

Economic and Fiscal Impact Study: Colorado State University

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Introduction

Colorado State University is one of the nation's leading universities. Each year, thousands of newly minted graduates join the ranks of CSU alumni making important and life-changing contributions in Colorado and around the world. Similarly, CSU researchers and extension specialists widely share their discoveries and knowledge, helping address critical problems affecting society, the environment, businesses and individuals. In short, CSU is an important touchstone for improving the well-being of all Coloradans.

Because of its diverse teaching, research and engagement portfolio, CSU makes significant economic and fiscal contributions to the state of Colorado. In this report we document these impacts in three key areas:

- The impacts of more than 105,000 CSU alumni currently working in Colorado, whose degrees help them earn higher wages than their non college graduate peers.
- The impacts of CSU operational and student spending on the Fort Collins and state economies.
- The impacts of CSU research and innovation, which strengthens a wide range of Colorado businesses and industries.

Of course, CSU's benefits extend well beyond the numbers in this report. Previous research shows that the demand for many public services falls as education increases, and crime rates are lower and community engagement is greater in places with more college graduates. Further, worker satisfaction and financial security are also higher for college graduates. This report does not attempt to quantify these impacts, but they are important outcomes. Additionally, CSU is multi-faceted, with operations throughout the state including CSU Pueblo and CSU experiment stations; this report only looks at the economic impacts stemming from activity related to CSU-Fort Collins.

In this report we look at the impacts of CSU both to the state and the Fort Collins area. Although we present key findings for each of these two geographic areas, it is important to note that they are not additive. This is due to the fact that when looking at state-level economic impacts, it is important to distinguish between new money entering from outside and the reallocation of resources within a state. CSU's economic impact is felt statewide by bringing in money from federal agencies, out-of-state students, and by transferring knowledge to businesses and industries across the state. CSU's economic impact in Fort Collins includes factors considered in the statewide impacts plus money injected into the region from state government and students from other areas of the state.

Key Findings

Colorado Impacts

CSU Alumni

- Nearly 1-in-25 Colorado workers have a CSU degree. The 105,000 CSU alumni currently working in the state earned an estimated \$5.54 billion from their jobs in 2015.
 - We estimate that the “value added” from a CSU degree translates into \$2.2 billion in additional income for college graduates relative to their earnings had they only finished high school.
- At the state level, total alumni worker earnings support more than \$171.6 million in income tax revenue and \$105.3 million in sales, use and excise tax revenue. This represents 2.7 percent of total state tax collections in these categories.

CSU Operations, Out-of-state Student Spending, and Knowledge Integration

- CSU captures more than \$300 million in annual research awards, which translates into innovation that drives technological advances for Colorado businesses.
- CSU has more than 8,000 out of state students currently enrolled that bring new money into the Colorado economy.
 - About 40 percent of alumni originally from somewhere else now work in Colorado, helping grow the state’s talent base.
- We estimate CSU operations and spending by out of state students, coupled with knowledge diffusion, supports about 19,000 jobs in Colorado and \$188.3 million in state income (individual and corporate) and sales tax revenue.

Fort Collins Area Impacts

CSU Operations, Student Spending and Knowledge Integration

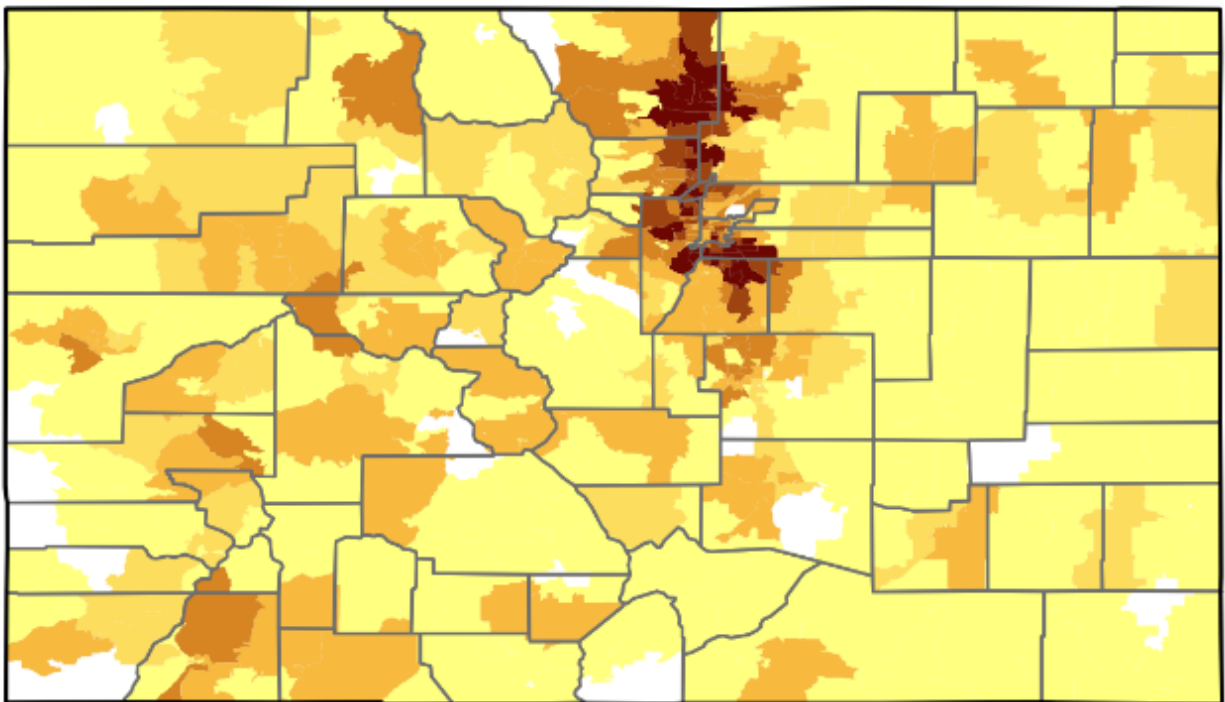
- As home to CSU, the Fort Collins area receives more about \$36 million in local sales and use tax revenues from economic activity related to CSU’s operations, knowledge integration and students. Total direct and indirect city employment impacts are estimated at 16,865. This affect has 3 primary components.
 - CSU directly employs about 7,500 workers, and its payroll exceeds \$550 million.
 - Accounting for multiplier impacts of CSU operational spending, approximately 14,013 jobs supported in Fort Collins.
 - CSU students not originally from Fort Collins spend \$270.4 million dollars a year in the Fort Collins community, which, including multiplier impacts, supports 2,500 jobs and \$5.8 million in local sales and use tax revenue. This represents about 4.3 percent of Fort Collins sales and use tax revenue.

- Business spin-off and increases in regional productivity stemming from CSU translates into an additional 352 jobs and \$13.5 million in household income to the Fort Collins area economy

A 4-Year College Degree Improves Individual Economic Outcomes and Drives Economic Growth

Colorado State is proud to be the state’s *University of Choice*, enrolling and graduating more in-state students than any other Colorado campus. Founded in 1870 as the Colorado Agricultural College, CSU has played an essential role in the state’s development. The first graduating class in 1884 had just 3 students. Today, Colorado State’s Fort Collins campus has an enrollment of more than 27,500 undergraduate, graduate and professional students. Many of these students stay and contribute to the Colorado economy once they graduate. This map shows that Rams can be found residing in every Colorado County.

CSU alumni Colorado residents by zip code



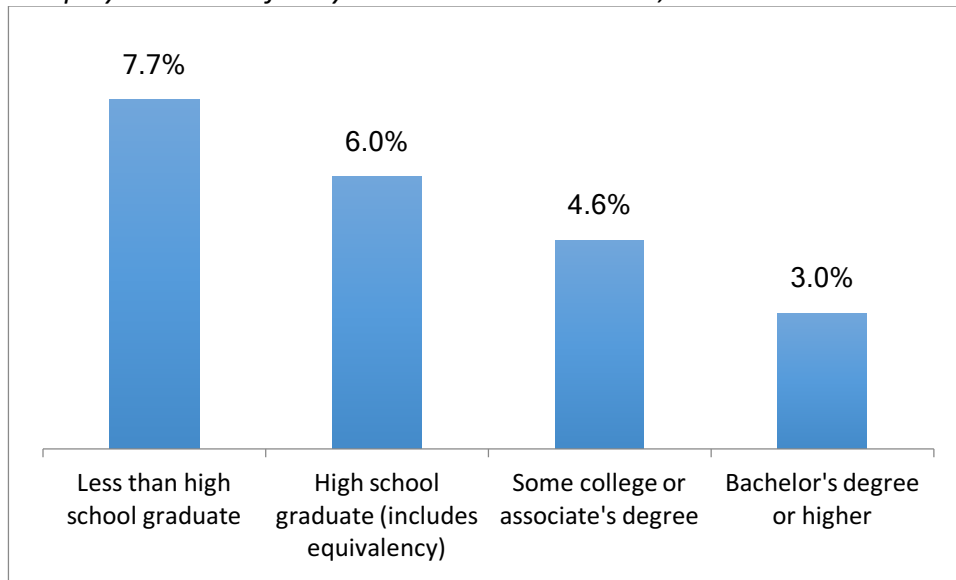
CSU Alumni Colorado Residents



CSU graduates still working in Colorado make important contributions to state and local economies. On average, people with at least a 4-year degree are much less likely to be

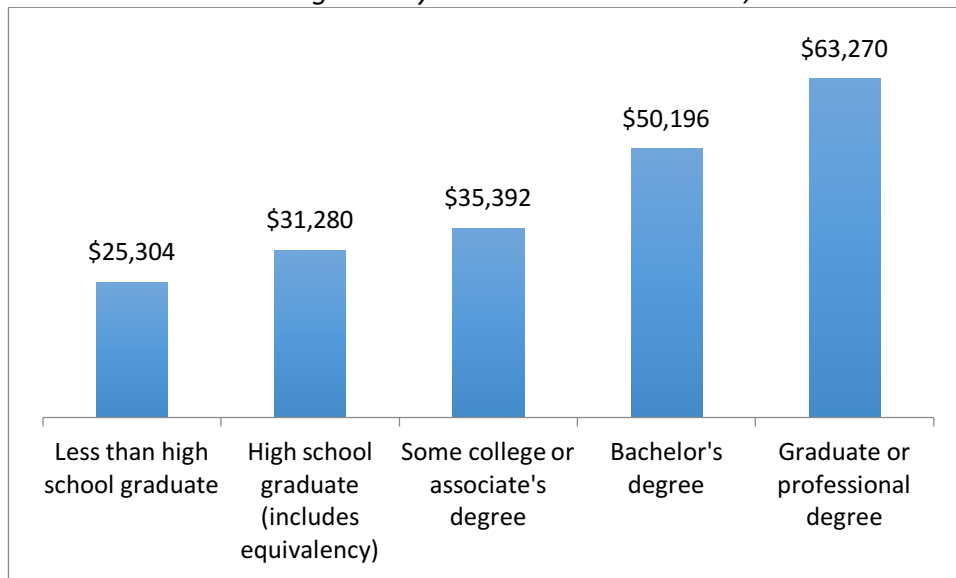
unemployed and tend to earn substantially more money than those with less education. Data from the American Community Survey (ACS) shows that the unemployment rate for 4-year degree holders in Colorado was 3.0 percent in 2015, whereas it was 6.0 percent for those with only a high school degree. Average individual earnings also tend to increase with education. ACS data show that in 2015, median annual earnings for Coloradans 25+ years of age with a 4-year degree only (i.e., those without graduate degrees) were nearly \$52,000. By comparison, median earnings for state residents with a high-school degree only were \$31,280. (The median is the level of earnings at which half of workers make more and half make less.)

Colorado unemployment rates fall by educational attainment, 2015



Source: American Community Survey, US Census Bureau

Colorado median individual earnings rise by educational attainment, 2015



Source: American Community Survey, US Census Bureau Table B2004

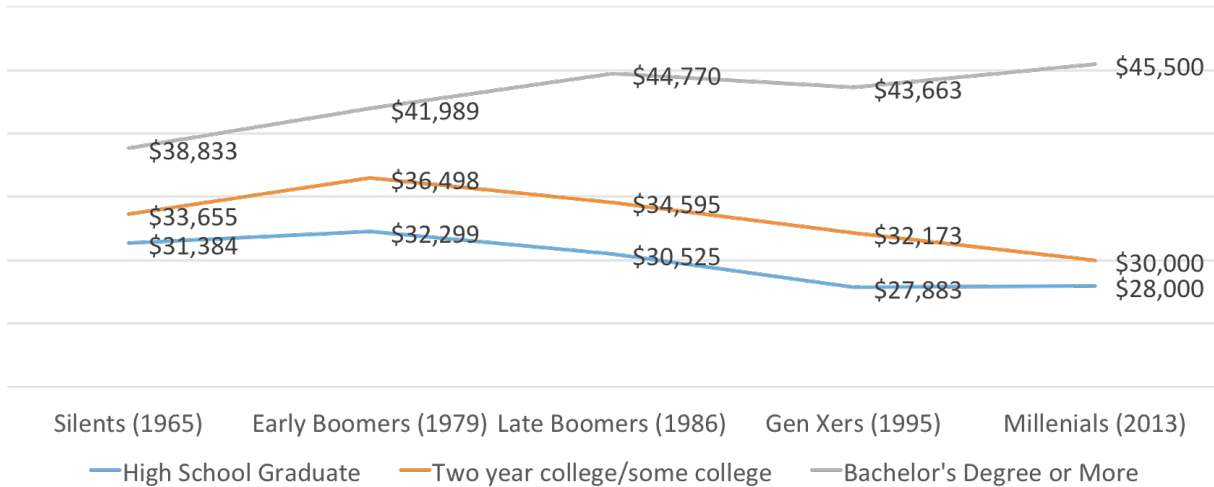
Recent earnings trends also show that upward income mobility is largely influenced by education. A 2014 report by the Pew Research Center documents how education impacts the median earnings of young workers across generations.¹ For Millennials aged between 25 and 32 with a college degree that are working full-time, median earnings in 2013 were \$45,500 compared to \$28,000 for full-time workers in the same age range with just a high school

¹ Pew Research Center. 2014. "The Rising Cost of Not Going to College."
<http://www.pewsocialtrends.org/2014/02/11/the-rising-cost-of-not-going-to-college/>

degree. By comparison, when Early Boomers were between 25 and 32 years old, the inflation-adjusted earnings for full time-workers were \$41,989 for 4-year degree holders and \$32,299 for high school graduates. Here, we see today’s college grads tend to out-earn their parents generation at similar ages, while high school graduates are lagging.

Is a college degree now essential for middle class status?

US median annual earning among full-time workers ages 25-32, in 2012 dollars

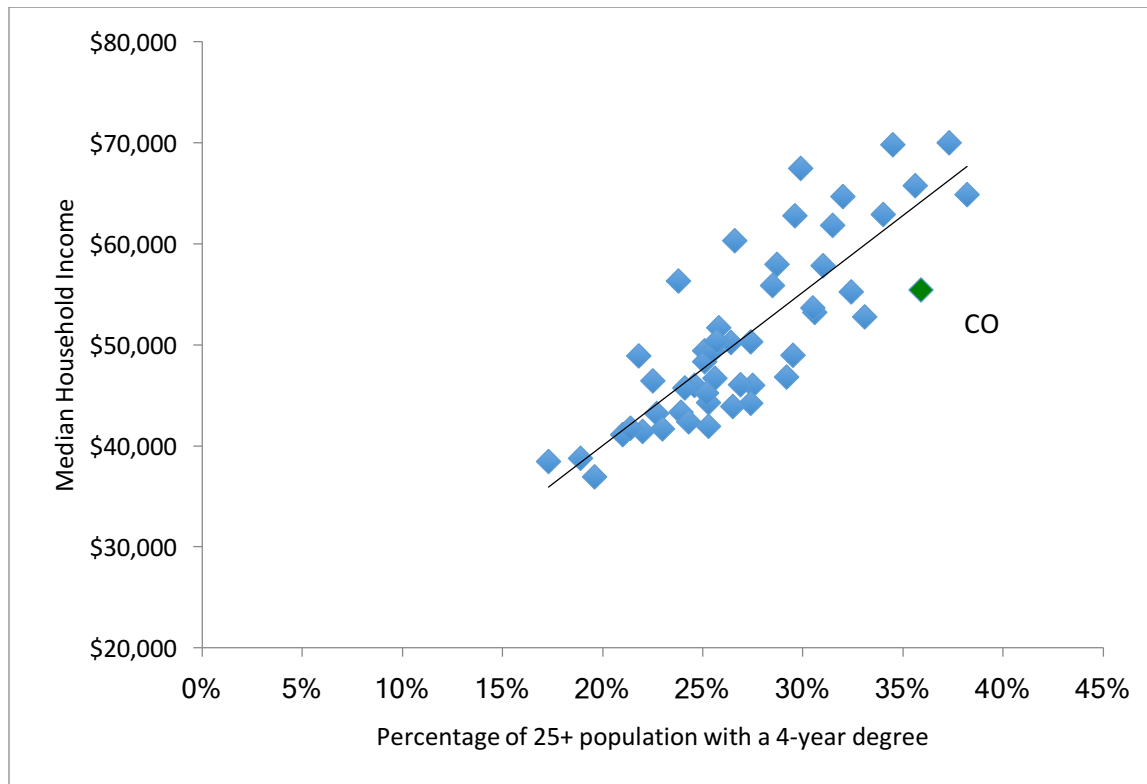


Source: Pew Research Foundation

Higher education is also an important economic growth driver. A recent study by the Kauffman Foundation finds that entrepreneurs are more likely to have a college degree, leading the authors to conclude “education appears to be the most significant factor that the public sector may affect” in terms of facilitating the formation and growth of start-ups.² These growth effects manifest themselves in differences in household incomes. In the following chart we show the relationship between median household income and the percentage of the 25+ population with at least a 4-year college degree for US states in 2013. This chart shows that a 1 percentage point increase in a state’s population with at least a bachelor’s degree is, on average, correlated with more than a \$1,500 increase in the state’s median household income.

² Yasuyuki Motoyama and Jordan Bell-Masterson. 2014. “Beyond Metropolitan Startup Rates: Regional Factors Associated with Startup Growth.” Kauffman Foundation. <http://www.kauffman.org/what-we-do/research/2014/01/beyond-metropolitan-startup-rates-regional-factors-associated-with-startup-growth>

*Median household income is highly correlated with a state's share of college-educated adults:
2013*



Source: Author's calculation using US Census Bureau data

Because higher education tends to significantly increase individual income, it provides important contributions to a variety of dimensions of household well-being. For example, research shows that higher income individuals tend to self-report better physical and mental health. This is evidenced in a 2013 Gallup poll that found “Americans who earn less than \$36,000 annually are nearly three times more likely to be depressed than those who earn more than \$90,000 per year.”³ Better health outcomes are likely correlated with the fact that college degree holders are much more likely to have private health insurance than those without a 4-year degree.⁴ From an economic development perspective, a healthier workforce increases workforce productivity and places fewer demands on publicly funded health programs.

³ Alyssa Brown and Kiley McGeeney. 2013. “In U.S., Employment Most Linked to Being Depression-Free.” Gallup http://www.gallup.com/poll/164090/employment-linked-depression-free.aspx?g_source=mental%20health&g_medium=search&g_campaign=tiles.

⁴ Sandy Baum and Jennifer Ma. 2007. “Education Pays: The Benefits of Higher Education for Individuals and Society.” The College Board. http://www.collegeboard.com/prod_downloads/about/news_info/cbsenior/yr2007/ed-pays-2007.pdf

CSU Alumni Provide Important Economic Benefits Statewide

In addition to better health, higher individual earnings translate into a more vibrant state economy and a larger tax base. For example, as a household's income increases so, too, does their spending on goods and services, supporting jobs and businesses in the supplying sectors. Similarly, state sales and income tax revenues are greater when household incomes rise.

Keeping (and making) Colorado Home Sweet Home

Although most CSU students hail from Colorado, the university draws students from across the US and around the world. Because they drive the knowledge economy and their education represents a significant state investment, retaining creative and talented individuals after graduation is an essential economic development strategy. Alumni records show that CSU graduates tend to stay in the state after finishing their degrees. For example, available zip code data shows that for individuals who graduated in the last 15 years, nearly 2/3 of those that hailed from Colorado are still here. Additionally, the state has managed to keep more than 40 percent of the students that lived somewhere other than Colorado in the year before coming to CSU.

Here we estimate the “value added” effects of a CSU degree. Specifically, we examine how higher worker earnings—attributable to 4-year degree attainment—translate into additional economic activity in Colorado. To examine these “alumni effects,” we use an economic and fiscal impact model we developed expressly for Colorado.⁵

The underlying approach is to estimate the additional employment income earned by individuals because they have a 4-year CSU degree rather than only a high school degree. To estimate 2015 wages and salaries we use the

national *Hamilton Project* dataset that estimates earnings by major for each year of experience.⁶ This is merged with internal data from the CSU Alumni Association for Colorado-based alumni that provides each individual's major and the year that they graduated. We consider only individuals under the age of 65. Together, this gives an estimate of the total employment earnings in the state in 2015 that accrue to CSU alumni (about \$5.54 billion).

However, ascribing all individual income to CSU certainly overestimates the university's impact—most of these folks would be working anyways. Thus, a fair accounting requires looking only at the economic impact attributable to the additional education. To do so we net

⁵ The economic and fiscal impact analysis described in this report is based on computable general equilibrium (CGE) models built specifically for Colorado and Fort Collins. CGE models consider the full spectrum of economic interactions between industries, households and the public sector, and provide information on prices, wages, employment, income distribution and sales and income tax revenues, among other economic indicators. A complete description of the models is available from the authors on request.

⁶ The Hamilton Project is an effort by the Brookings Institution to document the lifetime earnings benefits according to college major. The dataset can be found here: http://www.hamiltonproject.org/charts/career_earnings_by_college_major/.

out estimates of an individual’s earnings had they instead had only a high-school degree (also derived from the Hamilton Project dataset). We further adjust our analysis to recognize that workers with a college degree may differ in important, yet unobservable ways from those without one. This means that the typical college graduate, had they not gone to college, would likely earn more than the typical worker who initially chose not to go to college. To account for this we increase our estimates of what a CSU alumni would earn with only a high school degree by increasing the Hamilton Project’s projected average earnings of high school graduates by 20 percent. All together, we estimate that CSU degree holders currently living in Colorado earn about \$2.2 billion in aggregate more than they would have with only a high school degree. We consider this the economic “value added” of the CSU degree.

To model the overall economic impacts of these higher incomes we introduce the aggregate earnings differences into the Colorado model as increases in household income. The additional money is distributed across 5 labor groups and 7 household income categories in the model and are included in economic impact results reported later in this document.

Colorado State University is one of the State’s Leading Sources of Innovation

CSU’s annual research expenditures total more than \$300 million, leading to new discoveries in a variety of important and diverse sectors including agriculture, engineering, biophysics, veterinary medicine, chemistry, atmospheric sciences, and business. CSU-related activities led to 49 patents being awarded in 2015, and over the past 5 years 200 licensing agreements with industry have been completed and nearly 30 new start-ups have been formed. The following table identifies many of the companies that have built on knowledge created at CSU.

Company	Location	Technology/Products
Heska Corporation	Loveland, CO	Animal Healthcare Products, Diagnostic
Numerica, Inc.	Fort Collins, CO	DOD-Based Mathematical Solutions
Solix Algreredients	Fort Collins, CO	Algae-Based, Natural Ingredients
Envirofit International	Fort Collins, CO	Biomass-Burning Cookstoves
KromaTiD, Inc.	Fort Collins, CO	Human Chromosome Painting
SurgiReal Products, Inc.	Fort Collins, CO	Synthetic tissue for veterinary, medical and nursing students
Carbo Analytics, Inc.	Fort Collins, CO	Sugar Analysis
XUV Lasers, Inc.	Fort Collins, CO	Ultraviolet/Soft X-Ray Lasers
Food Friends, Inc.	Fort Collins, CO	Nutrition Education Products
VetDC	Fort Collins, CO	Develops human technologies for use in Companion Animals
Beken Learning Systems	Fort Collins, CO	Math Education Software Programs
Ridgeline Instruments, Inc.	Fort Collins, CO	Weather Radar Technology
Cetya Therapeutics	Fort Collins, CO	Early-Stage HDAC Inhibitor Company
Endolytics, LLC	Fort Collins, CO	Accelerating Drug Development

JobZology	Fort Collins, CO	People Analytics Software
Access Sensors	Fort Collins, CO	Pollutant Exposure Sensors
MetriChip	Fort Collins, CO	Microchip Embedded Sensor
Growcentia	Fort Collins, CO	Organic Soil Supplements
MicroChemica LLC	Fort Collins, CO	Mass Spectroscopy Instrumentation
Nexus Bioenergy	Superior, CO	Anaerobic Digesters/Organic Fertilizers
Sapien LLC	Fort Collins, CO	Electronic Devices and Embedded Systems
Plasma Controls	Fort Collins, CO	Electron and Plasma Beam Products
SiVEC Biotechnologies	Fort Collins, CO	Development of Antiviral Products
The Fairs App	Fort Collins, CO	Mobile and Online Fair Experience
mAIRsure LLC	Fort Collins, CO	Methane Level Monitoring
Poudre Canyon Therapeutics	Fort Collins, CO	Veterinary Pharmaceutical Therapeutic
CLEAR	Fort Collins, CO	Structured Process for Regenerative Urban Development
Eflux	Fort Collins, CO	Products for Monitoring Soil Gas Flux
Prieto Battery	Fort Collins, CO	Next Generation Li Ion Batteries
Sahti	Fort Collins, CO	Novel Pet Food Using Navy Beans as Protein
OptiEnz Sensors	Fort Collins, CO	Multichannel Monitoring Systems
MonImmune Therapeutics	Fort Collins, CO	Developing Enhanced Immune Response to Vaccines
Diazamed	Fort Collins, CO	Coating for Medical Devices /Implants
Keen Ingredients	Denver, CO	Quinoa Protein Concentrate Technology

CSU is an Important Driver of the Fort Collins and State Economies

As northern Colorado's largest employer, CSU plays an important role in the regional economy. In 2015, the university's budget was more than \$1 billion. Major revenue sources include tuition and fees (\$341 million), research grants and contracts (about \$300 million), auxiliary enterprises (e.g., room and board) (about \$152 million) and state support (about \$119 million).

The university's largest expenditure item is payroll, with about 7,500 workers earning nearly \$550 million. Additionally, CSU spends significant amounts of money in the local and state economy on a wide array of supplies and services, including maintenance.⁷

But CSU's economic footprint is much larger than university operations. The more than 27,500 students attending CSU-Fort Collins spend money on housing, entertainment, food, health care, transportation and a variety of other activities. All of these purchases support additional local employment. Finally, CSU faculty and staff have extensive and deep partnerships with a number

⁷ CSU also spends substantial amounts of money on construction projects. The economic impacts of these projects are not provided in this report, but will be available in a forthcoming analysis.

of local businesses that serve to increase industry productivity and enhance their competitive position in the global economy.

To estimate the effects of university and student expenditures on the regional economy and the “integrative” effects on local productivity we use economic impact models developed specifically for the Fort Collins area economy and the Colorado economy. In this section we describe these impacts in turn, including a brief description of the methodology, a more in-depth description of the methodology is available from the authors upon request.

Impacts of CSU Expenditures on the Fort Collins Area Economy

As noted above, CSU spends more than \$1 billion per year on teaching, research and engagement. About 55 percent of this spending is dedicated to payroll, supporting approximately 7,500 workers. Additionally, the university purchases goods and services from vendors across Colorado, supporting additional jobs. Further, the spending by employees of both the university and the suppliers generates economic activity—this is referred to the “multiplier” effect, as initial spending is “multiplied” into larger total impacts.

The primary impacts we are interested in here are the total employment, income and tax revenue effects supported by CSU spending. To estimate these impacts we use data gleaned from the university’s financial reports, which categorize spending across a variety of categories.⁸ This spending is entered into our model in the appropriate category.

Overall, we find that CSU spending supports 14,013 jobs in the Fort Collins area, both directly and indirectly. Related economic activity provides the city with approximately \$23.2 million in city sales and use tax revenue. This represents about 17.2 percent of total city revenue from these sources.

Impacts of Student Spending on the Fort Collins Area Economy⁹

CSU student expenditures are also substantial, and support local businesses in a wide variety of sectors, including food and beverage, health care, housing and recreation. The model we built for Fort Collins is helpful in translating these purchases into employment, payroll and tax revenues. In order to get a better understanding of the student expenditures, we conducted a survey of all CSU-Fort Collins students, asking them their average local monthly spending on housing, food, recreation and a variety of other goods and services (not including tuition).

Overall, more than 3,000 students responded to the online survey conducted in November 2016. With this information we calculated the “typical” monthly spending per student for each

⁸ CSU Factbook: 2015-2016 http://irpe-reports.colostate.edu/pdf/fbk/1516/FactBook_2015-16_Full.pdf and CSU Greenbook http://www.budgets.colostate.edu/docs/greenbook_fy16.pdf

⁹ A more in-depth discussion and analysis related to student expenditures will be available in a forthcoming analysis.

expenditure category. To estimate annual CSU student spending, we multiplied the monthly spending by 10.5, the average number of months a student is in Fort Collins each year. These annual per student expenditures were then multiplied by the total number of CSU-Fort Collins resident students (27,556) to determine total expenditures (\$270.4 million), and entered as a change in demand in our economic impact model. Given that about 4,500 students at CSU hail from Fort Collins, we adjusted our model to include only expenditures of students originally living outside of the city, as they are considered sources of “new” economic activity in the Fort Collins economy.

Using our Fort Collins model, we find that CSU student spending supports approximately 2,500 jobs in the Fort Collins economy beyond campus and \$5.5 million in local sales and use tax revenue.¹⁰

Colorado Impacts

Impacts of CSU and Student Spending on the Colorado Economy

CSU’s statewide impacts differ somewhat from its local impacts. As demonstrated above, the university has alumni working and living across Colorado. Similarly, CSU extension is actively involved in every county, and faculty and staff work closely with industries and communities statewide. In this section we expand the analysis in the previous section to quantify these larger operations and productivity impacts.

In economic impact analysis, it is important to distinguish between new economic activity and that which is merely reallocated. In general, economic growth is largely dependent on new money coming into the economy. In the Fort Collins analysis, we considered money new to the city, which includes not only out of state students, but also students that call other parts of Colorado home, and state government support. When looking at CSU’s impacts in all of Colorado, however, we must acknowledge that student expenditures in Fort Collins often come at the expense of other places, and that taxpayers from across the state provide support to the university. In a sense, while Fort Collins may gain, other places in the state see less spending.

¹⁰ County and school district property taxes paid are an additional fiscal contribution made by homeowners, renters and business owners that benefit from economic activity generated by CSU related expenditures. Although substantial, modeling complexities mean these impacts are not estimated here.

Like the Fort Collins area analysis, we use CSU budget data to determine the economic and fiscal impacts of CSU spending. However, we exclude spending that is based on monies provided by in-state actors, such as in-state student spending on tuition, fees and room and board and state assistance to the university. We do, however, include local spending estimates from out-of-state students. After accounting for just new economic activity we estimate that CSU supports around 19,000 jobs in Colorado and \$188.3 million in state income (individual and corporate) and sales tax revenue. This represents about 2/3 of one percent of total state employment, and about 1.7 percent of state revenue in these categories.

Impacts of Knowledge Integration, CSU Start-ups, Licensing and Patents

Economic research suggests that universities have important impacts on regional economic performance beyond their own spending and that of their students. In particular, research universities are shown to be an important source of “knowledge spillovers.” This is the idea that businesses and organizations are more productive when they have access to the university’s expertise, both directly and indirectly. For example, CSU faculty and staff work closely with a variety of industry clusters in Fort Collins, providing valuable ideas and feedback that assist businesses taking their own ideas and products to market.

Colorado is immersed in a fiercely competitive global economy. In such an environment, research, ideas, creativity and knowledge are essential components for success. To enhance state-level productivity, and subsequently economic activity, CSU provides research and innovation expertise to businesses across the state through a variety of channels, including new technologies, patents and licensing, industry partnerships and an ever-deepening knowledge pool. An important outcome of this work is increased productivity for Colorado businesses, allowing them to establish world-renowned efficiency advantages that keep Colorado competitive.

Drawing on the extensive body of empirical work done on the impact of research at universities in terms of stimulating economic growth, this analysis (conservatively) assumes that CSU research results in a 0.2 percent increase in productivity for firms in Colorado. This level of productivity effect equates to 10,425 jobs and \$676 million in household income annually. This translates into \$34 million in additional state tax revenue. If we assume that businesses in Fort Collins are 0.2 percent more productive due to the presence of CSU, all else equal then the productivity increase translates into 352 jobs, and \$13.5 million in household income to the Fort Collins area economy.

Summary and Conclusions

This report describes the substantial economic contributions the Colorado State University makes to the state and Fort Collins economies. Simply put, CSU is one of the state’s most important economic growth engines and a cornerstone of Colorado’s economic future. The importance of CSU’s statewide economic impacts can be seen in its support of 19,000 jobs and

\$188.3 million in state income and sales taxes. CSU alumni live in every county in Colorado and, because of their education, they earn significantly more relative to their earnings had they only finished high school (about \$2.2 billion in “value added”).

It is important to note that this report does not quantify the impacts of CSU’s capital spending. Currently, the university is in the middle of a variety of construction projects, totaling more than \$--- in new facility spending, including new laboratories, classrooms, residence halls and sports facilities. More in depth research into the economic impacts stemming from these expenditures, as well as a more through analysis of student expenditures, are currently underway, and will give more in-depth insights into the economic impact of these activities.