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AUTHOR   Christophersen, Kjell A.; Robison, M. Henry
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ABSTRACT

        This document is a report on the Wisconsin Technical College
System's (WTCS) benefits to community college students and the overall state
economy and welfare. The report shows how the WTCS rates, using the
Association for Community College Trustees' (ACCT) model for measuring the
economic and social benefits of technical colleges to their surroundings. The
ACCT model is based on economic theories, functional relationships among
technical colleges, its students, the community, and education-related data.
The model tracks four types of technical college benefits: (1) contributions
to job and income formation; (2) higher earnings captured by exiting
students; (3) a broad collection of social benefits (improved health, reduced
crime, lower welfare and unemployment); and (4) the return to taxpayers for
their support to technical colleges. Results show that the WTCS accounts for
approximately 3,852 million dollars of the annual earnings in the state.
Technical college students are reported as enjoying a 20% return on their
investment of time and money at the community college. State statistics have
shown improved health, reduced welfare, less unemployment, and lower crime,
which has saved the state over 45.5 million dollars. Finally, taxpayers are
shown to have a 100% return rate on their investments--on average, they
recover all invested money in 2.2 years. (MKF)

The Socioeconomic Benefits Generated by Wisconsin Technical College System.

Volume 1: Main Report [and] Volume 2: Detailed Results [and] Executive Summary.

Kjell A. Christophersen

M. Henry Robinson

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Wisconsin Technical College System

The Socioeconomic Benefits Generated by Wisconsin Technical College System

State of Wisconsin

Volume 1: Main Report

December 20, 2001

Kjell A. Christophersen & M. Henry Robison

*CC*Benefits Inc.

email: ccb@turbonet.com

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ACRONYMS

WTCS	Wisconsin Technical College System
AD	Associate Degree
ABE	Adult basic education
ACCT	Association of Community College Trustees
B/C	Benefit–cost ratio
CC	Community college
CE	Credit equivalent
ESL	English as a second language
GED	General Equivalency Diploma (also Education Development Certificate)
HS	High school
IO	Input–output analysis
NCF	Net cash flow
NPV	Net present value
REIS	Regional Economic Information System
RR	Rate of return
TC	Technical college
TD	Technical Diploma

Chapter 1
INTRODUCTION

OVERVIEW

W isconsin's technical colleges generate a wide array of benefits. Students benefit directly from higher personal earnings, and society at large benefits indirectly from a more competitive and robust economy, and from an assessment of cost savings (avoided costs) associated with reduced welfare and unemployment, improved health and reduced crime. Higher education requires a substantial investment on the part of the student and society as a whole, however. All education stakeholders—taxpayers, legislators, employers, and students—want to know if they are getting their money's worth. In this study, the 16 Technical College (TC) districts in Wisconsin (**Table 1.1** and **Figure 1.1**) joined forces to determine their economic attractiveness to Wisconsin's technical college students, taxpayers, and the public at large. The benefits are presented in three ways: 1) annual benefits, 2) present values of future annual benefits (rates of return and benefit-cost ratios, etc.), and 3) statewide economic benefits.[1]

The study has four chapters and two appendices. **Chapter 1** is an overview of the benefits measured. **Chapter 2** details the major assumptions underlying the analysis. **Chapter 3** presents the main socioeconomic and statewide economic results. Finally, **Chapter 4** presents a sensitivity analysis of some key assumptions—tracking the changes in the results as assumptions are changed. **Appendix 1** is a short primer on the context and meaning of the investment analysis results—the net present values (NPV), rates of return (RR), benefit/cost ratios (B/C), and the payback period. **Appendix 2** explains how the earnings related to higher education data were derived.

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[1] The public benefits measured are only the quantifiable subset of all potential benefits generated by the TC. Additional benefits can probably be quantified and will be included in future iterations of this effort. These additional benefits would add further to the overall attractiveness of investing in higher education.

Table 1.1. Participating Technical Colleges and '99-00 Enrollment

Name of College	Acronym	Enrollment
Blackhawk Technical College	BTC	19,612
Chippewa Valley Technical College	CVTC	23,534
Fox Valley Technical College	FVTC	49,432
Gateway Technical College	GTC	25,512
Lakeshore Technical College	LTC	19,519
Madison Area Technical College	MATC	50,800
Mid-State Technical College	MSTC	14,755
Milwaukee Area Technical College	MATC	64,163
Moraine Park Technical College	MPTC	23,645
Nicolet Area Technical College	NATC	11,537
Northcentral Technical College	NTC	17,846
Northeast Wisconsin Technical College	NWTC	43,225
Southwest Wisconsin Technical College	Southwest Tech	11,859
Waukesha County Technical College	WCTC	33,012
Western Wisconsin Technical College	WWTC	20,678
Wisconsin Indianhead Technical College	WITC	27,309
Wisconsin Technical College System (aggregate)	WTCS	456,438

Figure 1.1. Geographical Distribution of Participating TCs
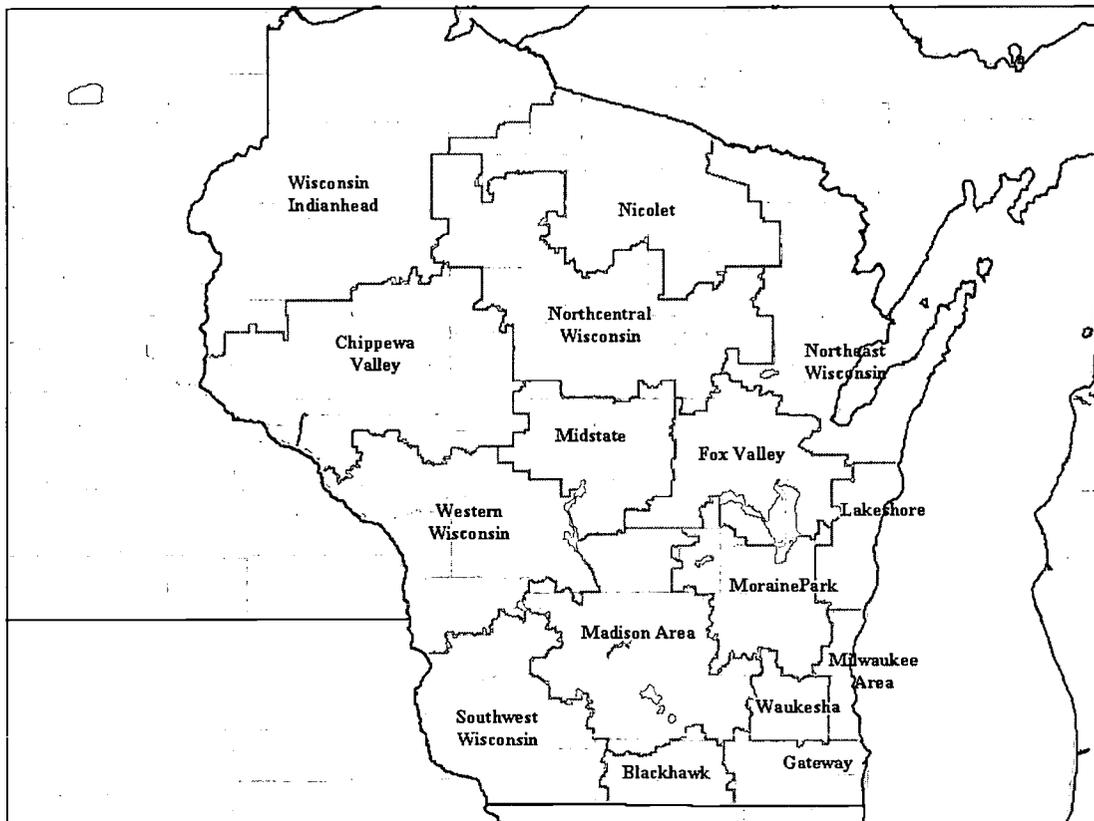
ANNUAL PRIVATE AND PUBLIC BENEFITS

Private benefits are the higher earnings captured by the students; these are well known and well documented in the economics literature. Less well-known and documented is a collection of public benefits captured by society at large, the indirect benefits, or what economists call *positive externalities*, such as improved health and lifestyle habits, lower crime, and lower incidences of welfare and unemployment. These stem from savings to society from reduced burdens on taxpayer-provided services. We estimate dollar savings (or avoided costs) from reduced arrest, prosecution, jail, and reform expenditures based on published crime statistics arranged by education levels. Likewise, statistics that relate unemployment, welfare, and health habits to education levels are used to measure other savings. The annual impacts are presented in three ways: per credit equivalent (CE), defined as a combination of credit and non-credit attendance[2], per student, and in the aggregate.

PRESENT VALUES OF FUTURE BENEFITS

The annual impacts continue and accrue into the future and are quantified and counted as part of the economic return of investing in education. This lifetime perspective is summarized as *present values*—a standard approach of projecting benefits into the future and discounting them back to the present. The present value analysis determines the economic feasibility of investing in TC education—i.e., whether the benefits outweigh the costs. The time horizon over which future benefits are measured is the retirement age (65) less the average age of the students.

The present values are also expressed in four ways: 1) net present value (NPV) total, per CE, and per student, 2) rate of return (RR) where the results are expressed as a percent return on investment, 3) benefit/cost (B/C) ratio—

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[2]Instruction hours are not the same as credit hours. TCs prepare people for jobs and are less concerned with (ceremonial) degrees. Many attend for short periods and then leave to accept jobs without graduating. Others simply enroll in non-academic programs. Nonetheless, the CEs earned will positively impact the students' lifetime earnings and social behavior.

the returns per dollar expended, and 4) the payback period—the number of years needed to fully recover the investments made (see **Appendix 1** for a more detailed explanation of the meaning of these terms).

STATEWIDE ECONOMIC BENEFITS

The benefits of a robust economy are many: jobs for the young, increased business revenues, greater availability of public investment funds, and eased tax burdens. In this study we estimate the share of statewide earnings attributable to Wisconsin's 16 TCs. In general, these TC-linked earnings fall under two categories: 1) earnings generated by the annual operating expenditures of the colleges; and 2) earnings attributable to the increased productivity of TC-trained workers.

Chapter 2
DATA SOURCES AND ASSUMPTIONS

INTRODUCTION

To the extent possible, documented statistics are used to estimate model parameters. In the few cases where hard data are scarce, however, institutional researchers on the scene apply best judgments and estimations on the basis of their intimate knowledge of the college and the student body.

This chapter contains six assumption sections, all based on various data imbedded in the analytic model: 1) the aggregate WTCS profile; 2) annual earnings by education levels; 3) the social benefit assumptions (health, crime and welfare/unemployment); 4) education costs; 5) other assumptions (the discount rate used, health, crime, and welfare cost statistics, etc.); and 6) the statewide economic benefits assumptions.

PROFILE

Faculty, Staff, and Operating Budgets

The Wisconsin Technical College System (WTCS) employed 7,518 full- and 12,343 part-time faculty and staff in FY 2000 amounting to a total annual payroll of some $554 million. **Table 2.1** shows WTCS's annual revenues by funding source: a total of $954.8 million. Two main revenue sources—private and public—are indicated. Private sources include tuition and fees (11%) plus 22% from other private sources (such as contract revenues, interest payments and the like). Public funding is comprised of local taxes, 45% (by far the largest component), state aid, 15%, and federal grants, 7%. These budget data are critical in identifying the annual costs of educating the WTCS student body from the perspectives of the students and the taxpayers alike.

Table 2.1. Aggregate Revenues, the Budgets

Sources	Revenues	Total	% of Total
Private Funding			
Tuition payments	$109,253,423		11%
Institut. & other sources of revenues	$208,038,082	$317,291,505	22%
Public Funding			
Local taxes	$429,211,036		45%
State aid	$141,103,625		15%
Federal grants	$67,191,978	$637,506,639	7%
Total		$954,798,144	100%

WTCS Client Reporting System

Figure 2.1. Revenues: The Budget
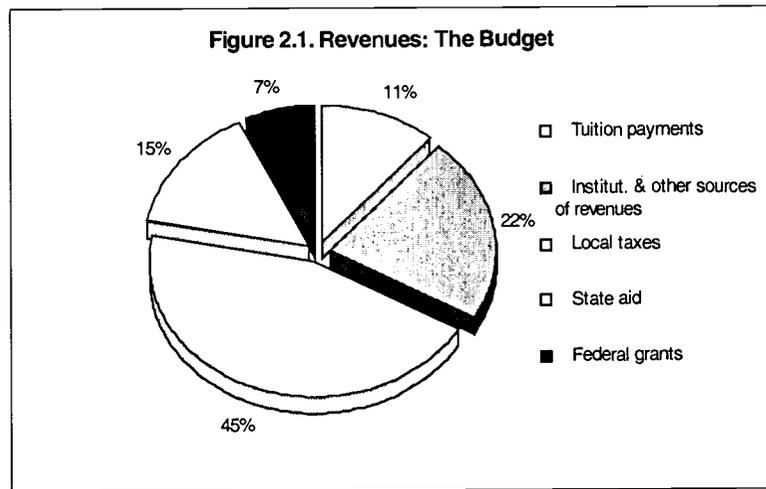
The Students

Students attend technical colleges for different reasons: to prepare for transfer to four-year institutions, to obtain Associate Degrees or Technical Diplomas, obtain basic skills, or perhaps most importantly, to take refresher courses in non-credit programs—workforce students, for example. Students also leave for various reasons; they may have achieved their educational goals or decided to interrupt their college career to work full-time. **Tables 2.2 – 2.4** summarize the student body profile. The unduplicated aggregate student body (headcount) is 456,438 (FY99-00 enrollment).

Some students forego earnings entirely while attending college while others may hold part- or full-time jobs. Information about student employment

plays a role in determining the *opportunity cost* of education incurred by the students while attending WTCS[3]. **Table 2.2** rows labeled: "% Employed While Attending" and "% of Full-Time Earning Potential" provide the percentage estimates of the students who held jobs (79%) while attending WTCS, and how much they earned (65%) relative to full-time employment (or what they would statistically be earning if they did not attend WTCS).

Table 2.2. Aggregate Student Body Profile

	Values
Total enrollment	456,438
% of students employed while attending college	79%
% of full-time earning potential	65%
Students remaining in-state after leaving	95%
Attrition rate over time	31.0%
< 1 year "settling in" factor (years)	0.0
1 year "settling in" factor (years)	0.5
> 1 year "settling in" factor (years)	2.5

WTCS Client Reporting System

As indicated in the table, it is estimated that 95% of the students remain in-state and thereby generate statewide benefits. The remaining 5% leave the state and are not counted as part of the statewide economic development benefits. The 95% in-state retention rate applies only to the first year, however. We assume that one-third of the students, and associated benefits, will leave over the next 30 years due to attrition (e.g., retirement, out-migration, or death).

The last three items in **Table 2.2** are *settling-in* factors—the time needed by students to settle into the careers that will characterize their working lives. These factors are adapted from Norton Grubb (June 1999). Settling-in factors have the effect of delaying the onset of benefits.[4]

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[3] The opportunity cost is the measure of the earnings foregone; the earnings the individual would have collected had he or she not attended the WTCS institutions.

[4] The three settling-in factors are: 1) short term: attending for less than one year, including students not pursuing a degree, non-completers, and students under contract; 2) one year/Technical Diploma equivalent: attending for one year, including Technical Diploma students and those working toward an Associate Degree; and 3) two years or more/Associate Degree equivalent: attending for two years or more and/or earning an Associate Degree.

Entry-Level Education, Gender, and Ethnicity

Table 2.3 shows the education level, gender, and ethnicity of the WTCS student body. This breakdown is used only to add precision to the analysis, not for purposes of comparing between different groups. Seven education entry levels are indicated in one-year increments, ranging from less than HS to HS plus five years. These provide the platform upon which the economic benefits are computed.

Table 2.3. Education Level and Ethnicity of Student Body

Entry Level	Percent of Student Body	Total	Male White	Male All Other	Female White	Female All Other
<HS/GED	16%	74,649	40%	13%	34%	13%
HS/GED Equiv.	53%	241,933	43%	5%	47%	6%
HS/GED+1 = TD	7%	33,318	37%	4%	54%	5%
HS/GED+2 = AD	8%	35,341	47%	3%	46%	4%
HS/GED+3	3%	12,593	41%	4%	50%	5%
HS/GED+4 = BS	9%	41,592	45%	2%	50%	3%
HS/GED+5	4%	17,013	46%	3%	47%	4%
Total	100%	456,438				

WTCS Client Reporting System

Figure 2.2. Student Body by Entry Level of Education
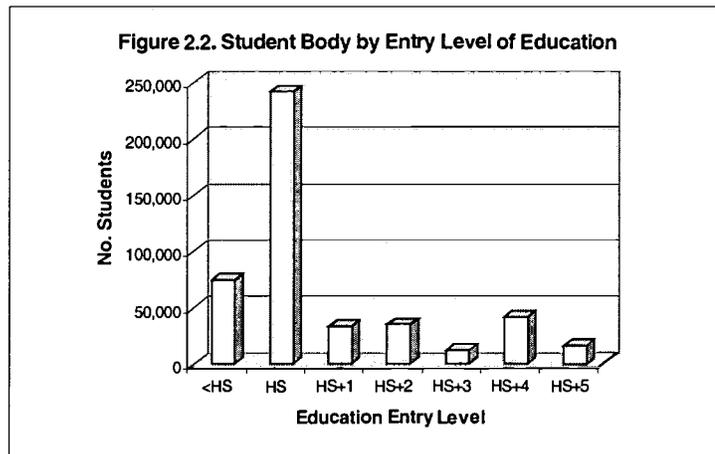
The Achievements

Table 2.4 shows the student breakdown in terms of scholastic achievement in four categories: 1) Associate Degree completers, 2) Technical Diploma and Certificate completers, 3) all contract students, HS/GED completers,

ABE/ESL students[5], and all partial completers, non-completers and non-degree students; and 4) retirees who attend largely for self enrichment.

As indicated in the table, students achieving their graduation goals would be those completing Associate Degrees, Technical Diplomas or Certificates. The remaining majority (96.5%) of students complete college credits, and either fulfill their educational needs, or return the following year to continue to work toward their goals (91.2% + 5.3% = 96.5%). Some students leave temporarily to return at a later time to complete their degrees or diplomas.

Table 2.4. Levels of Achievement

Student Body	%	St. Body 456,438	Gener. Impacts	Avg. Age	Avg. Credits Cumul.	CEs This Year	Total Credits	# Years Resid.
Completing AD equivalent	1.6%	7,400	100%	28	69	20.0	148,297	0.67
Completing TD equivalent	1.9%	8,454	100%	27	26	12.4	104,581	0.41
All other students[*]	91.2%	416,499	100%	34	9	3.5	1,463,184	0.12
Retired	5.3%	24,089	0%	NA	NA	1.0	23,720	NA
Total or weighted averages	100.0%	456,440		33.6			1,739,782	
Eligible for ABE/ESL pool		416,499	% enrolled in ABE/ESL	20%	=		85,276	students
ABE/ESL earnings relative to avg.		29%	Credits required for one full time year equivalent of study					30

* This includes non-completing degree, contract, and non-degree students

Figure 2.3. Credit Equivalents Completed, All Students
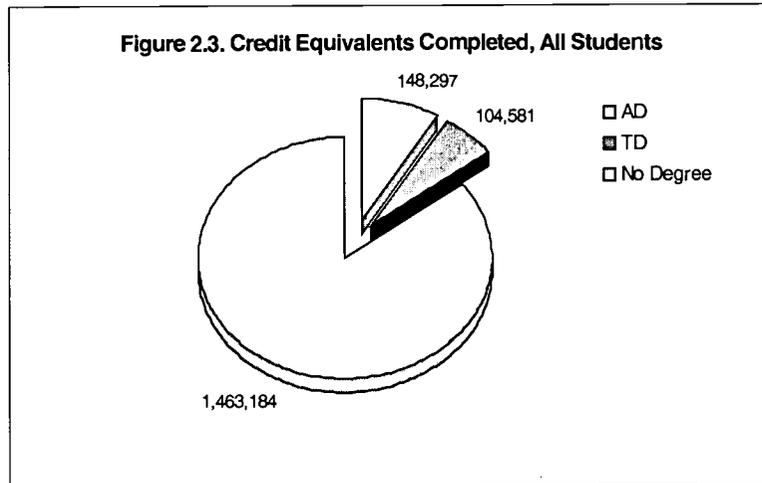
The earnings statistics (see **Table 2.5** below) on which benefit estimates are based reflect all occupations (technical and non-technical). The lower the

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[5] ABE/ESL = Adult basic education and English as a second language

education level, the lower the average earnings, regardless of the subject matters studied. The distinguishing feature among the achievement categories, therefore, is the number of CEs completed. The column labeled "Generating Impacts" in **Table 2.4** simply reflects this equal treatment of earnings relative to average earnings statistics—Associate Degree and Technical Diploma holders, contract, and non-completers all contribute benefits on an equal basis (100%) relative to the statistical averages. The exceptions are the retirees[6] and students in the ABE/ESL category.

ABE/ESL students (a subset of the contract and non-completer pool of students indicated in the table) are viewed differently. They are assumed to have a lower percentage impact than the others (the assumption applied for the state as a whole is 29%), because the end product of their education is to arrive at the "starting gate" on an equal basis with other students. This does not mean that ABE/ESL education has lower value, it simply means that these students must complete an extra step before they can compete effectively in the job market and reap the benefit of higher earnings.

The fourth column shows the average age of the students generating the benefits (excluding retirees). The average age determines the time horizon for the analysis—the difference between the average age (34 years) and retirement at 65, or 31 years.

As indicated in column five, the average Associate Degree and Technical Diploma student completed a cumulative total of 69 and 26 CEs, respectively; many doing so over a relatively long time period, typically including several stopouts. The number of CEs completed last year only is calculated in columns six and seven for all categories of achievement—the total number of CEs completed during the year of analysis is 1,739,782. Finally, the last column shows the average time the students are in residence since the last time they attended. This information is needed to determine the opportunity cost of their education.

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[6] Retirees, by definition, do not attend the TC to increase earnings and are thus backed out of the pool of students contributing benefits. The default assumption on added earnings for this category is 0%.

ANNUAL PRIVATE BENEFITS

Statistics indicate that earnings are highly correlated with education. Correlation does not necessarily equal causation, however. Higher education is not the only factor explaining the private and public benefits reported in the statistics. Other variables such as ability, family background, and socioeconomic status play a role. The *simple correlation* between higher earnings and education nonetheless defines the *upper limit* of the effect measured. Our estimates of higher education's impact on earnings are based on a survey of recent econometric studies. A literature review by Chris Molitor and Duane Leigh (March, 2001) indicates that the upper limit benefits defined by correlation should be discounted by 10%. Absent any similar research for the social variables (health, crime, and welfare and unemployment), we assume that the same 10% discounting factor applies as well to the public benefits.

As education milestones are achieved, students move into higher levels of average earnings. **Table 2.5** shows average earnings by one-year education increments, linked to the gender and ethnicity profile of the WTCS student body. The differences between the steps are indicated in the last column. We also assume that *all* education has value, and thereby attribute value to students completing less than full steps as well. Specific detail on **Table 2.5** data sources and estimating procedures are found in **Appendix 2: Methodology for Creating Income Gains by Levels of Education by Gender and Race.**

Table 2.5. Weighted Avg. Earnings

Entry Level	Average Earnings	Diff.
<HS/GED	$19,490	$7,885
HS/GED Equiv.	$27,375	$5,845
HS/GED+1 = TD	$33,220	$4,892
HS/GED+2 = AD	$38,113	$6,262
HS/GED+3	$44,375	$9,036
HS/GED+4 = BS	$53,411	$6,288
HS/GED+5	$59,699	NA

Source: Department of Commerce, US Bureau of the Census, 1998.

Figure 2.4. Average Earnings by Education Levels
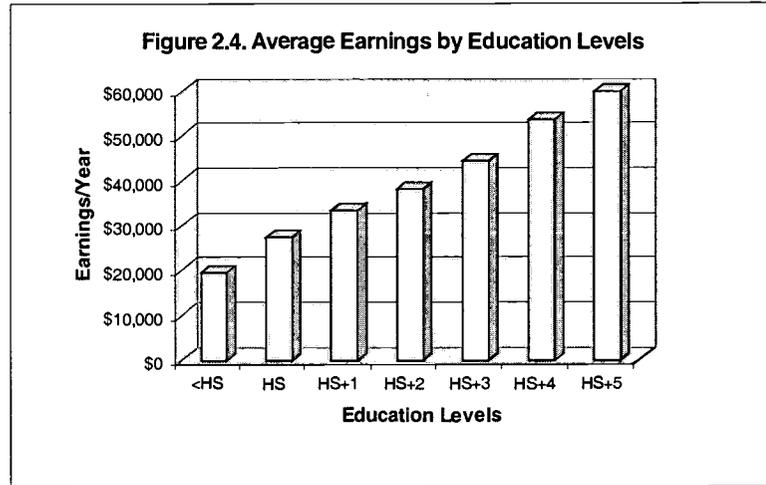
ANNUAL PUBLIC BENEFITS

Students and society at large both benefit from higher earnings. Indeed, the principal motivation for publicly funded higher education is to raise the productivity of the workforce and the incomes the students will enjoy once they complete their studies. Society benefits in other ways as well. Higher education is associated with a variety of lifestyle changes that generate savings; e.g., reduced welfare and unemployment, improved health, and reduced crime. Note that these are *external* or *incidental* benefits of education. All colleges, of course, are created to provide education, not to reduce crime, welfare and unemployment, or improve health. The fact that these incidental benefits occur and can be measured, however, is a bonus that enhances the economic attractiveness of the college operations. It should not be taken to mean, as some opportunists might argue, that taxpayers would need to channel more money to colleges on the strength of these external benefits. Our purpose is simply to bring to the attention of education stakeholders that the activities of WTCS impact society in many more ways than simply the education it provides. In so doing, we have identified and measured some social benefits obviously related to educational achievements and included them in the mix of impacts generated by the college.

With state and local taxpayers representing the public, the public benefits of higher education can be gauged from two perspectives, 1) a *broad* perspective that tallies all benefits, and 2) a *narrow* perspective that considers only changes in the revenues and expenditures of the state government.

Higher Earnings

Broad Perspective: Higher education begets higher earnings. The economy generates more income than it would absent the TC skills embodied in the labor force. From the broad taxpayer perspective, the total increase in earnings is counted as a benefit of TC education.

Narrow Perspective: Higher earnings translate into higher *tax collections*. In the narrow taxpayer perspective we assume that the state will, in the aggregate, collect 18% of the higher earnings in the form of taxes—the estimated composite of state and local income taxes, sales taxes, and property taxes (all taxes other than the federal income taxes).[7]

Health Savings

The improved health of students generates savings in three measurable ways: 1) lower absenteeism from work, 2) reduced smoking and 3) reduced alcohol abuse (**Table 2.6**). These variables are based on softer (i.e., less-documented) data. In general, statistics show a positive correlation between higher education and improved health habits. The table shows the calculated reductions in the incidences of smoking and alcohol abuse as a function of adding the higher education, also linked to the aggregate gender and ethnicity profile of the WTCS student body. Recall from above, the health savings are reduced by 10% in recognition of causation variables not yet identified.

Broad Perspective: The benefits from reduced absenteeism are equal to the average earnings per day multiplied by the number of days saved. These are benefits that accrue largely to employers. Smoking- and alcohol-related savings accrue mostly to the individuals who will *not* have to incur the health-related costs. In the broad taxpayer perspective, however, these benefits accrued to employers and individuals are also public benefits.

Narrow Perspective: Taxpayers benefit from reduced absenteeism to the extent that state and local government is an employer. Accordingly, we assume a taxpayer's portion of absenteeism savings at 10.1%, equal to the

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[7] The tax data are obtained from the U.S. Census Bureau. See also **Appendix 2**.

estimated public portion of employment in the state.[8] As for smoking and alcohol related savings, the taxpayers benefit to the extent that state and local health subsidies (to hospitals, for example) are reduced. We assume that 5.0% of the total benefits can be counted as taxpayer savings.

Table 2.6. Reduced Absenteeism, Smoking and Alcohol Habits

Education Level	Absenteeism		Smoking		Alcohol Abuse	
	Days	%/Year	Average	Reduction	Average	Reduction
<HS/GED	21	8%	36%	18%	12%	29%
HS/GED Equiv.	18	7%	30%	61%	8%	49%
HS/GED+1 = TD	15	6%	11%	-1%	4%	-3%
HS/GED+2 = AD	13	5%	12%	60%	4%	11%
HS/GED+3	12	5%	5%	1%	4%	15%
HS/GED+4 = BS	11	4%	5%	-1%	3%	6%
HS/GED+5	9	4%	5%	NA	3%	NA

1. The Public Purpose, U.S. Employee Absences by Ind.: 1997; US Dept. of Labor, Bur. of Lab. Statistics.
2. Centers for Disease Control & Prevention, National Center for Health Statistics; Health 1998.

Figure 2.5. Days of Absenteeism by Education Levels

Figure 2.6. Average Incidence of Smoking by Education Levels
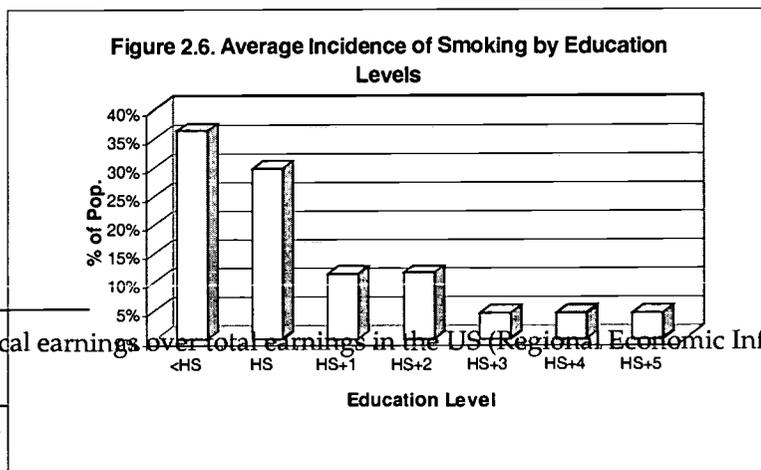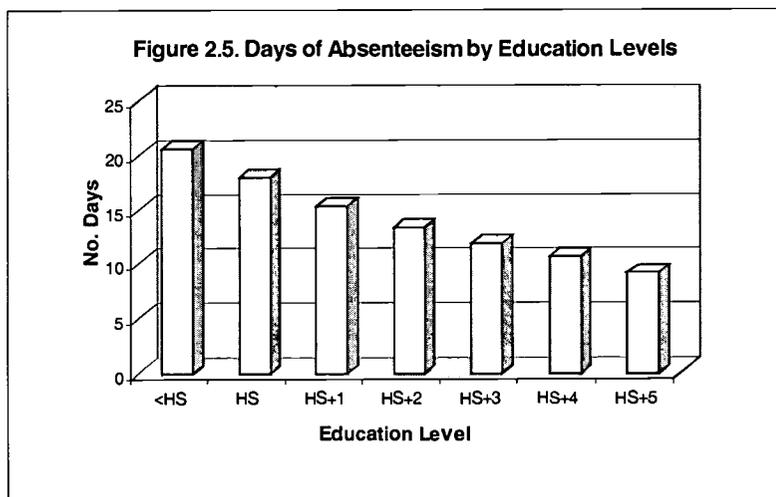
[8] The ratio of state and local earnings over total earnings in the US (Regional Economic Information

The

Figure 2.7. Average Incidence of Alcohol Abuse
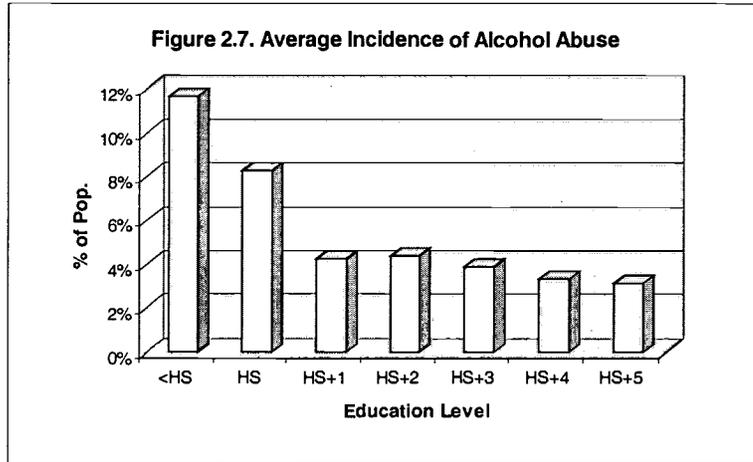
Crime Reduction Benefits

Table 2.7 relates the probabilities for incarceration to education levels in the first column—incarceration drops on a sliding scale as education levels rise (linked to the gender and ethnicity profile of the WTCS student body). The percentage reductions are based on total prison population relative to the population at large.[9] The implication is, as people achieve higher education levels, they are statistically less likely to commit crimes. The difference between before and after comprises the benefit attributable to education.

We identify three types of crime-related expenses, 1) the expense of prosecution, imprisonment, and reform, tracked as incarceration expense, 2) victim costs, and 3) productivity lost as a result of time spent in jail or prison rather than working. As with our other social statistics, crime-related expenses are reduced by 10% in recognition of other causation factors.

System—REIS, Bureau of Economic Analysis, Dept. of Commerce, 1998).
[9] See also: http//:www.ojp.usdoj.gov/bjs/dtdata.htm#corrections.

Broad Perspective: From the broad taxpayer perspective, all reductions in crime-related expenses are counted as a benefit.

Narrow Perspective: We assume that nearly all (80%) of the incarceration savings accrue to the state and local taxpayers—federal funding covers the remainder. Crime victim savings are avoided costs to the potential victims, not to the taxpayers. As such, we claim none of these as taxpayer savings. Finally, we apply our "composite" state and local government average tax rate (18%) to the added productivity of persons *not* incarcerated to arrive at the taxpayer benefits.

Table 2.7. Incarceration Rates

Education Level	Average	Reduction
<HS/GED	10%	64%
HS/GED Equiv.	3%	40%
HS/GED+1 = TD	2%	12%
HS/GED+2 = AD	2%	13%
HS/GED+3	2%	26%
HS/GED+4 = BS	1%	12%
HS/GED+5	1%	NA

1. US Dept. of Justice, Office of Justice Program.
2. T. P. Bonczar & Alan J. Beck; Lifetime Likelihood of Going to State or Federal Prison, 3/1997.
3. Stat. Abstract of the US, US Dept. of Com., 1997-99.

Figure 2.8. Incidence of Incarceration
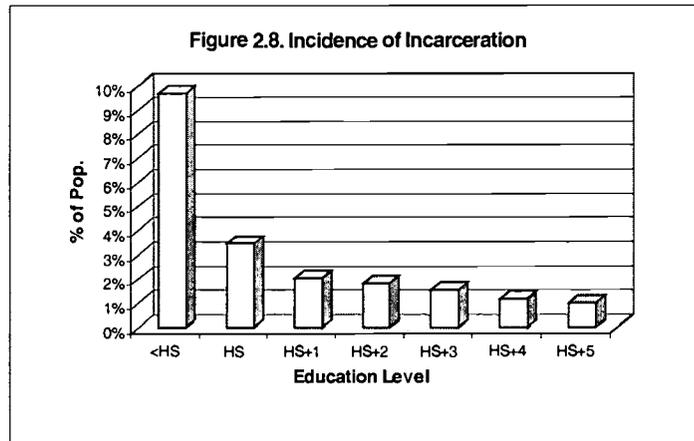
Welfare and Unemployment Reduction Benefits

Higher education is statistically associated with lower welfare and unemployment. **Table 2.8** relates the probabilities of individuals applying for welfare and/or unemployment assistance to education levels (linked to the

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gender and ethnicity profile of the aggregate WTCS student body). As above, all welfare and unemployment savings are reduced by 10% in recognition of other causation factors.

Broad Perspective: Reduced welfare and unemployment claims are counted in full as benefits in the broad taxpayer perspective.

Narrow Perspective: Taxpayer benefits from reduced welfare are limited to 16%--the extent to which the state and local taxpayers subsidize the welfare system. None is claimed for unemployment, because most of these costs are borne by the Federal Government.

Table 2.8. Welfare & Unemployment

Education Level	Welfare		Unemployment	
	Average	Reduction	Average	Reduction
<HS/GED	11%	11%	13%	14%
HS/GED Equiv.	10%	71%	11%	5%
HS/GED+1 = TD	3%	10%	11%	30%
HS/GED+2 = AD	3%	6%	8%	18%
HS/GED+3	2%	38%	6%	43%
HS/GED+4 = BS	2%	40%	4%	16%
HS/GED+5	1%	NA	3%	NA

1. Department of Health and Human Services.
2. Public Aid Recipients as a % of Population; Mothers Who Receive AFDC or Foodstarr
3. Statistical Abstract of the US, US Department of Commerce, 1997-1999.

Figure 2.9. Incidence of Welfare and Unemployment

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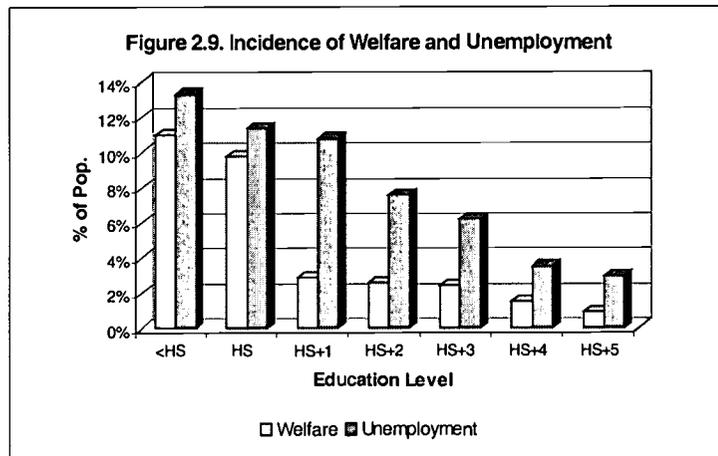
COSTS

There are two main cost components considered in the analytic framework: 1) the cost incurred by the student, including the opportunity cost of his or her time (represented by the earnings foregone while attending WTCS), and expenses for tuition and books, and 2) the cost incurred by state and local government taxpayers, part of the college's operating and capital costs (the budget—see **Table 2.1**). These are briefly discussed below.

Opportunity Cost of Time

The opportunity cost of time is, by far, the largest cost. While attending WTCS, most students forego some earnings, because they are not employed or are employed only part-time. The assumptions are discussed in conjunction with **Table 2.2** above. For the non-working students, the opportunity cost is the full measure of the incomes not earned during their TC attendance. For students working part-time, the opportunity cost is the difference between what they could make full-time less what they are making part-time. No opportunity cost of time is charged for the fully employed. The opportunity costs are derived from the earnings categories by education entry levels given in **Table 2.5**, although with some important modifications, as briefly described below:

- The earnings in **Table 2.5** are averages based on trajectories of earnings for all ages, from 17 to 65 (roughly defining the time spent engaged in the workforce).

- The average earnings, therefore, define the mid-point of the trajectory beginning with the average minimum wage of $12,480 we assume will be earned per year by 17-year-old workers. By the time a worker with an education level of less than HS/GED is 41 years old—the approximate working life span midpoint—he or she will have reached the level of earnings indicated in **Table 2.5**.[10]

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[10] The calculation: 65 – 17 = 48 years in the workforce. The mid-point: 48 years/2 = 24 years. The average age of worker defining the $19,490 earnings level (<HS/GED) = 24 years midpoint + 17 years, or 41.

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- The opportunity cost of time is then conditioned by the average age of the student (34 years, see **Table 2.4**). In particular, the average earnings at age 41 are adjusted downward to reflect the average earnings at age 34, assuming a straight line of earnings across the assumed 17 to 65 working life span.

The Budget

Beyond the student perspective, our assessment of WTCS considers the benefits and costs from the taxpayer perspective. Accordingly, only the state and local government revenues in **Table 2.1** are included as costs in the investment and benefit-cost assessment. All else equal, the larger the other revenue sources in **Table 2.1** (federal grants, student tuition, and contract revenues) relative to state and local government revenues, the larger will be the relative economic payback to the taxpayers.

OTHER ASSUMPTIONS

Table 2.9 lists several other assumptions imbedded in the analytic model: a) the discount rate and time horizon, b) crime-related costs (incarceration costs are inclusive of the cost per prison year plus all costs associated with arrest, investigation, trial and finally incarceration), c) welfare and unemployment costs per year[11], and d) health-related costs.[12] Annual real increases in costs are also included, although these are not used in the study. The alternative education opportunity assumption is discussed further below in association with the statewide economic impacts.

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[11] As indicated in the table, we assume that the average duration on welfare and unemployment is four years. This means that, over the next 30 years or so, the cumulative incidence of welfare and/or unemployment will amount to four years over the 30-year period—it is not a consecutive period.
[12] The incarceration, health, welfare and unemployment probability and cost variables are internal to the analytic model.

Table 2.9. Miscellaneous Variables

	Variables
Discount rate	4.0%
Time horizon, years to retirement	31.4
Average real earnings increase per year	1.0%
Avg. cost/prison year (all incl.: arrest, trial, incarc., rehab. etc.)	$53,478
Avg. length of incarc. (total years over 30-year time horizon)	4
Real cost increase per prison year	0.00%
Average victim cost	$ 17,308
Real victim cost increase per year	0.00%
Average cost per welfare year	$ 24,881
Avg. duration on welfare (total years over 30-year time horizon)	4.00
Welfare/unemployment cost increase per year	0.00%
Average cost per unemployment year	$ 34,634
Avg. duration on unempl. (total years over 30-year time horizon)	4
Smoking-related medical costs per year	$ 1,625
Alcohol-related medical costs/year	$ 3,926
Real medical cost increase per year	0.0%
Alternative education opportunities	18.8%

Assumptions adapted from:
1. Bur. of Justice Statistics, *Total Direct Exp. by Activity and Type of Govt.*, 11/23/99).
2. Bur. of Justice Statistics, *The Cost of Crime to Victims*, Patsy K. Klaus, 2/94.
3. *Work Versus Welfare Tradeoff: Analysis of Total Welfare Benefits by State*, 9/95;
Cato Institute; Policy Analysis 240, M. Tanner, S. Moore, and D. Hartman.
4. U.S. Census Bureau, *Current Population Survey*, 1999.
5. U.S. Dept. of Health and Human Services, Centers for Disease Control and Prev., and
National Inst. on Alcohol Abuse and Alcoholism—NIAAA.
6. U.S. Department of Health and Human Services, Centers for Disease Control and
Prevention, Targeting Tobacco Use.

STATEWIDE ECONOMIC BENEFITS

In general, the statewide economy is affected by the presence of the WTCS in two ways: from its day-to-day operations (including capital spending), and from students who enter the workforce with increased skills and know-how. Day-to-day operations of the colleges provide the *direct* jobs and earnings of the faculty and staff, and additional *indirect* jobs and earnings through the action of multiplier effects. At the same time, students expand the skill-base of the workforce, deepening the economy's stock of human capital, which attracts new industry and makes existing industry more productive.

Estimating these statewide economic effects requires a number of interrelated models. Multiplier effects are obtained with an input-output (IO) model

constructed for the State of Wisconsin.[13] Estimating TC operations effects requires an additional model that takes TC expenditures, deducts spending that leaks from the economy, and bridges what is left to the sectors of the IO model.

Several steps are involved in estimating the skill-enhancing effect of past students on the workforce, and in turn, the effect of these workforce changes on the statewide economy. First, the number of past students still active in the workforce is estimated and converted to total workforce embodied CEs. In the section above, titled **Annual Private Benefits**, an estimate was made of the incremental (per CE) effect of WTCS instruction on student earnings. This estimate is applied to total embodied CEs to arrive at an initial estimate of the past student income effect. In arriving at the final estimate, the initial value must first be reduced to account for a collection of substitution effects, and then expanded to capture a collection of demand and supply-side effects. The end result is an estimate of the impact of past student skills and increased productivity on the size of the statewide economy.

This section is divided into two subsections. The first documents our estimation of day-to-day WTCS operations effects. The second documents our estimation of the effect of past student skills on the statewide economy.

The Impact of WTCS Operations

The first step in estimating the impact of WTCS operations is to assemble a profile of its combined operating and capital expenditures (see **Table 2.10**). These data are drawn from the college budget and collected into the categories of **Table 2.10**. Column 1 simply shows the total dollar amount of spending. Columns 2 through 5 apportion that spending to in-state and out-of-state vendors. The total in-state spending is derived in Column 6. The spending data shown in this column are fed into the IO model.

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[13] The State of Wisconsin model is constructed according to traditional practice using national model IO coefficients and secondary data. The models employ the IO accounting framework presented in Robison (1997) and are equipped with purchase coefficients adapted from Stevens et. al., 1983.

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The information on total spending required for column 1 is generally readily available, though sorting specific items to the categories of the table can take some time. Information in columns 2 through 5 is generally more problematic—hard data are scarce on the in-state/out-of-state split. In these cases, staff is asked to use their best judgment.

The first row in **Table 2.10** shows the aggregate WTCS salaries and wages. These *direct* earnings are part of the overall statewide earnings, and appear as "Direct Earnings of Faculty and Staff" in the table of findings, **Table 3.8**. Dollar values in **Table 2.10** column 6, "net in-state spending," are fed into the IO model. The IO model provides an estimate of indirect effects, and these appear as "Indirect Earnings" in **Table 3.8**.

Table 2.10. Profile of College Spending in and out of State Economy ($ Thousands)

Spending Categories	Tot. Dollar Amount (1)	In-State % (2)	Out of State % (3)	% In-State Manufact. (4)	% Out-of State Manufact. (5)	Net In-State Spending (6)
Salaries and Wages	$553,659	98%	2%			$544,959
Travel	$7,897	59%	41%			$4,653
Electricity and natural gas	$6,493	97%	3%			$6,328
Telephone	$4,113	90%	10%			$3,719
Building Materials & Gardening Supplies	$37,391	60%	40%	53%	47%	$22,375
General Merchandise Stores	$55,066	67%	33%	57%	43%	$36,724
Maintenance & Repair Construction	$16,566	87%	13%			$13,825
New Construction	$36,135	94%	6%			$34,147
Insurance	$14,381	90%	10%			$12,949
Legal Services	$621	74%	26%			$459
Credit Agencies	$78,835	32%	68%			$25,024
U.S. Postal Service	$2,839	89%	11%			$2,532
Marketing	$5,060	96%	4%			$4,874
Other Business Services	$58,121	82%	18%			$47,683
Water Supply & Sewerage Systems	$3,342	100%	0%			$3,342
Printing & Publishing	$5,188	78%	22%			$4,038
Rental Property	$5,580	90%	10%			$4,995
Honoraria + other payments to households	$82,144	76%	24%			$62,711
Total	$973,430					$835,340

Note: this table provides details for the summary of the college role in the state economy (Table 3.8)

The Direct Economic Development Effects of Students

In the next chapter we estimate that the average CE of WTCS instruction is worth $131 per year in increased employee earnings (see **Table 3.2**). This is

the average value across the student's entire working life.[14] At any point in time, the workforce will embody thousands of CEs of past WTCS instruction. We obtain an initial estimate of the direct past student economic development effect by multiplying the total hours of embodied instruction by the $131 value.

A separate model is constructed to estimate the CEs of past WTCS instruction embodied in the workforce. **Table 2.11** indicates variables critical to the model, while **Table 2.12** shows the output of the model itself. Considering **Table 2.12** one column at a time conveys the logic of the model.

Column 1 provides an estimate of enrollment history (unduplicated headcount) of WTCS students. Column 2 is the same as column 1, but net of students who leave the state immediately upon leaving WTCS. As shown in the table, 95% of the students remain in-state upon leaving the TC, 5% leave the state.

Column 3 transitions from students to leavers (i.e., the past students). A comparison of columns 2 and 3 indicates that all past students have left WTCS, except for the last three years (1997 – 2000) where students are still enrolled (the leaver assumptions are shown in column 8).

Column 4 further reduces leavers to focus only on those who have settled into a somewhat permanent occupation. As shown in column 9 (the "settling factor"), it is assumed that all students settle into permanent occupations by their fourth year out of school. Settling-in assumptions are specified in **Table 2.2** above.

Column 5 transitions further from leavers who have settled into jobs to leavers still active in the current workforce. Here we net off workers who, subsequent to leaving WTCS and settling into the workforce, have out-

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[14] In reality, the earnings increment due to WTCS skills might be expected to start low and grow over the course of a student's working life. WTCS-acquired skills open doors for the students, giving them a chance to excel and advance in their careers. Our earnings increment due to WTCS attendance is an **average** across all age levels (as also discussed above in relation to the opportunity cost of time variable). It would thus overstate earnings in the early years and understate them in later years. Our interest, however, is to arrive at an estimate of the lifetime accumulated earnings increment. Use of the average for the entire course of student working lives should provide the proper aggregate estimate.

migrated, retired, or died. As shown in **Table 2.11**, roughly one-third of working past students will out-migrate, retire or die over the course of the next 30 years. This "30-year attrition" follows an assumed logarithmic decay function shown in column 10 labeled "active in state workforce."

Column 6 shows the average CEs generated per year back to 1971. These data were obtained by dividing total year-by-year CEs by the corresponding headcount.[15] Column 7 shows the product of the year-by-year average CEs, and the estimate of the number of past students active in the current workforce in column 5. Looking to the total in Column 7, we estimate that the current workforce of the State of Wisconsin embodies some 37.4 million CEs of past WTCS instruction.

From Embodied CEs to Direct Income Effects

An *upper-bound* estimate of the past student economic development effect is obtained by multiplying the total embodied CEs (**Table 2.12**) by the estimated $131 per-CE value (**Table 3.2**). The result of this calculation is still an upper bound, for reasons pertaining to economic development theory. We constructed a model to capture this dynamic, and thereby reduced the upper bound to arrive at the estimate of the direct past student economic development effect. Our model hinges on two assumptions for two polar case scenarios (**see Box**).

Note that with polar case scenario 1 we would reduce our upper-bound estimate to zero – i.e., an enhanced workforce skill base has no economic development effect. In contrast, with polar case scenario 2 we would accept the full upper-bound amount as our past student economic development effect. Obviously the true measure is somewhere in between.

There is considerable empirical literature on the economic development effects of education, and from this research we are able to adapt a documented adjustment factor. In particular, in a recent study Bils and Klenow (2000) survey past work on the economic development effects of education, and advance a model of their own. Based on their findings, we

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[15] We used weighted average annual CEs prior to 1977 (accurate data before then were unavailable).

reduce the upper bound by 70% to arrive at our final estimate: thus 30% of the upper bound value is counted as the direct past student economic development effect. These appear in Table 3.8 under the heading "Earnings Attributable to Past Student Economic Development Effects," "Direct Earnings."

Box: Polar Cases

Polar Case Scenario 1. Assumption #1 under this scenario is that the rate of technical substitution between skilled and unskilled workers is infinitely elastic. This means that newly skilled past WTCS students are substituted for unskilled workers in a manner that creates no net additional earnings. Businesses simply replace lower productivity (and lower paid) unskilled workers with some smaller number of higher productivity (and higher paid) skilled workers, with no net change in overall output or earnings.

Assumption #2 is that the rate of technical substitution between in-state and out-of-state workers is infinitely elastic, and that the existence of a skilled workforce is not a factor in attracting new industry to the state. This means that existing industry can readily draw skilled workers from outside the state, and growth is driven by something other than skills in the workforce. Skilled workers are easily imported without extraordinary inducements or wage premiums that would otherwise increase costs and reduce competitiveness.

Polar Scenario 2. Assumption #1 is that the rate of technical substitution between skilled and unskilled workers is infinitely inelastic. Skilled workers are able to perform the same tasks at less expense than unskilled workers, and they are able to perform many tasks that unskilled workers cannot. Under this assumption, skilled workers increase efficiency, enable an expansion of the product line, and generally increase the competitiveness of existing industry. The result is an expansion of earnings as well as output.

Assumption #2 is that the rate of technical substitution between in-state and out-of-state workers is infinitely inelastic, and the existence of a skilled workforce is, therefore, a factor in attracting new industry to the state (there is a near stand-alone development theory based on the notion that skilled workers attract new industry—Borts and Stein, 1964).

The Indirect Economic Development Effects of Students

The direct earnings attributed to the WTCS skills embodied in the current workforce are not the only past student economic development effects. Associated with the increased output and earnings is an increased demand for both consumer goods and services, and goods and services purchased by

businesses as inputs. These, in turn, produce a set of economic multiplier effects as increased employee and business spending ripples through the other parts of the economy.

We assume that the students will acquire jobs in the *higher-stage* sectors of the economy (e.g., technical services and advanced manufacturing sectors, see Parr, 1999). For demand-induced effects, we compute a weighted average demand-driven earnings multiplier from the IO model. Higher-stage sectors receive greater weight than lower-stage sectors. Demand-side indirect effects are obtained in the usual manner by applying the multiplier to the direct effect estimate.

There is still more. Economic development theory describes an "agglomeration" effect whereby growth itself stimulates growth. A new plant is followed by other plants that use its outputs as inputs. This in turn spawns another round of industry growth, and so on. To estimate agglomeration effects, we configure our IO model to provide a set of so-called supply-driven multipliers (see for example Miller and Blair, 1985). We then compute a weighted average supply-driven earnings multiplier, again favoring higher-stage sectors. Agglomeration (or supply-side) effects are obtained by applying the multiplier to the direct effect estimate.

Finally, a third key element is accounted for—the *alternative education opportunity variable* (see **Table 2.9**). This is technically not a cost variable, but rather a "negative benefit," one that recognizes the fact that, absent the WTCS, some portion of the aggregate student body would obtain an education elsewhere. The problem is determining what this portion is. Clearly, 100% would be incorrect because not everyone would be able to attend a technical college in a neighboring state. Indeed, an integral part of the TC mission is to provide open educational access for those who cannot avail themselves of the alternatives. For the WTCS (on average) the assumption for this variable is 19%; i.e., the statewide economic benefits are reduced across the board by this amount.

Table 2.11. Critical Variables

Assumptions	Values
Current headcount of student body	456,438
Students remaining in-state after leaving TC	95%
30-year attrition	31%
Decay rate	1.2%
Overall average of credits earned per student this year	4
Annual turnover	81%

Table 2.12. Estimating Credits of Instruction Embodied in the Economic Region Workforce

Year	Student Enrollment Headcount	Subtract Students Migrating Immediately	Students who have left college (Leavers)	Leavers Who Have Settled Into Jobs	# Settled Into Jobs - Active in State Workforce	Credits Embodied in State Workforce	% of Students in Workforce	"Settling" Factor	Active in State Workforce
	1	2	3	4	5	6	7	8	9
1971	215,224	204,463	204,463	204,463	141,079	563,081	100%	100%	69%
1972	246,677	234,343	234,343	234,343	163,709	653,403	100%	100%	70%
1973	282,733	268,596	268,596	268,596	189,973	758,229	100%	100%	71%
1974	304,279	289,065	289,065	289,065	206,995	826,166	100%	100%	72%
1975	343,561	326,383	326,383	326,383	236,626	944,433	100%	100%	72%
1976	315,612	299,831	299,831	299,831	220,082	878,400	100%	100%	73%
1977	325,890	309,596	309,596	309,596	230,077	1,088,964	100%	100%	74%
1978	375,485	356,711	356,711	356,711	268,391	1,115,796	100%	100%	75%
1979	406,990	386,641	386,641	386,641	294,530	1,143,240	100%	100%	76%
1980	444,322	422,106	422,106	422,106	325,549	1,215,016	100%	100%	77%
1981	464,195	440,985	440,985	440,985	344,342	1,336,603	100%	100%	78%
1982	461,086	438,032	438,032	438,032	346,293	1,422,327	100%	100%	79%
1983	465,383	442,114	442,114	442,114	353,870	1,475,620	100%	100%	80%
1984	460,158	437,150	437,150	437,150	354,252	1,476,521	100%	100%	81%
1985	448,024	425,623	425,623	425,623	349,203	1,402,968	100%	100%	82%
1986	439,974	417,975	417,975	417,975	347,196	1,387,436	100%	100%	83%
1987	438,082	416,178	416,178	416,178	350,006	1,392,052	100%	100%	84%
1988	421,666	400,583	400,583	400,583	341,083	1,374,322	100%	100%	85%
1989	436,942	415,095	415,095	415,095	357,838	1,426,064	100%	100%	86%
1990	447,819	425,428	425,428	425,428	371,311	1,496,662	100%	100%	87%
1991	454,728	431,992	431,992	431,992	381,732	1,536,280	100%	100%	88%
1992	464,435	441,213	441,213	441,213	394,733	1,601,464	100%	100%	89%
1993	452,897	430,252	430,252	430,252	389,717	1,576,584	100%	100%	91%
1994	438,396	416,476	416,476	416,476	381,934	1,576,258	100%	100%	92%
1995	434,780	413,041	413,041	413,041	383,498	1,552,087	100%	100%	93%
1996	431,405	409,835	409,835	409,835	385,257	1,516,831	100%	100%	94%
1997	434,885	413,141	413,141	413,141	393,198	1,499,566	100%	100%	95%
1998	439,068	417,115	414,069	372,662	359,088	1,381,404	99%	90%	96%
1999	442,274	420,160	404,348	303,261	295,851	1,154,542	96%	75%	98%
2000	453,668	430,985	347,377	173,688	173,688	669,011	81%	50%	100%
Embodied Total						37,441,337			

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Chapter 3
PRIVATE, PUBLIC AND STATEWIDE ECONOMIC BENEFITS

INTRODUCTION

T his chapter summarizes the main WTCS results in four sections: 1) the aggregate annual private and public benefits; 2) these same benefits measured per CE and per student; 3) future benefits expressed in terms of NPV, RR, and B/C ratio, and 4) the statewide economic benefits. Recall from the discussion in **Chapter 1**, all benefits are discounted by 10% for earnings and 10% for all other public benefits (the avoided costs) to account for the correlation vs. causation issue.

ANNUAL BENEFITS

Higher Student Earnings

We begin with earnings growth in **Table 3.1** (which summarizes both the private and public benefits generated by the students, including both credit and non-credit students). Last year, each student completed, on average, 4 CEs at WTCS, only a small fraction of one full year of study. This is because the majority of students attend for a variety of purposes as discussed in conjunction with **Table 2.4** above; for some, to make progress towards an eventual degree, and for others, simply to acquire certain skills that will increase their productivity in the workforce. Approximately 456,400 students will capture $228.9 million worth of higher annual earnings based on this average increase in educational attainment.

Social Savings

Health-Related Savings

Health-related absenteeism will decline by 139,308 days per year. This translates to a total of 536 years' worth of productivity gained per year (based

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on 260 workdays per year). Annual total dollar savings from reduced absenteeism days equals $13.9 million. There will be 6,471 fewer smokers and 1,472 fewer alcohol abusers, amounting to annual total dollar savings of $9,465,200 and $5,200,600, respectively, inclusive of insurance premiums, personal payments, and withholding for Medicare and Medicaid.

Crime-Related Savings

There will be 759 fewer people incarcerated as a result of the higher education obtained, saving the taxpayers a grand total of some $4,652,000 per year. The assumptions pertaining to these results are listed in **Table 2.9** in the previous chapter. They are based on an average incarceration duration of four years at an average cost of $53,478 per year (inclusive of arrest, prosecution, incarceration, and rehabilitation). [16] Fewer people incarcerated means more people gainfully employed—this translates to $2,518,000 in additional annual earnings for the state as a whole. Victim costs will be reduced by $1,506,000 per year.

Welfare and Unemployment Savings

There will be 1,853 and 772 fewer people on welfare and unemployment, respectively, in the state. The corresponding total dollar statewide savings amounts to $8,346,000 ($5,282,000 welfare + $3,064,000 unemployment savings) for one year, assuming that the average time spent on welfare and unemployment is four years (see **Table 2.9**).

Total Public Benefits

All told, there will be $45.5 million in public savings per year in the state—the sum of all health, crime, and welfare/unemployment benefits in **Table 3.1.**

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[16] The calculation is as follows: 759 not incarcerated x $53,478 x 4 years = $162.4 million total / 31 years to retirement from **Table 2.9** x 90% (accounting for causation/correlation) = $4,652,090 .

Table 3.1. Summary of Annual Benefits

	Units	Benefits	Social Savings
Higher earnings	NA	$228,903,103	
Health benefits			
Absenteeism savings (days)	139,308	NA	$13,860,053
Fewer smokers, medical savings (# persons)	6,471	NA	$9,465,235
Fewer alcohol abusers (# persons)	1,472	NA	$5,200,566
Crime benefits			
Incarceration savings (# persons)	759	NA	$4,652,090
Crime victim savings	NA	NA	$1,505,608
Added productivity (fewer incarcerated)	NA	NA	$2,517,655
Welfare/unemployment benefits			
Welfare savings (# persons)	1,853	NA	$5,282,014
Unemployment savings (# persons)	772	NA	$3,064,206
Total		$228,903,103	$45,547,427

Figure 3.1. Higher Earnings and Social Savings per Year (Social Savings)
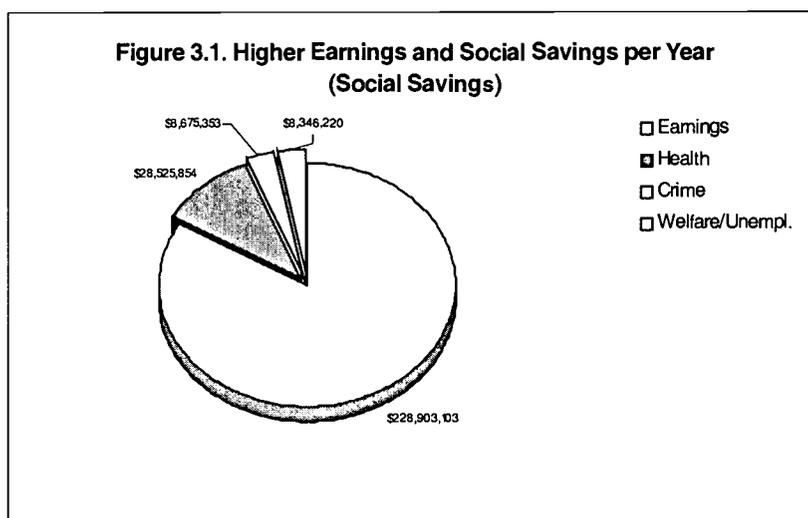
ANNUAL BENEFITS PER CE AND PER STUDENT

The aggregate benefits reported in **Table 3.1** above are expressed per CE and per student in **Table 3.2.** On average, students capture: a) $131 per year in higher earnings per CE,[17] and b) $501 per year in higher earnings per student on the basis of the number of CEs completed. **Converted to a full-year-equivalent (30 CEs), the annual earnings would amount to $3,940 per**

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[17] Thus, a student attending for 10 CEs will add $1,313 per year to the lifetime earnings. A longer curriculum will add substantially more. The earnings expectations are portrayed as linear but with many computational steps involved (see **Chapter 2**). The extrapolation is based on the averages of low earnings additions for leavers completing few CEs, plus higher additions for leavers completing more CEs.

student. On average, the social benefits per CE range from a low of $3 for Unemployment Savings to a high of $10 per CE for Medical Cost Savings. On a per student basis, they range from a low of $10 per student for Unemployment Savings to a high of $37 for Medical Cost Savings. On a full-year equivalent basis (30 CEs), the social savings would amount to $1,224 per student (the total of $5,164 less $3,940 of higher private earnings as indicated in **Table 3.2**).

Table 3.2. Annual $ per Credit and Student

	Per Credit	Per Student	Annualized
Higher earnings	$ 131	$ 501	$3,940
Absenteeism Savings	$ 8	$ 30	$ 233
Medical Cost Savings	$ 10	$ 37	$ 291
Incarceration Savings	$ 10	$ 37	$ 289
Crime Victim Savings	$ 3	$ 12	$ 94
Add Prod. (fewer incarc.)	$ 4	$ 14	$ 110
Welfare Savings	$ 4	$ 16	$ 127
Unemployment Savings	$ 3	$ 10	$ 80
Total	$ 172	$ 656	$ 5,164

Figure 3.2. Annual Benefits per Credit
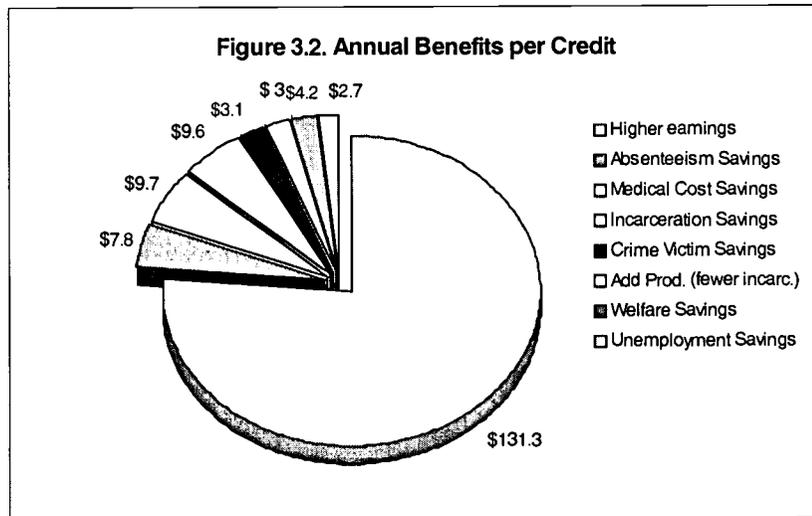
THE INVESTMENT ANALYSIS: INCORPORATING FUTURE BENEFITS

The results in **Tables 3.1** and **3.2** provide only a single-year snapshot of the benefits. As long as the students remain in the workforce, however, the TC-acquired skills continue to add productivity over time. In the investment

analysis, the higher earnings and avoided costs are projected into the future over the working life of the student, discounted to the present, and then compared to the present costs of education. The investment is feasible if all discounted future benefits are greater than or equal to the costs.[18]

The investment analysis results are shown in **Table 3.7** (in the aggregate, per CE and per student). The end results sought are the **Net Present Value (NPV)**, **Rate of Return (RR)**, the **Benefit/Cost (B/C)** ratio and the **Payback Period**.[19] These are simply different ways of expressing the results. All of the present value results shown are intermediary steps that *ultimately generate* the NPVs, RRs and B/C ratios.

We begin with some definitions in **Table 3.3**. **Private** benefits are the higher earnings captured by the students themselves. **Broad taxpayer benefits** are the additions to statewide earnings plus lower overall expenditures related to health, crime, welfare and unemployment. **Narrow taxpayer benefits** include increased state and local tax revenues (from increased income), and savings from reduced state and local government expenditures for incarceration, health and welfare.

Table 3.3. Some Definitions

Definitions	
Student Benefits	Higher earnings, captured by the students
Taxpayer Benefits: Broad	Additions to statewide earnings plus lower overall expenditures related to health, crime, welfare and unemployment
Taxpayer Benefits: Narrow	Increased State & local Government tax collections plus lower State & local Govt. exp. related to health, crime, welfare and unemployment
Student Costs	Tuition (**Table 2.1**) + opp. cost of time
Taxpayer Costs	Taxes (state and local, see **Table 2.1**)
Results:	
Student Perspective	Private Benefits / Private Costs
Taxpayer Perspective: Broad	Public Benefits (Broad) / Public Costs
Taxpayer Perspective: Narrow	Public Benefits (Narrow) / Public Costs

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[18] Future benefits are worth less than present benefits. The present value of $5,000 to be received 30 years from today is worth only $1,603 given a 4% discount rate ($5,000/(1.04)^{30} = $1,603$). If the same benefits occur each year for 30 years, each year's benefit must be discounted to the present, summed and collapsed into one value that represents the *cumulative* present value of all future benefits. Thus, the present value of 30-years' worth of $5,000 per year is $90,000.

[19] The criteria for feasibility: a) NPV must be positive or equal to zero; b) RR must be equal to or greater than the returns from other similar risk investments; c) the B/C ratio must be equal to or greater than 1; and d) the payback period is the number of years of benefits required to fully recover the investment made.

On the cost side, **student costs** consist of the tuition paid by the students (11% of the total budget in **Table 2.1**) and, most importantly, the opportunity cost of time (the earnings foregone). Also included here are the other sources of institutional revenues from private sources (22% in the case of WTCS). The **taxpayer costs** consist of the state and local tax items in **Table 2.1.**

We also present the results in different ways. **First**, the student perspective results indicate whether the WTCS education pays by comparing the private benefits (higher earnings) to the private costs. **Second** (as discussed in the previous chapter), we compare *all* private and public benefits to the public costs (the state and local taxpayer contributions in **Table 2.1**) in a **broad taxpayer perspective** in present value terms. **Third** and finally, in a **narrow taxpayer perspective**, we compare only a portion of the public benefits (taxpayer actual savings) to the public costs; i.e., do state and local taxpayer investments of $570,314,661 (**Table 2.1**) pay off in terms of the public savings generated?

The Student Perspective

The collective investment of the students (time and money) is assessed in **Table 3.4.** Column 1 tracks the increased earnings of the student body as they leave the TC, and follows them over the course of their assumed working life of 31 years. The upward trend in earnings reflects an assumed 1.0% per year real increase in earnings over the course of their careers. Column 2 is simply column 1 reduced by the 10% discount value that accounts for causation factors affecting student earnings. Column 3 shows the cost of the single-year's education. Finally, Column 4 looks at the educational investment from a cash flow perspective, subtracting annual costs from the annual benefits.

Does attending WTCS make economic sense for the students? The future stream of benefits (higher earnings) accruing to the students has an NPV of $2,988 million (**Table 3.4**). The B/C ratio of 3.1 is strongly positive since the ratio is well above 1. The RR of 20% is also well above the long-term rates of return obtainable in the stock or bond markets. In the long run, therefore, the average WTCS student will be substantially better off attending the college. The payback period for a student (tuition plus the earnings foregone) is 6.4

years—the higher earnings received beyond that period are pure economic rent—or a persistent earnings flow over and beyond the initial investments.

Table 3.4. Student Earnings ($'000)

Year	1 Higher Earnings Gross	2 Higher Earnings Net	3 Cost	4 Net Cash Flow
1	$8,922	$8,030	$1,004,937	($996,907)
2	$9,011	$8,110	$0	$8,110
3	$248,215	$223,394	$0	$223,394
4	$250,698	$225,628	$0	$225,628
5	$253,205	$227,884	$0	$227,884
6	$255,737	$230,163	$0	$230,163
7	$258,294	$232,465	$0	$232,465
8	$260,877	$234,789	$0	$234,789
9	$263,486	$237,137	$0	$237,137
10	$266,121	$239,508	$0	$239,508
11	$268,782	$241,904	$0	$241,904
12	$271,470	$244,323	$0	$244,323
13	$274,184	$246,766	$0	$246,766
14	$276,926	$249,233	$0	$249,233
15	$279,695	$251,726	$0	$251,726
16	$282,492	$254,243	$0	$254,243
17	$285,317	$256,786	$0	$256,786
18	$288,170	$259,353	$0	$259,353
19	$291,052	$261,947	$0	$261,947
20	$293,963	$264,566	$0	$264,566
21	$296,902	$267,212	$0	$267,212
22	$299,871	$269,884	$0	$269,884
23	$302,870	$272,583	$0	$272,583
24	$305,899	$275,309	$0	$275,309
25	$308,958	$278,062	$0	$278,062
26	$312,047	$280,843	$0	$280,843
27	$315,168	$283,651	$0	$283,651
28	$318,319	$286,487	$0	$286,487
29	$321,503	$289,352	$0	$289,352
30	$324,718	$292,246	$0	$292,246
31	$327,965	$295,168	$0	$295,168
0	$0	$0	$0	$0
0	$0	$0	$0	$0
0	$0	$0	$0	$0
0	$0	$0	$0	$0
0	$0	$0	$0	$0
0	$0	$0	$0	$0
0	$0	$0	$0	$0
0	$0	$0	$0	$0
NPV		$3,953,868	$966,285	$2,987,583
IRR				19.7%
B/C ratio				3.1
Payback (years)				6.4

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The Broad Taxpayer Perspective

Table 3.5 assesses one year's operation of WTCS from the broad taxpayer perspective. The taxpayers must weigh requests for WTCS funding against the myriad of other public needs. As such, they need information to better allocate increasingly scarce resources between alternative and competing ends. Column 1 shows the stream of total benefits, including increased earnings, and social savings from reduced spending on incarceration, health, welfare and unemployment. Specifics on the estimation of values in column 1 are presented in **Volume 2: Detailed Results, Table 25.** Column 2 is the same as column 1, save for the deduction of direct earnings at the WTCS campuses themselves—the broad taxpayer perspective is conservative in the sense that it includes only off-campus earnings as part of public benefits. Column 3 shows the single year state and local taxpayer cost, as reflected in state and local tax items in **Table 2.1.** Finally, Column 4 considers the broad perspective on the taxpayer's investment in a cash flow sense, subtracting annual costs from annual benefits.

The NPV given this broad perspective is $5,293 million and the B/C ratio is 10.7. More succinctly, every dollar of tax monies spent on WTCS education will generate a total of $10.65 worth of social savings. The corresponding RR of >100% is also indicative of a very strong investment relative to alternative investment opportunities in the economy.[20] The payback period from this broad perspective is 2.2 years.

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[20] A word of caution—the RR approach sometimes generates percentage results that defy the imagination. Technically, the approach requires at least one negative cash flow (tuition plus opportunity cost of time) to offset all subsequent positive flows. A very high percentage return may be technically correct, but perhaps not consistent with conventional understanding of returns expressed as percentages. For purposes of the reports prepared for all colleges in the statewide system, therefore, we express all results exceeding 100% simply as: "> 100%" (particularly for the broad taxpayer perspective where high returns are expected).

Table 3.5. Taxpayer Perspective: Broad

Year	1 All Benefits	2 Less TC Direct Earnings	3 Total Taxpayer Costs	4 Less TC Income Cash Flow
1	$1,008,282	$454,623	$570,315	($115,691)
2	$56,346	$56,346	$0	$56,346
3	$340,041	$340,041	$0	$340,041
4	$340,108	$340,108	$0	$340,108
5	$340,175	$340,175	$0	$340,175
6	$340,244	$340,244	$0	$340,244
7	$340,313	$340,313	$0	$340,313
8	$340,383	$340,383	$0	$340,383
9	$340,454	$340,454	$0	$340,454
10	$340,526	$340,526	$0	$340,526
11	$340,599	$340,599	$0	$340,599
12	$340,672	$340,672	$0	$340,672
13	$340,746	$340,746	$0	$340,746
14	$340,821	$340,821	$0	$340,821
15	$340,897	$340,897	$0	$340,897
16	$340,973	$340,973	$0	$340,973
17	$341,050	$341,050	$0	$341,050
18	$341,128	$341,128	$0	$341,128
19	$341,207	$341,207	$0	$341,207
20	$341,286	$341,286	$0	$341,286
21	$341,367	$341,367	$0	$341,367
22	$341,448	$341,448	$0	$341,448
23	$341,529	$341,529	$0	$341,529
24	$341,612	$341,612	$0	$341,612
25	$341,695	$341,695	$0	$341,695
26	$341,779	$341,779	$0	$341,779
27	$341,864	$341,864	$0	$341,864
28	$341,949	$341,949	$0	$341,949
29	$342,035	$342,035	$0	$342,035
30	$342,122	$342,122	$0	$342,122
31	$342,210	$342,210	$0	$342,210
0	$0	$0	$0	$0
0	$0	$0	$0	$0
0	$0	$0	$0	$0
0	$0	$0	$0	$0
0	$0	$0	$0	$0
0	$0	$0	$0	$0
0	$0	$0	$0	$0
0	$0	$0	$0	$0
NPV	$6,374,071	$5,841,707	$548,379	$5,293,327
IRR				>100%
B/C ratio				10.7
Payback (years)				2.2

The Narrow Taxpayer Perspective

Table 3.6 provides an investment analysis of the WTCS from the narrow taxpayer perspective. The first column shows the stream of added state and local government revenues stemming from the operation of the WTCS during the single analysis year. The values in column 1 reflect net increases in

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income, multiplied by average state and local government tax rates – thus indicating additional tax revenues accruing to the state from higher past student earnings. Also included in column 1 are the estimated state and local government savings stemming from lower expenditures on crime, welfare, unemployment and health. The dollar amounts in column 1 are the sum of the additional taxes collected plus the associated tax dollars saved as a result of the education provided by the WTCS during the single analysis year.

Column 2 is simply the state and local government expenditure in support of WTCS for the analysis year, a value obtained directly from **Table 2.1**. Finally, column 3 subtracts state and local government cost (column 2) from benefits (column 1), thereby providing the temporal cash flow needed for the investment analysis. As shown at the bottom of the table, WTCS provides state and local government with an annual return of 13.4% on its one-year investment. Alternatively, the one-year investment provides a B/C ratio of 2.05 (indicating that the investment is attractive). The payback period of 8.4 indicates that state and local taxpayers fully recoup their one-year investment in WTCS within 8.4 years.

Table 3.6. Taxpayer Perspective: Narrow

	1	2	3
	Total	Total	
	Taxpayer	Taxpayer	Net Cash
Year	Benefits	Costs	Flow
1	$179,474	$570,315	($390,841)
2	$9,072	$0	$9,072
3	$59,848	$0	$59,848
4	$59,855	$0	$59,855
5	$59,862	$0	$59,862
6	$59,869	$0	$59,869
7	$59,876	$0	$59,876
8	$59,883	$0	$59,883
9	$59,891	$0	$59,891
10	$59,899	$0	$59,899
11	$59,907	$0	$59,907
12	$59,915	$0	$59,915
13	$59,923	$0	$59,923
14	$59,931	$0	$59,931
15	$59,940	$0	$59,940
16	$59,949	$0	$59,949
17	$59,957	$0	$59,957
18	$59,966	$0	$59,966
19	$59,976	$0	$59,976
20	$59,985	$0	$59,985
21	$59,994	$0	$59,994
22	$60,004	$0	$60,004
23	$60,014	$0	$60,014
24	$60,024	$0	$60,024
25	$60,034	$0	$60,034
26	$60,044	$0	$60,044
27	$60,054	$0	$60,054
28	$60,065	$0	$60,065
29	$60,076	$0	$60,076
30	$60,086	$0	$60,086
31	$60,097	$0	$60,097
0	$0	$0	$0
0	$0	$0	$0
0	$0	$0	$0
0	$0	$0	$0
0	$0	$0	$0
0	$0	$0	$0
0	$0	$0	$0
0	$0	$0	$0
NPV	$1,122,147	$548,379	$573,767
IRR			13.4%
B/C ratio			2.05
Payback (years)			8.4

Summary

A summary of the investment analysis results (also reported in **Tables 3.4 – 3.6** above) is provided in **Table 3.7,** on aggregate, per CE, and per student bases.

Table 3.7. Benefit - Cost Summary

	Aggregate	Per Credit	Per Student
PV of private benefits, increased earnings	$ 3,953,868,000	$ 2,273	$ 8,700
Health benefits, captured by society			
PV of absenteeism savings	$ 245,225,000	$ 141	$ 537
PV of tobacco and alcohol abuse medical savings	$ 241,870,000	$ 139	$ 530
Crime			
PV of reduced incarceration	$ 76,723,000	$ 44	$ 168
PV of reduced victim costs	$ 24,831,000	$ 14	$ 54
PV of earnings (opportunity gained)	$ 44,545,000	$ 26	$ 98
Unemployment and welfare			
PV of reduced welfare rolls	$ 99,043,000	$ 57	$ 217
PV of reduced unemployment	$ 54,757,000	$ 31	$ 120
Sum of all present values, benefits	$ 4,740,862,000	$ 2,725	$ 10,424
PV of all costs			
PV of college budget	$ 570,315,000	$ 328	$ 1,249
PV of opportunity cost of education + tuition	$ 1,004,937,000	$ 578	$ 2,202
Sum of all present values, costs	$ 1,575,252,000	$ 905	$ 3,451
NPV, Private (Student) Perspective		$2,987,583	
RR, Private (Student) Perspective		20%	
B/C Ratio, Private (Student) Perspective		3.1	
Payback Period, Private Perspective		6.4	
NPV, Taxpayer Perspective: Broad		$5,293,327	
RR, Taxpayer Perspective: Broad		>100%	
B/C Ratio, Taxpayer Perspective: Broad		10.7	
Payback Period, Taxpayer Perspective: Broad		2.2	
NPV, Taxpayer Perspective: Narrow		$573,767	
RR, Taxpayer Perspective: Narrow		13.4%	
B/C Ratio, Taxpayer Perspective: Narrow		2.0	
Payback Period, Taxpayer Perspective: Narrow		8.4	

Figure 3.3. Investment Analysis: Present Value of Benefits

$146,099,000 $153,800,000

$487,095,000

□ Earnings
■ Health Benefits
□ Crime Benefits
□ Unempl. & Welf. Benefits

$3,953,868,000
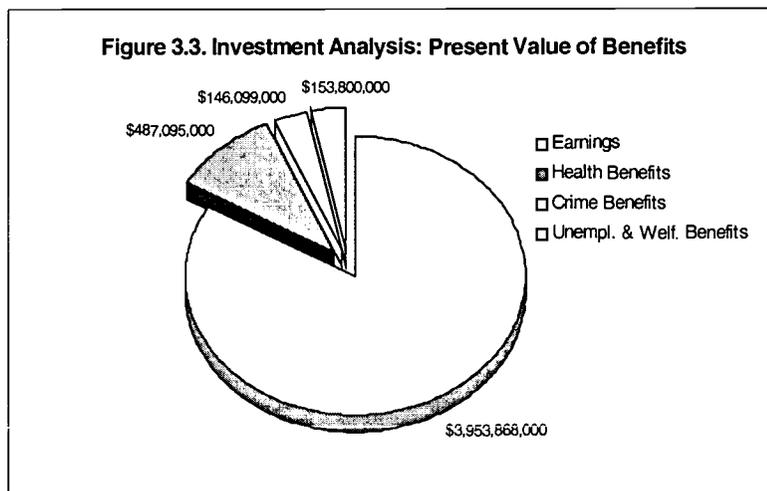
STATEWIDE ECONOMIC BENEFITS

The Wisconsin Technical College System plays an important role in the health, growth and development of the statewide economy. This section estimates that role and expresses it as a gross share of statewide earnings. As indicated in **Table 3.8**, statewide earnings in the State of Wisconsin amount to $111,824,000 (Regional Information System, U.S. Department of Commerce).

Table 3.8. Summary of CCs Role in the State Economy

	Earnings ($Thousands)	% of Total
Total Earnings in State	$111,823,512	100%
Earnings Attributable to College Operations		
Direc Earnings of Faculty and Staff	$553,659	0.5%
Indirect Earnings	$398,202	0.4%
TOTAL	$951,861	0.9%
Earn...gs Attributable to Past Student Econ. Dev. Effects		
Direct Earnings	$1,198,401	1.1%
Indire :t Earnings	$1,700,305	1.5%
TOTAL	$2,898,706	2.6%
GRAND TOTAL	$3,850,566	3.4%

WTCS Operations

As shown in **Table 3.8**, the direct earnings of faculty and staff are equal to $553.7 million per year, and thus account for 0.5% of statewide earnings. Multiplier effects, from the spending of faculty and staff salaries and from WTCS's purchase of goods and services, account for another $398.2 million, or 0.36% of statewide earnings. Altogether, WTCS operations directly or indirectly account for $951.9 million per year, or 0.9% of statewide earnings.

Past Student Economic Development Effects

Past students provide skills that attract new industry and make existing industry more competitive and productive. Accounting for retirement, out-migration and death, we estimate that the current State of Wisconsin workforce embodies 37.4 million CEs of past instruction (see **Table 2.12**). As shown in **Table 3.8**, these directly account for $1,198.4 million, or 1.1% of statewide earnings.

Associated with the increased earnings of past WTCS students is a collection of *demand-induced* and *agglomeration-induced* indirect effects. As shown in **Table 3.8**, these indirect effects account for $1,700 million, or 1.5% of state-wide earnings.

Total Statewide Economic Benefits

Finally, the overall role of WTCS in the state economy is equal to the sum of the direct and indirect effects. Accordingly, the college accounts for $3,850.6 million, or 3.4% of statewide earnings.

Chapter 4
SENSITIVITY ANALYSIS OF KEY VARIABLES

INTRODUCTION

We conclude this impact analysis with a **base case** sensitivity analysis of some key variables on both the investment and economic development sides of the impact analysis. The purpose of the sensitivity analysis is to set our approach apart from "advocacy" education impact analyses. Many of these may lack uniformity and use assumptions that will not stand up to rigorous peer scrutiny, and often generate results that overstate benefits. The approach taken here is to account for all relevant variables on both the benefit and cost sides as reflected in the conservatively estimated base case assumptions laid out in **Chapter 2**.

INVESTMENT ANALYSIS: THE STUDENT PERSPECTIVE

The variables tested relate to the earnings foregone by the students—the opportunity cost of time. They include: 1) the % of the students employed, and 2) of those employed, the earnings received relative to the full earnings they would have received if not attending WTCS. These affect the investment analysis manifested in the results (NPV, RR, B/C, and payback period).

Percent of Students Employed

The students incur substantial expense by attending WTCS because of time spent not gainfully employed. Some of that cost is recaptured if the student remains partially (or fully) employed while attending WTCS. It is estimated that some 79% of the aggregate student body is employed. In the sensitivity analysis this variable is tested by changing the assumptions to 100%. This would mean that all the students are employed, and the average opportunity cost of time would be reduced substantially.

Percent of Earnings Relative to Full Earnings

The second opportunity cost variable is more difficult to estimate. For the WTCS it is estimated that, of the students working while attending classes, their earnings amounted to only 65%, on average, relative to earnings they would have statistically received if not attending the TC. This suggests that many of the students hold part-time jobs earning minimum wage (or less than their "statistical" wages). The model captures these differences and counts them as a part of the opportunity cost of time. In the sensitivity analysis this variable also is tested by changing the assumption to 100%. As above, this would mean that the students are fully employed, and the average opportunity cost of time would be reduced accordingly.

RESULTS

The changed results are summarized in **Table 4.1**. Here, the base case assumptions are reflected in the two shaded rows for the variables tested— 79% for the portion of students employed, and 65% for their earnings relative to the statistical averages, taken from **Table 2.2**. These (base case) assumptions are held constant in the shaded rows for the student perspective. The sensitivity analysis results are shown in the non-shaded rows—the extent to which the investment analysis results would change if the two base case variables were increased to 100%, first separately, and second, together. Changing both assumptions to 100% (all students fully employed) would automatically increase the benefits, because the opportunity cost of time would reduce to zero.

1. Increasing the students employed assumption from 79% to 100% first (holding all of the other assumptions constant), the RR, B/C, and payback period results would improve to 23.6%, 4.1 , and 5.5 years, respectively, relative to the base case results. The improved results are attributable to a lower opportunity cost of time—all students would be employed in this case.

2. Increasing the earnings relative to the statistical averages from 65% to 100% second (holding the second employment assumption constant at the base case level), the RR, B/C, and payback period results would improve to

29.6%, 5.7 , and 4.7 years, respectively, relative to the base case results—a strong improvement over the base case results, again attributable to a lower opportunity cost of time.

3. Finally, increasing both of the above assumptions to 100% simultaneously, the RR, B/C, and payback period results would improve yet further to 50.0%, 12.0 , and 3.3 years, respectively, relative to the base case results. This scenario assumes that all students are fully employed and earning full salaries (equal to the statistical averages) while attending classes. These results are not realistic, albeit not uncommon for advocacy analyses.

Table 4.1 Sensitivity Analysis of Student Perspective

Variables	Assumptions	RR	B/C	Payback
1. Percent	79%	19.7%	3.1	6.4
Employed	100%	23.6%	4.1	5.5
2. Percent of	65%	19.7%	3.1	6.4
Earnings	100%	29.6%	5.7	4.7
1 = 100%, 2 = 100%		50.0%	12.0	3.3

A final note to the investment sensitivity analysis of the student perspective—we strongly emphasize that the results, given the assumptions laid out in Chapter 2, are very attractive—the results are all well above their threshold levels and the payback periods are short. As clearly demonstrated here, advocacy results appear much more attractive, although they would overstate the benefits. It is incumbent on the TC administration, therefore, to clearly argue to legislators, private donors, and others that the results presented in Chapter 3 are realistic and are not based on advocacy assumptions. The results for the base case indicate that investments in WTCS will generate excellent returns; they are clearly above the long-term average percent rates of return in the stock and bond markets of roughly 7%.

STATEWIDE ECONOMIC DEVELOPMENT

We estimated the statewide economic impacts of WTCS in Chapter 3, Table 3.8 based on college operations and capital spending, and the increased productivity effects of past WTCS students in the state workforce. The

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impacts were expressed in terms of earnings, i.e., wages, salaries and proprietors' income, published by the U.S. Department of Commerce.[21] In the present section we address two issues that occasionally arise in college economic impact studies: 1) the addition of **student spending** effects to impact estimates, and 2) the expression of economic impacts in terms of **gross sales** rather than earnings.

The Economic Impact of Student Spending

Students spend money while attending college: they buy books and supplies, rent rooms, purchase food, pay for transportation, attend sports events and go to movies, and so on. These expenditures create jobs and incomes for businesses, which, as argued by some, should be counted among the economic impacts attributable to the colleges.

In **Table 3.8**, however, we exclude student spending because most of the students already reside in the state. Student expenditures, therefore, do not represent **new** monies in the state, but rather a redirection of monies that would have been spent anyway. The other side of the argument is that, even though the college-related spending of a resident student does not constitute new money, absent the college, some students will leave the state to obtain an education elsewhere. Thus, the state loses the spending and related jobs and incomes. Both cases have merit, although we believe the former more so than the latter. This is because only a few students will actually be able to avail themselves of education elsewhere (see **Table 2.9**). Our approach, therefore, was to exclude student spending, recognizing at the same time, that the statewide impact estimates may err on the conservative side.

In **Table 4.2** we show the potential magnitude of student spending effects in the state economy. The table parallels **Table 3.8** in the previous chapter, but adds the section "Earnings Attributable to Student Spending,"[22] creating

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[21] U.S. Department of Commerce, Regional Economic Information System (REIS) data include earnings estimates for counties and states, and are published annually in the *Department's Survey of Current Business*. They are also readily available in electronic form.

[22] We estimated student spending effects by borrowing average college student information from a study conducted for higher education economic impacts in Illinois (University of Illinois, 2000). Student

some $926 million in additional earnings for the businesses patronized by students (the direct effects), plus another $849 million in earnings stemming from related multiplier effects (indirect effects). Adding the student spending to the mix increases the WTCS total "explanatory power" of the statewide earnings from 3.4% in **Table 3.8** to 5.0% in **Table 4.2**.

Table 4.2. Summary of CCs Role in the State Economy

	Earnings (1,000)	% of Total
Total Earnings in State	$111,823,512	100%
Earnings Attributable to Student Spending		
Direct Earnings	$926,422	0.8%
Indirect Earnings	$849,423	0.8%
TOTAL	$1,775,845	1.6%
Earnings Attributable to College Operations		
Direct Earnings of Faculty and Staff	$553,659	0.5%
Indirect Earnings	$398,202	0.4%
TOTAL	$951,861	0.9%
Earnings Attributable to Past Student Econ. Dev. Effects		
Direct Earnings	$1,198,401	1.1%
Indirect Earnings	$1,700,305	1.5%
TOTAL	$2,898,706	2.6%
GRAND TOTAL	$5,626,412	5.0%

Economic Impacts Reported as Gross Sales

Advocates sometimes favor gross sales over earnings as an impact measure, because sales are always larger than the earnings. But gross sales used as an impact measure has notable drawbacks. An immediate drawback is that, unlike earnings, there is generally no published total against which a sales impact can be measured. More importantly though, the most troublesome aspect of gross sales impact measures is captured in the following example:

> Two visitors spend $50,000 each. One purchases a luxury automobile, the other enters a hospital for a medical procedure. In terms of direct economic impact, both have spent $50,000. However, the expenditures will likely have very different meanings to the economy. Of the $50,000 spent for the luxury automobile, perhaps $9,000 remains in-state as salesperson commissions and auto dealer income (part of the overall earnings), while the other $41,000 leaves the state for Detroit or somewhere else as wholesale payment for the new

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spending by broad expenditure category was bridged to the sectors of the statewide input-output model. Adjustments were made consistent with the model's accounts to allow for spending leakages.

automobile. Contrast this to the hospital expenditure. Here perhaps $40,000 appears as physician, nurse, and assorted hospital employee wages (part of the overall earnings), while only $10,000 leaves the area, to pay for hospital supplies, or to help amortize building and equipment loans. In terms of sales, both have the same impact, while in terms of earnings, the former has less than one-fourth the impact of the latter.

Table 4.3 expresses the WTCS impacts in terms of gross sales rather than earnings. Note that gross sales measures are everywhere larger than earnings. The economy-wide measure of total gross sales estimated by the economic model is $339 billion.[23] Direct spending by students reflects their total spending, reduced by the estimated portion that leaks out-of-state to purchase goods produced elsewhere.[24] In the usual fashion, indirect effects reflect the action of economic multiplier effects, also estimated by the economic model.

Direct expenditures include all spending by the college for consumer items and faculty and staff salaries. Both items are reduced to reflect purchases from outside the state. All told, the operation of the WTCS is estimated to explain some $11,931 million in gross sales, a number roughly twice the some $5,626 million explained by the colleges in gross earnings shown in **Table 4.2**. While the gross sales impacts shown in **Table 4.3** are not incorrect (because of the ambiguities suggested earlier), our preference is to report collect impacts in terms of earnings rather than gross sales.

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[23] Simply stated, economy-wide gross sales are obtained by multiplying sector-specific earnings by a national estimate of sales-to-earnings.

[24] Students purchase gasoline for their cars, for example, and while the trade margin stays in the state, in most cases the producer price of gasoline itself will leak out to the oil producing region.

Table 4.3. Summary of CCs Role in the State Economy

	Gross Sales (1,000)	% of Total
Total Gross Sales	$339,352,434	100%
Gross Sales Attributable to Student Spending		
Direct Spending by Students	$1,677,298	0.5%
Indirect Spending Effect	$1,415,765	0.4%
TOTAL	$3,093,063	0.9%
Gross Sales Attributable to College Operations		
Direct Expenditures of CC	$461,158	0.1%
Indirect Spending Effect	$563,269	0.2%
TOTAL	$1,024,427	0.3%
Gross Sales Attributable to Past Student Econ. Dev. Effects		
Direct Gross Sales	$3,520,171	1.0%
Indirect Gross Sales	$4,293,027	1.3%
TOTAL	$7,813,198	2.3%
GRAND TOTAL	$11,930,688	3.5%

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Appendix 1: Explaining the Results—a Primer

The purpose of this appendix is to provide some context and meaning to investment analysis results in general, using the simple hypothetical example summarized in **Table 1** below. The table shows the projected (assumed) benefits and costs over time for one student and the associated investment analysis results.

Table 1. Costs and Benefits

	Tuition	Opportunity Cost	Total cost	Higher Earnings	NCF
1	$1,500	$20,000	$21,500	$0	($21,500)
2	$0	$0	$0	$5,000	$5,000
3	$0	$0	$0	$5,000	$5,000
4	$0	$0	$0	$5,000	$5,000
5	$0	$0	$0	$5,000	$5,000
6	$0	$0	$0	$5,000	$5,000
7	$0	$0	$0	$5,000	$5,000
8	$0	$0	$0	$5,000	$5,000
9	$0	$0	$0	$5,000	$5,000
10	$0	$0	$0	$5,000	$5,000
NPV			$20,673	$35,747	$15,074
IRR					18%
B/C ratio					1.7
Payback period					4.2 years

The assumptions are as follows:

1) The time horizon is 10 years—i.e., we project the benefits and costs out 10 years into the future (column 1). Once the higher education has been earned, the benefits of higher earnings remain with the student into the future. Our objective is to measure these future benefits and compare them to the costs of the education.

2) The student attends the TC for one year for which he or she pays a tuition of $1,500 (column 2).

3) The opportunity cost of time (the earnings foregone while attending the TC for one year) for this student is estimated at $20,000 (column 3).

4) Together, these two cost elements ($21,500 total) represent the out-of-pocket investment made by the student (column 4).

5) In return, we assume that the student, having completed the one year of study, will earn $5,000 more per year than without the education (column 5).

6) Finally, the net cash flow column (NCF) in column 6 shows higher earnings (column 5) less the total cost (column 4).

7) We assume a "going rate" of interest of 4%, the rate of return from alternative investment schemes, for the use of the $21,500.

Now the "mechanics"—we express the results in standard investment analysis terms: the net present value (NPV), the internal rate of return (IRR—or, as referred to in the main report, simply the rate of return—RR), the benefit/cost ratio (B/C), and the payback period. Each of these is briefly explained below in the context of the cash flow numbers in **Table 1**.

THE NET PRESENT VALUE (NPV)

"A bird in hand is worth two in the bush." This simple folk wisdom lies at the heart of any economic analysis of investments lasting more than one year. The student we are tracking in **Table 1** has choices: a) to attend the TC, or b) forget about higher education and hold on to the present employment. If he or she decides to enroll, certain economic implications unfold: the tuition must be paid and earnings will cease for one year. In exchange, the student calculates that, with the higher education, his or her income will increase by at least the $5,000 per year as indicated in the table.

The question is simple: will the prospective student be economically better off by choosing to enroll? If we add up the higher earnings of $5,000 per year

for the remaining nine years in **Table 1**, the total will be $45,000. Compared to a total investment of $21,500, this appears to be a very solid investment. The reality, however, is different—the benefits are far lower than $45,000 because future money is worth less than present money. The costs (tuition plus foregone earnings) are felt immediately because they are incurred today—in the present. The benefits (higher earnings), on the other hand, occur in the future. They are not yet available. We must discount all future benefits by the going rate of interest (referred to as the discount rate) to be able to express them in present value terms.[25] A brief example: at 4%, the present value of $5,000 to be received one year from today is $4,807. If the $5,000 were to be received in year 10, the present value would reduce to $3,377. Or put another way, $4,807 deposited in the bank today earning 4% interest will grow to $5,000 in one year; and $3,377 deposited today would grow to $5,000 in 10 years. An "economically rational" person would, therefore, be equally satisfied receiving $3,377 today or $5,000 10 years from today given the going rate of interest of 4%. The process of discounting—finding the present value of future higher earnings—allows us express values on an equal basis in future or present value terms.

Our goal is to express all future higher earnings in present value terms so that we can compare them to the investments incurred today—the tuition and foregone earnings. As indicated in **Table 1**, the cumulative present value of the flow of $5,000 worth of higher earnings between years 2 and 10 is $35,747 given the 4% interest rate, far lower than the undiscounted $45,000 discussed above.

The measure we are looking for is the NPV result of $15,074. It is simply the present value of the benefits less the present value of the costs, or $35,747 - $20,673 = $15,074. In other words, the present value of benefits exceeds the present value of costs by as much as $15,074. The criterion for an economically worthwhile investment is that the NPV is equal to or greater

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[25] Technically, the **interest rate** is applied to compounding—the process of looking at deposits today and determining how much they will be worth in the future. The same interest rate is called a **discount rate** when we reverse the process—determining the present value of future earnings.

than zero. Given this result, it can be concluded that, *in this case*, and given these assumptions, this particular investment in TC education is very strong.

THE INTERNAL RATE OF RETURN (IRR)

The IRR is another way of measuring the worth of the investment in education using the same cash flows shown in **Table 1**. In technical terms— the IRR is a measure of the average earning power of the money used over the life of the investment. It is simply the interest rate that makes the NPV equal to zero. In the NPV example above we applied the "going rate" of interest of 4% and computed a positive NPV of $15,074. The question now is: what would the interest rate have to be in order to reduce the NPV to zero? Obviously it would have to be higher—18% in fact, as indicated in **Table 1**. Or, if we applied 18% to the NPV calculations instead of the 4%, then the NPV would reduce to zero.

What does this mean? The IRR of 18% defines a breakeven solution—the point where the present value of benefits just equals the present value of costs, or where the NPV equals zero. Or, at 18%, the higher incomes of $5,000 per year for the next 9 years will earn back all the investments of $21,500 made plus pay 18% for the use of that money (the $21,500) in the meantime. Is this a good return? Indeed it is—first, if we compare it to the 4% "going rate" of interest we applied to the NPV calculations, 18% is far higher than 4%. We can conclude, therefore, that the investment in this case is solid. Alternatively, we can compare the rate to the long-term 7% rate or so obtained from investments in stocks and bonds. Again, the 18% is far higher, indicating that the investment in TC education is strong relative to the stock market returns (on average).

A word of caution—the IRR approach can sometimes generate "wild" or "unbelievable" results—percentages that defy the imagination. Technically, the approach requires at least one negative cash flow (tuition plus opportunity cost of time) to offset all subsequent positive flows. For example, if the student works full time while attending college, the opportunity cost of time would be much lower—the only out-of-pocket cost would be the $1,500

paid for tuition. In this case, it is still possible to compute the IRR, but it would be a staggering 333% because only a negative $1,500 cash flow will be offsetting 9 subsequent years of $5,000 worth of higher earnings. The 333% return is technically correct, but not consistent with conventional understanding of returns expressed as percentages. For purposes of this report, therefore, we express all results in the main report exceeding 100% simply as: "> than 100%."

THE BENEFIT/COST RATIO (B/C)

The B/C ratio is simply the present value of benefits divided by present value of costs, or $35,747 / $21,500 = 1.7 (based on the 4% discount rate). Of course, any change in the discount rate will also change the B/C ratio. If we applied the 18% IRR discussed above, the B/C ratio would reduce to 1.0—or the breakeven solution where benefits just equal the costs. Applying a discount rate higher than the 18 percent would reduce the ratio to less than one and the investment would not be feasible. The 1.7 ratio means that a dollar invested today will return a cumulative $1.70 over the 10-year time period.

THE PAYBACK PERIOD

This is the length of time from the beginning of the investment (consisting of the tuition plus the earnings foregone) before the higher future earnings return the investments made. In **Table 1**, it will take roughly 4.2 years of $5,000 worth of higher earnings to recapture the student's investment of $1,500 in tuition and the $20,000 earnings he or she foregoes while attending the TC. The higher earnings occurring *beyond* the 4.2 years are the returns (the "gravy") that make the investment in education *in this example,* economically worthwhile. The payback period is a fairly rough, albeit common, means of choosing between investments. The shorter the payback period, the stronger the investment.

Appendix 2: Methodology for Creating Income Gains by Levels of Education

The US Bureau of the Census reports income in two ways:

1) Mean income by race and Hispanic origin and by sex.

2) Educational attainment by mean income and sex.

The first and second data sets can be found at the following source:

Table P-3: Race and Hispanic Origin of People by Mean Income and Sex: 1947 to 2000, and Table P-18: Educational Attainment--People 25 Years Old and Over by Mean Income and Sex: 1991 to 2000. Also consult:

http://www.census.gov/ftp/pub/hhes/income/histinc/histinctb.html

Further contact information: a) Income Surveys Branch, b) Housing & Household Economic Statistics Division, c) U.S. Census Bureau, and d) U.S. Department of Commerce.

The data needed for this analysis is mean income by educational attainment reported by race/ethnic origin and by sex. A model was developed to translate these two data sets into the data needed for the analysis. This was accomplished in the following way:

1. Mean income by race and sex are calculated as a percent of all races.

2. This percent is then applied to mean income by educational attainment. For example, African-American males make an average income of $28,392 versus $40,293 for all males, or 70% of the average income of all males.

3. This percent (70%) is then applied to the income levels by educational attainment for all males to estimate the income levels by educational attainment for African-American males.

4. To simplify the analysis, all nonwhite males are averaged together as are all nonwhite females. The same process is repeated for white males and white females.

5. The educational levels of attainment are aggregated together in some categories to model the educational system of community colleges. These numbers are then adjusted for inflation to 2001 dollars.

6. The final step is to adjust these income levels by state. The *Four Person Median Family Income by State* from the Bureau of the Census was used to make state level adjustments. Each state's median family income is taken as a percentage of the national average. These percentages are then applied to the income levels by educational attainment by race, ethnicity and sex calculated earlier.

Wisconsin
Technical College System

The Socioeconomic Benefits Generated by Wisconsin Technical College System

State of Wisconsin

Volume 2: Detailed Results

by

Entry Level of Education

Gender and Ethnicity

December 20, 2001

Kjell A. Christophersen & M. Henry Robison

*CC*Benefits Inc.

email: ccb@turbonet.com

INTRODUCTION

The purpose of this volume is to present the results of the economic impact analysis in detail, by gender, ethnicity and entry level of education. It is kept as a separate volume intended for limited distribution only, however, because this effort is not about gender and ethnicity differences *per se*. The study is about the overall economic impacts generated by technical colleges (TCs). As such, the Main Report and the short Executive Summary both present the results without reference to gender and ethnicity differences.

We feel, nevertheless, that it is important to present *all* of the results for the sake of completeness, not just the consolidated ones, so long as the users of the detailed information remain prudent in its use and distribution. The results should not be used, for example, to further political agendas. Other studies about gender and ethnicity differences address such questions better and in greater detail. Our intent is simply to provide TC presidents with pertinent information should specific questions arise.

On the input side, gender and ethnicity are important variables that help characterize the student body profile. We collect the profile data and link it to national statistical databases which themselves are also broken out by gender and ethnic differences. The student body profile, to a large extent, drives the magnitudes of the results as presented in detail in this volume and in a consolidated fashion in the Main Report and the Executive Summary.

Tables 25 and 26 in this report are particularly important. They provide the data needed for computing the investment analysis results in Tables 3.5 and 3.6 in the Main Report—the broad and narrow taxpayer perspectives. In Table 25, every other column (the higher taxes and the avoided cost columns) provides the data needed for the narrow taxpayer perspective. The remaining columns provide the data needed for the broad taxpayer perspective. Table 26 provides the detailed calculations on student earnings that feed into the first column of Table 25.

DETAILED RESULTS

Table 1. The Student Body

Entry Level	Male		Female		
	White	All Other	White	All Other	Total
<HS/GED	29,504	9,945	25,486	9,715	74,649
HS/GED Equiv.	104,313	11,131	113,031	13,460	241,934
HS/GED+1 = TD	12,459	1,199	17,930	1,730	33,318
HS/GED+2 = AD	16,441	1,205	16,184	1,510	35,341
HS/GED+3	5,149	495	6,325	623	12,593
HS/GED+4 = BS	18,721	966	20,749	1,156	41,592
HS/GED+5	7,746	579	8,069	619	17,013
Total	194,333	25,520	207,774	28,813	456,439
Avg. no. of CEs completed					4

Table 2. Male, No. of Students by Achievement Category

Entry Level	White Male			Of Color Male		
	AD	TD	Other	AD	TD	Other
<HS/GED	478	546	28,479	161	184	9,599
HS/GED Equiv.	1,691	1,932	100,690	180	206	10,745
HS/GED+1 = TD	202	231	12,026	19	22	1,157
HS/GED+2 = AD	267	305	15,870	20	22	1,163
HS/GED+3	83	95	4,971	8	9	478
HS/GED+4 = BS	303	347	18,071	16	18	932
HS/GED+5	126	143	7,477	9	11	559
Subtotal	3,150	3,599	187,584	414	473	24,634
Grand Total		194,334			25,520	

Table 3. Female, No. of Students by Achievement Category

Entry Level	White Female			Of Color Female		
	AD	TD	Other	AD	TD	Other
<HS/GED	413	472	24,600	157	180	9,377
HS/GED Equiv.	1,832	2,093	109,106	218	249	12,992
HS/GED+1 = TD	291	332	17,308	28	32	1,670
HS/GED+2 = AD	262	300	15,622	24	28	1,458
HS/GED+3	103	117	6,106	10	12	601
HS/GED+4 = BS	336	384	20,028	19	21	1,116
HS/GED+5	131	149	7,788	10	11	598
Subtotal	3,368	3,848	200,558	467	534	27,812
Grand Total		207,775			28,813	

Table 4. Higher Annual Earnings per Male Student

Entry Level	White Male			Of Color Male		
	AD	TD	Other	AD	TD	Other
<HS/GED	$ 22,614	$ 18,701	$ 9,327	$ 13,967	$ 11,551	$ 5,761
HS/GED Equiv.	$ 13,286	$ 9,374	$ 9,374	$ 8,206	$ 5,790	$ 5,790
HS/GED+1 = TD	$ 3,912	$ 3,912	$ 3,912	$ 2,416	$ 2,416	$ 2,416
HS/GED+2 = AD	$ 11,168	$ 11,168	$ 11,168	$ 6,898	$ 6,898	$ 6,898
HS/GED+3	$ 11,168	$ 11,168	$ 11,168	$ 6,898	$ 6,898	$ 6,898
HS/GED+4 = BS	$ 6,909	$ 6,909	$ 6,909	$ 4,267	$ 4,267	$ 4,267
HS/GED+5	$ 8,643	$ 8,643	$ 8,643	$ 5,338	$ 5,338	$ 5,338

Table 5. Higher Annual Earnings per Female Student

Entry Level	White Female			Of Color Female		
	AD	TD	Other	AD	TD	Other
<HS/GED	$ 13,725	$ 11,602	$ 6,207	$ 11,016	$ 9,311	$ 4,982
HS/GED Equiv.	$ 7,518	$ 5,394	$ 5,394	$ 6,034	$ 4,329	$ 4,329
HS/GED+1 = TD	$ 2,124	$ 2,124	$ 2,124	$ 1,704	$ 1,704	$ 1,704
HS/GED+2 = AD	$ 4,986	$ 4,986	$ 4,986	$ 4,002	$ 4,002	$ 4,002
HS/GED+3	$ 4,986	$ 4,986	$ 4,986	$ 4,002	$ 4,002	$ 4,002
HS/GED+4 = BS	$ 5,524	$ 5,524	$ 5,524	$ 4,434	$ 4,434	$ 4,434
HS/GED+5	$ 4,870	$ 4,870	$ 4,870	$ 3,909	$ 3,909	$ 3,909

Table 6. Expected Aggregate Earning Increases for Students ($/Year)

Entry Level	Male		Female		
	White	All Other	White	All Other	Total
<HS/GED	$13,229,871	$2,853,233	$7,637,213	$4,832,760	$28,553,076
HS/GED Equiv.	$53,727,145	$4,658,088	$32,785,304	$5,818,554	$96,989,091
HS/GED+1 = TD	$24,166,422	$2,184,394	$16,622,113	$1,280,557	$44,253,487
HS/GED+2 = AD	$11,327,616	$785,377	$6,793,519	$316,814	$19,223,326
HS/GED+3	$6,902,293	$12,808	$4,071,688	$138,568	$11,125,358
HS/GED+4 = BS	$9,638,062	$442,093	$6,293,293	$257,099	$16,630,547
HS/GED+5	$7,403,335	$354,606	$4,232,610	$137,664	$12,128,217
Total	$126,394,745	$11,290,601	$78,435,741	$12,782,016	$228,903,103

Table 7. No. of Days Reduced Absenteeism/Year

Entry Level	Male		Female		
	White	All Other	White	All Other	Total
<HS/GED	7,497	6,318	6,476	2,469	22,759
HS/GED Equiv.	39,760	2,829	43,083	5,130	90,802
HS/GED+1 = TD	1,583	305	4,556	440	6,884
HS/GED+2 = AD	2,089	306	4,113	384	6,891
HS/GED+3	654	126	804	158	1,742
HS/GED+4 = BS	2,379	123	5,272	294	8,068
HS/GED+5	984	74	1,025	79	2,162
Total	54,946	10,079	65,329	8,953	139,308

Table 8. Employer Savings from Reduced Absenteeism, $ per Year

	Male		Female		
Entry Level	White	All Other	White	All Other	Total
<HS/GED	$730,023	$379,939	$306,982	$93,916	$1,510,860
HS/GED Equiv.	$5,155,267	$226,515	$2,967,984	$283,660	$8,633,425
HS/GED+1 = TD	$256,605	$30,507	$398,951	$30,902	$716,964
HS/GED+2 = AD	$366,924	$33,218	$390,333	$29,233	$819,708
HS/GED+3	$140,214	$16,660	$90,150	$14,256	$261,280
HS/GED+4 = BS	$601,712	$19,172	$682,432	$30,520	$1,333,836
HS/GED+5	$272,509	$12,572	$152,294	$9,378	$446,752
Total	$7,523,253	$718,583	$4,989,125	$491,864	$13,722,825

Table 9. Fewer Smokers

	Male		Female		
Entry Level	White	All Other	White	All Other	Total
<HS/GED	229	63	207	46	545
HS/GED Equiv.	2,770	328	2,219	298	5,614
HS/GED+1 = TD	0	0	0	0	0
HS/GED+2 = AD	153	12	139	9	312
HS/GED+3	0	0	0	0	0
HS/GED+4 = BS	0	0	0	0	0
HS/GED+5	0	0	0	0	0
Total	3,152	403	2,565	352	6,471

Table 10. Medical Savings from Reduced Smoking, $ per Year

	Annual Costs, Male		Annual Costs, Female		
Entry Level	White	All Other	White	All Other	Total
<HS/GED	$334,452	$92,403	$303,109	$66,796	$796,759
HS/GED Equiv.	$4,051,434	$479,912	$3,245,269	$435,218	$8,211,833
HS/GED+1 = TD	$0	$0	$0	$0	$0
HS/GED+2 = AD	$224,059	$16,944	$203,011	$12,629	$456,643
HS/GED+3	$0	$0	$0	$0	$0
HS/GED+4 = BS	$0	$0	$0	$0	$0
HS/GED+5	$0	$0	$0	$0	$0
Total	$4,609,945	$589,258	$3,751,389	$514,643	$9,465,235

Table 11. Fewer Alcohol Abusers

	Male		Female		
Entry Level	White	All Other	White	All Other	Total
<HS/GED	109	88	71	26	294
HS/GED Equiv.	941	69	101	17	1,128
HS/GED+1 = TD	11	1	0	2	14
HS/GED+2 = AD	10	1	0	0	11
HS/GED+3	3	0	8	0	12
HS/GED+4 = BS	12	1	0	0	13
HS/GED+5	0	0	0	0	0
Total	1,086	161	180	45	1,472

Table 12. Medical Savings from Reduced Alcohol Abuse, $/Year

| Entry Level | Annual Costs, Male | | Annual Costs, Female | | |
	White	All Other	White	All Other	Total
<HS/GED	$384,148	$312,543	$251,732	$91,593	$1,040,017
HS/GED Equiv.	$3,325,201	$244,887	$355,236	$60,430	$3,985,755
HS/GED+1 = TD	$39,155	$3,768	$0	$6,992	$49,916
HS/GED+2 = AD	$36,909	$2,705	$0	$0	$39,614
HS/GED+3	$11,560	$1,112	$28,400	$0	$41,071
HS/GED+4 = BS	$42,026	$2,168	$0	$0	$44,195
HS/GED+5	$0	$0	$0	$0	$0
Total	$3,838,999	$567,184	$635,368	$159,016	$5,200,566

Table 13. Fewer Incarcerated, Aggregate for Student Body

| Entry Level | Male | | Female | | |
	White	All Other	White	All Other	Total
<HS/GED	206	158	23	19	405
HS/GED Equiv.	252	27	29	3	311
HS/GED+1 = TD	6	11	0	2	19
HS/GED+2 = AD	4	1	2	0	7
HS/GED+3	3	1	0	0	4
HS/GED+4 = BS	10	3	0	0	13
HS/GED+5	0	0	0	0	0
Total	481	200	53	24	759

Table 14. Savings from Reduced Incarceration, $ per Year

| Entry Level | Annual Costs, Male | | Annual Costs, Female | | |
	White	All Other	White	All Other	Total
<HS/GED	$1,263,279	$967,739	$138,883	$113,441	$2,483,342
HS/GED Equiv.	$1,542,940	$164,649	$175,989	$20,957	$1,904,535
HS/GED+1 = TD	$38,796	$66,277	$0	$10,777	$115,850
HS/GED+2 = AD	$25,599	$4,690	$12,599	$0	$42,889
HS/GED+3	$20,044	$6,170	$0	$970	$27,184
HS/GED+4 = BS	$58,297	$17,293	$0	$2,700	$78,291
HS/GED+5	$0	$0	$0	$0	$0
Total	$2,948,955	$1,226,818	$327,471	$148,845	$4,652,090

Table 15. Victim Savings Aggregate for Student Body, $/Year

| Entry Level | Annual Costs, Male | | Annual Costs, Female | | |
	White	All Other	White	All Other	Total
<HS/GED	$408,849	$313,200	$44,948	$36,714	$803,712
HS/GED Equiv.	$499,359	$53,287	$56,957	$6,782	$616,386
HS/GED+1 = TD	$12,556	$21,450	$0	$3,488	$37,494
HS/GED+2 = AD	$8,285	$1,518	$4,078	$0	$13,881
HS/GED+3	$6,487	$1,997	$0	$314	$8,798
HS/GED+4 = BS	$18,867	$5,597	$0	$874	$25,338
HS/GED+5	$0	$0	$0	$0	$0
Total	$954,403	$397,049	$105,983	$48,172	$1,505,608

Table 16. Productivity Gained (Fewer Incarc.), $ per Year

| Entry Level | Annual Costs, Male | | Annual Costs, Female | | Total |
	White	All Other	White	All Other	
<HS/GED	$664,495	$314,396	$35,563	$23,314	$1,037,769
HS/GED Equiv.	$1,080,704	$71,227	$65,493	$6,259	$1,223,683
HS/GED+1 = TD	$33,974	$35,847	$0	$4,091	$73,912
HS/GED+2 = AD	$24,290	$2,749	$6,460	$0	$33,499
HS/GED+3	$23,205	$4,411	$0	$472	$28,088
HS/GED+4 = BS	$79,666	$14,596	$0	$1,515	$95,777
HS/GED+5	$0	$0	$0	$0	$0
Total	$1,906,334	$443,225	$107,516	$35,652	$2,492,728

Table 17. Fewer People on Welfare

| Entry Level | Male | | Female | | Total |
	White	All Other	White	All Other	
<HS/GED	-10	-134	-9	-131	-285
HS/GED Equiv.	727	244	762	341	2,074
HS/GED+1 = TD	-3	5	0	7	9
HS/GED+2 = AD	-3	1	4	8	10
HS/GED+3	2	3	6	1	12
HS/GED+4 = BS	-3	9	24	3	34
HS/GED+5	0	0	0	0	0
Total	711	127	787	228	1,853

Table 18. Community Welfare Saving, $ per Year

| Entry Level | Annual Costs, Male | | Annual Costs, Female | | Total |
	White	All Other	White	All Other	
<HS/GED	($29,659)	($383,255)	($25,620)	($374,385)	($812,919)
HS/GED Equiv.	$2,073,036	$695,326	$2,171,310	$972,080	$5,911,752
HS/GED+1 = TD	($8,265)	$12,857	$0	$20,059	$24,651
HS/GED+2 = AD	($7,271)	$2,195	$11,929	$21,434	$28,287
HS/GED+3	$5,693	$9,492	$16,318	$3,184	$34,689
HS/GED+4 = BS	($7,452)	$25,913	$68,822	$8,272	$95,555
HS/GED+5	$0	$0	$0	$0	$0
Total	$2,026,082	$362,528	$2,242,760	$650,644	$5,282,014

Table 19. Fewer People on Unemployment

| Entry Level | Male | | Female | | Total |
	White	All Other	White	All Other	
<HS/GED	37	38	65	37	177
HS/GED Equiv.	133	42	144	17	336
HS/GED+1 = TD	16	3	91	9	119
HS/GED+2 = AD	21	3	41	4	69
HS/GED+3	7	1	32	2	42
HS/GED+4 = BS	0	0	26	3	29
HS/GED+5	0	0	0	0	0
Total	213	88	399	72	772

Table 20. Unemployment Saving, $ per Year

| Entry Level | Annual Costs, Male | | Annual Costs, Female | | Total |
	White	All Other	White	All Other	
<HS/GED	$148,752	$150,417	$256,985	$146,936	$703,090
HS/GED Equiv.	$525,923	$168,366	$569,878	$67,861	$1,332,028
HS/GED+1 = TD	$62,814	$12,091	$361,602	$34,898	$471,404
HS/GED+2 = AD	$82,894	$12,150	$163,195	$15,228	$273,467
HS/GED+3	$25,962	$4,995	$127,566	$9,425	$167,948
HS/GED+4 = BS	$0	$0	$104,611	$11,658	$116,269
HS/GED+5	$0	$0	$0	$0	$0
Total	$846,345	$348,019	$1,583,837	$286,005	$3,064,206

Table 21. Summary of Annual Impacts, $ per Year

| | Male | | Female | | Total |
	White	All Other	White	All Other	
Higher earnings	$126,394,745	$11,290,601	$78,435,741	$12,782,016	$228,903,103
Absenteeism Savings	$7,598,486	$725,769	$5,039,016	$496,782	$13,860,053
Medical Cost Savings	$8,448,943	$1,156,443	$4,386,757	$673,659	$14,665,801
Incarceration Savings	$2,948,955	$1,226,818	$327,471	$148,845	$4,652,090
Crime Victim Savings	$954,403	$397,049	$105,983	$48,172	$1,505,608
Add Prod. (fewer incarc.)	$1,925,397	$447,658	$108,591	$36,009	$2,517,655
Welfare Savings	$2,026,082	$362,528	$2,242,760	$650,644	$5,282,014
Unemployment Savings	$846,345	$348,019	$1,583,837	$286,005	$3,064,206
Total	$151,143,357	$15,954,884	$92,230,156	$15,122,133	$274,450,530

Table 24. Opportunity Costs (Earnings Foregone), $ per Year

| Entry Level | Male | | Female | | Total |
	White	All Other	White	All Other	
<HS/GED	$40,498,716	$9,295,710	$20,004,278	$6,556,066	$76,354,770
HS/GED Equiv.	$182,797,132	$13,015,665	$117,286,578	$11,813,635	$324,913,010
HS/GED+1 = TD	$26,587,300	$1,684,697	$22,543,017	$1,823,813	$52,638,826
HS/GED+2 = AD	$37,705,326	$1,811,533	$21,747,090	$1,696,465	$62,960,414
HS/GED+3	$14,150,726	$883,749	$9,783,738	$801,527	$25,619,740
HS/GED+4 = BS	$59,958,361	$1,994,412	$36,305,016	$1,675,531	$99,933,320
HS/GED+5	$26,987,914	$1,295,376	$15,932,809	$1,008,917	$45,225,016
Total					

Table 22. Annual Impacts per Credit Generated, $ per Year

| | Male | Female | Weighted |

Table 23. Annual Impacts per Student, $ per Year

| | Male | | Female | | Weighted |
	White	All Other	White	All Other	Average
Higher earnings	$650	$442	$378	$444	$501
Absenteeism Savings	$39	$28	$24	$17	$30
Medical Cost Savings	$43	$45	$21	$23	$37
Incarceration Savings	$15	$48	$2	$5	$37
Crime Victim Savings	$5	$16	$1	$2	$12
Add Prod. (fewer incarc.)	$10	$18	$1	$1	$14
Welfare Savings	$10	$14	$11	$23	$16
Unemployment Savings	$4	$14	$8	$10	$10
Total	$778	$625	$444	$525	$656

Table 25. Cumulative Impact Over Time ($'000), Details for Both Taxpayer Perspectives

Year	Earnings Net	Added Taxes	Reduced Absent.	Health Avoided Cost	Medical Saving	Avoided Cost	Incarc-eration	Avoided Cost	Crime Victims	Avoided Cost	Product. Gained	Avoided Cost	Reduced Welfare	Welfare/Un Avoided Cost
1	$962,651	$172,315	$13,860	$1,400	$14,666	$733	$4,652	$3,722	$1,506	$0	$2,518	$451	$5,335	$854
2	$10,796	$1,932	$13,867	$1,401	$14,586	$729	$4,627	$3,701	$1,497	$0	$2,519	$451	$5,359	$857
3	$294,570	$52,728	$13,874	$1,401	$14,506	$725	$4,601	$3,681	$1,489	$0	$2,520	$451	$5,383	$861
4	$294,716	$52,754	$13,881	$1,402	$14,426	$721	$4,576	$3,661	$1,481	$0	$2,521	$451	$5,407	$865
5	$294,862	$52,780	$13,888	$1,403	$14,348	$717	$4,551	$3,641	$1,473	$0	$2,523	$452	$5,431	$869
6	$295,008	$52,806	$13,894	$1,403	$14,269	$713	$4,526	$3,621	$1,465	$0	$2,524	$452	$5,455	$873
7	$295,154	$52,833	$13,901	$1,404	$14,191	$710	$4,501	$3,601	$1,457	$0	$2,525	$452	$5,480	$877
8	$295,300	$52,859	$13,908	$1,405	$14,113	$706	$4,477	$3,581	$1,449	$0	$2,526	$452	$5,504	$881
9	$295,446	$52,885	$13,915	$1,405	$14,036	$702	$4,452	$3,562	$1,441	$0	$2,528	$452	$5,529	$885
10	$295,593	$52,911	$13,922	$1,406	$13,959	$698	$4,428	$3,542	$1,433	$0	$2,529	$453	$5,554	$889
11	$295,739	$52,937	$13,929	$1,407	$13,883	$694	$4,404	$3,523	$1,425	$0	$2,530	$453	$5,578	$893
12	$295,885	$52,963	$13,936	$1,408	$13,807	$690	$4,380	$3,504	$1,417	$0	$2,531	$453	$5,603	$897
13	$296,032	$52,990	$13,943	$1,408	$13,732	$687	$4,356	$3,485	$1,410	$0	$2,533	$453	$5,628	$901
14	$296,179	$53,016	$13,950	$1,409	$13,656	$683	$4,332	$3,466	$1,402	$0	$2,534	$454	$5,654	$905
15	$296,325	$53,042	$13,956	$1,410	$13,582	$679	$4,308	$3,447	$1,394	$0	$2,535	$454	$5,679	$909
16	$296,472	$53,068	$13,963	$1,410	$13,507	$675	$4,285	$3,428	$1,387	$0	$2,536	$454	$5,704	$913
17	$296,619	$53,095	$13,970	$1,411	$13,434	$672	$4,261	$3,409	$1,379	$0	$2,538	$454	$5,730	$917
18	$296,766	$53,121	$13,977	$1,412	$13,360	$668	$4,238	$3,390	$1,372	$0	$2,539	$454	$5,756	$921
19	$296,913	$53,147	$13,984	$1,412	$13,287	$664	$4,215	$3,372	$1,364	$0	$2,540	$455	$5,781	$925
20	$297,060	$53,174	$13,991	$1,413	$13,214	$661	$4,192	$3,353	$1,357	$0	$2,541	$455	$5,807	$929
21	$297,207	$53,200	$13,998	$1,414	$13,142	$657	$4,169	$3,335	$1,349	$0	$2,543	$455	$5,833	$933
22	$297,354	$53,226	$14,005	$1,414	$13,070	$654	$4,146	$3,317	$1,342	$0	$2,544	$455	$5,859	$937
23	$297,501	$53,253	$14,012	$1,415	$12,999	$650	$4,123	$3,299	$1,334	$0	$2,545	$456	$5,886	$942
24	$297,649	$53,279	$14,019	$1,416	$12,928	$646	$4,101	$3,281	$1,327	$0	$2,546	$456	$5,912	$946
25	$297,796	$53,306	$14,026	$1,417	$12,857	$643	$4,078	$3,263	$1,320	$0	$2,548	$456	$5,938	$950
26	$297,944	$53,332	$14,033	$1,417	$12,787	$639	$4,056	$3,245	$1,313	$0	$2,549	$456	$5,965	$954
27	$298,091	$53,358	$14,040	$1,418	$12,717	$636	$4,034	$3,227	$1,306	$0	$2,550	$456	$5,992	$959
28	$298,239	$53,385	$14,047	$1,419	$12,647	$632	$4,012	$3,209	$1,298	$0	$2,552	$457	$6,018	$963
29	$298,387	$53,411	$14,054	$1,419	$12,578	$629	$3,990	$3,192	$1,291	$0	$2,553	$457	$6,045	$967
30	$298,534	$53,438	$14,061	$1,420	$12,509	$625	$3,968	$3,174	$1,284	$0	$2,554	$457	$6,072	$972
31	$298,682	$53,464	$14,067	$1,421	$12,441	$622	$3,946	$3,157	$1,277	$0	$2,555	$457	$6,100	$976
0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

Table 26. Earnings Calculations, Taxpayer Perspectives ($'000)

Year	Gross Student Earnings	Net of Attrition	Direct Earnings Net	Indirect Student Earnings	Net Total Student Earnings	Total TC Earnings	Total Earnings Net
1	$8,922	$8,922	$4,461	$6,329	$10,790	$951,861	$962,651
2	$9,011	$8,926	$4,463	$6,332	$10,796	$0	$10,796
3	$248,215	$243,566	$121,783	$172,787	$294,570	$0	$294,570
4	$250,698	$243,686	$121,843	$172,872	$294,716	$0	$294,716
5	$253,205	$243,807	$121,904	$172,958	$294,862	$0	$294,862
6	$255,737	$243,928	$121,964	$173,044	$295,008	$0	$295,008
7	$258,294	$244,049	$122,024	$173,129	$295,154	$0	$295,154
8	$260,877	$244,169	$122,085	$173,215	$295,300	$0	$295,300
9	$263,486	$244,290	$122,145	$173,301	$295,446	$0	$295,446
10	$266,121	$244,411	$122,206	$173,387	$295,593	$0	$295,593
11	$268,782	$244,532	$122,266	$173,473	$295,739	$0	$295,739
12	$271,470	$244,654	$122,327	$173,559	$295,885	$0	$295,885
13	$274,184	$244,775	$122,387	$173,645	$296,032	$0	$296,032
14	$276,926	$244,896	$122,448	$173,731	$296,179	$0	$296,179
15	$279,695	$245,017	$122,509	$173,817	$296,325	$0	$296,325
16	$282,492	$245,139	$122,569	$173,903	$296,472	$0	$296,472
17	$285,317	$245,260	$122,630	$173,989	$296,619	$0	$296,619
18	$288,170	$245,382	$122,691	$174,075	$296,766	$0	$296,766
19	$291,052	$245,503	$122,752	$174,161	$296,913	$0	$296,913
20	$293,963	$245,625	$122,812	$174,248	$297,060	$0	$297,060
21	$296,902	$245,746	$122,873	$174,334	$297,207	$0	$297,207
22	$299,871	$245,868	$122,934	$174,420	$297,354	$0	$297,354
23	$302,870	$245,990	$122,995	$174,507	$297,501	$0	$297,501
24	$305,899	$246,112	$123,056	$174,593	$297,649	$0	$297,649
25	$308,958	$246,234	$123,117	$174,679	$297,796	$0	$297,796
26	$312,047	$246,356	$123,178	$174,766	$297,944	$0	$297,944
27	$315,168	$246,478	$123,239	$174,853	$298,091	$0	$298,091
28	$318,319	$246,600	$123,300	$174,939	$298,239	$0	$298,239
29	$321,503	$246,722	$123,361	$175,026	$298,387	$0	$298,387
30	$324,718	$246,844	$123,422	$175,112	$298,534	$0	$298,534
31	$327,965	$246,966	$123,483	$175,199	$298,682	$0	$298,682
0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0
0	$0	$0	$0	$0	$0	$0	$0

Wisconsin
Technical College System

The Socioeconomic Benefits Generated by the Wisconsin Technical College System

State of Wisconsin

Executive Summary

December 20, 2001

Kjell A. Christophersen & M. Henry Robison

CCBenefits, Inc.

email: ccb@turbonet.com
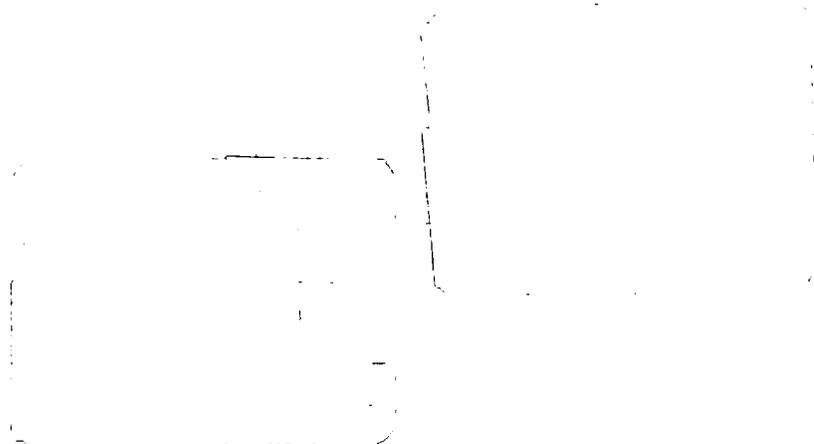
HIGHLIGHTS

- Wisconsin Technical College System accounts for $3,851 million worth of annual earnings in the state.

- Students enjoy a return of 20% on their investment of time and money, higher than the long-term return on US stocks and bonds.

- The State of Wisconsin benefits from improved health and reduced welfare, unemployment, and crime, saving the public some $45.5 million per year.

- Taxpayers see a return on investments in Wisconsin Technical College System of more than >100% and recover all investments in 2.2 years.

INTRODUCTION

How does the State of Wisconsin benefit from the presence of Wisconsin Technical College System (WTCS)? An obvious question often asked, but rarely answered with more than anecdotes. The Association for Community College Trustees (ACCT) has teamed with CCbenefits, Inc. to develop a model to capture the economic and social benefits of technical colleges (TCs). The model took over a year to develop, relies on data collected from individual TCs, and translates these into common sense benefit-cost and investment terms. It has been subjected to peer review, field tested on over 40 different TCs throughout the nation, and now applied to the WTCS. Model results are based on solid economic theory, carefully drawn functional relationships, and a wealth of national and local education-related data. The model provides relief from the all-too-common "advocacy analyses" that inflate benefits, understate costs, and thus discredit the process of higher education impact assessment.
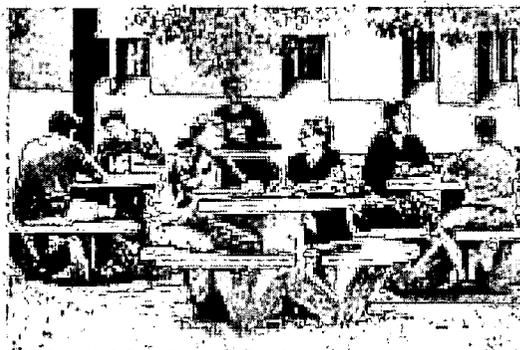

Four types of benefits are tracked: (1) contributions to job and income formation; (2) higher earnings captured by exiting students; (3) a broad collection of social benefits (improved health, reduced crime, and lower welfare and unemployment); and (4) the return to taxpayers for their TC support.

THE RESULTS

This executive summary does not include explanations of how the results were derived. The reader is encouraged to consult the main report "The Socioeconomic Benefits Generated by Wisconsin Technical College System" containing the detailed assumptions, their context, and the computation procedures.

➤ **The State of Wisconsin Perspective**
The existence of the WTCS explains $3,851 million of all annual earnings in the State of Wisconsin economy (see map). The earnings explained by WTCS are equal to that of roughly 124,810 jobs.

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The earnings and job effects break down as follows:

- *WTCS Operations and Capital Spending*

The Wisconsin Technical College System pays wages and salaries, which generate additional incomes as they are spent. Likewise, WTCS operating and capital expenditures generate still further earnings. Altogether, these earnings account for $952 million annually in the State of Wisconsin economy (equal to that of 30,850 jobs).

- *Higher Earnings due to Past Instruction*

Each year students leave the WTCS and join or rejoin the workforce. Their added skills translate to higher earnings and a more robust economy. Based on current enrollment, turnover, and the growth of instruction over time, the State of Wisconsin workforce embodies an estimated 37.4 million credits of past instruction (credit and non-credit hours).

The accumulated contribution of past WTCS instruction adds some $2,899 million in annual earnings to the State of Wisconsin economy (equal to that of 93,960 jobs).

➤ **Student Perspective**

The student's perspective on the benefits of higher education is the most obvious: he or she sacrifices tuition and current earnings for a lifetime of higher earnings. For every credit completed, WTCS students will, on average, earn $131 more per year, every year they are in the workforce. Alternatively, for every full-time year they attend they will earn an additional $3,940 per year. In the aggregate (all exiting students), the higher earnings amount to some $228.9 million per year, every year they remain in the workforce.

From an investment standpoint, WTCS students will enjoy a 20% return, which compares most favorably with the returns on other investments, e.g., the long-term return on US stocks and bonds. The corresponding B/C ratio (the sum of the discounted future benefits divided by the sum of the discounted costs) is 3.1, i.e., for every $1 the student invests in WTCS education, he or she will receive $3.09 in higher future earnings. The payback period (the time needed to recover all of the investments) is 6.4 years.

➢ **Taxpayer Perspectives**
State and local government spent $570,314,661 in support of WTCS during the analysis year. Is this a good use of taxpayer money? Our analysis indicates that the answer is a resounding yes: returns far outweigh the costs, particularly when a collection of social savings is included in the assessment. For example, persons with higher education are less likely to smoke or abuse alcohol, draw welfare or unemployment benefits, or commit crimes. This translates into associated dollar savings (avoided costs) amounting to some $41 per credit per year that can be counted as an indirect benefit of WTCS education. When aggregated across all exiting students, the State of Wisconsin will benefit from $45.5 million worth of avoided costs per year, broken down as follows:

• *Improved Health*
State of Wisconsin area employers will see health-related absenteeism decline by 139,308 days per year, with a corresponding annual dollar savings of $13.9 million. The state will benefit from the health-related savings of 6,471 fewer smokers and 1,472 fewer alcohol abusers. The corresponding dollar savings are $9,465,200 and $5,200,600 per year, now and into the future (these savings include insurance premiums, co-payments and deductibles, and withholding for Medicare and Medicaid).

• *Reduced Crime*
Studies show that incarceration drops with each year of higher education. In the State of Wisconsin, 759 fewer individuals will be incarcerated per year, resulting in annual savings of $4,652,000 (combined savings from reduced arrest, prosecution, jail, and reform costs). Reductions in victim costs (e.g., property damage, legal expenses, lost workdays, etc.) result in savings of $1,506,000 per year. Finally, people employed rather than incarcerated add $2,518,000 of earnings per year to the economy.

• *Reduced Welfare/Unemployment*
There will be 1,853 fewer people on welfare, and 772 fewer drawing unemployment benefits per year, respectively saving some $5,282,000 and $3,064,000 per year in the state.

➢ **Taxpayer Return on Investment**
The return on state and local government investments in WTCS is obtained by projecting educational benefits into the future, discounting them back to present, and weighing these against the $570,314,661 state and local taxpayers annually spend in support of the college. Two perspectives are possible, one broad and one narrow.

• *Broad Perspective*
The public expects their investment in WTCS to result in higher lifetime earnings for students, and social savings from lifestyle changes (including reduced crime, welfare and unemployment, and improvements in health). From a broad investment perspective, the value of all future earnings and associated social savings are compared against one year of state and local taxpayer support. Following this procedure, WTCS provides a state and local taxpayer return on investment of more than >100% per year. The B/C ratio is 10.7—every dollar of state or local tax money invested in WTCS today returns $10.65. Finally, the

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payback period is 2.2 years – the one-year of state and local government support is recovered in increased earnings and social savings within 2.2 years. Absent state and local government support, WTCS would have to shut it doors and none of the benefits measured here would occur. For this reason, it is legitimate to count total benefits against state and local government support, as is done under the broad perspective.

- *Narrow Perspective*

The narrow perspective limits the benefit stream to actual state and local government increased tax collections and budget savings. For example, in place of total increased student earnings, the narrow perspective includes only the increased state and local tax receipts from those higher earnings. Similarly, in place of overall crime, welfare, unemployment and health savings, the narrow perspective includes only those portions that translate to actual savings of state and local government expenditures. Note here that governments often undertake tasks that the marketplace would not find sufficiently appealing and, more often than not, expecting to lose money in the process. From the narrow taxpayer perspective, therefore, even a small positive return (a B/C ratio equal to just greater than 1, and/or a rate of return

equal to or just greater than the 4.0% discount rate used in this analysis) would be a most favorable result, certainly one that justifies continued taxpayer support of WTCS. The results indicate just that—a state and local taxpayer return on investment of 13.4% per year. The B/C ratio is 2.05—every dollar of state or local tax money invested in WTCS today returns $2.05. Finally, the payback period is 8.4 years – the one-year of state and local government support is returned to state and local coffers within 8.4 years.


CONCLUSION
The results of this study demonstrate that WTCS is a sound investment from a multiple of perspectives. It enriches the lives of students while reducing the demand for taxpayer-supported social services. Finally, it contributes to the vitality of both the local and state economies.

Benefits at a Glance

Statewide Analaysis	State Impact
Statewide Economic Development	
Increment from college operations	$951,861,000
Increment from past student productivity	$2,898,706,000
Total	$3,850,567,000
Job equivalent	124,809
Annual Benefits	
Higher earnings	
Aggregate (all students)	$228,903,100
Per Credit	$131
Per year per full time student	$3,940
Social savings	
Aggregate (all students)	$45,547,000
Per Credit	$41
Per year per full time student	$1,224

Investment Analysis	Rate of Return	Benefit/Cost	Payback
Students	20%	3.1	6.4
Taxpayers: Broad Perspective	>100%	10.7	2.2
Taxpayers: Narrow Perspective	13%	2.0	8.4

Annual Benefits per Credit

- Higher earnings
- Absenteeism Savings
- Medical Cost Savings
- Incarceration Savings
- Crime Victim Savings
- Add Prod. (fewer incarc.)
- Welfare Savings
- Unemployment Savings

$4.2 $3 $2.7 $3.1 $9.6 $9.7 $7.8 $131.3

Regional Earnings Attributable to College Operations and Past Students

25% 75%

- From college operations
- From past students
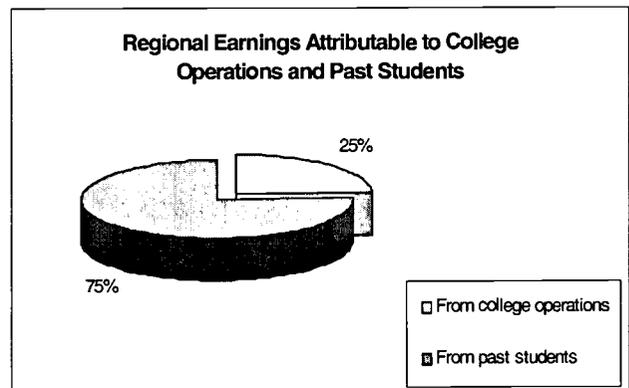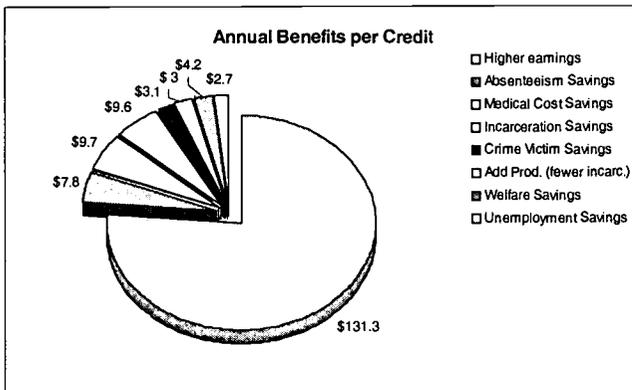
This short summary report is one of four products generated for this impact study. In addition, one long report intended for economists and TC institutional researchers (55 pp) lays out the detailed assumptions and analysis. Another report (10 pp) provides detailed tabular results by gender, ethnicity, and entry levels of education. Lastly, a PowerPoint presentation is developed showing the main results for TC Presidents to adapt and use in speeches before state legislators and other education stakeholders.