

THE IMPACT OF PUBLIC HIGHER EDUCATION ON THE STATE OF COLORADO

**Prepared for Colorado Department of Higher Education
December 2007**



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Colorado's 28 public colleges, universities and community colleges are educating 213,956 students, over 190,000 of whom are Colorado residents. Higher education in Colorado supports 97,563 jobs, which contribute \$4.25 billion in wages and salaries and almost \$387 million in state and local taxes to the Colorado economy annually.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	4
A. Introduction	7
a. State of Higher Education in Colorado Today.	
b. Data	
c. Methodology	
d. Other Impact Studies	
B. Higher Education in Colorado	12
a. Public Four-Year Colleges and Universities	
b. Public Two-Year Colleges	
c. Public Vocational Schools/Technical Colleges	
d. Private Institutions	
e. Financial Aid	
C. Impact of Capital Construction Spending (\$100 million)	16
D. Impact of Annual Operations Budget (\$100 million)	17
E. Impact on Jobs and Income of Graduates	18
F. Location Decisions	21
G. Qualitative Impacts	23
H. Summary and Conclusions	25
Selected Bibliography	26
Appendix A: Economic Impact Analysis	27
Appendix B: RIMS II Multipliers for the State of Colorado	29
Appendix C: Colorado Employment by Industry - 2006	30

EXECUTIVE SUMMARY

Colorado has a long history of providing higher education for its citizens. The University of Colorado was authorized in 1861, at the first assembly of the Colorado Territory, and opened in 1877. The Colorado School of Mines opened in 1874. Today, 13 public four-year colleges and universities operating under ten governing boards, 18 two-year community colleges, four public vocational and technical schools and three private nonprofit institutions, along with 106 other private institutions and 344 occupational schools serve Colorado's student population.

In 2006, Colorado ranked 48th in state and local government support per student (full-time equivalent or FTE) for higher education, behind New Hampshire and Vermont. For many Colorado colleges and universities, state support covers less than 10% of the cost of a four-year college education. In addition to state support and student tuition, colleges rely on private philanthropy and on sponsored research and grants to cover education costs.

There are two ways to look at the impact of higher education on the state of Colorado. The first is to do a traditional economic impact analysis of the jobs and income that are created as money spent by our colleges and universities circulates through the economy. The second is to examine the impact of a well-educated workforce on the type of jobs and level of income and spending Coloradans enjoy. This study, prepared by The Adams Group, Inc. for the Colorado Department of Higher Education, considers both. We also document the qualitative benefits that come with a well-educated population.

The number of faculty and staff employed in higher education and the size of the student body are reported in two ways – headcount and full-time equivalent jobs and students. We use student headcount, faculty and staff headcount, and work/study headcount data provided by the Colorado Department of Higher Education (CDHE). A consistent data series on other part-time positions filled by students was not available. Hence, our analysis understates the impact of higher education jobs on the state.

This study uses traditional multiplier analysis (RIMS II multipliers for Colorado from the Department of Commerce) to trace the impact of higher education jobs and spending on Colorado businesses, organizations and individuals. Multiplier analysis recognizes the interdependence of various sectors of the economy as activities in one sector spill over into other sectors, stimulating additional business activity.

We examined a group of impact studies done by individual colleges and universities in the last several years, but did not rely on them. Methodologies varied enormously and most were focused on the impact on a local community rather than on the state as a whole. The results are not cumulative, since money spent by an in-state resident in one community is money not spent elsewhere in the state.

Despite the data problems, a number of very solid conclusions emerge from this study.

1. Colorado's 28 public colleges, universities and community colleges are educating 213,956 students. Of these, 84.4% of the four-year students and 95.6% of the two-year students are Colorado residents.
2. In addition, there are four public vocational/technical schools serving 10,000-13,000 students annually.

3. Higher education in Colorado employs 57,675 workers, according to the Colorado Department of Labor as adjusted for this study. The combined impact of the 57,675 direct employees is an additional 39,888 indirect and induced jobs for a total of 97,563 jobs. If these jobs pay the average Colorado wage of \$43,524, they contribute \$4.25 billion in wages and salaries and almost \$387 million in state and local taxes to the Colorado economy annually.
4. The public higher education sector is one of the largest employers in the state, bigger than Natural Resources/Mining, Heavy Construction, Computers/Electronics, Telecommunications or Federal Government. It accounts for over half of all state government jobs.
5. A state appropriation of \$100 million spent in Colorado on capital construction will generate another \$100.65 million in expenditures in other sectors of the state's economy (e.g., manufacturing, transportation, public utilities, trade, finance and services). It will create 1,212 jobs, including those on the actual construction project, which will pay \$58.52 million in wages and salaries. Assuming that the average worker pays about 9.1% of his salary in state and local taxes, the \$100 million expenditure will generate over \$5.3 million in tax revenues.
6. Each dollar paid to a construction employee will generate another \$1.03 in wages and salaries for employees in other industries as it circulates through the Colorado economy. Each construction job will generate 2.1 additional jobs in other industries as:
 - a. goods and services are purchased for the construction site,
 - b. the employees of these companies purchase goods and services for their personal use, and
 - c. construction employees buy goods and services for their personal use.
7. A state appropriation of \$100 million for operating budgets spent within the state of Colorado by its colleges, universities and professional schools will generate another \$147.63 million in expenditures in other sectors of the state's economy. It will create 3,063 jobs, including direct employment at the colleges and universities, which will pay \$87.81 million in wages and salaries. Assuming that the average worker pays about 9.1% of his salary in state and local taxes, the \$100 million expenditure will generate almost \$8 million in tax revenues.
8. Each dollar paid to a higher education employee will generate another \$0.97 in wages and salaries for employees in other industries as it circulates through the Colorado economy. Each higher education job will generate 0.69 additional jobs in other industries as goods and services are purchased for the institution and employees buy goods and service for their personal use.
9. Economic development officials agree that a well-trained workforce plus the ability to provide specific industry-based training is the #1 priority of companies seeking to relocate or expand.

10. The existence of colleges and universities in a community impacts the economy in many ways that cannot be measured. For example:
 - a. Higher education brings visitors to the state.
 - b. Faculty research frequently leads to new companies that return money to the university and create jobs in the community where they are established.
 - c. Colleges and universities collaborate with local businesses for their mutual benefit.
 - d. College educated adults are healthier, devote more time to volunteer activities and are more likely to vote.

Without Colorado's institutions of higher education, many young people would not receive a post-high school education and would face a lifetime of constrained job opportunities and lower earnings. Others would receive their higher education in other states, draining money from the Colorado economy and lessening the probability that they would become a part of Colorado's labor force.

A. INTRODUCTION

Colorado has a long history of providing higher education for its citizens. The University of Colorado was authorized in 1861, at the first assembly of the Colorado Territory. Colorado Seminary (now the University of Denver), was founded in 1864, Colorado College and the Colorado School of Mines opened in 1874, the University of Colorado at Boulder opened in 1877, Colorado Agricultural College (now Colorado State University) opened in 1879 and the State Normal School (now University of Northern Colorado) opened in 1890. Trinidad State Junior College opened with 37 students in 1925, the first of Colorado's two-year community colleges.

a. State of Higher Education

Higher education is an important industry in Colorado. Thirteen public four-year colleges and universities operating under ten governing boards, 18 two-year community colleges, four public vocational and technical schools and three private nonprofit institutions, along with 106 other private institutions and 344 occupational schools serve Colorado's student population. In 2006, over 12% of Coloradans - 575,000 - were of traditional college age (18-25).

Despite the number of educational institutions, Colorado does not produce enough college graduates to meet the demand from local companies. The 2000 Census found that metro Denver was the fifth largest magnet for college graduates (after Atlanta, Phoenix, Dallas and San Francisco), attracting 40,973 graduates between 1995 and 2000 rather than educating its own population to fill these jobs. Utah is the only Mountain Region state that exports college graduates. The U. S. is a net importer of educated adults.

In 2006, Colorado ranked 48th in state and local government support per student (full-time equivalent or FTE) for higher education, behind New Hampshire and Vermont. The government's per FTE support of \$3,364 was 53.2% of the national average of \$6,325 and 25.1% of neighboring Wyoming's \$13,425 (NCHEMS) Colorado appropriated \$3 per \$1,000 of personal income (versus Wyoming's \$12) and \$127 per capita (versus Wyoming's \$434) for higher education. Colorado appropriations for higher education have risen 3% since 1996, while Wyoming's are up 71% (NCPPE).

In 2006, the Colorado Commission on Higher Education asked the National Center for Higher Education Management Systems to conduct a study on how Colorado compared to its peers in state funding for public higher education institutions (NCHEMS). The study found that Colorado would need to appropriate more than \$830 million (2006 dollars) to reach the level of peer institutions across the U.S. Colorado General Fund appropriations to higher education were roughly 50% of peer institutions, while educational costs covered by tuition and fees varied from 67% to 120% of its peers.

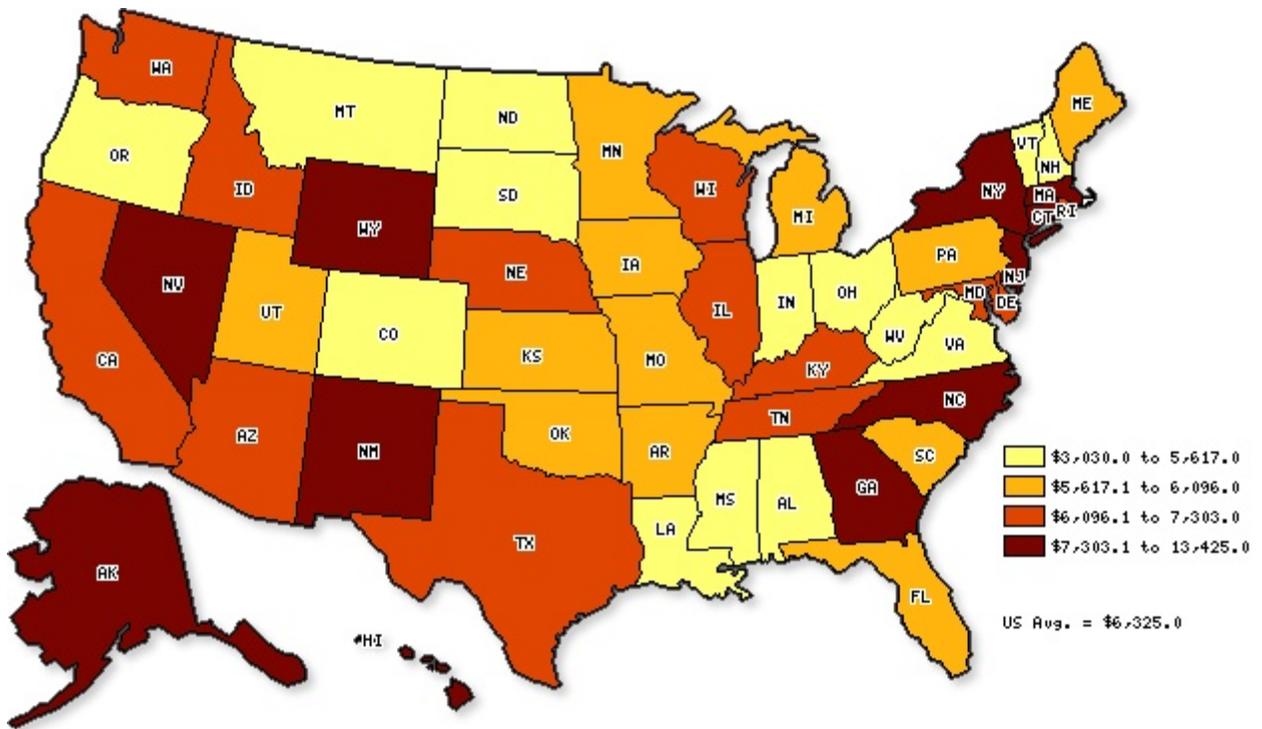
Table: 1. Colorado versus Peer Support for Higher Education
(excludes sponsored research, grants and gifts)

	General Fund Per FTE	Tuition and Fees Per FTE	Total Per FTE
Research Institutions	41%	120%	64%
4-Year Institutions	51%	67%	58%
Community Colleges	55%	108%	69%

Source: NCHEMS.

The NCHEMS study overstates Colorado’s support of higher education since its revenue calculation includes funds that institutions receive from the College Opportunity Fund (COF) stipend and Fee-for-Service contracts in the comparison with out-of-state institutions. These sources of funding are unique to Colorado and are not considered state grants by the State Auditor’s Office. The stipends are paid to the institutions through eligible students who have applied and authorized the use of the stipend, so they are not considered a direct state appropriation. The Fee-for-Service contracts represent a business transaction in the purchase of services by the state from institutions.

State and Local Public Higher Education Support Per Full-Time Equivalent Student - 2006



Source: State Higher Education Executive Officers (SHEEO)

In addition to state support and student tuition, colleges rely on private philanthropy and on sponsored research and grants to cover education costs. For example, Colorado State University has a \$250 million endowment and received \$267 million for sponsored research last year. The Colorado School of Mines received \$32.8 million in sponsored research grants and contracts in 2005-06. The University of Colorado Foundation had a long term investment pool (endowment and university funds) of almost \$800 million in

June 2007, which earned \$140.8 million during the fiscal year. The Foundation raised an additional \$105 million in donations. The University of Colorado at Boulder reported that contracts and grants of \$239.8 million covered 26.5% of its budget last year. In the most recent fiscal year, the University of Colorado System received a total of \$637 million in research funding.

b. Data

There are two ways to look at the impact of higher education on the state of Colorado and both are important. The first is to do a traditional economic impact analysis of the jobs and income that are created as money spent by our colleges and universities circulates through the economy. The second is to examine the impact of a well-educated workforce on the type of jobs and level of income and spending Coloradans enjoy. This study, prepared by The Adams Group, Inc. for the Colorado Department of Higher Education, considers both. We also document a number of non-quantifiable benefits that come with a well-educated population.

There are two ways of reporting number of faculty and staff employed and the size of the student body – headcount and full-time equivalent jobs or students. We used student headcount data provided by the Colorado Department of Higher Education (CDHE) because we wanted to show the number of people directly impacted by the state’s public institutions of higher education. These data are valid only for a point in time. The number of students enrolled varies from semester to semester and even within a semester as students drop out. For example, although the 13 state and local community colleges have 72,939 students using our point-in-time methodology, the unduplicated annualized headcount for 2006-2007 is 107,348), 47.2% larger. The annualized headcount includes every student who is on campus during the year, while the point-in-time headcount misses those who weren’t enrolled the semester the count was conducted.

A consistent data series on the number of employees was more difficult to obtain. Some institutions count all employees, whether full or part-time; others convert these data to full-time equivalents. Since multiplier analysis is designed to work with headcount, not FTE data, we used faculty/staff headcounts provided by the CDHE for our analysis.

Some institutions provided us with data on students who work in campus jobs; others ignored this large group of part-time labor. We used only the headcount of work/study positions provided by CDHE in our analysis. This excludes many part-time jobs. For example, the University of Colorado system reported 8,203 student jobs but only 1,234 work/study jobs were used in our analysis. The University of Northern Colorado reported 5,846 student jobs, but only 487 work/study jobs. The Colorado School of Mines reported 992 student jobs but only 239 Colorado work/study jobs are included in the CDHE data base.

Some institutions count contract workers, e.g. food service providers, as employees; others exclude them. These workers are not included as direct jobs in our analysis, but rather show up as indirect employees.

Our analysis, which misses the student jobs described above, understates public higher education’s impact on the state. We also did not include data on the four public

vocational and technical schools. This also causes the impact of public higher education to be understated.

Because of these data problems, our conclusions on the number of students, faculty and staff in these institutions and their impact on jobs and spending do not pretend to be precise. They are merely an order-of-magnitude indicator to give some idea of the size and importance of this sector of the Colorado economy. Although the methodology used is sound and well accepted, the basic data are “soft.” Whenever there was a question, we chose the more conservative assumption so as not to overstate the impact.

c. Methodology

There are several ways to look at the economic benefits of a large employer, including examining the impact of the jobs created and the impact of the dollars spent. In our analysis we consider both.

Multiplier analysis is used to trace the impact on Colorado businesses, organizations and individuals who are affected by the construction and operation of the higher education system as this impact works its way through the Colorado economy. It recognizes the interdependence of various sectors of the economy as activities in one sector spill over into other sectors, stimulating business activity.

The flow of jobs and dollars is divided into three groupings:

- ◆ **Direct:** This is the first round impact generated by companies (construction companies in the construction phase and colleges and universities in the operation phase) as they hire Coloradans to work for them.
- ◆ **Indirect:** A second round impact is generated by the purchase of goods and services by the direct business. For example, the purchase of the concrete and steel used in the construction of a university building, as well as computers, office supplies and cleaning services by the colleges and universities, are examples of indirect economic impacts.
- ◆ **Induced:** This is the economic activity generated by the purchase of goods and services by the individuals whose incomes are derived directly or indirectly from the construction and operation of the higher education institutions in Colorado. The purchase of groceries, a car or a home by a professor is an example of induced economic activity.

Companies that sell their goods and services outside of the region generate the largest employment impact. This is called basic industry, industry that brings new dollars into the state. Examples in higher education would be tuition and spending by out-of-state students. Companies that pay high salaries have a larger impact than those that pay less. The more employees a company hires, the bigger its impact. This study uses the RIMS (Regional Input-Output Modeling System) II multipliers developed by the Bureau of Economic Analysis of the U.S. Department of Commerce to trace the indirect and induced jobs and income flows generated by companies and organizations. This is the standard methodology for conducting multiplier analysis. An explanation of the RIMS multipliers is found in Appendix A.

d. Other Impact Studies

We examined a number of impact studies done by individual colleges and universities in the last several years, but did not rely on them. Methodologies varied enormously and most were focused on the impact on a local community rather than on the state as a whole. The results are not cumulative, since money spent by an in-state resident in one community is money not spent elsewhere in the state.

B. HIGHER EDUCATION IN COLORADO

There are hundreds of institutions of post-high school education in Colorado, ranging from the big research universities such as the University of Colorado and Colorado State University through the two-year community college system to numerous for-profit schools offering degrees and certificates in various fields. This study concentrates on 31 public institutions.

a. Public Four-Year Colleges and Universities

There are 13 public four-year colleges and universities in Colorado, including two in the Colorado State University system and four in the University of Colorado system.

Table 2. Colorado Public Colleges and Universities

Institution	Location
Adams State College	Alamosa
Colorado School of Mines	Golden
Colorado State University	Fort Collins
Colorado State University-Pueblo	Pueblo
Fort Lewis College	Durango
Mesa State College	Grand Junction
Metropolitan State College	Denver
University of Colorado at Boulder	Boulder
University of Colorado at Colorado Springs	Colorado Springs
University of Colorado at Denver	Denver
University of Colorado Health Sciences Center	Denver
University of Northern Colorado	Greeley
Western State College	Gunnison

Source: CDHE.

b. Public Two-Year Colleges

There are 15 public two-year community and junior colleges in Colorado, some with multiple campuses. Seven campuses are located in metro Denver, four more are located in Front Range communities and the rest are spread across rural Colorado. In 2007, the State Demography Office estimated that 81.8% of Colorado's 4.9 million residents lived along the Front Range. Clearly, the two-year colleges, with 38.9% of their campuses located outside of the populous Front Range, are targeted to provide access to higher education in small towns and rural Colorado.

Table 3. Public Community Colleges

Institution	Location
<u>Metro Denver</u>	
Arapahoe Community College	Littleton
Community College of Aurora	Aurora
Community College of Denver	Denver
Front Range Community College	Brighton
Front Range Community College	Longmont
Front Range Community College	Westminster
Red Rocks Community College	Lakewood
<u>Other Front Range</u>	
Aims Community College	Greeley
Front Range Community College	Fort Collins
Pikes Peak Community College	Colorado Springs
Pueblo Community College	Pueblo
<u>Rest-of-State</u>	
Colorado Mountain College	Glenwood Springs
CO Northwestern Community College	Rangely
Lamar Community College	Lamar
Morgan Community College	Fort Morgan
Northeastern Junior College	Sterling
Otero Junior College	La Junta
Trinidad State Junior College	Trinidad

Source: CDHE.

c. Public Vocational Schools/Technical Colleges

Colorado’s four area vocation schools (AVS)/technical colleges (Delta/Montrose Technical College in Delta; Emily Griffith Opportunity School in Denver; Pickens Technical College in Aurora; San Juan Basin Technical College in Cortez) are defined in the Colorado Revised Statutes as schools offering approved postsecondary career and technical education programs for credit. It is further stated that any postsecondary course credits earned by students will apply in full to associate degrees at community colleges or into degree programs offered at four-year institutions.

AVS/technical colleges typically serve 10,000 – 13,000 students annually and awarded 4,193 certificates in 2006. AVS/technical college students, at a minimum, enjoy an increased earning capacity of somewhere between 13.7% – 36.1% percent above high school graduates. Although not strictly institutions of higher education, these schools are an essential component of workforce development in Colorado.

The 13 four-year colleges and universities serve 129,471 students, have 31,212 faculty and staff employees, provide work/study jobs for 4,059 students, and have a combined annual budget of \$3.2 billion. Of these students, 84.4% are Colorado residents.

Table 4. Public Colleges, Universities and Community Colleges

Institution	Students	Faculty/Staff	Work/Study Jobs	Annual Budget
Adams State College	2,708	502	227	\$36.7 million
CO School of Mines	3,711	1,181	239	\$124.5 million
CSU System	28,610	9,162	881	\$690.5 million
Fort Lewis College	3,937	568	119	\$51.7 million
Mesa State College	3,711	433	335	\$50.4 million
Metropolitan State College	20,470	1,433	408	\$116.0 million
U of CO System	51,717	15,975	1,234	\$1,940.6 million
UNC	12,351	1,656	487	\$142.8 million
Western State College	2,256	302	129	\$33.0 million
TOTAL Four-Year	129,471	31,212	4,059	\$3,186.2 million
State Community Colleges	72,939	5,940	1,846	\$429.2 million
Local Community Colleges	11,546	3,530	2,145	\$107.6 million
TOTAL Community Colleges	84,485	9,470	3,991	\$536.8 million
TOTAL	213,956	40,682	8,050	\$3,723.0 million

Source: CDHE and CO State Auditor's Memo.

The 15 state and local community colleges have 84,485 students, 9,470 faculty and staff employees, provide work/study jobs for 3,991 students and have a combined annual budget of \$536.8 million. Of these students, 95.6% are Colorado residents.

The community colleges provide an inexpensive educational opportunity for many young people who might not otherwise attend college. Many transfer to a four-year college after receiving their associate's degree through articulation agreements under which their credits are accepted by Colorado's public four-year colleges and universities.

The community colleges also have a significant impact on the local economies. A study done in 2004 by CCbenefits, Inc. on Northeastern Junior College in Sterling found that the institution directly and indirectly supported 740 jobs that paid \$12.8 million annually in wages and benefits. An impact study of Pikes Peak Community College in Colorado Springs by Omega Associates found that direct budget expenditures of \$43.1 million generated another \$29.3 million of spending in the local community.

d. Private Institutions

There are three private nonprofit institutions of higher education in Colorado. Regis University, with 11,099 students and 2,657 faculty/ staff, and the University of Denver (no data provided) are located in metro Denver. Colorado College, with 1,989 students and 823 faculty/staff, is in Colorado Springs.

In addition to these three institutions, there are over 100 other private institutions offering degrees that are authorized by the Colorado Commission on Higher Education (CCHE). There are also 319 in-state private occupational schools and 25 out-of-state private occupational schools authorized by CCHE. These schools train realtors, hairdressers, bartenders, locksmiths, dental assistants, chefs, court reporters, bookkeepers, etc.

While none of these institutions is included in our analysis of the impact of public higher education on Colorado, they provide education and vocational training for thousands of local residents and employ thousands of Colorado instructors. In so doing, they improve the job options and incomes of state residents and increase state and local tax revenues.

e. Financial Aid

In fiscal year 2006, the state of Colorado provided \$78.4 million in financial aid to students in authorized public and private institutions. By fiscal year 2008, this had risen to \$86.6 million. All of the state's public two-year and four-year institutions had students receiving state financial aid, as well as the three nonprofit private institutions and 15 for-profit institutions.

C. IMPACT OF CAPITAL CONSTRUCTION SPENDING

This section looks at the impact of a \$100 million state appropriation (spent within the state) for capital construction. It utilizes traditional multiplier analysis (Appendix A) using the RIMS II multipliers (Appendix B) from the U.S. Department of Commerce.

An appropriation of \$100 million spent in Colorado on capital construction will generate another \$100.65 million in expenditures in other sectors of the state's economy (e.g., manufacturing, transportation, public utilities, trade, finance and services). It will create 1,212 jobs, including those on the actual construction project, which will pay \$58.52 million in wages and salaries. Assuming that the average worker pays about 9.1% of his salary in state and local taxes (Dunn), the \$100 million expenditure will generate over \$5.3 million in tax revenues.

Each dollar paid to a construction employee will generate another \$1.03 in wages and salaries for employees in other industries as it circulates through the Colorado economy. Each construction job will generate 2.1 additional jobs in other industries, as goods and services are purchased for the construction site and the employees of these companies as well as the goods and services construction employees buy for their personal use.

As an example of these effects, the University of Colorado at Colorado Springs provided us with specific data on three capital construction projects there. These three projects, which totaled \$75.5 million, each employed between 50-100 workers per day, 260-350 total workers over the life of the project, and used 30-38 subcontractors and suppliers, with the great majority located in Colorado. These construction projects provided a substantial multiyear impact on the Colorado Springs economy, generating additional jobs, income, spending, and state and local tax revenues as the \$75.5 million worked its way through the local and state economies.

D. IMPACT OF ANNUAL OPERATING BUDGETS

This section looks at the impact of a \$100 million state appropriation (spent within the state) to the annual operating budgets of Colorado's 31 public colleges and universities. It utilizes traditional multiplier analysis (Appendix A) using the RIMS II multipliers from the U.S. Department of Commerce (Appendix B).

A \$100 million operating appropriation spent within the state of Colorado at its colleges, universities and professional schools will generate another \$147.63 million in expenditures in other sectors of the state's economy (e.g., manufacturing, transportation, public utilities, trade, finance and services). It will create 3,063 jobs, including direct employment at the colleges and universities, which will pay \$87.81 million in wages and salaries. Assuming that the average worker pays about 9.1% of his salary in state and local taxes (Dunn), the \$100 million expenditure will generate almost \$8 million in tax revenues.

Each dollar paid to a higher education employee will generate another \$0.97 in wages and salaries for employees in other industries as it circulates through the Colorado economy. Each higher education job will generate 0.69 additional jobs in other industries, as goods and services are purchased for the institution and employees buy goods and services for their personal use.

E. IMPACT ON JOBS AND INCOME OF GRADUATES

CDHE data report that Colorado's 28 public institutions directly employ 48,732 in faculty, staff and work/study jobs. A more complete measure of state higher education jobs comes from the Colorado Department of Labor and Employment, which reported 52,200 jobs in 2006 in State Government Educational Services. These data include the part-time student jobs not included in CDHE data, but exclude the jobs at the two locally supported community colleges and the four vocational and technical schools. To make the data comparable with the rest of this study, we add in the jobs at Aims Community College and Colorado Mountain College, which are reported in Local Government Educational Services, and take out a small number of employees in the state total who are not working in the higher education sector, for a total of 57,675 jobs in state public higher education.

This makes the public higher education sector one of the largest employers in the state, bigger than Natural Resource/Mining, Heavy Construction, Computers/Electronics, Telecommunications or Federal Government. It accounts for over half of all state government jobs (Appendix C).

The combined impact of the 57,675 direct employees is an additional 39,888 indirect and induced jobs for a total of 97,563 jobs. If these jobs pay the average Colorado wage of \$43,524, they would contribute \$4.25 billion in wages and salaries and almost \$387 million annually in state and local taxes to the Colorado economy.

In addition to the direct, indirect and induced jobs that result from employment at Colorado's colleges and universities, higher education affects jobs in three other ways. A degree often enables a worker to find a higher paying job. It enables a worker to find or retain a job in a labor market where he is competing with workers from around the world who are often happy to work for lower wages, fewer benefits and in more difficult working conditions. There are spillover effects on the wages of less educated workers at businesses with a higher percentage of college graduates.

First, there is the issue of finding a better paying job. Census Bureau data show that in 2006, a college graduate earned almost twice as much as someone with only a high school diploma. A professional degree more than quadrupled a worker's annual earnings.

Table 5: Education and Income

Degree	2006 Income	% of High School Only
< High School	\$17,299	64.2%
High School	\$26,933	100.0%
Some College	\$30,627	113.7%
Associate	\$36,645	136.1%
Bachelors	\$52,671	195.6%
Masters	\$66,754	247.9%
Doctoral	\$91,370	339.2%
Professional	\$112,902	416.2%
AVERAGE	\$36,286	

Source: U.S. Census Bureau.

A study by the Federal Reserve Bank of Dallas found that the long-term payoff for a bachelor's degree over 40 years is \$1.1 million (2003 data). In Colorado, CCbenefits, Inc., estimates that the improved earning power of the graduates of Northeastern Junior College since it opened in 1941 adds \$94.2 million in annual earnings and 3,800 jobs to the five-county service area in northeastern Colorado. Omega Associates estimates that a Pikes Peak Community College education added \$51.1 million (direct impact only) to its graduates' earnings in 2003-04.

Table 6: Payoff to Higher Education

Degree	40-year Earnings	Payoff
High School Diploma	\$1.5 million	
Bachelors	\$2.6 million	\$1.1 million
Masters	\$3.0 million	\$1.5 million
Doctorate	\$4.0 million	\$2.5 million
Professional	\$5.3 million	\$3.8 million

Source: FRB of Dallas 2004 Annual Report..

A 2007 survey by Experian and the Gallup Organization found that 88% of respondents with college degrees felt they had enough money to live comfortably, compared with only 69% of those with a high school education or less.

Second, there is the issue of unemployment. The unemployment rate consistently is higher among workers with only a high school diploma than among those with a bachelor's degree. In September 2007, 7.4% of those with less than a high school education were unemployed, compared with 4.6% of those with only a high school diploma, 3.4% of those with some college or an associate degree, and 2.0% of those with a bachelor's or higher degree.

In an increasingly global economy, blue collar jobs where an employee learns the necessary skills during on-the-job training are moving to lower wage countries. The jobs in which U.S. workers can compete increasingly require a post-high school education. In the information sector, for example, the U.S. increasingly exports the highly valued knowledge of researchers, systems architects and designers and imports the services of basic programmers.

In 1970, the manufacturing sector accounted for 14% of Colorado's output of goods and services and provided 15.8% of state jobs. In 2006, it accounted for only 6.5% of output and 6.6% of jobs. Agriculture has fallen from 4.3% of output to only 0.8% in 2006 and provided only 1.8% of state jobs. Jobs in such sectors as information, finance, health care, and professional and business services accounted for 33.7% of state output in 2006 and 33.8% of jobs. Many of the job vacancies reported in the 2006 (most recent) survey by the Colorado Department of Labor and Employment were in fields that require higher education.

Finally, there are spillover benefits to workers who have not attended college when a business employs a high percentage of college-educated workers. Research at the National Bureau of Economic Research by Enrico Moretti, found that the presence of educated workers makes other, less educated workers in the same location more productive, increasing output and economic growth. A percentage point increase in the supply of college graduates raises high school drop-outs' wages by 1.9% and high school graduates' wages by 1.6%. In other words, the less-educated workers produce more and have higher wages/salaries than someone in a comparable job at a company employing fewer college graduates.

Since educated workers are less likely to be unemployed and earn higher incomes when they are employed, the public benefits from their decreased reliance on public assistance. In Colorado the 2000 Census showed that 2.4% of those with less than a high school diploma received public assistance, compared with no one with a bachelor's degree or higher.

This analysis does not attempt to quantify the savings in public expenditures that result from avoided costs of unemployment compensation, Medicaid, social services, corrections and the like. These savings accrue as the educational level of the state's population increases.

F. LOCATION DECISIONS

Colorado has one of the most highly educated populations in the U.S. In 2006, 90.0% of residents were high school graduates and 36.4% of residents 25 or over had a bachelor's degree or higher (versus 26% nationally) and another 7% (versus 6.9% nationally) had an associate degree from a community college. In addition, 24% (versus 20.4% nationally) had at least some college, although they had not obtained a degree (Bureau, 2006 CPS). In 2005, Colorado ranked third in percentage of its population with a college degree, behind only Washington, D.C. and Massachusetts (Bureau, 2005 ACS).

Ned Hill, professor of economic development at Cleveland State University, points out that the largest predictor of economic well-being in cities is the percentage of college graduates. Economic development organizations across the state are unanimous in citing the importance of a well-educated workforce to their job recruitment activities.

- Tom Clark, executive vice president of the Metro Denver Chamber of Commerce and head of the Metro Denver Economic Development Corporation, is very clear about the importance of Colorado's institutions of higher education. "A well-trained workforce, coupled with a state's ability to provide additional, specific 'industry-based' training, is consistently the #1 priority of companies seeking to relocate or expand. Colorado's highly-educated workers are the greatest 'incentive' we have to offer."
- Mike Kazmierski, president and CEO of the Colorado Springs Economic Development Corporation, agrees. "A company will not look at the other site selection factors (like tax advantage or quality of life) until they are convinced we have the workforce they need. A company cannot succeed without qualified employees to do the work and there is no question that the quality of our workforce is key to our success in attracting and retaining jobs. The effectiveness of our higher education system and its ability to meet the needs of our future employers are vital to the economic survival of our state."
- Jim Spaccamonti, president and CEO of the Pueblo Economic Development Organization, talks about the importance of coalitions. "Quite simply, Education = Jobs! The higher the educational level of the community's workforce, the more it can compete globally for the companies who require that workforce. It is increasingly important for community economic leaders to form coalitions of educators and private businesses such as the Pueblo Economic Consortium. PEC is directly involved with public education to insure that the Pueblo workforce is educated and prepared for jobs opportunities in the market today and tomorrow."
- Ann Driggers, president and CEO of the Grand Junction Economic Partnership, cites programs at local colleges that help the GJEP in its effort to attract jobs. "In today's economy, the availability of a skilled workforce is key to business growth and success. In Mesa County we are focused on creating quality jobs for our local residents. In order to attract companies, we need to have the education and training opportunities that enable people to fill these jobs. Recent examples of the synergy between workforce needs and higher education programs are a new construction trades program at Western Colorado Community College [a

subdivision of Mesa State College that serves the college's two-year role and mission] and an expanded nursing program at Mesa State.”

- Debbie Woodward, 2005 president of the Economic Development Council of Colorado, states: “Colorado can no longer rely on its incredible quality of life to attract and retain businesses in our state. There has been a fundamental shift in building the infrastructure necessary to grow a strong economy. Our knowledge-based economy is now focused on brainpower, capital research, innovation and entrepreneurship. Ten years ago, businesses made site selection decisions based on location. Today, businesses make these same decisions based on labor. A trained workforce is essential.”

There is another way that higher education institutions impact location decisions. People looking for a place to relocate after retirement often prefer communities with a college because of the amenities it offers – lectures, plays, musical performances, the opportunity to audit classes, and well-educated, interesting neighbors, to name a few. These retirees are a form of “basic industry,” bringing new dollars into the state that will circulate through the economy, creating jobs, income and tax revenues just like a plant selling widgets outside the region. With the Baby Boom generation rapidly approaching retirement age –it is estimated that a Baby Boomer will retire once every seven seconds by 2010, when there will be 2.6 million 65-year olds – this is an important economic development opportunity for the state. In Colorado in 2006, there were already 1.3 million Baby Boomers, 27% of the state's population.

Finally, students who are educated in Colorado – both Colorado residents and those who come from out-of- state – frequently remain in Colorado. If educational opportunities were not available in-state for Colorado's high school graduates, not only would the state lose the economic benefit of their college expenditures, the students might not return to Colorado to enrich its workforce after graduating from college.

G. QUALITATIVE IMPACTS

The existence of colleges and universities in a community impacts the economy in many qualitative (or non-measurable) ways. This section discusses a number of the most important.

Tourism is one of Colorado's largest basic industries, bringing 26.9 million overnight visitors who spent \$8.9 billion in 2006. A portion of these visitors come to attend conferences and athletic events at higher education institutions and to visit students. In the 2005-06 academic year, Mesa State College in Grand Junction had 183,628 visitors, about 50,000 from outside the region. These non-local visitors added more than \$5.4 million to the local economy. A survey of friends and family attending Welcome Week at the college found that 58% of respondents planned to spend more than one day there and some as many as five days. Over 35% planned to spend \$500 or more (Adams Group).

College athletic facilities are often used for summer sports camps and regional tournaments. Not only do guests spend money while visiting Colorado, they frequently come back to the state to vacation after becoming acquainted with it on that initial visit.

The commercialization of faculty research frequently leads to new companies that return money to the university and create jobs in the community where they are established. The Colorado School of Mines cites MicroPhage, founded and incorporated in June 2002 to commercialize a bacterial detection technology licensed from the Colorado School of Mines, and Metafluidics, Inc., an industry leader in microfluidic/optical integration for sophisticated biomedical diagnostic lab-on-a-chip applications using core intellectual property developed in research laboratories at the university.

The University of Colorado reports that more than 60 companies have resulted from the commercialization of faculty research. In 2006-07 alone, there were 254 invention disclosures, 140 patent applications filed, ten new start-ups and \$24 million in revenues. Over the last five years CU intellectual property has generated over \$110 million in revenue, which was distributed to inventors, their labs and departments at the University, and the technology transfer office.

Colleges and universities collaborate with business and industry for their mutual benefit. Two examples at the Colorado School of Mines are the Colorado Fuel Cell Research Center and the Colorado Energy Research Institution. The Fitzsimmons BioBusiness Incubator and the Boulder Business Incubator connect early concept companies with University of Colorado centers such as the Deming Center for Entrepreneurship and the Bard Center for Entrepreneurship to help them develop a clear business model to attract management expertise and private investment. At the University of Colorado in Denver, the Business School is collaborating with a group of local and national energy companies to develop a Masters of Science in Global Energy Management, tailored specifically to the needs of the energy industry.

A primary justification for public support of higher education is the social returns – the benefit to society as a whole is more than the sum of the benefits to the individuals who attend higher education institutions. The American Council on Education, Center for Policy Analysis, points out that a college education is related to many activities and

characteristics associated with good health, intellectual stimulation and active community participation. K-12 education is enriched by programs provided for teachers and students on college campuses and by professors who visit K-12 classrooms.

A 2005 study by the Institute for Higher Education Policy attempted to quantify the investment payoff to higher education by the state. It found that higher education provides both public and private economic benefits. College educated adults are more likely to be healthy, to vote and to volunteer their time.

Table 7. Higher Education Payoff in Colorado

	< High School	High School	Some College	Bachelor's	Advanced
Good to Excellent Health	80.4%	86.3%	89.0%	94.9%	94.8%
Volunteer	7.1%	24.3%	35.7%	42.6%	n/a*
Vote	20.7%	50.0%	62.8%	76.9%	87.2%

* not available

Institute for Higher Education Policy.

Research on the social returns to human capital at the National Bureau of Economic Research validates these conclusions. None of these benefits can be assigned a dollar value, but all contribute to growth and economic activity in Colorado. Enrico Moretti finds that schooling significantly reduces the probability of incarceration, with the largest impact on murder, assault and motor vehicle theft. Education also improves infant and maternal health and reduces smoking. He finds a strong effect on voting, with better educated adults more likely to register to vote, follow election campaigns in the media, be aware of candidates' platforms, discuss politics with others, and associate with a political group. He concludes that estimates of the returns to education focusing only on increases in wages may significantly understate the total return.

H. SUMMARY AND CONCLUSIONS

Colorado's 28 public colleges, universities and community colleges are educating 213,956 students, most of them Colorado residents. Higher education directly and indirectly provides 97,563 jobs, which pay \$4.25 billion in wages and salaries and almost \$387 million in state and local taxes.

Without Colorado's institutions of higher education, many of our young people would not receive a post-high school education and would face a lifetime of constrained job opportunities and lower earnings. Others would receive their higher education in other states, draining money from the Colorado economy and lessening the probability that they would become a part of Colorado's labor force.

Tom Clark, Metro Denver Economic Development Corporation, succinctly summarizes our need for a well educated workforce. "The chasm of U.S. students academically capable of succeeding in advanced science and mathematical careers is simply too wide for the U.S. to remain competitive in the global economy. Much like the Space Race of the 1960s, we must fill the workforce pipeline with qualified U.S. citizens over the next two decades. In the interim, we must welcome the best and brightest students from other nations and hope that some will stay and make America their permanent home."

SELECTED BIBLIOGRAPHY

- Adams Group, Inc.** “The Impact of Tourism on the Grand Valley Economy.” December, 2004.
- Bradley, David.** “Fiction and Fact: A Response to the Tax Foundation’s Distortion of Colorado’s TABOR.” Center on Budget and Policy Priorities. May 2, 2005.
- Bureau of the Census.** 2005 American Community Survey. R1402.
- Bureau of the Census.** Census 2000 Summary File 3. Pp. 25, 26. 2002.
- Bureau of the Census.** Current Population Survey. 2006 Annual Social and Economic Supplement. Table 13. March 15, 2007.
- Colorado Business Review.** Leeds School of Business, University of Colorado at Boulder. v. 7, n. 2. 2005.
- Colorado Department of Labor and Employment.** Various data.
<http://www.coworkforce.com/LMI/Intro/research.asp>.
- Colorado State Auditor.** Symanski, Sally. “Memorandum to the Legislative Audit Committee.” September 13, 2006.
- Dunn, Tom.** “How Colorado Compares in State and Local Taxes.” Issue Brief. Colorado Legislative Council. January 24, 2005.
- Experian-Gallup Survey.** News Release. April 17, 2007.
- Federal Reserve Bank of Dallas.** Southwest Economy. “Region Lags Nation in Education Gains.” Issue 1. January/February 2003.
- Federal Reserve Bank of Dallas.** 2006 Annual Report. “The Best of All Worlds: Globalizing the Knowledge Economy.” Pp. 3-28.
- Federal Reserve Bank of Dallas.** 2004 Annual Report. “Lifetime Learning in Pursuit of the American Dream.” Pp. 5-19.
- Institute for Higher Education Policy.** “The Investment Payoff: A 50-State Analysis of the Public and Private Benefits of Higher Education.” February 2005.
- Moretti, Enrico.** “Social Returns to Human Capital.” NBER Reporter. Spring 2005.
- National Center for Higher Education Management Systems.** “State and Local Higher Education Support for Full-Time Equivalent Student: 2006.” www.higheredinfo.org.
- National Center for Higher Education Management Systems.** 2006.
http://highered.colorado.gov/Publications/Studies/2007/200705_HEDS_NCHEMS.pdf
- National Center for Public Policy and Higher Education.** “Measuring Up 2006: The State Report Card on Higher Education.” www.highereducation.org.
- Omega Associates, LLC.** “Economic Impact of Pikes Peak Community College on El Paso County, Colorado.” June 1, 2005.
- Robison, M. Henry and Kjell A. Christophersen.** “The Socioeconomic Benefits Generated by Northeastern Junior College.” CCbenefits Inc. March 11, 2004.
- “The CU Technology Transfer Performance Metrics.”** July 2007.
https://www.cu.edu/techtransfer/about/newsletters/2007/06_07_metrics.ppt.
- Woodward, Debbie.** “Labor, Not Location.” *The Denver Post*. April 9, 2005.

APPENDIX A

A User Handbook for the Regional Input-Output Modeling System (RIMS II)

Third Edition

March 1997

U.S. Department of Commerce

Effective planning for public and private-sector projects and programs at the State and local levels requires a systematic analysis of the economic impacts of the projects and programs on affected regions. In turn, systematic analysis of economic impacts must account for the inter-industry relationships within regions because these relationships largely determine how regional economies are likely to respond to project and program changes. Thus, regional input-output (I-O) multipliers, which account for inter-industry relationships within regions, are useful tools for regional economic impact analysis.

In the 1970's, the Bureau of Economic Analysis (BEA) developed a method for estimating regional I-O multipliers known as RIMS (Regional Industrial Multiplier System), which was based on the work of Garnick and Drake (1). In the 1980's, BEA completed an enhancement of RIMS, known as RIMS II (Regional Input-Output Modeling System) and published a handbook for RIMS II users (2). In 1992, BEA published a second edition of the handbook, in which the multipliers were based on more recent data and improved methodology. Now, BEA is making available a third edition of the handbook, in response to requests by users for additional discussion of the data that they must provide in order to use RIMS II and of the data sources and methods used for multiplier estimation. The multipliers in the third edition reflect I-O data for 1987, the most recent benchmark year for which BEA's national I-O data are available.

RIMS II is based on an accounting framework called an I-O table. For each industry, an I-O table shows the distribution of the inputs purchased and the outputs sold. A typical I-O table in RIMS II is derived mainly from two data sources: BEA's national I-O table, which shows the input and output structure of nearly 500 U.S. industries, and BEA's regional economic accounts, which are used to adjust the national I-O table in order to reflect a region's industrial structure and trading patterns (3).

Using RIMS II for impact analyses has several advantages (4). RIMS II multipliers can be estimated for any region composed of one or more counties and for any industry or group of industries in the national I-O table. The cost of estimating regional multipliers is relatively low because of the accessibility of the main data sources for RIMS II. According to empirical tests, the estimates based on RIMS II are similar in magnitude to the estimates based on relatively expensive surveys (5).

To effectively use the multipliers for impact analysis, users must provide geographically and industrially detailed information on the initial changes in output, earnings or employment that are associated with the project or program under study. The multipliers can then be used to estimate the total impact of the project or program on regional output, earnings, or employment.

RIMS II is widely used in both the public and private sector. In the public sector, for example, the Department of Defense uses RIMS II to estimate the regional impacts of military base closings, and State departments of transportation use RIMS II to estimate the regional impacts of airport construction and expansion. In the private sector, analysts, consultants, and economic development practitioners use RIMS II to estimate the regional impacts of a variety of projects, such as the development of theme parks and shopping malls.

1. See Daniel H. Garnick, "Differential Regional Multiplier Models," *Journal of Regional Science* 10 (February 1970): 35–47; and Ronald L. Drake, "A Short-Cut to Estimates of Regional Input-Output Multipliers," *International Regional Science Review* 1 (Fall 1976): 1–17.
2. See U.S. Department of Commerce, Bureau of Economic Analysis, *Regional Input-Output Modeling System (RIMS II): Estimation, Evaluation and Application of a Disaggregated Regional Impact Model* (Washington, DC: U.S. Government Printing Office, 1981); and U.S. Department of Commerce, Bureau of Economic Analysis, *Regional Multipliers: A User Handbook for the Regional Input-Output Modeling System (RIMS II)* (Washington, DC: U.S. Government Printing Office, 1986).
3. See U.S. Department of Commerce, Bureau of Economic Analysis, *Benchmark Input-Output Accounts of the United States, 1987* (Washington, DC: U.S. Government Printing Office, 1994); and U.S. Department of Commerce, Bureau of Economic Analysis, *Local Area Personal Income, 1969–92* (Washington, DC: U.S. Government Printing Office, 1994).
4. For a discussion of the limitations of using I-O models in impact analysis, see Daniel M. Otto and Thomas G. Johnson, *Microcomputer-Based Input- Output Modeling* (Boulder, CO: Westview Press, 1993), 28–46.
5. See *Regional Input-Output Modeling System (RIMS II)*, 39–57; and Sharon M. Brucker, Steven E. Hastings, and William R. Latham III, "The Variation of Estimated Impacts from Five Regional Input-Output Models," *International Regional Science Review* 13 (1990): 119–39.

APPENDIX B

RIMS II MULTIPLIERS FOR THE STATE OF COLORADO

Construction Multipliers

Final Demand	2.006	
Output (\$1)	5	Total dollar change in output, all row industries
	0.585	
Earnings (\$1)	2	Total dollar change in earnings, all row industries
*Jobs (\$1M)	14.2	Total change in jobs, all row industries
Direct Effect	2.031	
Earnings (\$1)	9	Total dollar change in earnings per dollar paid to construction earnings
	3.094	
Employment	3	Total change in employment per job in construction

College/University/Professional School Multipliers

Final Demand	2.476	
Output (\$1)	3	Total dollar change in output, all row industries
	0.878	
Earnings(\$1)	1	Total dollar change in earnings, all row industries
*Jobs (\$1M)	35.9	Total change in jobs, all row industries
Direct Effect	1.970	
Earnings \$1)	2	Total dollar change in earnings per dollar paid to higher education earnings
	1.691	
Employment	6	Total change in employment per job in higher education

*Because employment multipliers are based on 2000 regional data and 1999 national data, the output delivered to final demand should be in 2000 dollars.
\$100 in 2006 dollars = \$85.42 in 2000 dollars.

APPENDIX C

COLORADO EMPLOYMENT BY INDUSTRY - 2006

Sector	Nonagricultural Employment	
10	Natural Resources and Mining	20,800
20	Construction	167,700
2023	Heavy Construction	21,600
30	Manufacturing	149,300
3133	Computers/Electronics	28,300
3200	Nondurable Goods	49,700
40	Trade/Transportation/Utilities	419,100
4100	Wholesale Trade	96,200
4200	Retail Trade	248,000
4322	Utilities	8,100
50	Information	75,500
5051	Telecommunications	27,600
5552	Insurance	40,000
5553	Real Estate	35,100
60	Professional/Business Services	331,600
6054	Legal Services	17,400
6561	Educational Services	28,500
70	Leisure and Hospitality	264,700
80	Other Services	90,800
90	Government	367,700
9091	Federal	52,100
9092	State	82,600
	<i>Educational Services</i>	52,200
9093	Local	233,000
	TOTAL NONAGRICULTURAL	2,278,800

Source: CDLE.