ILLINOIS COMMUNITY COLLEGE TRUSTEES ASSOCIATION

The Socioeconomic Benefits Generated by 39 Community College Districts in Illinois

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CCbenefits Inc. is a company created in collaboration with the Association of Community College Trustees (ACCT) to provide economic analysis services to community and 2-year community colleges. Questions of a technical nature concerning the approach, assumptions, and/or results should be directed to CCbenefits, Inc., c/o Drs Kjell Christophersen and Hank Robison, 121 Sweet Ave., Moscow ID 83843, phone: 208-883-3500, fax: 208-885-3803, e-mail: ccb@turbonet.com.

ACRONYMS

ICCTA	Illinois Community College Trustee Association
ICCB	Illinois Community College Board
AD	Associate Degree
ABE	Adult basic education
ACCT	Association of Community College Trustees
B/C	Benefit–cost ratio
CC	Community College
CHE	Credit hour 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

Preface

The Association of Community College Trustees (ACCT) contracted with the authors in 1999 to create the model used in this study. The original vision was simple—to make available to colleges a generic and low cost yet comprehensive tool that would allow them to estimate the economic benefits accrued by students and taxpayers as a result of the higher education achieved. In short: it only makes economic sense for the students to attend college if their future earnings increase beyond their present investments of time and money; likewise, taxpayers will only agree to fund colleges at the current levels or increase funding if the economic benefits exceed the costs.

An important requirement of the ACCT vision was that the model reach far beyond the "standard" study—the computation of the simple multiplier effects stemming from the annual operations of the colleges. Although the standard study was part and parcel of the model ultimately developed, it was only a relatively small part. The current model also accounts for the economic impacts generated by past students who are still applying their skills in the workforce; and it accounts for a number of external social benefits such as reduced crime, improved health, and reduced welfare and unemployment, which translate into avoided costs to the taxpayers. All of these benefits are computed for each college and analyzed. To the extent possible, the analysis is based on regional data adjusted to local situations and then aggregated to a statewide analysis.

Although the written reports generated for each college are similar in text, the results differ widely. This, however, should not be taken as an indication that some colleges are doing a better job than others in educating the students. Differences among colleges are a reflection of the student profiles, particularly whether or not the students are able to maintain their jobs while attending, and the extent to which state and local taxpayers fund the colleges. Some students give up substantial earnings while attending college because employment opportunities are few and far between. In other cases they are able to work while attending because the area has an abundance of opportunities. That the average student rate of return of 15% for college A is different from the rate of return of 20% for college B, therefore, does not

mean that B is doing a better job than A. Rather, it is attributable to the employment opportunities in the region, and to the fact that one college may cater more to women than to men, or to minorities, and/or to different kinds of students such as transfer, workforce or retired, etc. In turn, the student body profiles are associated with their own distinct earnings functions reflecting these employment, gender and ethnicity differences. The location of the college, therefore, dictates the profile of the student body, which, to a large extent, translates into the magnitudes of the results. In this sense, it could well be that College A with a 15% student rate of return is actually a better or more efficiently managed school than College B with a 20% student rate of return. The qualitative difference in management efficiency is not equal to the difference between the two returns.

Chapter 1
INTRODUCTION

OVERVIEW

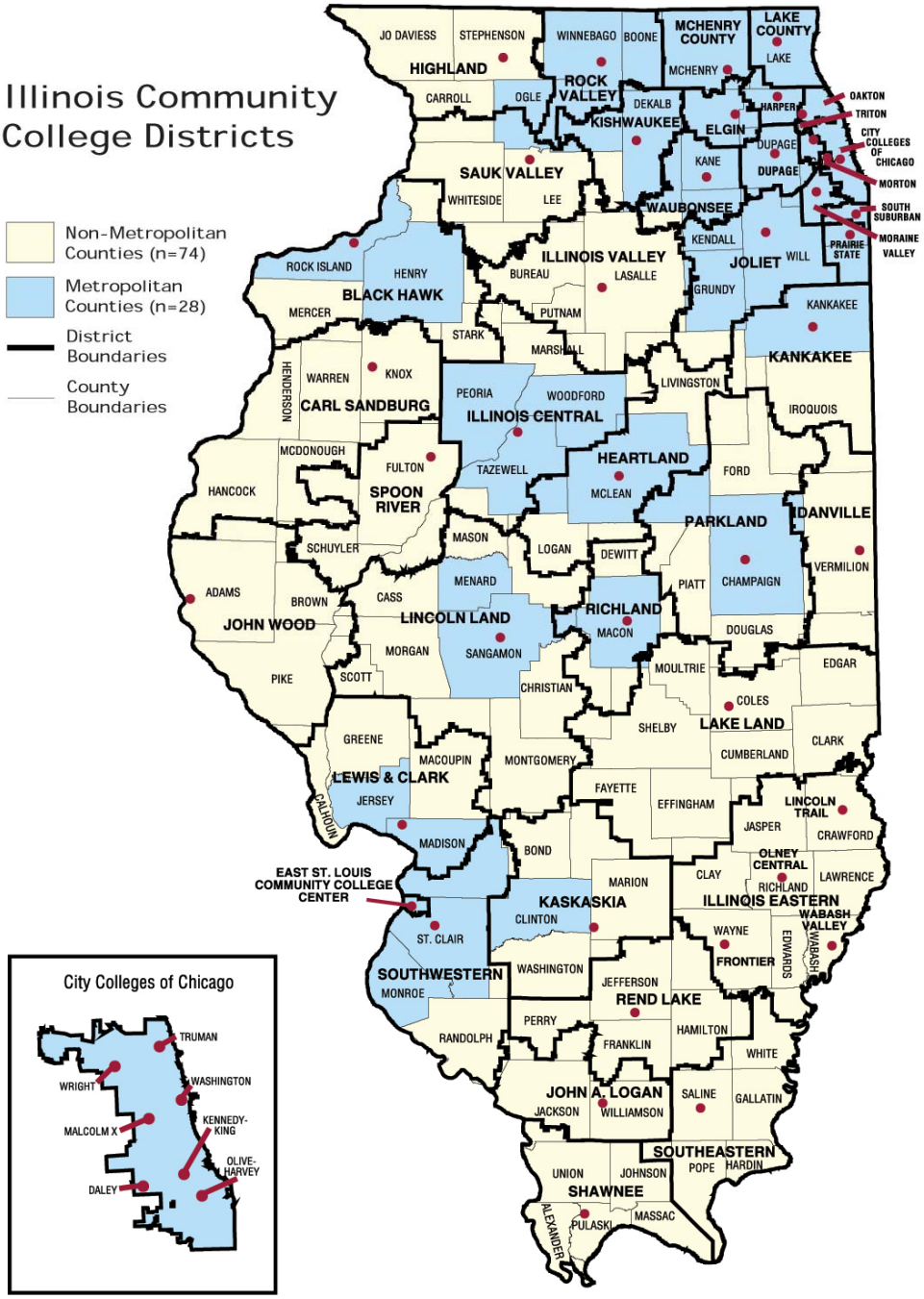
Illinois' 39 community college districts (CCs) generate a wide array of benefits. Students benefit directly from higher personal earnings, and society at large benefits indirectly from cost savings (avoided costs) associated with reduced welfare and unemployment, improved health, and reduced crime. Higher 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 Illinois Community College Trustee Association (ICCTA) investigates the attractiveness of the returns generated by the 39 community colleges in the state (**Table 1.1** and **Figure 1.1**) relative to alternative public investments. 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.

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.

Table 1.1. Illinois Participating CCs and '99-00 Enrollment

Name of College	Abbreviation	Enrollment
Black Hawk	BHC	18,491
Carl Sandburg	CSC	8,726
City Colleges of Chicago	CCC	159,228
Danville	DACC	5,803
Du Page	DuPage	74,525
Elgin	ECC	26,320
Heartland	HCC	10,286
Highland	Highland CC	8,742
Illinois Central	ICC	27,359
Illinois Eastern	IECC	25,527
Illinois Valley	IVCC	11,262
John Logan	JALC	15,006
John Wood	JWCC	8,366
Joliet	JJC	35,184
Kankakee	KCC	13,308
Kaskaskia	KC	9,040
Kishwaukee	Kishwaukee	10,937
Lake County	CLC	28,042
Lake Land	LLC	15,854
Lewis & Clark	LCCC	10,665
Lincoln Land	LLCC	19,825
McHenry	MCC	33,027
Moraine Valley	MVCC	32,271
Morton	Morton	8,356
Oakton	OCC	26,594
Parkland	Parkland	24,779
Prairie State	PSC	10,498
Rend Lake	RLC	11,497
Richland	RCC	10,988
Rock Valley	RVC	23,518
Sauk Valley	SVCC	5,921
Shawnee	Shawnee	5,309
South Suburban	SSCC	17,987
Southeastern	SIC	6,874
Southwestern IL	SBAC	25,309
Spoon River	SRC	6,299
Triton	TCC	33,317
Waubonsee	WCC	20,588
William Rainey Harper	Harper	39,276
Total		884,904

Figure 1.1. Geographical Distribution of Participating CCs



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 economic impacts are presented in three ways: 1) per credit-hour equivalent (CHE), defined as a combination of credit and non-credit attendance[1], 2) per student, and 3) in the aggregate (statewide).

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 CC 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 CHE, and per student, 2) rate of return (**RR**) where the results are expressed as a percent return on investment, 3) benefit/cost (**B/C**)

[1]Instruction hours are not the same as credit hours. CCs 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 CHEs earned will positively impact the students' lifetime earnings and social behavior.

ratio—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 role of Illinois' 39 community colleges in the statewide economy in terms of their aggregate share of total earnings. In general, these CC-linked earnings fall under two categories: 1) earnings generated by the annual operating expenditures of the colleges; and 2) earnings attributable to the CC skills embodied in the workforce.

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, the institutional researchers on the scene apply best judgments and estimations on the basis of their intimate knowledge of their colleges and the student bodies.

This chapter contains six assumption sections, all based on various data imbedded in the analytic model: 1) the aggregate profiles of the 39 CCs; 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) assumptions pertaining to statewide economic effects.

PROFILE

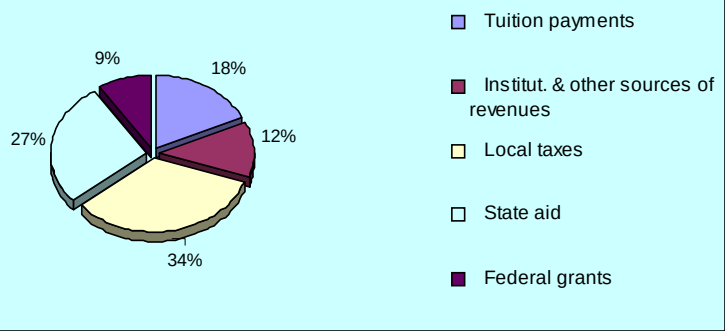
Faculty, Staff, and Operating Budgets

The Illinois community colleges employed 12,510 full- and 20,919 part-time faculty and staff in fiscal year 2001 amounting to a total annual payroll of some $1,008.1 million. **Table 2.1** shows the aggregate annual revenues by funding source: a total of $1,826 million. Two main revenue sources—private and public—are indicated. Private sources include tuition and fees (17.9%) plus 12.3% from other private sources (such as contract revenues, interest payments and the like). Public funding is comprised of local taxes (33.8%), state aid (26.7%), and federal grants (9.3%). These budget data are critical in identifying the annual costs of educating the CC student body from the perspectives of the students and the taxpayers alike.

Table 2.1. Aggregate Revenues, the Budget

Sources	Revenues	Total	% of Total
Private Funding			
Tuition payments	$327,376,646		17.9%
Institut. & other sources of revenues	$223,833,140	$551,209,786	12.3%
Public Funding			
Local taxes	$617,290,353		33.8%
State aid	$487,952,042		26.7%
Federal grants	$169,696,348	$1,274,938,744	9.3%
Total		$1,826,148,529	100%

Figure 2.1. Revenues: The Budget



The Students

Students attend community colleges for different reasons: to prepare for transfer to four-year institutions, to obtain Associate Degrees or Certificates, 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 profiles for the 39 CCs in the state of Illinois. The unduplicated student body (headcount) is 884,904 (FY01 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 the Illinois community college system[2]. **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 college, and how much they earned (61%) relative to full-time employment (or what they would statistically be earning if they did not attend college).

Table 2.2. Student Body Profiles

	Values
Total unduplicated enrollment, all campuses	884,904
% of students employed while attending college	79%
% of full-time earning potential	61%
Students remaining in state after leaving college	95%
Attrition rate over time (leaving state)	35%
"Settling In" factors (years):	
Completing Associate Degree	2.0
Completing Certificate	0.5
Non-completing transfer track	2.5
Non-completing workforce	0.0
ABE/ESL/GED	0.5

As indicated in the table, it is estimated that 95% of the students remain in state (as defined in **Figure 1.1**) and thereby generate statewide benefits. The remaining 5% leave the state altogether and are not counted as part of the economic development benefits. The 95% retention rate applies only to the first year, however. We assume that 35% of the students, and associated benefits, will leave the state over the next 30 years due to attrition (e.g., retirement, out-migration, or death).

The last five 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 the benefits to the students and to society at large.

[2] The opportunity cost is the measure of the earnings foregone; the earnings the individual would have collected had he or she not attended any of the 39 Illinois community college districts.

Entry-Level Education, Gender, and Ethnicity

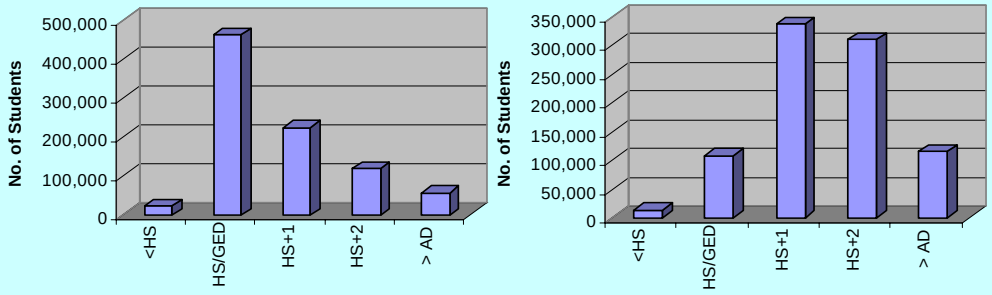
Table 2.3 shows the education level, gender, and ethnicity of the aggregate student body. This breakdown is used only to add precision to the analysis, not for purposes of comparing between different groups. Five education entry levels are indicated in approximate one-year increments, ranging from less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

The *entry level* characterizes the education level of the students when they **first** enter the colleges; this is consistent with the way most colleges keep their records. The analysis in this report, however, is based on the educational achievements of the students during the current year. As not all students reported in the enrollment figures for the fiscal year are in their first year of college, an adjustment was made to account for upper class students who had accumulated credits during their community college experience and moved up from the HS/GED equivalent category. For this reason, the education levels of the student body must also be estimated for the beginning of the analysis year. Thus, of the 118,044 white males who **first** entered with HS/GED equivalent, it is estimated that only 27,773 still remain in that category at the beginning of the analysis year, meaning that 90,272 students have actually moved up from the "HS/GED equivalent" category to the "1 year post HS or less" category or beyond since they first entered the colleges. Note that the "Entry Level" and "Begin Year" columns always add to the same total. Differences between the two columns reflect a redistribution of students from entry level to where they are at the beginning of the analysis year. The assumptions underlying the process of redistributing the students from the "Entry Level" to "Begin Year" columns are internal to the economic model—they are designed to capture the dynamics of the educational progress as the students move up the educational ladder beyond their initial entry level.

Table 2.3. Education Entry Level of Student Body

	White Male		Minority Male		White Female		Minority Female		Total	
Entry Level	Entry Level	Begin Year	Entry Level	Begin Year	Entry Level	Begin Year	Entry Level	Begin Year	Entry Level	Begin Year
< HS/GED	5,929	3,459	5,761	3,361	5,956	3,475	5,465	3,188	23,111	13,482
HS/GED equivalent	118,044	27,773	99,962	23,684	138,430	32,346	105,821	24,930	462,257	108,733
1 year post HS or less	71,976	91,778	20,028	61,983	101,063	114,052	30,797	69,308	223,863	337,121
2 years post HS or less	37,165	92,388	11,311	41,004	53,800	124,573	17,225	52,402	119,501	310,367
> AD	19,628	37,345	4,740	11,771	25,033	49,835	6,770	16,250	56,172	115,201
Total	252,742	252,742	141,803	141,803	324,282	324,282	166,078	166,078	884,904	884,904

Figure 2.2. Student Body Education Level: Entry vs. Beginning of Analysis Year



The Achievements

Table 2.4 shows the student breakdown in terms of analysis year academic pursuits and/or achievements according to six categories: 1) retirees plus those attending (non-reimbursable) hobby and recreation courses, 2) Associate Degree completers, 3) Diploma and Certificate completers, 4) all transfer students, 5) all workforce students, and 6) ABE/ESL students[3].

As indicated in the table, students achieving their graduation goals would be those completing Associate Degrees or Certificates (2.4% and 1.7%, respectively). The majority of students complete college credits, and either fulfill their educational needs, or return the following year to continue to work toward their goals (27.6% + 39.6% = 67.2% in the transfer track and workforce categories, respectively). The retired and leisure students (3.9%) and ABE/ESL/GED students (24.9%) complete the breakdown of the student body. The retired students are simply backed out of the analysis altogether on the assumption that they do not attend the community colleges to acquire skills that will increase their earnings. ABE/ESL/GED students are assumed to have a lower percentage impact than other students, because the end product of their education is to arrive at the "starting gate" on an equal basis with others. This does not mean that ABE/ESL/GED education has lower value; it simply means that these students must complete an extra step before

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

they can compete effectively in the job market and reap the benefits of higher earnings.

The third column shows the average age of the students generating the benefits (excluding retirees). The difference between the average age (30.3 years) and retirement at 65, or 34.7 years is the time horizon for the analysis.

As indicated in column four, the average Associate Degree and Certificate student completed 17.9 and 14.0 CHEs of study, respectively, during the analysis year. The total number of CHEs completed during the year of analysis for the entire system student body is 7,197,473. Finally, the last column shows the average time the students are actually in residence on campus during the analysis year. This information is needed to determine the opportunity cost of their education.

Table 2.4. Levels of Achievement

Student Body	%	St. Body 884,904	Avg. Age	CHEs This Year	Total Credits	# Years Resid.
Retired + recreation students	3.9%	34,686	72	3.4	119,191	0.11
Completing AA	2.4%	20,933	28	17.9	374,701	0.60
Completing Certificate	1.7%	14,604	33	14.0	203,802	0.47
Non-completing transfer track	27.6%	244,284	27	10.4	2,528,963	0.35
Non-completing workforce	39.6%	350,073	33	7.9	2,754,789	0.26
ABE/ESL/GED	24.9%	220,325	30	5.5	1,216,028	0.18
Total or weighted averages	100.0%	884,904	30.3	8.3	7,197,473	
Credits required for one full-time year equivalent of study					30	

Note: weighted average of "CHEs" per year does not include the retired students

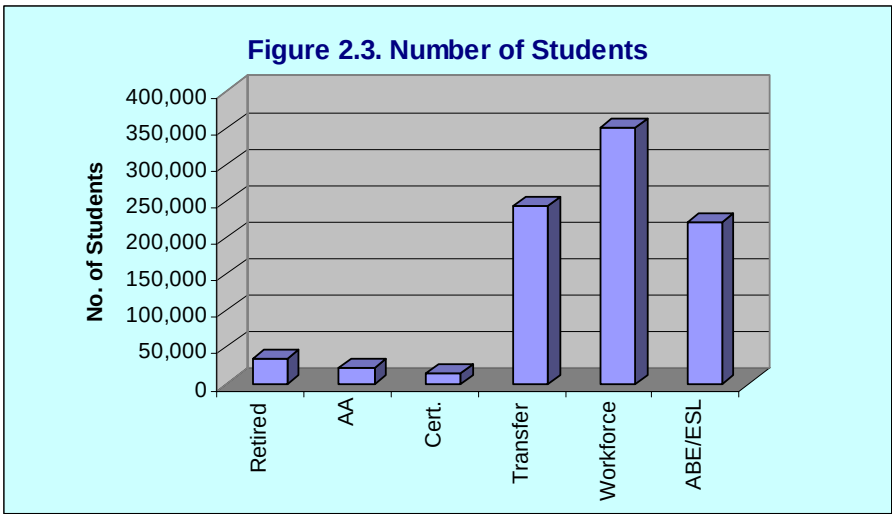
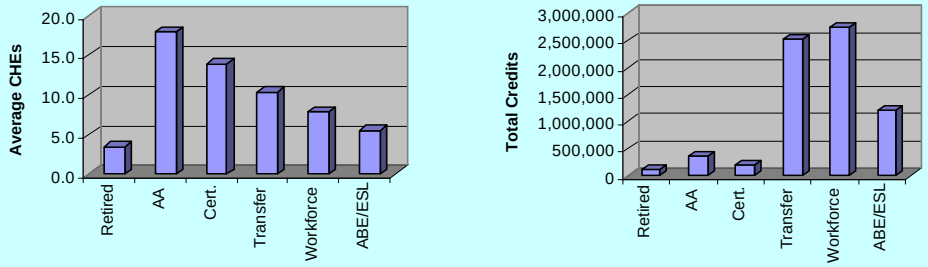


Figure 2.4. Average and Total CHEs Earned for the Analysis Year



ANNUAL PRIVATE BENEFITS

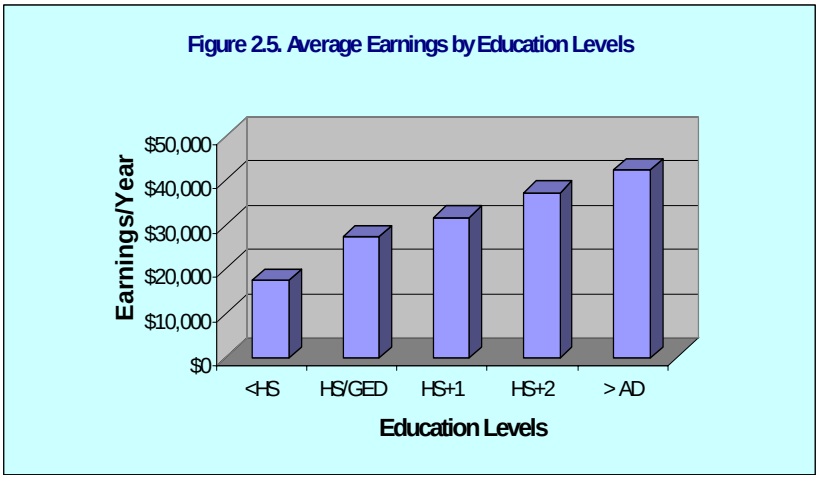
The earnings statistics in **Table 2.5,** on which the benefit estimates (reported in **Chapter 3** below) are based, reflect all occupations (technical and non-technical). The lower the education level, the lower the average earnings, regardless of the subject matters studied. The distinguishing feature among the achievement categories, therefore, is the number of CHEs completed. 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 significant roles. 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 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 Illinois community colleges' 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 Average Earnings

Entry Level	Average Earnings	Diff.
1 short of HS/GED	$17,529	NA
HS/GED equivalent	$27,321	$9,792
1-year Certificate	$31,698	$4,377
2-year Associate Degree	$37,275	$5,576
1 year post Associate Degree	$42,444	$5,170



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 (see box). Colleges 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 that taxpayers should 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 the 39 colleges in the Illinois system impact society in many more ways than simply the education they provide. 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 colleges.

Assuming state and local taxpayers represent 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 state and local government.

The Beekeeper Analogy

The classic example of a positive externality (sometimes called "neighborhood effect") in economics is that of the private beekeeper. The beekeeper's only intention is to make money by selling honey. Like any other business, the beekeeper's receipts must at least cover his operating costs. If they don't, he will shut down.

But from society's standpoint there is more. Flower blossoms provide the raw input bees need for honey production, and smart beekeepers locate near flowering sources such as orchards. Nearby orchard owners, in turn, benefit as the bees spread the pollen necessary for orchard growth and fruit production. This is an uncompensated external benefit of beekeeping, and economists have long recognized that society might actually do well to subsidize positive externalities such as beekeeping.

CCs are in some ways like the beekeepers. Strictly speaking, their business is in providing education and raising the incomes of the young. Along the way, however, external benefits are created. Students' health and other lifestyles are improved, and society indirectly benefits from these just as orchard owners indirectly benefit from the location of beekeepers. Aiming at an optimal expenditure of public funds, the CCbenefits model tracks and accounts for many of these external benefits, and compares them to the public cost (what the taxpayers agree to pay) of CC education.

Higher Earnings

Broad Perspective: Higher education begets higher earnings. The economy generates more income than it would absent the CC skills embodied in the

labor force. From the broad taxpayer perspective, the total increase in earnings is counted as benefits of CC education, adjusted down by the benefits accruing to students covered by the alternative education variable in **Table 2.9** further below (27%)—these students would still attend college elsewhere even if the CCs did not exist.

Narrow Perspective: Higher earnings translate into higher state and local *tax collections*. In the narrow taxpayer perspective we assume that the state and local authorities will collect 13.9% of the higher earnings in the form of taxes—the estimated composite of all taxes other than the federal income taxes.[4]

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 gender and ethnicity profiles of the aggregate 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 (less the students covered by the alternative education variable, as above). 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 13.0%, equal to the

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

estimated public portion of employment in the state.[5] 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 6% of the total benefits can be counted as taxpayer savings.

Table 2.6. Reduced Absenteeism, Smoking and Alcohol Habits

	Absenteeism		Smoking		Alcohol Abuse	
Education Level	Days	%/Year	Average	Reduction	Average	Reduction
< HS/GED	9.4	3.6%	32.3%	NA	9.5%	NA
HS/GED equivalent	5.8	2.2%	28.2%	12.8%	8.8%	7.3%
1 year post HS or less	4.7	1.8%	23.9%	15.3%	7.7%	12.5%
2 years post HS or less	4.2	1.6%	19.4%	18.5%	6.6%	14.1%
> AD	3.8	1.5%	15.2%	21.7%	5.6%	15.3%

1. Absenteeism: U.S. Department of Labor, Bureau of Labor Statistics, Division of Labor Force Statistics, ftp://ftp.bls.gov/pub/special.requests/lf/aat46.txt

2. Smoking: *Health*, United States, 2001, Table 61: Centers for Disease Control and Prevention; National Center for Health Statistics; and *The Economic Costs of Smoking in the United States and the Benefits of Comprehensive Tobacco Legislation*, U.S. Treasury Department, http://www.ustreas.gov/press/releases/docs/tobacco.pdf

3. Alcoholism: *Health Promotion and Disease Questionnaire* of the 1990 National Health Interview Survey of the Center for Health Statistics; and National Institute on Drug Abuse and the National Institute on Alcohol Abuse and Alcoholism,http://www.nida.nih.gov/EconomicCosts/Index.html.

[5] The ratio of state and local earnings over total earnings in the US (Regional Economic Information System—REIS, Bureau of Economic Analysis, Dept. of Commerce, 1998).

Figure 2.6. Days of Absenteeism by Education Levels

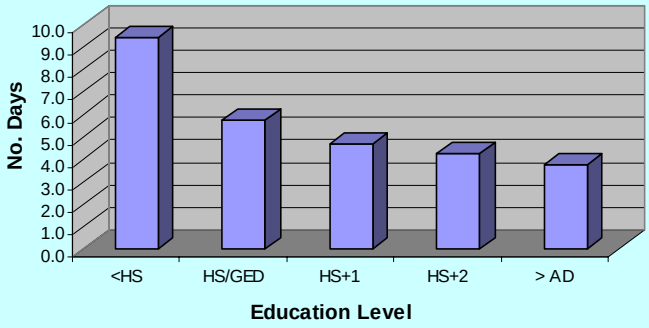


Figure 2.7. Average Incidence of Smoking by Education Levels

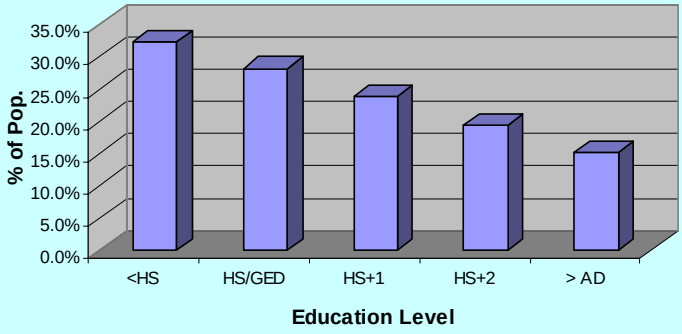
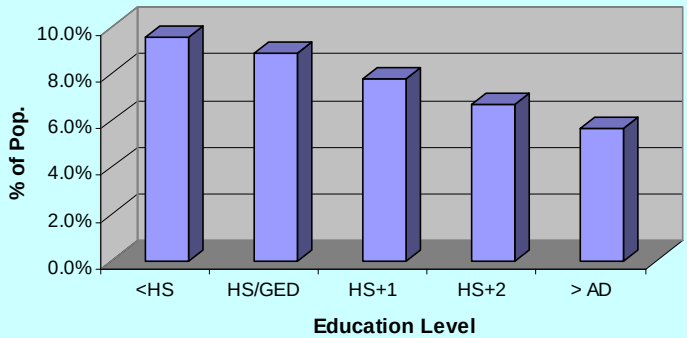


Figure 2.8. Average Incidence of Alcohol Abuse



Crime Reduction Benefits

The first column of **Table 2.7** relates the probabilities of incarceration to education levels—incarceration drops on a sliding scale as education levels rise (linked to the gender and ethnicity profile of the aggregate student body). The percentage reductions are based on total prison population relative to the population at large.[6] 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.

Broad Perspective: From the broad taxpayer perspective, all reductions in crime-related expenses are counted as a benefit (less the students covered by the alternative education variable, as above).

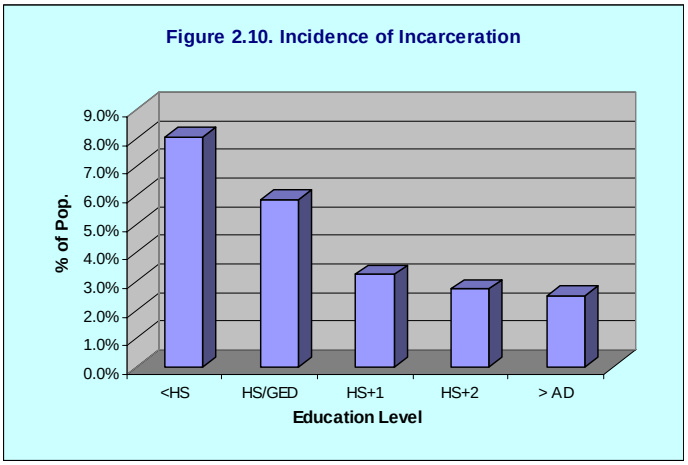
Narrow Perspective: We assume that nearly all (80%) of the incarceration savings accrue to the state and local taxpayers—federal funding covers the remainder. Crime victim savings are avoided costs to the potential victims, not to the taxpayers. As such, we claim none of these as taxpayer savings. Finally, we apply our "composite" state and local government average tax rate (13.9%) to the added productivity of persons *not* incarcerated to arrive at the taxpayer benefits.

[6] See also: http://www.ojp.usdoj.gov/bjs/abstract/p00.htm.

Table 2.7. Incarceration Rates

Education Level	Average	Reduction
< HS/GED	8.0%	NA
HS/GED equivalent	5.8%	27.5%
1 year post HS or less	3.2%	44.6%
2 years post HS or less	2.7%	15.8%
> AD	2.5%	8.8%

1. *Literacy Behind Walls*, National Center for Education Statistics, Prison Literacy Programs, DIGEST No. 159 Literacy in Corrections, Correctional Educational Association,
2. T. P. Bonczar & Alan J. Beck; Lifetime likelihood of Going to State or Federal Prison, US Department of Justice, Office of Justice Programs, March 1997.
3. *Criminal Justice Expenditure and Employment*, Extracts Program (CJEE), author: Sidra Lea Gifford, askbjs@ojp.usdoj.gov (202) 307-0765, 12/14/00.



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

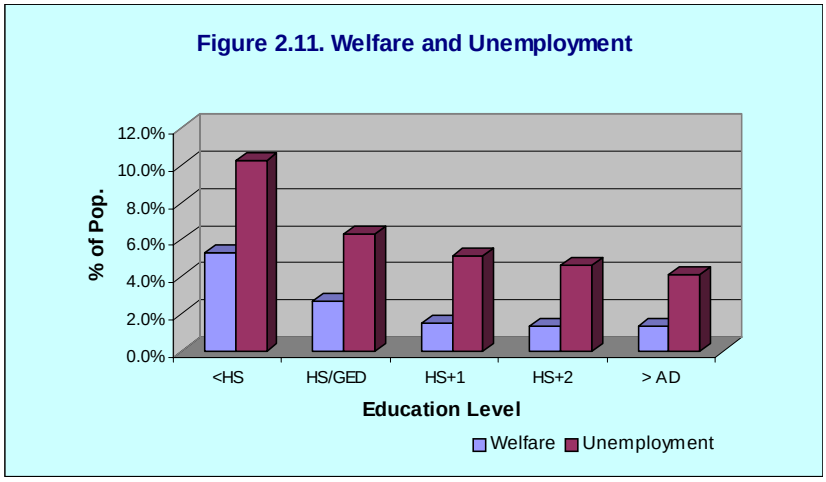
Broad Perspective: Reduced welfare and unemployment claims are counted in full as benefits in the broad taxpayer perspective (less the students covered by the alternative education variable, as above).

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

	Welfare		Unemployment	
Education Level	Average	Reduction	Average	Reduction
< HS/GED	5.3%	NA	10.3%	NA
HS/GED equivalent	2.6%	50.2%	6.3%	38.7%
1 year post HS or less	1.5%	43.7%	5.1%	18.7%
2 years post HS or less	1.3%	9.3%	4.6%	10.3%
> AD	1.3%	3.3%	4.1%	10.9%

1. Temporary Assistance for Needy Families, TANF Program 3rd annual report to Congress, US Dept of Health and Human Resources, Table 10:12.
2. The Heritage Foundation, *Means-Tested Welfare Spending: Past and Future Growth*, Testimony by Robert Rector, (3/07/01).



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 college), 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 college, 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 CC 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 a working life trajectory that begins with low entry-level wages and culminates with a typical worker's highest wages around age 60.[7] The earnings data shown in **Table 2.5** are specific to the state of Illinois, weighted, however, to reflect the specific gender and ethnicity makeup of the aggregate student body. Details on earnings and education sources are found in **Appendix 2**.

- The opportunity cost of time is then conditioned by the average age of the student (30.3 years, see **Table 2.4**). In particular, the average earnings at the midpoint ($32,545 in **Table 3.5**) are adjusted downward to $25,677 to reflect the average earnings at age 30.3.

[7] This profile of lifetime earnings is well documented in labor economics literature, see for example, Willis (1986), supported by the well-respected theoretical and empirical work of Becker (1964) and Mincer (1958).

The Budget

Beyond the student perspective, our assessment of the Illinois community colleges considers the benefits and costs from the state and local government 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[8], and d) health-related costs.[9] 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.

[8] As indicated in the table, we assume that the average duration on welfare and unemployment is 4.0 and 4.0 years, respectively. This means that, over the next 30 years or so, the cumulative incidence of welfare and/or unemployment will be spread evenly over the time horizon—it is not a consecutive period.
[9] 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	34.7
Avg. cost/prison year (all incl.: arrest, trial, incarc., rehab. etc.)	$82,415
Avg. length of incarc. (total years over 30-year time horizon)	4.0
Real cost increase per prison year	0.0%
Average victim cost	$ 60,219
Real victim cost increase per year	0.0%
Average cost per welfare year	$ 75,138
Avg. duration on welfare (total years over 30-year time horizon)	4.0
Welfare/unemployment cost increase per year	0.0%
Average cost per unemployment year	$ 36,249
Avg. duration on unempl. (total years over 30-year time horizon)	4.0
Smoking-related medical costs per year	$ 2,962
Alcohol-related medical costs/year	$ 7,946
Real medical cost increase per year	0.0%
Alternative education opportunities	26.7%

Assumptions adapted from:

1. Bureau of Justice Statistics, Table #. 05 Total direct and intergovernmental expenditure, by activity and level of government, fiscal years 1980-97, Criminal Justice Expenditure and Employment Extracts Program, 12/14/00.
2. OICJ The Extent and Costs of Victimization, Crime and Justice: The Americas, Dec-Jan 1995.
3. The Heritage Foundation, *Means-Tested Welfare Spending: Past and Future Growth*, Testimony by Robert Rector, (3/07/01).
4. U.S. Department of Labor, Bureau of Labor Statistics, http://www.bls.gov/news.release/annpay.t01.htm.
5. The Economic Costs of Smoking in the United States and the Benefits of Comprehensive Tobacco Legislation, http://www.ustreas.gov/press/releases/docs/tobacco.pdf.
6. National Institute on Drug Abuse and the National Institute on Alcohol Abuse and Alcoholism, found at: http://www.nida.nih.gov/EconomicCosts/Index.html.

STATEWIDE ECONOMIC BENEFITS

In general, the economy is affected by the presence of Illinois's 39 CCs in two ways: from the colleges' 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 economic effects requires a number of interrelated models. Multiplier effects are obtained with an input-output (IO) model constructed for the state of Illinois.[10] Estimating CC operation effects requires an additional model that takes CC 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 economy. First, the number of past students still active in the workforce is estimated and converted to total workforce embodied CHEs. In the **Annual Private Benefits** section above an estimate was made of the incremental (per CHE) effect on student earnings of CC instruction. This estimate is applied to total embodied CHEs 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 economy.

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

The Impact of the Illinois CC Operations

The first step in estimating the impact of the Illinois community college operations is to assemble a profile of the combined operating and capital expenditures (see **Table 2.10**). These data are drawn from the college budgets 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 net local portion is

[10] The Illinois 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.

derived in Column 6. The spending data shown in this column are fed into the IO model.[11]

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 local/non-local split. In these cases, the institutional researchers at each college use their best judgment.

The first row in **Table 2.10** shows salaries and wages. These *direct* earnings are part of the statewide overall earnings, and appear as "Direct Earnings of Faculty and Staff" in the table of findings, **Table 3.11**. Dollar values in **Table 2.10** column 6, "net local spending," are fed into the IO model. The IO model provides an estimate of indirect effects, and these appear as "Indirect Earnings" in **Table 3.11**.

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 % (4)	Out of State % (5)	Net In-State Spending (6)
Salaries and Wages	$1,008,061	98%	2%			$983,132
Travel	$20,896	69%	31%			$14,394
Electricity and natural gas	$37,022	97%	3%			$36,037
Telephone	$11,009	94%	6%			$10,300
Building Materials & Gardening Supplies	$8,574	85%	15%	26%	74%	$7,295
General Merchandise Stores	$217,180	68%	32%	22%	78%	$148,473
Eating & Drinking	$2,035	80%	20%			$1,626
Maintenance & Repair Construction	$44,697	97%	3%			$43,161
New Construction	$55,447	97%	3%			$53,658
Insurance	$15,072	88%	12%			$13,257
Legal Services	$5,411	100%	0%			$5,396
Credit Agencies	$105,147	91%	9%			$96,194
U.S. Postal Service	$8,905	95%	5%			$8,429
Accounting, Auditing & Bookkeeping	$1,789	100%	0%			$1,781
Marketing	$11,624	93%	7%			$10,815
Other Business Services	$92,004	87%	13%			$80,232
Water Supply & Sewerage Systems	$1,459	100%	0%			$1,454
Printing & Publishing	$16,662	90%	10%			$15,066
Rental Property	$14,518	98%	2%			$14,257
Services to Buildings	$21,534	86%	14%			$18,525
Unemployment Compensation	$2,047	100%	0%			$2,044
Honoraria + other payments to households	$154,263	98%	2%			$151,347
Total	$1,855,354					$1,716,872

Note: this table provides details for the summary of the college role in the regional economy (Table 3.11)

[11] **Table 2.10**, by itself, provides very important information to present to in-state audiences—Chambers of Commerce, business establishments, Rotary clubs, and the like. The table demonstrates that the colleges are "good neighbors," evidenced by the fact that an estimated 93% of all college expenditures benefit state vendors ($1,716,872 / $1,855,354 = 93%).

The Direct Economic Development Effects of Students

In the next chapter we estimate that the average CHE of instruction is worth $120 per year in increased employee earnings (see **Table 3.3**). This is the average value across the student's entire working life.[12] At any point in time, the workforce will embody thousands of CHEs of past CC instruction. We obtain an initial estimate of the direct past student economic development effect by multiplying the total hours of embodied instruction by the $120 value.

A separate model is constructed to estimate the CHEs of past 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 the enrollment history (unduplicated headcount) of the students in the aggregate. Column 2 represents the non-retired students, in other words, the students who have the potential to go into the workforce. Column 3 is the same as column 2, but net of students who leave the region immediately upon leaving the system. As shown in the table, 95% of the students remain in state upon leaving the CC, 5% leave.

Column 4 goes one step further—a comparison of columns 3 and 4 indicates that all past students have left the system except for the last three years (1997 – 2000) where students are still enrolled (the leaver assumptions are shown in column 9).

Column 5 further reduces leavers to focus only on those who have settled into a somewhat permanent occupation. As shown in column 10 (the "settling factor"), it is assumed that all students settle into permanent

[12] In reality, the earnings increment due to skills obtained at the CCs might be expected to start low and grow over the course of a student's working life. The acquired skills open doors for the students, giving them a chance to excel and advance in their careers. Our earnings increment due to college 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.

occupations by their fourth year out of school. Settling-in assumptions are specified in **Table 2.2** above.

Column 6 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 college and settling into the workforce, have out-migrated, retired, or died. As shown in **Table 2.11**, 35% 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 11 labeled "active in workforce."

Column 7 shows the average CHEs generated per year back to 1971. These data were obtained by dividing total year-by-year CHEs by the corresponding headcount. Column 8 shows the product of the year-by-year average CHEs, and the estimate of the number of past students active in the current workforce in column 6. Looking to the total in Column 8, we estimate that the current Illinois workforce embodies some 124.1 million CHEs of past CC instruction.

From Embodied CHEs to Direct Income Effects

An *upper-bound* estimate of the past student economic development effect is obtained by multiplying the total embodied CHEs (**Table 2.12**) by the estimated $120 per-CHE 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 reduce the upper bound to 30% of the potential (upper bound) total to arrive at our final estimate: thus $3,646.4 million of the upper bound value is counted as the direct past student economic development effect. These appear in **Table 3.10** under the heading "Earnings Attributable to Past Student Economic Development Effects," "Direct Earnings."

Polar Cases

Polar Case Scenario 1. Assumption #1 under this scenario is that the rate of technical substitution between local skilled and unskilled workers is infinitely elastic. This means that newly skilled past 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 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 for the impact area. 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 (A) established in a region attracts other plants to the same region (B, C, and D) that use A's outputs as inputs in their production processes. This in turn spawns another round of industry growth, and so on. To estimate agglomeration effects, we configure our economic 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 39 CCs, 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 community college in a neighboring state. Indeed, an integral part of the CC

mission is to provide open educational access for those who cannot avail themselves of the alternatives. For the Illinois CCs, the assumption for this variable is 27%; i.e., the statewide economic benefits are reduced across the board by this amount.

Table 2.11. Critical Variables

Assumptions	Values
Current headcount of students	884,904
Students remaining in-state after leaving CC	95%
30-year attrition	35%
Decay rate	1.4%
Overall average of credits earned per student this year	8.3

Table 2.12. Estimating Credit Hours of Instruction Embodied in the Workforce

Year	Student Enrollment Headcount 1	Subtract Retired Students 2	Subtract Students Migrating Immediately 3	Students who have left college (Leavers) 4	Leavers Who Have Settled Into Jobs 5	# Settled Into Jobs - Active in the Workforce 6	Average Credit Equivalents 7	Credits Embodied in the Workforce 8	Assumptions % of Students in Workforce 9	"Settling" Factor 10	Active in Workforce 11
1972	447,950	430,392	408,872	408,872	408,872	264,981	8.33	2,206,036	100%	100%	64.8%
1973	453,106	435,346	413,579	413,579	413,579	271,935	8.33	2,263,926	100%	100%	65.8%
1974	478,427	459,674	436,690	436,690	436,690	291,312	8.33	2,425,250	100%	100%	66.7%
1975	490,987	471,742	448,155	448,155	448,155	303,314	8.33	2,525,167	100%	100%	67.7%
1976	513,234	493,117	468,461	468,461	468,461	321,675	8.33	2,678,026	100%	100%	68.7%
1977	530,789	509,984	484,485	484,485	484,485	337,523	8.33	2,809,963	100%	100%	69.7%
1978	547,416	525,959	499,661	499,661	499,661	353,165	8.33	2,940,185	100%	100%	70.7%
1979	564,917	542,774	515,635	515,635	515,635	369,763	8.33	3,078,372	100%	100%	71.7%
1980	581,474	558,682	530,748	530,748	530,748	386,143	8.33	3,214,741	100%	100%	72.8%
1981	608,334	584,490	555,265	555,265	555,265	409,864	8.33	3,412,220	100%	100%	73.8%
1982	614,597	590,506	560,981	560,981	560,981	420,113	8.33	3,497,550	100%	100%	74.9%
1983	628,334	603,705	573,520	573,520	573,520	435,759	8.33	3,627,800	100%	100%	76.0%
1984	640,559	615,451	584,679	584,679	584,679	450,706	8.33	3,752,245	100%	100%	77.1%
1985	655,052	629,376	597,908	597,908	597,908	467,616	8.33	3,893,024	100%	100%	78.2%
1986	670,590	644,305	612,089	612,089	612,089	485,679	8.33	4,043,402	100%	100%	79.3%
1987	684,076	657,262	624,399	624,399	624,399	502,662	8.33	4,184,788	100%	100%	80.5%
1988	645,217	619,926	588,930	588,930	588,930	481,013	8.33	4,004,552	100%	100%	81.7%
1989	660,809	634,907	603,162	603,162	603,162	499,811	8.33	4,161,053	100%	100%	82.9%
1990	687,875	660,912	627,867	627,867	627,867	527,860	8.33	4,394,565	100%	100%	84.1%
1991	707,590	679,855	645,862	645,862	645,862	550,896	8.33	4,586,349	100%	100%	85.3%
1992	729,908	701,298	666,233	666,233	666,233	576,548	8.33	4,799,905	100%	100%	86.5%
1993	892,730	857,738	814,851	814,851	814,851	715,429	8.33	5,956,124	100%	100%	87.8%
1994	873,574	839,332	797,366	797,366	797,366	710,272	8.33	5,913,197	100%	100%	89.1%
1995	871,595	837,431	795,559	795,559	795,559	718,984	8.33	5,985,721	100%	100%	90.4%
1996	895,888	860,772	817,733	817,733	817,733	749,786	8.33	6,242,155	100%	100%	91.7%
1997	911,277	875,558	831,780	831,780	831,780	773,772	8.33	6,441,846	100%	100%	93.0%
1998	932,029	895,496	850,721	850,721	850,721	802,918	8.33	6,684,492	100%	100%	94.4%
1999	936,430	899,725	854,738	854,306	768,875	736,239	8.33	6,129,372	100%	90%	95.8%
2000	970,122	932,096	885,491	865,568	649,176	630,673	8.33	5,250,510	98%	75%	97.1%
2001	915,017	879,151	835,193	709,914	354,957	354,957	8.33	2,955,108	85%	50%	100.0%
Embodied Total								124,057,642			

Chapter 3
PRIVATE, PUBLIC AND STATEWIDE ECONOMIC BENEFITS

INTRODUCTION

This chapter summarizes the main study results in four sections: 1) the aggregate annual private and public benefits; 2) these same benefits measured per CHE and per student; 3) future benefits expressed in terms of NPV, RR, and B/C ratio, and 4) the statewide economic benefits.

ANNUAL BENEFITS

Higher Student Earnings

The annual benefits are summarized in **Tables 3.1** and **3.2**. We begin with earnings growth in **Table 3.1**. Last year, each student completed, on average, 8.3 CHEs at the Illinois community colleges (see **Table 2.4**), only a 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**; 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. A total of 884,904 students will capture $866.2 million worth of higher annual earnings based on this average increase in educational attainment.

Social Savings

Health-Related Savings

Also in **Table 3.1**, we see that improved health, lower welfare and unemployment, and lower crime will result in annual dollar savings to the taxpayers of $81.6, $28.2, and $65.9 million (rounded). In **Table 3.2**, these same results are presented in greater detail—health-related absenteeism will decline by 188,210 days per year, translating to a total of 724 years' worth of productivity gained per year (based on 260 workdays per year). Annual total

dollar savings from reduced absenteeism days equals $20.7 million. There will be 12,391 fewer smokers and 3,051 fewer alcohol abusers, amounting to annual total dollar savings of $36.70 and $24.2 million, respectively, inclusive of insurance premiums, personal payments, and withholding for Medicare and Medicaid.

Crime-Related Savings

There will be 3,821 fewer people incarcerated as a result of the higher education obtained, saving the taxpayers a grand total of some $41,560,664 per year. The assumptions pertaining to these results are listed in **Table 2.9** in the previous chapter. They are based on an average duration of 4.0 years incarcerated at an average cost of $82,415 per year (inclusive of arrest, prosecution, incarceration, and rehabilitation).[13] Fewer people incarcerated means more people gainfully employed—this translates to $15,640,730 in additional annual earnings for the state. Victim costs will be reduced by $8,728,168 per year.

Welfare and Unemployment Savings

There will be 1,709 and 2,431 fewer people on welfare and unemployment, respectively, in the community. The corresponding total dollar savings for the local community amounts to $28,199,487 ($7,141,037 welfare + $21,058,450 unemployment savings) for one year, assuming that the average time spent on welfare and unemployment is 4.0 years (see **Table 2.9**) spread over a 30-year period.

Total Public Benefits

All told, there will be $175.7 million in public savings per year in the community—the sum of all health, crime, and welfare/unemployment benefits in **Table 3.2.**

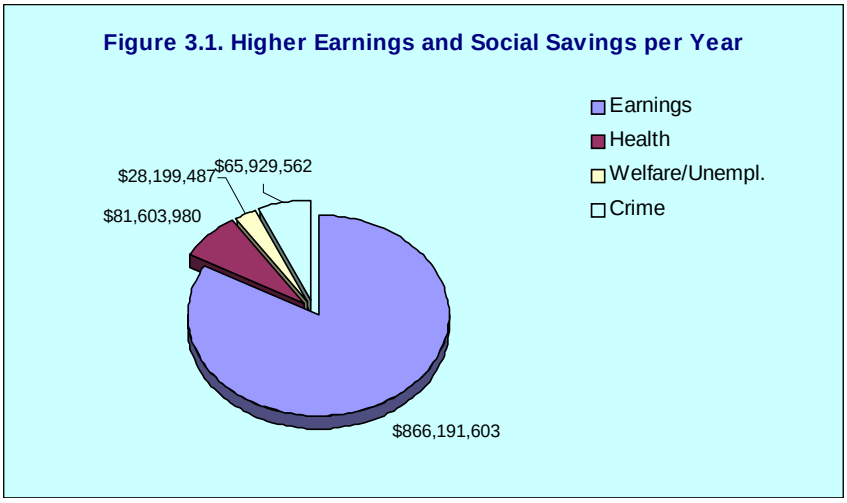
[13] The calculation is as follows: 3,821 not incarcerated x $82,415/4.0 years/34.7 years to retirement from **Table 2.9** = $2,269,381.

Table 3.1 Student Body Achievements, Higher Earnings

Level of Education	Higher Earnings	Social (External Benefits) Improved Health	Lower Welfare Unemployment	Lower Crime	Total
< HS/GED	$12,495,668	$1,089,104	$1,415,642	$1,068,258	$16,068,672
HS/GED equivalent	$15,087,236	$1,157,229	$1,137,324	$944,174	$18,325,963
1 year post HS or less	$300,397,633	$36,917,443	$18,598,223	$58,318,572	$414,231,871
2 years post HS or less	$383,394,465	$27,727,213	$4,753,959	$3,741,358	$419,616,995
> Associate Degree	$154,816,601	$14,712,991	$2,294,340	$1,857,200	$173,681,131
Total	$866,191,603	$81,603,980	$28,199,487	$65,929,562	$1,041,924,632

Table 3.2. Summary of Annual Benefits

	Units	Earnings	Social Savings
Higher earnings	NA	$866,191,603	
Health benefits			
Absenteeism savings (days)	188,210	NA	$20,655,915
Fewer smokers, medical savings (# persons)	12,391	NA	$36,704,937
Fewer alcohol abusers (# persons)	3,051	NA	$24,243,128
Crime benefits			
Incarceration savings (# persons)	3,821	NA	$41,560,664
Crime victim savings	NA	NA	$8,728,168
Added productivity (fewer incarcerated)	NA	NA	$15,640,730
Welfare/unemployment benefits			
Welfare savings (# persons)	1,709	NA	$7,141,037
Unemployment savings (# persons)	2,431	NA	$21,058,450
Total		$866,191,603	$175,733,029



Annual Benefits Per CHE and Per Student

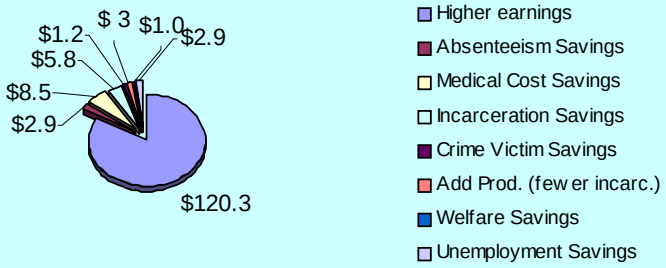
The aggregate benefits reported in **Tables 3.1** and **3.2** above are expressed per CHE and per student in **Table 3.3**. On average, students capture: a) $120 per

year in higher earnings per CHE,[14] and b) $1,045 per year in higher earnings per student on the basis of the number of CHEs completed. **Converted to a full-year-equivalent (30 CHEs), the annual earnings would amount to $3,767 per student**. On average, the social benefits per CHE range from a low of $1 for Welfare Savings to a high of $8 per CHE for Medical Cost Savings. On a per student basis, they range from a low of $31 per student for Welfare Savings to a high of $148 for Medical Cost Savings. On a full-year equivalent basis (30 CHEs), the social savings would amount to $1,493 per student (the total of $5,260 less $3,767 of higher private earnings as indicated in **Table 3.3**).

Table 3.3. Annual $ per Credit and Student

	Per Credit	Per Student	Annualized
Higher earnings	$120	$1,045	$3,767
Absenteeism Savings	$3	$31	$112
Medical Cost Savings	$8	$74	$268
Incarceration Savings	$6	$148	$532
Crime Victim Savings	$1	$31	$112
Add Prod. (fewer incarc.)	$2	$51	$183
Welfare Savings	$1	$40	$143
Unemployment Savings	$3	$40	$144
Total	$145	$1,460	$5,260

Figure 3.2. Annual Benefits per Credit



[14] Thus, a student attending for 10 CHEs will add $1,203 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 CHEs, plus higher additions for leavers completing more CHEs.

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 CC-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.[15]

The investment analysis results are shown in **Table 3.9** (in the aggregate, per CHE 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**.[16] 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 3.4. Private** benefits are the higher earnings captured by the students themselves. **Broad taxpayer benefits** are the additions to earnings plus lower overall expenditures related to health, crime, welfare and unemployment. **Narrow taxpayer benefits** include increased state and local tax revenues (from increased incomes), and savings from reduced state and local government expenditures for incarceration, health and welfare.

[15] 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.

[16] 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.

Table 3.4. Some Definitions

Definitions	
Student Benefits	Higher earnings, captured by the students
Taxpayer Benefits: Broad	Additions to 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**) + opportunity cost of time
Taxpayer Costs	Taxes (state and local, see **Table 2.1**)
Results:	
Student Perspective	Student Benefits / Student Costs
Taxpayer Perspective: Broad	Taxpayer Benefits (Broad) / Taxpayer Costs
Taxpayer Perspective: Narrow	Taxpayer Benefits (Narrow) / Taxpayer Costs

On the cost side, **student costs** consist of the tuition paid by the students (17.9% of the total 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 (12.3%). The **taxpayer costs** consist of the state and local tax items in **Table 2.1**, or a total of 33.8% plus 26.7% = 61%.

The opportunity cost (earnings foregone) incurred by the student body in the aggregate is estimated in **Table 3.5**. The first number in the table is the overall average statistical annual income of the student body (given gender and ethnicity characteristics). This number, however, reflects the midpoint of the lifetime trajectory of earnings, while what *is* needed is the earnings of the students while enrolled (which is expected to be less than earnings at the midpoint). This is the second number in the table, or $25,677 per year, assuming full-time employment. The adjustment from the first to the second number takes into account the average age of the student body and the relationship between earnings and age as specified by the well-known and tested "Mincer equation" (see, for example, Willis 1986, p 530).

We then deduct the retired student body (3.9%) to arrive at the net number of students subject to opportunity cost calculations— 850,218 students. The 181,989 **not working** are charged the full opportunity cost of time (based on the average term in residence), or $1,296,798,266 . The 668,229 **working** students are charged only a fraction of the full opportunity cost (61%), or $1,870,405,499 as indicated in the table. Finally, we adjust the opportunity

cost downward by the Pell and other student aid grants and the estimated 10% adjustment for the restricted use of these grants for tuition and fees.

Table 3.5. Opportunity Costs (Earnings Foregone), $ per Year

			Opp. Cost
Avg. statistical annual income of given gender and ethnicity profile		$32,545	
Annual income, given gender and ethnicity profile, at current age of students		$25,677	
CHEs per student (net of retired)	8.3		
Avg. term in residence and avg. income while in residence	28%	$7,126	
Total number of students		884,904	
Less retired %	3.9%	34,686	
Remaining students subject to opportunity cost computation		850,218	
Students not working while attending college and opportunity cost	21%	181,989	$1,296,798,266
No. of working students		668,229	
% working part time, earnings relative to stat. averages, and opp. cost	61%	$2,799	$1,870,405,499
Total opportunity cost			$3,167,203,766
Pell and other student aid		$154,774,640	
Restricted portion of student aid (tuition and fees)	10%	$15,477,464	($139,297,176)
GRAND TOTAL STUDENT OPPORTUNITY COST			$3,027,906,589

We also present the results in different ways. **First**, the student perspective results indicate whether the education obtained at the Illinois community colleges 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 $1,105,242,396 (**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 3.6.** Column 1 tracks the increased earnings of the student body as they leave the colleges, and follows them over the course of their assumed working life (65 - 30.3 = 34.7 years, see **Table 2.4**). The upward trend in earnings is calculated based on the Mincer equation (see Willis, 1986). It reflects both the growth in students' earnings over time and the spread in the increased earnings attributable to education.[17] Column 2 is simply column 1 reduced by the 10% discount value that accounts for causation factors

[17] We computed a Mincer equation based on the estimated coefficients presented in Willis, 1986, p. 545. These were adjusted to 2001 dollars in the usual fashion by applying the "GDP Implicit Price Deflator."

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.

Table 3.6. Student Earnings ($ Thousands)

Year	1 Higher Earnings Gross	2 Higher Earnings Net	3 Cost	4 Net Cash Flow
1	$425,479	$382,931	$3,558,417	($3,175,486)
2	$485,457	$436,911	$0	$436,911
3	$747,150	$672,435	$0	$672,435
4	$816,157	$734,541	$0	$734,541
5	$887,996	$799,196	$0	$799,196
6	$962,435	$866,192	$0	$866,192
7	$1,039,204	$935,284	$0	$935,284
8	$1,117,996	$1,006,196	$0	$1,006,196
9	$1,198,469	$1,078,622	$0	$1,078,622
10	$1,280,246	$1,152,221	$0	$1,152,221
11	$1,362,920	$1,226,628	$0	$1,226,628
12	$1,446,057	$1,301,451	$0	$1,301,451
13	$1,529,196	$1,376,276	$0	$1,376,276
14	$1,611,856	$1,450,671	$0	$1,450,671
15	$1,693,542	$1,524,188	$0	$1,524,188
16	$1,773,745	$1,596,371	$0	$1,596,371
17	$1,851,952	$1,666,757	$0	$1,666,757
18	$1,927,648	$1,734,883	$0	$1,734,883
19	$2,000,324	$1,800,292	$0	$1,800,292
20	$2,069,481	$1,862,533	$0	$1,862,533
21	$2,134,636	$1,921,172	$0	$1,921,172
22	$2,195,329	$1,975,796	$0	$1,975,796
23	$2,251,127	$2,026,015	$0	$2,026,015
24	$2,301,630	$2,071,467	$0	$2,071,467
25	$2,346,474	$2,111,827	$0	$2,111,827
26	$2,385,338	$2,146,804	$0	$2,146,804
27	$2,417,946	$2,176,151	$0	$2,176,151
28	$2,444,071	$2,199,664	$0	$2,199,664
29	$2,463,536	$2,217,183	$0	$2,217,183
30	$2,476,220	$2,228,598	$0	$2,228,598
31	$2,482,055	$2,233,849	$0	$2,233,849
32	$2,481,028	$2,232,925	$0	$2,232,925
33	$2,473,181	$2,225,863	$0	$2,225,863
34	$2,458,611	$2,212,750	$0	$2,212,750
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		$24,962,417	$3,421,555	$21,540,862
IRR				26.1%
B/C ratio				7.3
Payback (years)				5.6

Does attending the Illinois Community Colleges make economic sense for the students? The answer is a resounding **yes**. The future stream of benefits (higher earnings) accruing to the students has an NPV of $21,540,862 **(Table 3.6)**—a positive NPV (greater than zero) indicates that the investments made

are strongly feasible. The B/C ratio of 7.3 is strongly positive since the ratio is well above 1. The RR of 26.1% is also well above the long-term rates of return obtainable in the stock or bond markets, and certainly above the 4.0% discount rate used in the analysis. In the long run, therefore, the average student will be substantially better off attending a community college. The payback period for a student (tuition plus the earnings foregone) is 5.6 years—the higher earnings received beyond that period are pure economic rent—or a persistent earnings flow over and beyond the initial investments.

The Broad Taxpayer Perspective

Table 3.7 assesses one year's operation of the CCs from the broad taxpayer perspective. The taxpayers must weigh requests for funding against the myriad 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 19**. Column 2 adjusts for the 27% alternative education opportunity assumption (the percent of the student body able to avail themselves of similar education elsewhere absent the Illinois community colleges). Column 3 is simply column 1 less column 2. Column 4 shows the single year state and local taxpayer cost, as reflected in state and local tax items in **Table 2.1**. Finally, Column 5 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 $16,012 million and the B/C ratio is 16.1. More succinctly, every dollar of tax monies spent on community college education will generate a total of $16.07 worth of social savings.[18]

[18]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 RR results as: "NA" (particularly for the broad taxpayer perspective where high returns are expected). Only the B/C ratio is reported for the broad taxpayer perspective.

Table 3.7. Taxpayer Perspective: Broad ($ Thousands)

Year	1 All Benefits	2 Benefits from Alt. Ed. Opportunities	3 Net Benefits	4 Total Taxpayer Costs	5 Less CC Income Cash Flow
1	$2,188,628	$133,679	$2,054,949	$1,105,242	$949,706
2	$541,259	$144,681	$396,578	$0	$396,578
3	$732,499	$195,800	$536,699	$0	$536,699
4	$777,306	$207,777	$569,529	$0	$569,529
5	$823,285	$220,068	$603,218	$0	$603,218
6	$870,224	$232,614	$637,609	$0	$637,609
7	$917,886	$245,355	$672,531	$0	$672,531
8	$966,020	$258,221	$707,799	$0	$707,799
9	$1,014,358	$271,142	$743,216	$0	$743,216
10	$1,062,615	$284,041	$778,574	$0	$778,574
11	$1,110,499	$296,841	$813,658	$0	$813,658
12	$1,157,707	$309,460	$848,247	$0	$848,247
13	$1,203,933	$321,816	$882,116	$0	$882,116
14	$1,248,865	$333,827	$915,038	$0	$915,038
15	$1,292,197	$345,410	$946,787	$0	$946,787
16	$1,333,623	$356,483	$977,140	$0	$977,140
17	$1,372,850	$366,968	$1,005,881	$0	$1,005,881
18	$1,409,592	$376,790	$1,032,802	$0	$1,032,802
19	$1,443,581	$385,875	$1,057,706	$0	$1,057,706
20	$1,474,566	$394,158	$1,080,409	$0	$1,080,409
21	$1,502,317	$401,576	$1,100,742	$0	$1,100,742
22	$1,526,629	$408,074	$1,118,555	$0	$1,118,555
23	$1,547,321	$413,605	$1,133,716	$0	$1,133,716
24	$1,564,242	$418,128	$1,146,114	$0	$1,146,114
25	$1,577,272	$421,611	$1,155,661	$0	$1,155,661
26	$1,586,321	$424,030	$1,162,291	$0	$1,162,291
27	$1,591,332	$425,370	$1,165,962	$0	$1,165,962
28	$1,592,281	$425,623	$1,166,658	$0	$1,166,658
29	$1,589,178	$424,794	$1,164,384	$0	$1,164,384
30	$1,582,064	$422,892	$1,159,172	$0	$1,159,172
31	$1,571,013	$419,938	$1,151,075	$0	$1,151,075
32	$1,556,130	$415,960	$1,140,170	$0	$1,140,170
33	$1,537,548	$410,993	$1,126,555	$0	$1,126,555
34	$1,515,429	$405,080	$1,110,348	$0	$1,110,348
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			$17,074,653	$1,062,733	$16,011,920
IRR					NA
B/C ratio					16.1
Payback (years)					NA

The Narrow Taxpayer Perspective

Table 3.8 provides an investment analysis of the Illinois community colleges from the narrow taxpayer perspective. Recall from **Chapter 2** that the narrow perspective considers only moneys that actually appear on the books of state and local governments: revenue items such as tax receipts, and expenditure items such as road, bridge and street maintenance, police, public libraries and hospitals, jails and prisons, welfare payments, and so on.

Table 3.8, column 1 shows additions to state and local government revenues stemming from the operation of the Illinois community colleges during the single analysis year. The values in column 1 are computed by applying average state and local government tax rates to the net increase in statewide income attributed to the Illinois community college system.[19] Also included in column 1 are reductions (entered as negatives) in state and local government expenditures on crime, welfare, unemployment and health. Projected dollar amounts in column 1 are thus the sum of additional taxes collected, plus associated tax dollars saved as a result of the education provided by the colleges during the single analysis year.

Column 2 is simply the state and local government expenditure in support of the colleges 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, the colleges provide state and local government with an aggregate annual return of $1,062,733 million expressed as a net present value on its one year investment. Alternatively, the one year investment generates a 13.8% RR and a B/C ratio of 2.5, both indicating that the investment is attractive. The payback period is 9.1 years.

The returns shown in **Table 3.8** would be attractive even in the private sector, and they are very attractive in the public sector. Recall that the public sector generally undertakes those activities the private sector finds unprofitable, i.e., investments that generate book revenues insufficient to cover book costs, thus requiring taxpayer subsidy. For example, state governments fund the operation and maintenance of state parks at a substantial loss, collecting revenues in the form of camping and entrance fees that cover only a fraction of costs. Taxpayers are willing to subsidize parks because they perceive off-budget benefits, e.g., access to the outdoors, local development effects, environmental protection, and so on, that justify the budgetary losses. Note

[19] Increased income includes a portion of direct student earnings, salaries and wages at the colleges during the single analysis year, and an additional increment aimed at a collection of backward and forward multiplier effects.

that this broader collection of off-budget benefits would normally be captured in the broad taxpayer perspective.

Table 3.8. Taxpayer Perspective: Narrow ($ Thousands)

Year	1 Total Taxpayer Benefits	2 Benefits from Alt. Ed. Opportunities	3 Net Taxpayer Benefits	4 Total Taxpayer Costs	5 Net Cash Flow
1	$322,217	$13,879	$308,338	$1,105,242	($796,904)
2	$93,540	$25,004	$68,537	$0	$68,537
3	$119,987	$32,073	$87,914	$0	$87,914
4	$126,115	$33,711	$92,404	$0	$92,404
5	$132,406	$35,393	$97,013	$0	$97,013
6	$138,831	$37,110	$101,721	$0	$101,721
7	$145,356	$38,854	$106,502	$0	$106,502
8	$151,948	$40,616	$111,331	$0	$111,331
9	$158,568	$42,386	$116,182	$0	$116,182
10	$165,177	$44,152	$121,024	$0	$121,024
11	$171,735	$45,905	$125,829	$0	$125,829
12	$178,199	$47,633	$130,566	$0	$130,566
13	$184,527	$49,325	$135,202	$0	$135,202
14	$190,677	$50,969	$139,708	$0	$139,708
15	$196,604	$52,553	$144,051	$0	$144,051
16	$202,268	$54,067	$148,201	$0	$148,201
17	$207,626	$55,499	$152,127	$0	$152,127
18	$212,641	$56,840	$155,801	$0	$155,801
19	$217,274	$58,078	$159,195	$0	$159,195
20	$221,490	$59,205	$162,285	$0	$162,285
21	$225,258	$60,212	$165,045	$0	$165,045
22	$228,549	$61,092	$167,457	$0	$167,457
23	$231,338	$61,837	$169,500	$0	$169,500
24	$233,604	$62,443	$171,161	$0	$171,161
25	$235,330	$62,905	$172,426	$0	$172,426
26	$236,505	$63,219	$173,286	$0	$173,286
27	$237,120	$63,383	$173,736	$0	$173,736
28	$237,171	$63,397	$173,774	$0	$173,774
29	$236,660	$63,260	$173,400	$0	$173,400
30	$235,593	$62,975	$172,618	$0	$172,618
31	$233,981	$62,544	$171,437	$0	$171,437
32	$231,837	$61,971	$169,866	$0	$169,866
33	$229,180	$61,261	$167,919	$0	$167,919
34	$226,032	$60,419	$165,613	$0	$165,613
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			$2,613,452	$1,062,733	$1,550,718
IRR					13.8%
B/C ratio					2.5
Payback (years)					9.1

Investments in public education are usually viewed in the same way as investments in parks and other publicly subsidized activities, i.e., activities that generate losses from a narrow investment perspective but are justified by net benefits from a broad investment perspective. As shown in **Table 3.8,**

however, the Illinois community colleges are a notable exception to this general net-subsidy rule. The narrow perspective rate of return is strongly positive, and thereby indicates that the taxpayers' investments in the college generate increased public revenues, and reduced expenditures, that actually exceed the subsidy by taxpayers. **The practical effect of this is the following: If the investments made in the Illinois community colleges were reduced, taxes would have to be raised in order for state and local governments to continue their support of other activities at current levels. The taxpayer investments of 61% of the total revenues in Table 2.1, in effect, subsidize other sectors of the economy that also receive taxpayer support. The simple bottom line from the narrow taxpayer perspective is that benefits accruing to the taxpayers far outweigh the relatively low investments they make in the colleges.**

With and Without Social Benefits

Earlier in **Chapter 2**, the social benefits attributable to CC-education (reduced crime, welfare and unemployment, and improved health) were defined as *external benefits*, incidental to the operations of the college. Colleges do not directly aim at creating these benefits. Some would question the legitimacy of including these benefits in the calculation of the rates of return to higher education, they would argue only the direct benefits—the higher earnings—should be counted. **Tables 3.7** and **3.8** are both inclusive of the social benefits and are reported here as attributable to the college. Recognizing the other point of view, **Table 3.9** shows the rates of return for both the broad and narrow persepctives exclusive of the social benefits. As indicated, the returns are still well above the threshold values (a B/C ratio greater than 1) confirming that the taxpayers receive great value from investing in ICCTA.

Table 3.9. Taxpayer Perspective ($ Thousands)

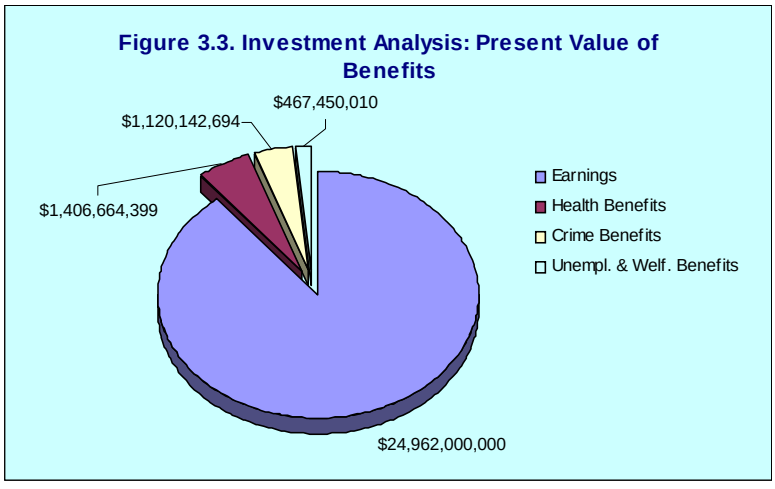
	Broad Perspective With Social Savings		Narrow Perspective With Social Savings	
	Included	Excluded	Included	Excluded
NPV	$16,011,920	$13,818,040	$1,550,718	$1,002,108
IRR	NA	NA	13.8%	10.1%
B/C ratio	16.1	14.0	2.5	1.9
Payback (years)	NA	NA	9.1	12.1

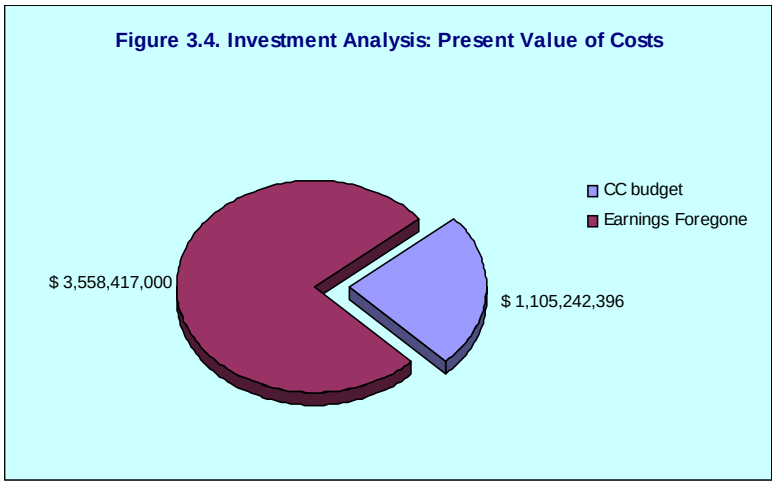
Summary

A summary of the investment analysis results (also reported in **Tables 3.6 – 3.8** above) is provided in **Table 3.10,** on aggregate, per CHE, and per student bases.

Table 3.10. Benefit - Cost Summary

	Aggregate	Per Credit	Per Student
PV of student benefits, increased earnings	$ 24,962,000,000	$3,468	$ 28,209
Health benefits, captured by society			
PV of absenteeism savings	$ 359,424,917	$50	$ 406
PV of tobacco and alcohol abuse medical savings	$ 1,047,239,482	$146	$ 1,183
Crime			
PV of reduced incarceration	$ 714,115,658	$99	$ 807
PV of reduced victim costs	$ 149,971,653	$21	$ 169
PV of earnings (opportunity gained)	$ 256,055,383	$36	$ 289
Unemployment and welfare			
PV of reduced welfare rolls	$ 122,700,789	$17	$ 139
PV of reduced unemployment	$ 344,749,221	$48	$ 390
Sum of all present values, benefits	$ 27,956,257,103	$ 3,884	$ 31,592
PV of all costs			
PV of state and local contribution to college budget	$ 1,105,242,396	$154	$ 1,959
PV of opportunity cost of education + tuition	$ 3,558,417,000	$494	$ 3,243
Sum of all present values, costs	$ 4,663,659,396	$ 648	$ 5,202
NPV, Student Perspective		$21,540,862	
RR, Student Perspective		26%	
B/C Ratio, Student Perspective		7.3	
Payback Period, Student Perspective		5.6	
NPV, Taxpayer Perspective: Broad		$16,011,920	
RR, Taxpayer Perspective: Broad		NA	
B/C Ratio, Taxpayer Perspective: Broad		16.1	
Payback Period, Taxpayer Perspective: Broad		NA	
NPV, Taxpayer Perspective: Narrow		$1,550,718	
RR, Taxpayer Perspective: Narrow		13.8%	
B/C Ratio, Taxpayer Perspective: Narrow		2.5	
Payback Period, Taxpayer Perspective: Narrow		9.1	



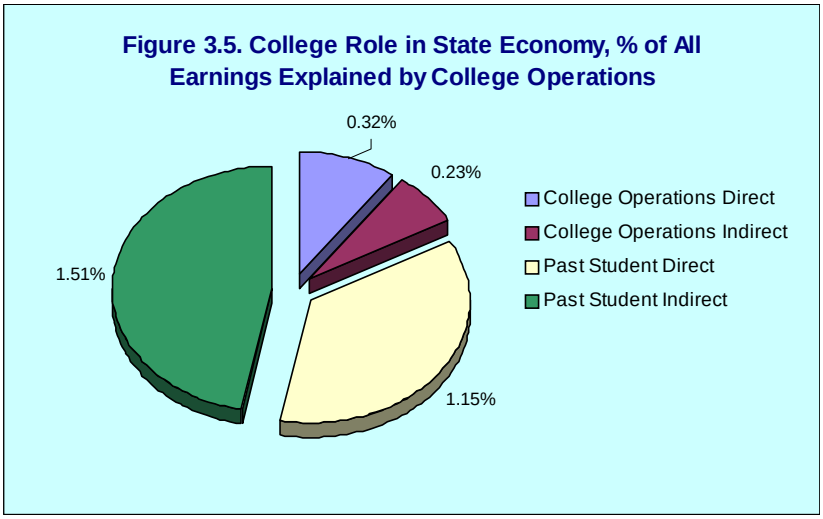


STATEWIDE ECONOMIC BENEFITS

The Illinois community colleges play an important role in the health, growth and development of the state economy. This section estimates that role and expresses it as a gross share of statewide earnings. As indicated in **Table 3.11**, statewide earnings amount to $316.88 billion (Regional Information System, U.S. Department of Commerce).

Table 3.11. Summary of CCs Role in the State Economy

	Earnings ($Thousands)	% of Total
Total Earnings in State	$316,883,929	100%
Earnings Attributable to College Operations		
Direct Earnings of Faculty and Staff	$1,008,061	0.3%
Indirect Earnings	$716,531	0.2%
TOTAL	$1,724,592	0.5%
Earnings Attributable to Past Student Econ. Dev. Effects		
Direct Earnings	$3,646,363	1.2%
Indirect Earnings	$4,777,423	1.5%
TOTAL	$8,423,786	2.7%
GRAND TOTAL	$10,148,378	3.2%



The College Operations

As shown in **Table 3.11**, the direct earnings of faculty and staff are equal to $1,008.1 million per year, and thus account for 0.3% of statewide earnings. Multiplier effects, from the spending of faculty and staff salaries and from college purchases of goods and services, account for another $716.5 million, or 0.2% of earnings. Altogether, college operations directly or indirectly account for $1,724.6 million per year, or 0.5% of all earnings generated in the state.

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 workforce embodies 124.1 million CHEs of past CC instruction (see **Table 2.12**). As shown in **Table 3.11**, these directly account for $3,646.4 million, or 1.2% of statewide earnings.

Associated with the increased earnings of past students is a collection of *demand-induced* and *agglomeration-induced* indirect effects. As shown in **Table 3.11**, these indirect effects account for $4,777.4 million, or 1.5% of statewide earnings.

Total Economic Benefits

Finally, the overall role of the community colleges in the state economy is equal to the sum of the direct and indirect effects. Accordingly, the colleges account for $10,148.4 million, or 3.2% of all statewide earnings in the aggregate.

Chapter 4
SENSITIVITY ANALYSIS OF KEY VARIABLES

INTRODUCTION

We conclude this study with a **base case** sensitivity analysis of some key variables on both the investment and statewide economic development sides. 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 they often generate results that grossly 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 any of the colleges in the system. 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 college because of time spent not gainfully employed. Some of that cost is recaptured if the student remains partially (or fully) employed while attending college. It is estimated that an overall average of 79% of the current student body in the state is employed. In the sensitivity analysis we test this variable by assuming 100% instead of the 79%. The revised assumption would mean that *all* of the students are employed, thus the average opportunity cost of time would be reduced accordingly.

Percent of Earnings Relative to Full Earnings

The second opportunity cost variable is more difficult to estimate. On average for all 39 colleges, we estimate that for the students working while attending classes, their earnings amounted to only 61% of the earnings they would have statistically received if not attending the CCs. 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. As above, we test this variable in the sensitivity analysis by changing the assumption to 100%. 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 61% 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 32.3%, 9.4, and 4.7 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 61% 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

51.8%, 15.4, and 3.3 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 >100%, 66.4, and 1.1 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 unrealistic, albeit not uncommon for advocacy analyses.

Table 4.1 Sensitivity Analysis of Student Perspective

Variables	Assumptions	RR	B/C	Payback
1. Percent	79%	26.1%	7.3	5.6
Employed	100%	32.3%	9.4	4.7
2. Percent of	61%	26.1%	7.3	5.6
Earnings	100%	51.8%	15.4	3.3
1 = 100%, 2 = 100%		>100%	66.4	1.1

A final note to this student perspective sensitivity analysis—we strongly emphasize that the results, given the assumptions, 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. The results presented in **Chapter 3** are **realistic,** indicating that investments in the CCs will generate excellent returns, well above the long-term average percent rates of return of roughly 7% in the stock and bond markets.

STATEWIDE ECONOMIC DEVELOPMENT

We estimated the economic impacts of the 39 community colleges in the state in **Chapter 3**, **Table 3.10** based on college operations and capital spending, and the increased productivity effects of past students in the workforce. The impacts were expressed in terms of earnings, i.e., wages, salaries and

proprietors' income, published by the U.S. Department of Commerce.[20] 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 local businesses, which, as argued by some, should be counted among the economic impacts attributable to the colleges.

In **Table 3.10**, however, we exclude student spending because most of the students already reside in-state. Student expenditures, therefore, do not represent **new** monies, 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 colleges, 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 has more 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, is 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 3.10** in the previous chapter, but adds the section "Earnings Attributable to Student Spending,"[21] creating

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

[21] 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 spending by broad expenditure category was bridged to the sectors of the statewide economy input-

some $1,856.4 million in additional earnings for the in-state businesses patronized by students (the direct effects), plus another $1,391.9 million in earnings stemming from related multiplier effects (indirect effects). Adding the student spending to the mix increases the total "explanatory power" of earnings from 3.2% in **Table 3.10** to 4.2% in **Table 4.2**.

Table 4.2. Summary of CCs Role in the State Economy

	Earnings ($ Thousands)	% of Total
Total Earnings in State	$316,883,929	100%
Earnings Attributable to Student Spending		
Direct Earnings	$1,856,393	0.6%
Indirect Earnings	$1,391,890	0.4%
TOTAL	$3,248,282	1.0%
Earnings Attributable to College Operations		
Direct Earnings of Faculty and Staff	$1,008,061	0.3%
Indirect Earnings	$716,531	0.2%
TOTAL	$1,724,592	0.5%
Earnings Attributable to Past Student Econ. Dev. Effects		
Direct Earnings	$3,646,363	1.2%
Indirect Earnings	$4,777,423	1.5%
TOTAL	$8,423,786	2.7%
GRAND TOTAL	$13,396,660	4.2%

Economic Impacts Reported as Gross Sales

Advocates sometimes favor gross sales over earnings as an impact measure, because sales are always larger than earnings. But using gross sales 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 visits an auto dealer and purchases a new luxury automobile. The other enters the county 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 state 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

output model. Adjustments were made consistent with the model's accounts to allow for spending leakages.

wholesale payment for the new automobile. Contrast this to the hospital expenditure. Here perhaps $40,000 appears as physician, nurse, and assorted hospital employee wages (part of the county's overall earnings), while only $10,000 leaves the state, 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 economic 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 $868.2 billion.[22] Direct local spending by students reflects their total spending, reduced by the estimated portion that leaks out-of-state to purchase goods produced elsewhere.[23] In the usual fashion, indirect effects reflect the action of local 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 39 community colleges in Illinois is estimated to explain some $30,507.6 million in gross sales, a number substantially larger than the $13,396.7 million explained by the colleges in gross earnings shown in **Table 4.2**.

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

[23] Students purchase gasoline for their cars, for example, and while the trade margin stays in-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	$868,157,756	100%
Gross Sales Attributable to Student Spending		
Direct Spending by Students	$3,251,806	0.4%
Indirect Spending Effect	$2,485,951	0.3%
TOTAL	$5,737,757	0.7%
Gross Sales Attributable to College Operations		
Direct Expenditures of CC	$898,911	0.1%
Indirect Spending Effect	$985,946	0.1%
TOTAL	$1,884,857	0.2%
Gross Sales Attributable to Past Student Econ. Dev. Effects		
Direct Gross Sales	$10,096,492	1.2%
Indirect Gross Sales	$12,788,512	1.5%
TOTAL	$22,885,005	2.6%
GRAND TOTAL	$30,507,619	3.5%

While the gross sales impacts shown in **Table 4.3** are not incorrect, we prefer to report college impacts in terms of earnings in **Table 3.10** rather than gross sales because they reflect the economic realities in the state much more accurately than the sales numbers. Advocacy studies, on the other hand, will often opt to express the results in terms of sales because the numbers are much more impressive. Such results, however, will likely not stand up to peer scrutiny in the economics profession.

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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 CC 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 CC 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 CC, 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.[24] 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

[24] 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 CC 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 CC 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 CC. 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 sources:

U.S. Census Bureau and U.S. Department of Commerce. 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.