorate Degree
Sum	\$42,227	\$30,786	\$19,191	\$14,462	\$14,154
Present Value	\$22,912	\$15,913	\$9,751	\$7,565	\$6,727
Degree Premium - Sum		-\$11,440	-\$23,035	-\$4,730	-\$5,038
Degree Premium - PV		-\$6,999	-\$13,161	-\$2,187	-\$3,025

Present values are calculated using a 3 percent real interest rate.

Table 6
 Estimated Lifetime Market Value of Medicare across Education Categories

	High School	Associate's Degree	Bachelor's Degree	Master's Degree	Professional & Doctorate Degree
Sum	\$183,452	\$173,941	\$179,536	\$167,034	\$165,884
Present Value	\$50,592	\$42,617	\$42,334	\$35,515	\$32,816
Degree Premium - Sum		-\$9,512	-\$3,917	-\$12,502	-\$13,652
Degree Premium - PV		-\$7,976	-\$8,259	-\$6,818	-\$9,517

Present values are calculated using a 3 percent real interest rate.

Government Expenditures

- The estimates of the fiscal premia in expenditures are somewhat conservative in that they do not include any public costs in administering programs. They show the value to the recipients rather than the total fiscal cost.
- Medicaid and Medicare do not take into account variation in the use of health care paid with government funds.
- Given that health varies with education attainment, the public cost of Medicaid across education attainment varies more than the market value.
 - Among recipients of Medicaid aged 27 and older, 38% of those with only a high school diploma report their health to be very good, compared to 54% for bachelor's degrees.

Government Expenditures

- Differences in mortality rates are not taken into account, thus the fiscal premia in Medicaid and Social Security may be biased upward.
- This may not make much difference, though, in terms of present value at age 19.
- However, the estimates do not take into account variation in the use of health care paid with Medicare.
 - Among recipients of Medicare, 33% of those with only a high school education report their health to be very good, compared to 50% for those with a bachelor's degree.
- The net bias of the approach in this study is unclear.
- But the results for Medicaid and Social Security are more uncertain than the other results.

Table 7
 Estimated Lifetime Social Security Benefits across Education Categories

	High School	Associate's Degree	Bachelor's Degree	Master's Degree	Professional & Doctorate Degree
Sum	\$180,557	\$174,288	\$173,404	\$161,467	\$183,655
Present Value	\$44,186	\$38,558	\$35,763	\$30,014	\$31,971
Degree Premium - Sum		-\$6,269	-\$7,153	-\$11,937	\$10,251
Degree Premium - PV		-\$5,628	-\$8,423	-\$5,749	-\$3,792

Present values are calculated using a 3 percent real interest rate.

Government Expenditures

- Correctional expenditure per inmate is estimated to be \$29,877.
- 0.115% of the adult population with a bachelor's degree or higher is incarcerated.
- For those with some college experience or associate's degrees, the incarceration proportion is 0.317%.
- For those with a high school diploma, the proportion is 1.191% (10.4 times higher than for college graduates).
- Thus, the bachelor's degree differential in incarceration costs is \$321 annually.

Table 12
 Estimated Lifetime Corrections Costs across Education Categories

	High School	Associate's Degree	Bachelor's Degree or More
Sum	\$21,702	\$6,166	\$2,697
Present Value	\$10,202	\$3,102	\$1,576
Degree Premium - Sum		-\$15,536	-\$19,004
Degree Premium - PV		-\$7,100	-\$8,626

Present values are calculated using a 3 percent real interest rate.

Government Expenditures

- The lack of health insurance is negatively correlated with college attainment.
- Hadley and Holahan (2003) estimate the annual government cost per uninsured to be \$823.
- Among those aged 27 and above, 16.8% of high school graduates reported having no health insurance, more than double the fraction of those with bachelor's degrees.
- Given the positive relationship between college attainment and health, the estimates are again conservative.
 - Among the uninsured aged 27 and older, 52% of those with only a high school education report their health to be very good, compared to 65% for those with a bachelor's degree.

Table 13
 Uninsurance Rates and Estimated Lifetime Public-Healthcare Costs across Education Categories

	High School	Associate's Degree	Bachelor's Degree	Master's Degree	Professional & Doctorate Degree
<u>Uninsured Percentage</u>	16.8%	10.5%	8.3%	5.0%	5.7%
<u>Public Healthcare Costs</u>					
Sum	\$9,220	\$5,488	\$4,548	\$3,255	\$3,715
Present Value	\$5,811	\$3,539	\$2,892	\$2,229	\$2,536
Degree Premium - Sum		-\$3,733	-\$4,673	-\$1,293	-\$833
Degree Premium - PV		-\$2,272	-\$2,918	-\$664	-\$357

Uninsured percentages are for population age 27 and older. Present values are calculated using a 3 percent real interest rate.

Public Cost per Degree

- Government spending on higher education is taken from National Income and Product Accounts.
- This measure includes expenditures financed through revenues from endowments.
- Rather than evaluate the relative merits of the different underlying concepts of opportunity cost, this study simply chooses the more generous measure.

Public Cost per Degree

- Measured public cost of degrees is generous in that it includes the costs of university research and service activities.
- Research and service is 19.3% of total educational and general expenditure.
- On the other hand, the data are for current expenditures only.
- Capital outlays are 13.5% as large as operating expenditures.

Public Cost per Degree

- Although most public funding is directed toward students in public institutions, significant funding also goes to students in private higher education.
- To be conservative, all government spending on higher education is divided by degrees granted from public institutions only.
- This imposes the implicit assumption that financial aid to students in private colleges does not lead to any additional college attainment.

Public Cost per Degree

- Higher education costs are not assigned by degree level.
- This study makes the simple assumption that each year of college creates the same fiscal cost.
- The relative importance of the separate degree levels is taken into account by weighting the corresponding fiscal effects (the fiscal weights for each degree level are their proportions of total four-year-equivalent degrees).
- This does not account for the fact that the fiscal cost is clearly increasing with the level of college education.
- Not accounting for this is conservative in showing the fiscal return because it puts disproportionate weight on the lowest degree levels, and the largest fiscal impact is for professional and doctorate degrees.

Table 14
 Estimated Government Cost per Four-Year-Equivalent Degree

	Federal	State & Local	Total
<u>All Degrees</u>			
Sum	\$9,008	\$38,948	\$47,955
Present Value	\$8,622	\$37,279	\$45,901
<u>Public Degrees Only</u>			
Sum	\$14,007	\$60,566	\$74,573
Present Value	\$13,407	\$57,971	\$71,378

Present values are calculated using a 3 percent real interest rate.

Table 15
 Estimated Lifetime Total Fiscal Effects per Four-Year-Equivalent Degree

	<u>Costs</u>		<u>Revenues</u>	
	Sum	Present Value	Sum	Present Value
State and Local Taxes			\$118,019	\$47,144
Federal Income Taxes			\$237,819	\$100,569
Federal Payroll Taxes			\$115,442	\$49,528
Welfare	-\$10,218	-\$6,544		
Medicaid	-\$20,763	-\$12,021		
Social Security and Medicare	-\$18,622	-\$19,867		
Supplemental Security Income	-\$5,749	-\$3,129		
Unemployment Compensation	-\$1,665	-\$1,054		
Worker's Compensation	-\$1,438	-\$506		
Corrections	-\$21,385	-\$9,726		
Public Healthcare	-\$4,828	-\$2,974		
Totals	-\$84,668	-\$55,819	\$471,281	\$197,240

Internal Rate of Return (public degrees only) = 10.3%
 Internal Rate of Return (all degrees) = 13.7%

Present values are calculated using a 3 percent real interest rate.

Figure 4
Cumulative Fiscal Effect per Four-Year Equivalent Degree

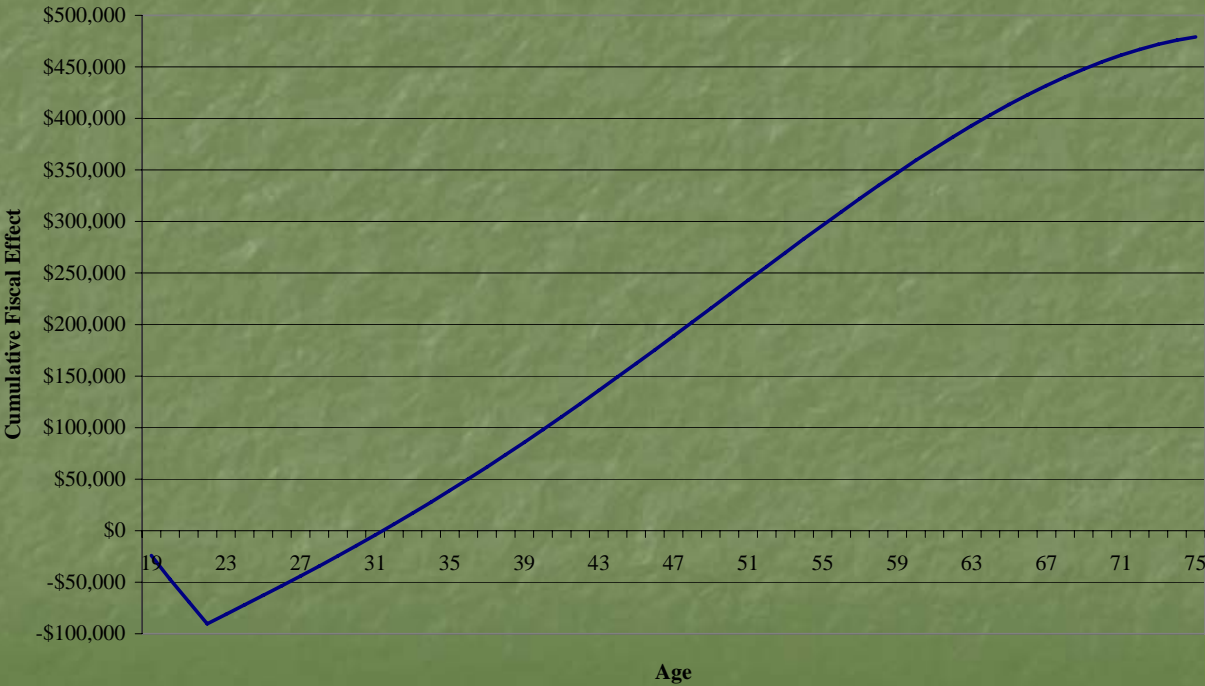


Table 17
 Estimated Lifetime State and Local Fiscal Effects per Four-Year-Equivalent Degree

	<u>Costs</u>		<u>Revenues</u>	
	Sum	Present Value	Sum	Present Value
Income Taxes			\$48,741	\$20,699
Property Taxes			\$35,439	\$12,842
Sales Taxes			\$25,357	\$9,872
Welfare	-\$2,073	-\$1,331		
Medicaid	-\$7,814	-\$4,534		
Unemployment Compensation	-\$1,552	-\$988		
Worker's Compensation	-\$1,350	-\$476		
Corrections	-\$18,322	-\$8,351		
Public Healthcare	-\$1,593	-\$983		
Totals	-\$32,704	-\$16,663	\$109,536	\$43,413
Internal Rate of Return (public degrees only) = 3.1%				
Internal Rate of Return (all degrees) = 5.1%				

Post-college fiscal effects are reduced by 6.6 percent to account for interstate emigration of graduates. Present values are calculated using a 3 percent real interest rate.

Appendix Table 4
 Estimated Lifetime Fiscal Effects per Four-Year-Equivalent Degree in Wisconsin

	<u>Costs</u>		<u>Revenues</u>	
	Sum	Present Value	Sum	Present Value
Cost per Public Degree	\$72,634	\$69,522		
Cost per (all) Degree	\$54,007	\$51,693		
Income Taxes			\$52,900	\$22,311
Property Taxes			\$22,063	\$9,079
Sales Taxes			\$16,788	\$6,043
Welfare	-\$2,928	-\$1,746		
Medicaid	-\$6,909	-\$4,054		
Unemployment Compensation	-\$6,045	-\$3,316		
Worker's Compensation	-\$849	-\$471		
Corrections*	-\$21,620	-\$9,852		
Public Healthcare*	-\$1,111	-\$696		
Post-college Totals	-\$39,462	-\$20,135	\$91,752	\$37,433

Internal Rate of Return (public degrees only) = 2.2%

Internal Rate of Return (all degrees) = 3.5%

Post-college fiscal effects are reduced by 6.7 percent to account for net emigration of graduates. Present values are calculated using a 3 percent real interest rate. *Estimates for Corrections and Public Healthcare are based on national averages.

A Mind is a Terrible Thing to Waste

- A mind denied a college education is figurative \$100 bill lying on the ground that we are not picking up.
- Specifically, from taxpayers' point of view each potential college degree is, conservatively, a \$481,000 bill (\$556,000 in various fiscal benefits minus the \$75,000 cost).
- In present value (at age 19, using a 3% real discount rate), each potential college graduate is a \$182,000 bill.
- Instead of rushing to pick up those bills, public investment in higher education is a falling priority.
 - In FY 1984, state funding for higher education was 4.1% of total state government spending.
 - In 1994, this proportion was 2.4%.
 - In 2004, it was 1.8%.