# The Statewide Economic Impact of the University of New Mexico

August 2018

THE UNIVERSITY OF NEW MEXICO

Ex. 2005 - IPR2021-00734
ZyXEL Communications Corp. v. UNM Rainforest Innovations

## Acknowledgements

This report would not have been possible without the financial support of New Mexico Gas Company, an Emera Company. I am grateful also to the UNM Economic Development Council, Lisa Kuuttila and Cara Michaliszyn of STC.UNM, and the many UNM employees who provided data critical to this analysis including Ellen Peterson at the UNM Foundation, UNM Budget Officer Regina Dominguez, Ella B. Watt, Chief Financial Officer at University of New Mexico Hospital, and Justin Walters of the Office of the UNM Vice President for Research.

**Report Prepared by Kelly O'Donnell, PhD**

*For questions about the Statewide Economic Impact of the University of New Mexico, please contact Kelly O'Donnell at kodonnell@unm.edu.*

STC.UNM
SUPPORTING TECHNOLOGY TRANSFER AND CATALYZING ECONOMIC DEVELOPMENT AT THE UNIVERSITY OF NEW MEXICO

SCHOOL OF PUBLIC ADMINISTRATION

## TABLE OF CONTENTS

EXECUTIVE SUMMARY ..... II

INTRODUCTION ..... 1

UNM BACKGROUND ..... 1

ECONOMIC IMPACT ..... 1

I-O MODELING WITH IMPLAN® ..... 2
UNIVERSITY OPERATIONS ..... 3
STUDENT EXPENDITURES ..... 7
ALUMNI HUMAN CAPITAL ..... 8
ENTREPRENEURSHIP AND INNOVATION ..... 13
*TECHNOLOGY TRANSFER* ..... 14
*INNOVATION ECOSYSTEM* ..... 16

STUDY LIMITATIONS ..... 18

CONCLUSION ..... 19

END NOTES ..... 20

## EXECUTIVE SUMMARY

The University of New Mexico (UNM) has a profound, positive effect on the New Mexico economy. Composed of the Albuquerque main campus and Health Sciences Center, as well as branch campuses in Taos, Valencia County, Los Alamos, and Gallup, UNM enhances workforce productivity and drives economic growth statewide.

UNM's quantifiable economic impact has four major components: university operations, student expenditures, alumni human capital, and technology transfer. Together these components account for an estimated 24,985 jobs, $3.5 billion in annual employee compensation, and $3.1 billion in economic output.

UNM's operational expenditures totaled $2.2 billion in 2017. UNM employs 16,388 faculty and staff, spending roughly $1.4 billion per year on wages, salaries, and benefits. Annual non-labor operational expenditures total $833 million.

Over 50 percent of UNM's purchases are made from New Mexico vendors. Spending by UNM generates a positive economic impact for New Mexico when funds originating outside New Mexico are spent in New Mexico. Roughly 47 percent of UNM operational spending, about $1.1 billion, meets both these criteria. As these expenditures move through the New Mexico economy, they stimulate additional economic activity resulting in further increases in employment, wages, and productivity. When these multiplier effects are accounted for, the total economic impact of UNM operations is 16,401 jobs, $876 million in labor income, and $2.1 billion in economic output.

Over 26,000 full and part-time students attend UNM. Eighty-three percent of students enrolled during the 2016-2017 school year were New Mexico residents. Spending by the school's 4,485 non-resident students totaled $53.5 million, supporting 822 full and part-time jobs, $21.2 million in labor income, and $78.6 million in economic output.

As the state's flagship university and home to New Mexico's only law and medical schools, UNM provides state businesses and institutions with a highly skilled professional workforce and serves as the training ground for New Mexico's political, business, and community leaders. Over 100,000 UNM alumni currently reside in New Mexico. The education they obtained at UNM enhances their economic productivity and increases their earning capacity. In 2017, UNM graduates earned roughly $2.3 billion more than they would have had they not gone to college. Over 40 percent of these funds were reinvested in the New Mexico economy as purchases from local businesses and institutions, resulting in a total economic impact of $933 million.

UNM faculty, staff, and students conduct cutting-edge research across a spectrum of disciplines, attracting over $300 million in contract and grant funding in 2017. UNM's technology-transfer and economic-development organization, STC.UNM, fosters innovation and entrepreneurship by helping UNM researchers commercialize their inventions. In 2017, New Mexico based start-ups affiliated with STC.UNM employed roughly 247 New Mexicans, paid an estimated $19.1 million in wages and salaries and generated $32.2 million in total output. The additional economic activity stimulated by these

new firms resulted in a total of 448 additional jobs, $28 million in labor income and $56.1million in new economic output.

The analysis presented here captures UNM's quantifiable contribution to the New Mexico economy, but it is not a comprehensive inventory of all the ways in which UNM supports economic growth and prosperity. Entities throughout UNM help make New Mexico a good place to live, work, and do business through a vast array of initiatives including internships, community engagement, support for the disadvantaged and disenfranchised, civic engagement, and expanded access to arts and culture, to name just a few. Societal benefits of education include improvements in health outcomes, enhanced social cohesion, increased civic engagement, and lower crime rates.

## INTRODUCTION

The University of New Mexico (UNM) has a profound, positive effect on the New Mexico economy. Composed of the main campus and Health Sciences Center, both in Albuquerque, as well as branch campuses in Taos, Valencia County, Los Alamos, and Gallup, UNM enhances workforce productivity, improves quality of life, stimulates innovation, and drives economic growth statewide. This report quantifies, to the greatest extent possible, UNM's impact on the New Mexico economy in 2017.

This report is not directly comparable to earlier studies of UNM's economic impact conducted by the UNM Bureau of Business and Economic Research in 2004 and 2011 or to studies of NMSU's economic impact conducted in 2004 and 2010. These studies, although similar, differ in a variety of ways, including the types of economic impacts estimated, the time period(s) assessed, the models and data sources used, and some underlying assumptions.

## UNM BACKGROUND

With over 16,000 faculty and staff and $1.3 billion in payroll expenditures, UNM is one of New Mexico's major employers.

*Table 1: UNM Employment, All Campuses, 2017**

| | Staff | Faculty | Total |
|---|---|---|---|
| Main | 3,501 | 1,636 | 5,137 |
| HSC | 2,469 | 1,306 | 3,775 |
| Gallup | 112 | 120 | 232 |
| Los Alamos | 60 | 66 | 126 |
| Taos | 110 | 95 | 205 |
| Valencia | 159 | 91 | 250 |
| UNM Hospitals | 6,112 | 0 | 6,112 |
| UNM Medical Group | 551 | 0 | 551 |
| Total | 13,074 | 3,314 | 16,388 |

*Includes temporary and part-time employees

Sources: UNM Office of Institutional Analytics, UNM Medical Group 2017 Audit, and UNM Hospitals 2017 Audit

## ECONOMIC IMPACT

UNM's quantifiable economic impact has four major components: university operations, student expenditures, alumni productivity, and technology transfer. Together these components account for 24,985 jobs, $3.5 billion in annual labor income, and $3.1 billion in economic output. Each component of economic impact is addressed separately in the following sections. Each impact estimate employs

a different methodology, although all rely, to some degree, on Input-Output (I-O) analysis utilizing the IMPLAN® modeling system. Specific data and methodologies are described in the individual sections.

*Table 2: UNM Economic Impact, Summary Results ($ millions)*

| | Employment | Labor Income | Output |
|---|---|---|---|
| UNM Operations | 16,402 | $876 | $2,073 |
| Student Spending | 821 | $21 | $79 |
| Alumni Income | 7,313 | $2,596 | $933 |
| Tech Transfer | 448 | $28 | $56 |
| Total | 24,985 | $3,521 | $3,140 |

## I-O Modeling with IMPLAN®

The IMPLAN® Online modeling system was used to estimate the impact of UNM operations on the New Mexico economy. IMPLAN® is a widely used software package and database for estimating local economic impacts[1] using input-output (I-O) analysis.

I-O analysis is based on the premise that regional economies are composed of interconnected households, industries, and institutions. These sectors purchase output from each other and supply inputs to each other in a complex web of interdependencies. A significant change to one sector will therefore impact the many other sectors to which it is connected.

In an I-O model, the initial economic change is called the "direct" effect. As the initial change travels outward through the regional economy it produces "indirect" and "induced" effects. Multipliers represent the mathematical relationship between the initial change in one sector of the economy and the changes in employment, income, and productivity it catalyzes in other sectors.

> Direct effects represent the initial change to the industry in question.
> Indirect effects result when the industries that supply the industry in question respond to the change in demand.
> Induced effects reflect changes in local spending that result from income changes in the directly and indirectly affected industry sectors.

In this report, economic impact is estimated using an export-base methodology wherein only expenditures funded with revenue originating outside the state are considered to have a net positive impact on the state economy. As such, revenue from state and local appropriations is assumed to have a no net impact on the state economy because, if not appropriated to UNM, it would likely be spent elsewhere in New Mexico, by government or by taxpayers, and generate comparable benefits. Conversely, federal revenue is considered to originate entirely out-of-state.

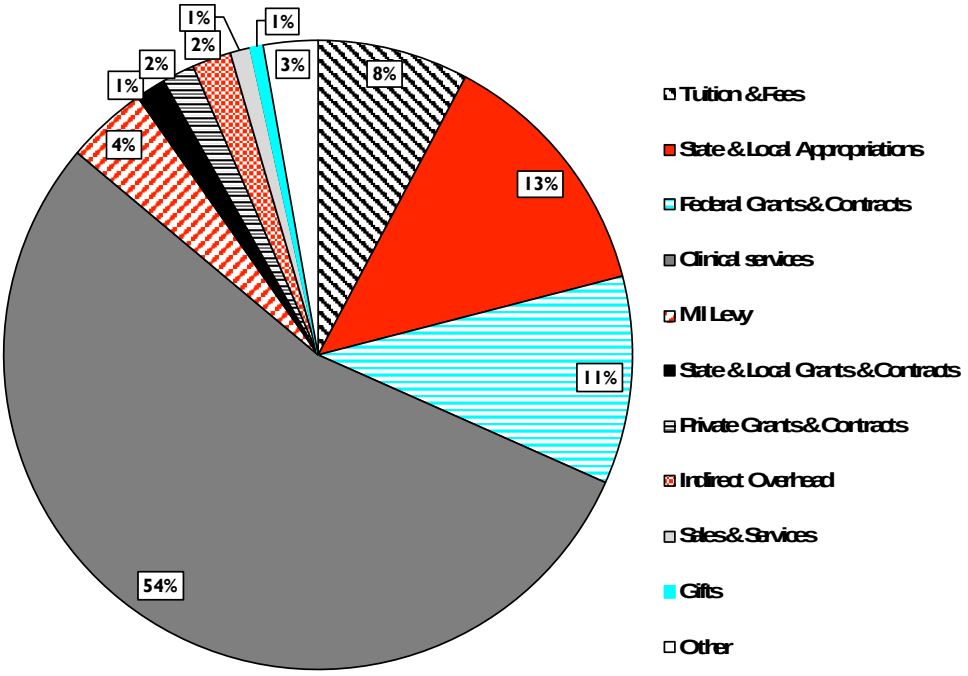
In order to generate a positive economic impact, revenue derived from external sources must also be spent in New Mexico. UNM expenditures of federal funds and other out-of-state revenue on employee compensation, locally produced goods and services, and construction therefore generate direct economic impact. Indirect impacts are the jobs and economic activity created by businesses in UNM's supply chain when they produce goods and services for UNM. Induced impacts result when employees of UNM and its suppliers use their wages and salaries to purchase goods and services in the regional economy.

The output of the IMPLAN® model is expressed in employment, labor income, and output. Employment includes all full-time, part-time, and temporary jobs created by or as a result of the event in question. Labor income includes all forms of employment compensation including employee wages, salaries, and benefits as well as proprietor income. Output is a measure of total sales or receipts and other operating income, plus inventory change. It is the sum of the final purchases and intermediate inputs.

## University Operations

In FY 2017, UNM made operational expenditures totaling $2.2 billion. As noted earlier, university operations have a net positive impact on the New Mexico economy when they are funded by revenue that originates outside the state. Forty-seven percent of UNM's annual revenue, about $1.1 billion, comes from out-of-state sources including tuition and fees paid by non-residents, federal grants, and payments by Medicare and Medicaid for clinical services provided by UNM Hospital and UNM Medical Group.

Figure 1: UNM 2017 Revenue by Source




Source: University of New Mexico - Consolidated Total Operations Current Funds. Statements of Revenues, Expenses and Changes in Net Position for the twelve month ended June 30, 2017

### *1.1 Revenue*

Patient revenue from UNM Hospitals and Medical Group made up the single largest share of UNM's revenue in 2017 (55%). State and local appropriations constituted 13 percent of revenue, the second largest share.

Figure 1 shows 2017 UNM revenue by source. Payments from Medicare and Medicaid make up two-thirds of patient revenue from UNM Hospitals and Medical Group. Medicare is 100 percent federally funded and funding for New Mexico Medicaid is split between the federal and state governments at an average rate of roughly 80:20. Thus, the majority of revenue from clinical services originates outside New Mexico.

Tuition and fees, including scholarships and grants, constituted 7.8 percent of UNM's 2017 revenue. That year, 17 percent of UNM students were non-residents. Although non-resident tuition rates are considerably higher than in-state rates, a large percentage of non-residents pay in-state tuition, thus, the number of non-resident full-time students was used to determine the out-of-state share of tuition and fees.

The UNM Foundation generated gift revenue of $15.5 million in 2017. Eighteen percent of gifts were made by parties located outside of New Mexico.

Table 3 shows UNM operations revenue and the share of revenue derived from out-of-state sources. Overall, 47 percent of UNM's 2017 operating revenue was derived from sources outside New Mexico. When spent in New Mexico, this external revenue produces a direct economic impact.

*Table 3: UNM 2017 Operating Revenue ($ millions)*

| | Revenue | Percent From a Source Outside NM | Direct Impact Revenue |
|---|---|---|---|
| Tuition & Fees | $180.0 | 17% | $30.6 |
| State & Local | $306.3 | 0% | $0.0 |
| Federal Grants & Contracts | $247.7 | 100% | $247.7 |
| Clinical services | $1,262.6 | 57% | $719.7 |
| Mil Levy | $96.6 | 0% | $0.0 |
| State & Local Grants & | $36.0 | 0% | $0.0 |
| Private Grants & Contracts | $38.4 | 86% | $33.0 |
| Gifts | $15.5 | 18% | $2.8 |
| Other | $135.6 | 48% | $65.1 |
| Total | $2,318.7 | 47% | $1,089.8 |

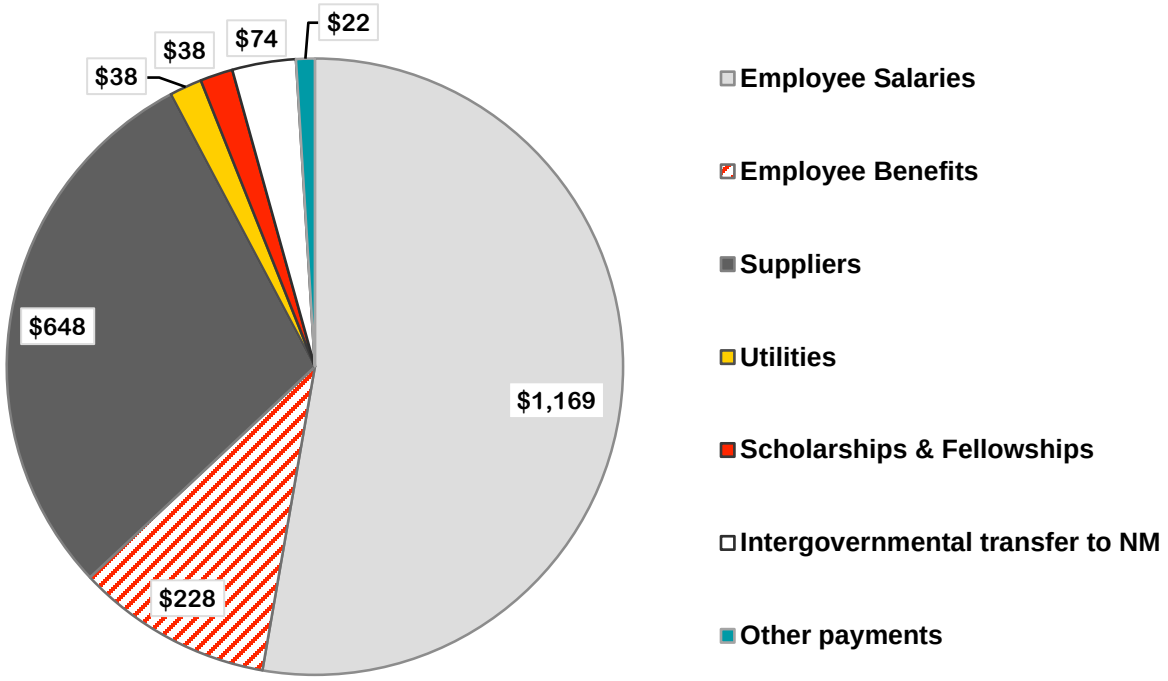
Note: Bond proceeds are not included in revenue. Medicare and Medicaid payments are included in "Clinical Services" and excluded from "Federal Grants & Contracts."

Source: University of New Mexico - Consolidated Total Operations Current Funds. Statements of Revenues, Expenses and Changes in Net Position for the twelve month ended June 30, 2017 and author calculations

### *1.2 Expenditure*

UNM's 2017 operational expenditures totaled $2.2 billion. Employee compensation and benefits accounted for majority of expenditures. In addition to educational services, UNM's expenditures support the provision of research and development services, student services such as the Student Health Center and recreational facilities, and auxiliary operations, such as book stores, residence halls, and cafeterias.

Figure 2: 2017 UNM Operations Spending




Source: University of New Mexico - Consolidated Total Operations Current Funds. Statements of Revenues, Expenses and Changes in Net Position for the twelve month ended June 30, 2017

Table 4 shows the spending used to calculate the economic impact of UNM operations by functional expense categories. Clinical operations account for the largest single share of expenditures. Clinical operations include all the patient care activities of the HSC campus, including the UNM Hospitals, School of Medicine physician professional services, Cancer Center operations and medical residents who are being trained in the UNM hospitals. The next largest category of expenditures are those related to general academic instruction. Sponsored programs - research, instruction or public service projects involving funding from an outside source under a legal agreement - account for 17 percent of UNM expenditures. Sponsored projects are a significant source of research funding for both the HSC and main campus. Public Service includes expenses for activities established primarily to provide community services and other non-instructional services beneficial to individuals and groups external to UNM, such as conferences, institutes, reference bureaus, and public broadcasting services.

***Table 4: UNM 2017 Expenditures by Functional Expense Category ($ millions)***

| Expenditures | Employee Compensation | All Other Spending | Total |
|---|---|---|---|
| Instruction & General | $382.1 | $83.5 | $465.6 |
| Public Service | $17.7 | $21.1 | $38.8 |
| Sponsored Programs* | $169.3 | $199.9 | $369.1 |
| Clinical Operations | $768.3 | $586.3 | $1,354.6 |
| Total | $1,337.3 | $890.8 | $2,228.1 |

*Includes research expenditures of facilities and administration (F&A) revenue

## *1.3 Methodology*

The economic impact of UNM operations was measured by inputting the share of UNM's 2017 spending that occurred in New Mexico and was funded by external sources into a model of the New Mexico economy and observing the effect those expenditures had on households, institutions, and industry.

IMPLAN® was used to create the model of the New Mexico economy. In order to accurately capture the interplay between UNM expenditures and other components of the state economy, UNM spending was distributed across the corresponding industrial sectors within the IMPLAN® model. This allocation process linked UNM's expenditures to the economic multipliers specific to the particular industrial activity.

## *1.4 Results*

UNM's 2017 operational expenditures contributed $2.1 billion in economic output and supported 16,402 full time, part-time, and temporary jobs providing $876 million in income to New Mexico workers. Consistent with the export-base methodology described earlier, only expenditures made in New Mexico with funds originating outside New Mexico are counted in the estimation of UNM's economic impact. Employee compensation and construction spending are counted as 100 percent in-state, while payments for goods and services supplied by out-of-state vendors are excluded. Depreciation and debt service payments are also excluded.

*Table 5: Economic Impact of University Operations ($ millions)*

| Impact Type | Employment | Labor Income | Output |
|---|---|---|---|
| Direct Effect | 9,598 | $614.1 | $1,197.4 |
| Indirect Effect | 2,687 | $109.8 | $349.2 |
| Induced Effect | 4,117 | $152.0 | $525.8 |
| Total Effect | 16,402 | $876.0 | $2,072.5 |

## Student Expenditures

Over 26,000 full and part-time students attend UNM. Eighty-three percent of students enrolled during the 2016-2017 school year were New Mexico residents. Spending by the school's 4,485 non-resident students totaled $53.5 million, supporting 821 full and part-time jobs, $21.2 million in labor income, and $78.5 million in economic output.

### *2.1 Data*

Students from outside New Mexico made up 17 percent of UNM's 2017 full-time student body. Spending by students who have temporarily moved to New Mexico to attend UNM has a positive impact on the New Mexico economy. Conversely, spending by students who lived in New Mexico prior to attending UNM does not count toward net economic impact because it is likely that, in the absence of UNM, those expenditures would still be made in New Mexico.

Table 6 shows estimated annual expenditures by traditional, full-time UNM students. It is important to note that the values for tuition and fees assume no financial aid. Most UNM students have some form of financial aid and thus average actual expenditures for both tuition and fees for both resident and non-resident students are considerably lower than those presented in the table.

*Table 6: 2017 Estimated Average UNM Student Costs*

| Estimated Costs Full-Time | Resident | Non-Resident |
|---|---|---|
| Tuition & Fees | $7,146 | $22,037 |
| Room & Board - Traditional | $9,662 | $9,662 |
| Books & Supplies | $1,102 | $1,102 |
| Transportation | $1,854 | $1,854 |
| Miscellaneous | $2,080 | $2,080 |
| Total | $21,844 | $36,735 |

Source: UNM Office of Admissions. https://admissions.unm.edu/costs-financial-aid/index.html

### *2.2 Methodology*

To estimate the economic impact of non-resident student expenditures, the number of out-of-state and international students is multiplied by an estimate of per capita student expenditures. To avoid double counting, tuition, fees and student spending at establishments owned or operated by the university such as the bookstore and residence halls are excluded from estimated student expenditures. Similarly, an estimate of income earned by non-resident students employed by UNM is also subtracted from non-resident student expenditures because these funds have already been included in university operational spending. Student spending, net of tuition and fees, is assumed to average $14,686 annually, or $65.9 million for 4,485 non-resident students. Subtracting 17 percent of UNM revenue from housing ($2.1 million), food ($387,000), and bookstores ($2.6 million) and 17 percent of salaries paid to UNM student employees ($7.2 million) yields $53.5 million in net

non-resident student spending. This amount is distributed across the corresponding IMPLAN® industrial sectors (Table 7). For retail purchases (books, supplies, some food, and "miscellaneous") only the retail margin (47%) is counted as an in-state expenditure.

*Table 7: 2016-2017 Net UNM Non-Resident Student Spending ($million)*

| | |
|---|---|
| Housing | $19.3 |
| Food | $16.6 |
| Books & Supplies | $2.1 |
| Transportation | $7.3 |
| Miscellaneous | $8.2 |
| Total | $53.5 |

Source: Author calculations and UNM Office of Admissions

### *2.3 Results*

Model results are shown in Table 8. In 2017, spending by non-resident UNM students supported 822 full and part-time jobs, $21.2 million in labor income, and $78.6 million in economic output.

*Table 8: Economic Impact of Student Expenditure ($ millions)*

| Impact Type | Employment | Labor Income | Output |
|---|---|---|---|
| Direct Effect | 627 | $14.0 | $52.5 |
| Indirect Effect | 95 | $3.5 | $13.4 |
| Induced Effect | 100 | $3.7 | $12.7 |
| Total Effect | 822 | $21.2 | $78.6 |

## Alumni Human Capital

Education is an investment in human capital and human capital powers economic growth. UNM graduates who stay in New Mexico contribute to the state economy by enhancing the productivity of New Mexico's workforce and increasing the productivity of New Mexico's capital stock. Increased labor productivity translates into higher earnings for UNM alumni and more productive capital translates into higher income for businesses that employ UNM alumni.

There is a strong and well-documented relationship between higher levels of educational attainment and higher earnings.[2] Studies have also shown that that the impact of a college education on earnings is roughly equivalent to the earnings differential that exists between college-educated and high school-educated workers.[3] Higher-income households also spend more on goods and services than less prosperous households.[4] Because higher income is correlated with educational attainment, the local economic impact of the increased human capital attributable to a UNM

education can be measured by comparing spending on locally produced goods and services by college-educated New Mexicans to spending on locally produced goods and services by New Mexico adults with just a high school diploma.

### *3.1 Data*

UNM has just over 184,000 living alumni. Fifty-eight percent, or about 107,000 alums, have a New Mexico home address.[5] The economic impact estimate presented here assumes a 40-year working life and thus considers only alumni who graduated in 1977 or later. Over 93,200 of the UNM alumni currently residing in New Mexico graduated between 1977 and 2017.

Table 9 shows average 2016 income by educational attainment for New Mexico workforce participants ages 25 through 64, the difference between average income at each level of educational attainment, the average income of adults with just a high school diploma, and the present value of the income differential between high school and college graduates over a 40-year career.

In 2016, a New Mexico worker with no education beyond a regular high school diploma had average income of $34,023. Bachelor's degree holders, by contrast, had average income of $55,374, a difference of $21,351, or 63 percent.[6] Over 40 years of employment, the increment to income resulting from a bachelor's degree would total $854,040 and have a present value of $493,533.[a] The present value of the lifetime incremental income from a doctoral or professional degree is roughly $1.9 million (Table 9).

*Table 9: Income by Educational Attainment, New Mexico Labor Force Participants Ages 25 through 64, 2016*

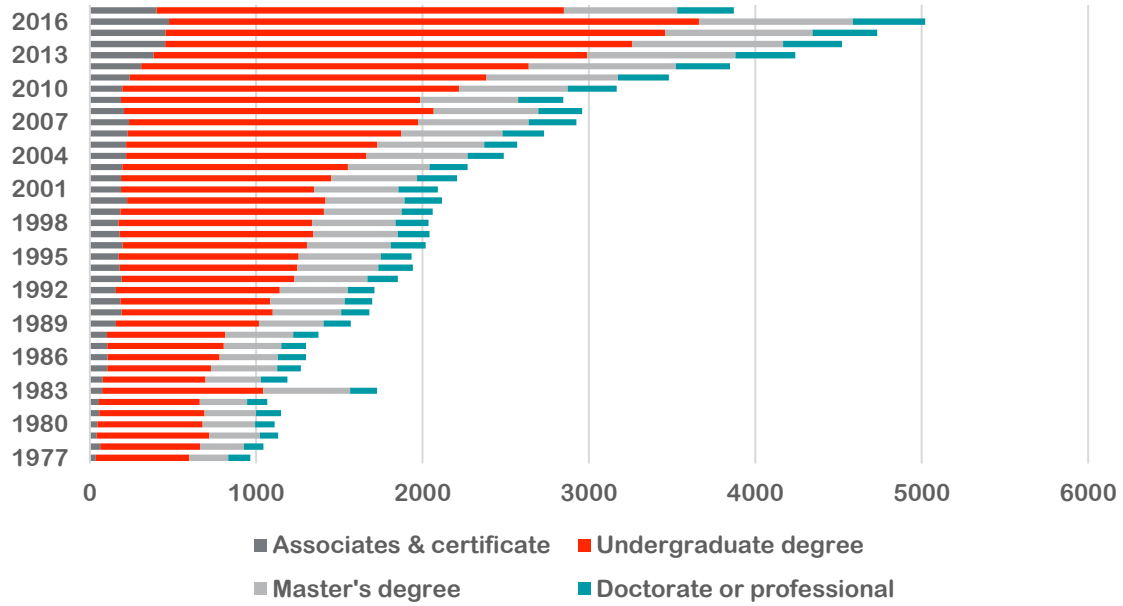
| | Average Annual Income | Incremental Income from Additional Education | |
|---|---|---|---|
| | | Income Differential | Present Value Over a 40-Year Career. |
| Regular high school diploma | $34,023 | -- | -- |
| Some college, but <1 year | $36,751 | $2,728 | $63,057 |
| 1+ years of college, no degree | $38,456 | $4,433 | $102,468 |
| Associate's degree | $41,778 | $7,755 | $179,255 |
| Bachelor's degree | $55,374 | $21,351 | $493,523 |
| Master's degree | $71,805 | $37,782 | $873,322 |
| Professional degree beyond BA | $127,013 | $92,990 | $2.1 MM |
| Doctoral degree | $118,224 | $84,201 | $1.9 MM |

Source: Author calculations from 2016 American Community Survey New Mexico 5 Year Public Use Micro-Sample

[a] Assumes a 3 percent annual discount rate.

Figure 3 shows UNM alumni with a 2017 New Mexico address by highest degree attained and graduation year.

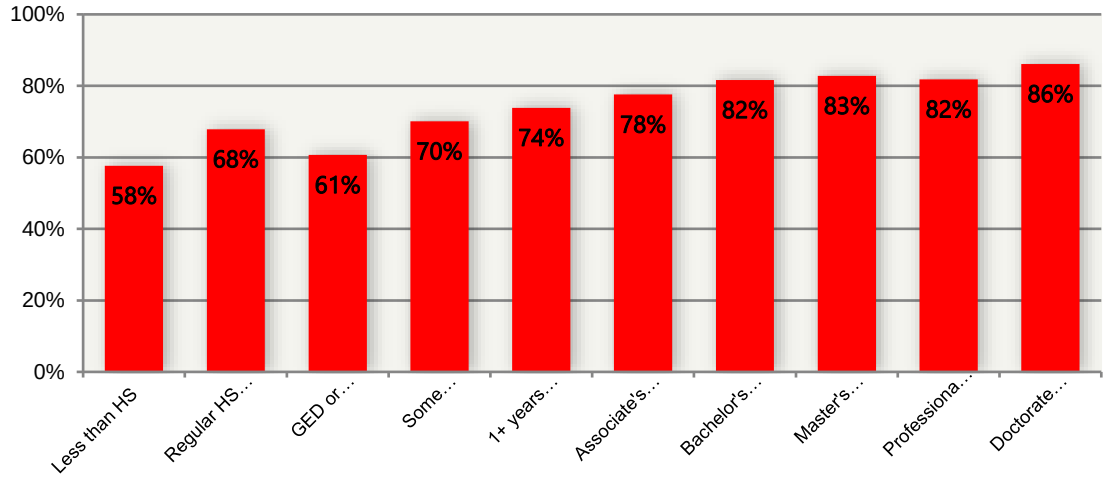
Figure 3: UNM Alumni Residing in New Mexico by Highest Degree and Year of Graduation




Source: UNM Office of Institutional Analytics
Note: 2016 data may be incomplete

College graduates are more likely than non-graduates to participate in the labor force.[7] Figure 4 shows 2016 labor force participation rates for New Mexicans ages 25 through 64 by highest level of education. Eighty-two percent of bachelor's degree holders are in the labor force, compared to 68 percent of New Mexicans with a regular high school diploma and 58 percent of New Mexicans who did not finish high school.

Figure 4: Labor Force Participation Rates: New Mexicans 25 through 64, by Educational Attainment, 2016




Source: US Census. 2016 American Community Survey

Each year, UNM alumni earn roughly $2.3 billion more than they would with just a high school diploma (Table 10).

*Table 10: NM Residents Awarded a UNM Degree Between 1977 and 2016: Income Increase from Higher Education*

| Highest degree attained | UNM Alumni | Alumni Workforce Participation Rate | Incremental Annual Income from Education per Worker | Total Additional Annual Income |
|---|---|---|---|---|
| Associates & certificate | 7,826 | 78% | $7,755 | $47.1 MM |
| Undergraduate degree | 55,020 | 82% | $21,351 | $959.2 MM |
| Master's degree | 21,477 | 83% | $37,782 | $671.8 MM |
| Professional degree | 790 | 82% | $92,990 | $60.1 MM |
| Doctoral degree | 8,126 | 86% | $84,201 | $589.4 MM |
| Total | 93,239 | n/a | n/a | $2,327.6 MM |

Source: UNM Foundation, US Census American Community Survey, and author calculations

Economists refer to the share of household income devoted to the purchase of goods and services as the "marginal propensity to consume" (MPC). The US Bureau of Labor Statistics' Consumer Expenditure Survey (CES) collects data on the spending patterns of households in the US. Data from the CES can be subdivided by household characteristics such as region, income, and education. CES data for households in the western US were used to estimate the marginal propensity to consume for New Mexicans at different levels of income and education.[8] Because the present analysis is concerned with the share of consumption spending that remains in the New Mexico economy, the data were further parsed to identify the subset of purchases most likely to be made locally. For purposes of this analysis, the share of income devoted to consumption of locally produced goods and services is defined as the "marginal propensity to consume locally" (MPC-L). To estimate the MPC-L, the goods and services included in the CES are defined as "local" or "non-local." Housing, healthcare, utilities, personal services, property maintenance, and restaurant expenditures are assumed to be entirely local, whereas most goods, including food for consumption at home, clothing, vehicles, gasoline, medical equipment, and drugs, as well as some services, such as insurance, are assumed to be produced outside New Mexico.[b, c] These calculations and the resulting estimate of total in-state spending are presented in Table 11.

Additional spending by UNM graduates on locally-produced goods and services totaled roughly $786.9 million in 2017. UNM alumni residing in New Mexico also spent an additional $195.5 million on state and local taxes, which were recycled into the local economy through government expenditures on public goods and services. The annual increment to in-state spending attributable to UNM degrees therefore totaled $982.4 million in 2017.

[b] This approach follows the methodology in: Rothwell, J. "What colleges do for local economies: A direct measure based on consumption." Brookings Institution. November 17, 2015

[c] This simplifying assumption likely produces an underestimate of local spending and thus a more conservative economic impact estimate, because many goods and services assumed to be produced entirely outside New Mexico actually have a small local component.

*Table: 11 Additional Local Spending ($ millions) by UNM Graduates by Highest Degree Earned*

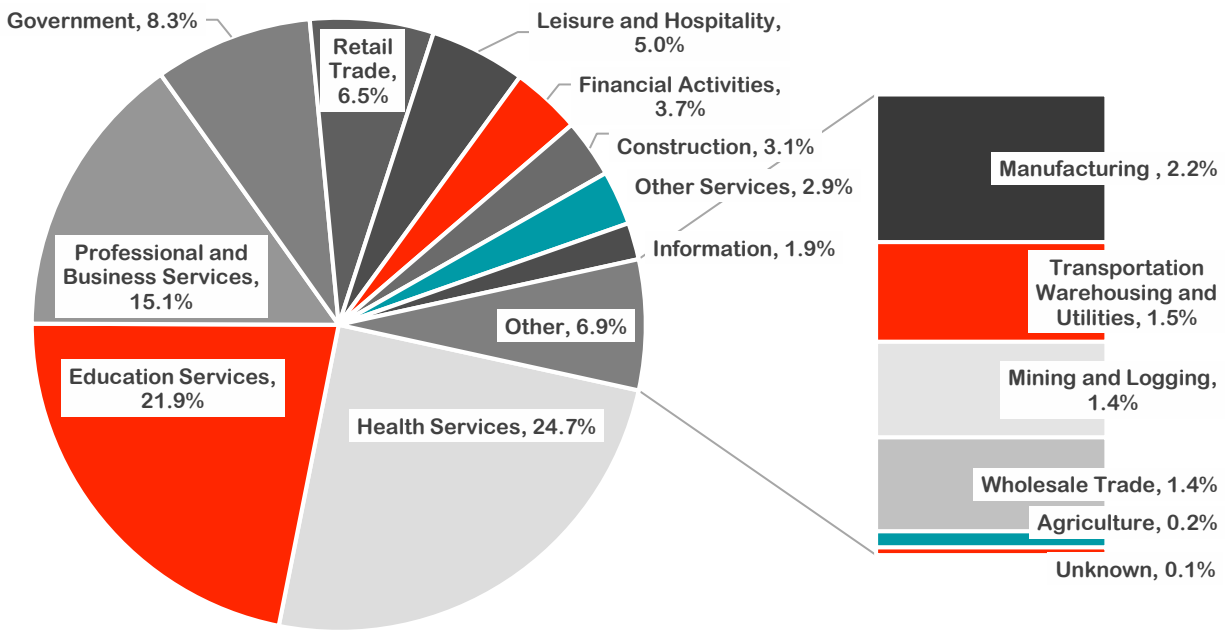
| Highest Degree Attained | MPC-L | Additional Local Spending per Year | State & Local Taxes | Total NM Spending |
|---|---|---|---|---|
| Associates & certificate | 43% | $20.1 | $4.0 | $24.0 |
| Undergraduate degree | 34% | $325.0 | $80.6 | $405.6 |
| Master's degree | 33% | $224.6 | $56.4 | $281.0 |
| Professional degree | 33% | $20.1 | $5.0 | $25.1 |
| Doctoral degree | 33% | $197.0 | $49.5 | $246.6 |
| Total | 34% | $786.9 | $195.5 | $982.4 |

Source: UNM Foundation, US Census American Community Survey, and author calculations

The skills UNM graduates bring to the labor force make New Mexico businesses and institutions more productive. The specific knowledge that alumni obtain through higher education enhances the performance of the organizations they work for. This effect is captured in the higher wages commanded by university graduates and in the incomes of in-state business owners. Skilled labor also acts as a complement to improved technologies and other forms of non-labor business capital. Thus, employers of UNM alumni generate higher profits as a result of the increased productivity of their capital assets.

Figure 5 shows the industrial sectors in which the 11,094 members of the 2013-14 UNM graduating class who stayed in New Mexico are employed. The health services sector employs the single largest share of UNM graduates, followed by education services, and professional services.

Figure 5: 2013-14 UNM Graduates Working in New Mexico, by Sector of Employment




Source: UNM Office of Institutional Analytics

### *3.2 Methodology*

A college degree increases lifetime earning potential. The direct impact of UNM alumni on the New Mexico economy is equal to the annual earnings differential of UNM graduates living and working in the state. Additional economic impacts occur because the increased earnings are spent on goods and services produced in New Mexico. When UNM alumni use the additional money they have earned as a result of going to college to make purchases from New Mexico vendors they create induced economic impacts. To model these impacts in IMPLAN®, the additional income attributable to higher education is allocated to New Mexico households and the model is configured to assume that 34 percent of income is spent on locally produced goods and services and 8.4 percent is devoted to state and local taxes.

*Table 12: Economic Impact of UNM Alumni Human Capital*

| Employment | Labor Income* | Output |
|---|---|---|
| 7,313 | $2,596.0 MM | $933 MM |

*Includes additional alumni wages and induced impact

Without the increased earnings and spending of UNM graduates, the New Mexico economy would have 7,313 fewer jobs, generate $2.6 billion less in wages and salaries, and produce $933 million less in economic output (Table 12).

## Entrepreneurship and Innovation

UNM fosters entrepreneurship and innovation in a wide variety of ways including courses, conferences, technical assistance, and business development. A full accounting of these activities is well beyond the scope of this report. Instead, this section describes some of UNM's more prominent business development initiatives. These initiatives strengthen and diversify New Mexico's economy by launching new businesses, supporting existing businesses, and/or by cultivating a robust "innovation ecosystem."

## Technology Transfer

Technology transfer is movement of discoveries and knowledge from the research institutions where they originate to the commercial marketplace. University technology transfer offices license intellectual property (I.P.) developed by university researchers to companies that seek to develop and produce the technology for specific applications. Commercialization of technologies developed at UNM helps create jobs through new startups and product sales, and may give rise to new industries or industrial clusters.

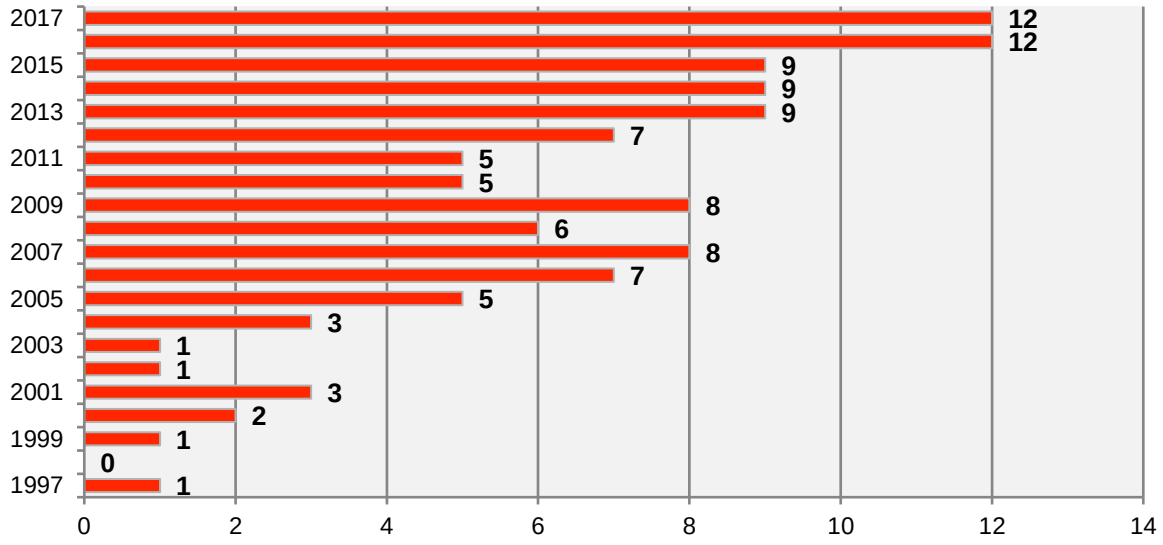
### *STC.UNM*

STC.UNM is a nonprofit corporation formed to protect and commercialize technologies invented at UNM. STC.UNM files patents, identifies licensing opportunities and facilitates the formation of start-up companies. As the technology transfer and economic development organization of New Mexico's flagship research university, STC.UNM is a core component of New Mexico's innovation ecosystem and an economic driver of high-tech industry.

Key metrics for each step in the technology transfer process are shown in Table 13. Disclosure of an invention to STC.UNM is the first step UNM inventors take toward commercialization. In 2017, UNM inventors disclosed 114 technologies to STC.UNM.

The protection of intellectual property stimulates innovation and makes technology transfer possible. In this second crucial phase of technology transfer, STC.UNM files patent applications and facilitates other forms of I.P. protection, such as copyright and trademark. In 2017, STC.UNM filed 68 patent applications. That year, a record 74 patents were issued for STC.UNM technologies (Figure 6).

Figure 6: STC.UNM Start Ups 1997-2017




Source: STC.UNM

STC.UNM helps inventors market their technologies by preparing the necessary documentation, identifying potential customers, and advertising that the technology is available for licensing. STC.UNM entered into 58 option or licensing agreements in 2017.

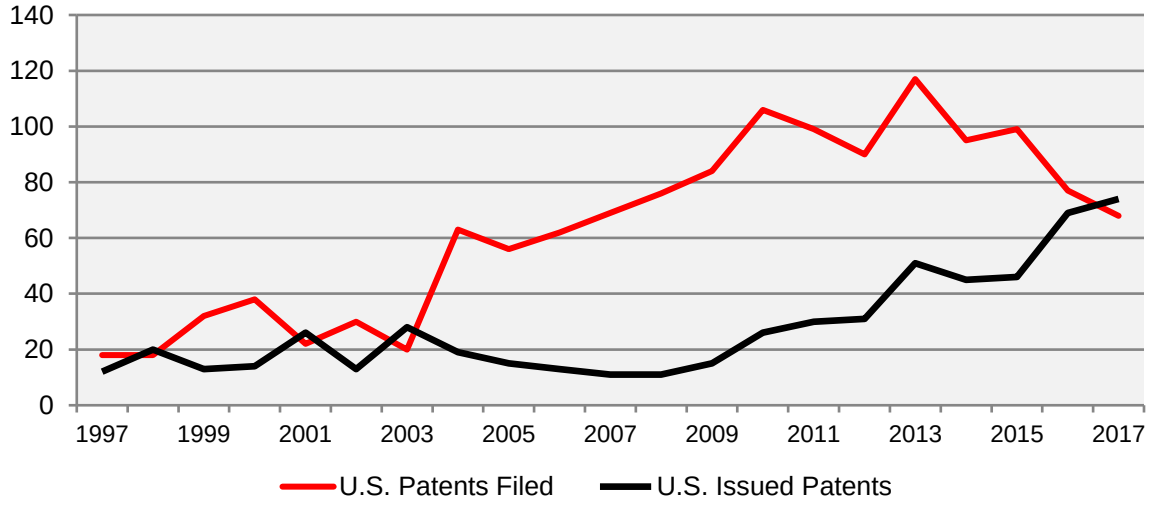
*Table 13: STC.UNM Key Metrics 2007-2017*

| Fiscal Year | Disclosures | U.S. Patents Filed | U.S. Issued Patents | Option/License Agreements | Start-up Companies | Income |
|---|---|---|---|---|---|---|
| 2017 | 114 | 68 | 74 | 58 | 12 | $2.1 MM |
| 2016 | 102 | 77 | 69 | 54 | 12 | $2.6 MM |
| 2015 | 125 | 99 | 46 | 50 | 9 | $2.7 MM |
| 2014 | 119 | 95 | 45 | 56 | 9 | $1.7 MM |
| 2013 | 138 | 117 | 51 | 63 | 9 | $2.2 MM |
| 2012 | 124 | 90 | 31 | 46 | 7 | $2.9 MM |
| 2011 | 110 | 99 | 30 | 36 | 5 | $3.3 MM |
| 2010 | 122 | 106 | 26 | 36 | 5 | $4.0 MM |
| 2009 | 113 | 84 | 15 | 38 | 8 | $1.1 MM |
| 2008 | 112 | 76 | 11 | 21 | 6 | $834,076 |
| 2007 | 85 | 69 | 11 | 25 | 8 | $938,308 |

Source: STC.UNM

STC.UNM supports the formation of start-up companies by connecting UNM inventors with entrepreneurs, venture capitalists, and other potential investors. The Joseph L. Cecchi Venture Lab (CVL), STC.UNM's business incubator program, helps New Mexico start-ups with access to shared office facilities, business services, mentoring, advice, and support in locating specialized facilities and laboratories.[9] The CVL also collaborates with faculty inventors, entrepreneurs, and UNM business students to perform market research and advance business opportunities for technologies developed at UNM. STC.UNM currently has 73 active start-up companies. STC.UNM supported the creation of 12 start-ups in 2017 (Figure 7), four of which are located in New Mexico. Overall, 40 STC.UNM start-ups (55%) are currently located in New Mexico.

**Figure 7: STC.UNM Patents Filed and Issued 1997-2017**



In 2014, the UNM Bureau of Business and Economic Research (BBER) estimated that the 23 STC-affiliated start-ups then headquartered in New Mexico were responsible for creating 83 jobs, $3.5 million in sales, $5.9 million in labor income, and for attracting $17 million in venture capital to New Mexico.[10]

Between 2014 and 2017, the number of New Mexico-based STC-affiliated start-ups increased from 23 to 40. In April 2018, STC.UNM surveyed the affiliated start-ups about their revenue, employment, and purchases from New Mexico vendors. The estimate of STC.UNM's 2017 economic impact presented in Table 14 draws upon responses to the 2018 survey, augmented by data from the 2014 BBER report. These data were combined and distributed across the IMPLAN industrial sectors occupied by STC.UNM start-ups active in 2017. IMPLAN® model results indicate that in 2017 STC.UNM start-ups created or stimulated the creation of 448 New Mexico jobs that paid $28 million in wages and salaries and generated $56.1 million in total output.

*Table 14: Economic Impact of STC.UNM Start-Ups*

| Impact Type | Employment | Labor Income | Output |
|---|---|---|---|
| Direct Effect | 247 | $19.1MM | $32.2 MM |
| Indirect Effect | 69 | $3.5 MM | $8.8 MM |
| Induced Effect | 132 | $5.5 MM | $15.1MM |
| Total Effect | 448 | $28.0 MM | $56.1 MM |

Source: IMPLAN® and author calculations based on estimates in UNM Bureau of Business and Economic Research STC.UNM: The Impact of Start-up Companies. June, 2014.

## Innovation Ecosystem

Innovate ABQ is a non-profit, private-public partnership between the City of Albuquerque, Bernalillo County, various private entities, and the University of New Mexico. The project is developing an "innovation district" in downtown Albuquerque to support entrepreneurial business, research, and economic development. By providing funding, mentoring, training, and facilities, the site cultivates collaboration, creativity, and strong innovation networks for and between students and local businesses. In 2017, the U.S. Department of Commerce's Economic Development Administration awarded Innovate ABQ a $1 million grant with which to establish the Innovate ABQ bioscience business incubator. Innovate expects the incubator to create 155 jobs, retain another 80, and leverage $2.5 million in private investment.[11]

The Lobo Rainforest is the first new construction on the Innovate ABQ site. This unique building houses UNM students on the upper floors and Albuquerque research institutions including Sandia National Laboratories, Air Force Research Laboratory, STC.UNM, and UNM's Innovation Academy, on the first floor. New start-up companies are located in the Rainforest at the Cecchi Venture Lab.

The UNM Innovation Academy (iA) is the academic component of UNM's innovation ecosystem. The program enables students to pursue their interests in innovation, creativity and entrepreneurship while completing their degree.[12] iA addresses shifting paradigms and needs in business and academia by

providing a space where the University's diverse people, communities, and disciplines can collaborate on innovations and entrepreneurial endeavors with the potential for future implementation.[13]

iA's programs include 2+1+2, an expedited pathway to a graduate degree for community college students that utilizes on-site mentors to guide students through the entire degree process; a capstone design project and design minor; and various hands-on academic programs that support student-run businesses and local economic development.[14]

As of June 2017, 581 students had registered for iA, 58 students had received academic credit for starting their businesses, and 14 student-run companies were in business.[15]

### *Programs at Anderson School of Management*

The Anderson School of Management (ASM) Center for Support of Economic Development is home to a variety of programs that support small business and grow the innovation economy including the Business Plan Competition, the UNM Small Business Institute, and the Small Business Assistance Program. ASM faculty also offer professional consulting services in their areas of expertise.

### *Business Plan Competition*

Nearly two dozen startups have been launched through the UNM Business Plan Competition.[16,17] The Competition is a seven-month program that helps students become entrepreneurs and launch their own businesses. The program culminates in the spring with prizes awarded to student teams with the best business plans. The competition consists of a Technology Track and the Entrepreneurial Track.

### *UNM Small Business Institute*

The UNM Small Business Institute (SBI) is a mentorship program that pairs teams of ASM students with local businesses to guide strategic planning, financial analyses, and marketing research. More than 700 small businesses of all types have consulted with the SBI since the program's inception.

A 2016 study by the Mid-Region Council of Governments found that in addition to the benefits of firsthand experience provided to both the students and businesses, SBI clients supported 195 jobs, adding more than $8 million in personal income to New Mexico households and $14 million to gross state product.[18]

### *Small Business Assistance Program*

The Small Business Assistance Program at the ASM Center for Support of Economic Development provides free support to local for-profit small businesses. Graduate students from Anderson's Management of Technology program work directly with businesses to provide technical assistance. Students focus on market research for new small high-tech companies, technology assessments, technological forecasting, creating technological product descriptions and value proposition narratives, and technology commercialization analysis to enhance the capabilities of small firms.

## STUDY LIMITATIONS

This study has addressed four of the major ways in which UNM contributes to the New Mexico economy; but it is far from a comprehensive inventory of UNM's beneficial economic impacts. Some economic effects, both positive and negative, were excluded from the analysis due to a lack of data.

Tourism, for example, has a net positive impact on the New Mexico economy because it draws new money into the state. Attractions such as performances at Popejoy Hall, lectures, art exhibits, academic conferences, and athletic events help attract out-of-state visitors to New Mexico, as do annual events such as homecoming, graduation, and freshman orientation. Unfortunately, this potentially significant source of economic stimulus is extremely difficult to quantify with the data currently available.

Similarly, the community service activities of numerous entities throughout UNM add tremendous value to the New Mexico economy. However, there is currently no centralized inventory of such activities at UNM. In addition, because "community service" encompasses a broad array of initiatives, activities, and partnerships, -- from adult literacy and community health to low cost legal clinics and civic engagement -- there is no uniform or consistent way to estimate its impact.

This study also fails to capture education's full value to society.[19] Education has been shown to benefit society by improving health outcomes,[20] enhancing social cohesion, increasing civic engagement, and reducing crime.[21] Educated workers have also been shown to enhance the productivity of their less educated colleagues.[22] The omission of spillover benefits from enhanced human capital attributable to higher education lessens the estimate of economic impact.

Also, this study does not fully address counterfactual outcomes. In impact analysis, counterfactuals are what would have happened if the event being analyzed had not occurred.[23] By quantifying UNM's contribution to workforce productivity and the revenue it attracts from outside the state, this analysis has, in a broad sense, answered the question, "What would the New Mexico economy be like if UNM did not exist?" However, it does not fully dissect all the possible ramifications of UNM's absence. For example, it is reasonable to assume that if UNM did not exist, some of the UNM alumni currently living and working in New Mexico would have obtained a comparable education at another New Mexico university or would have temporarily left the state to obtain their degree(s). Adjusting for this counterfactual outcome would require not counting the incremental labor income generated by these alumni toward UNM's economic impact. With data currently available, there is no way to estimate the percentage of UNM students who would seek out comparable educational alternatives if UNM did not exist. Thus, this adjustment is not made.

A similar adjustment could be made on the opposite side of the ledger to account for the UNM tuition and fees currently paid by New Mexico residents, that, in the absence of UNM, would be lost to New Mexico because these students attended out-of-state schools.

Finally, results are not adjusted for the importation of skilled labor that would likely occur if UNM did not exist and was consequently unable to supply New Mexico employers with qualified workers.

Faced with a deficit of skilled labor, New Mexico businesses would likely recruit some workers from outside the state. There are no statistics upon which to base an estimate of this effect.

## CONCLUSION

The University of New Mexico is one of New Mexico's most valuable economic assets. UNM's contribution to the New Mexico economy takes a variety of forms including direct expenditures on goods, services, and payroll, enhanced workforce productivity, and technology transfer. In all, the state's flagship university is responsible for roughly $3.1 billion in economic output each year.

## END NOTES

[1] IMPLAN Professional Version 4.1. Minnesota IMPLAN Group, Inc. http://www.implan.com.
[2] Card, D. (1999). The Causal Effect of Education on Earnings. Handbook of Labor Economics. 3. 1801-1863. 10.1016/S1573-4463(99)03011-4.
[3] Rothwell, J. What colleges do for local economies: A direct measure based on consumption. November 17, 2015. Retrieved from: https://www.brookings.edu/research/what-colleges-do-for-local-economies-a-direct-measure-based-on-consumption/
[4] Rothwell, J. What colleges do for local economies: A direct measure based on consumption. November 17, 2015. Retrieved from: https://www.brookings.edu/research/what-colleges-do-for-local-economies-a-direct-measure-based-on-consumption/
[5] University of New Mexico Alumni Relations Office, January, 2018
[6] U.S. Census Bureau. American Community Survey 2016 New Mexico Public Use Micro-Sample
[7] Brundage, V. Profile of the Labor Force By Educational Attainment. U.S. Bureau of Labor Statistics. August 2017. Retrieved from: https://www.bls.gov/spotlight/2017/educational-attainment-of-the-labor-force/pdf/educational-attainment-of-the-labor-force.pdf
[8] U.S. Bureau of Labor Statistics. Consumer Expenditure Survey. 2016 Annual Tables https://www.bls.gov/cex/tables.htm
[9] https://stc.unm.edu/cvl/
[10] UNM Bureau of Business and Economic Research. STC.UNM: The Impact of Start-up Companies. June, 2014.
[11] EDA Public Affairs Department. (2017, September 20). U.S. Department of Commerce Invests $1 Million to Build Bioscience Innovation Lab in Albuquerque. Retrieved April 10, 2018, from www.eda.gov
[12] https://stc.unm.edu/econdev/unm-innovation-academy/
[13] https://innovationacademy.unm.edu/about-ia/index.html
[14] Innovation Academy 2016/2017 Impact Report. Retrieved from: http://innovationacademy.unm.edu/assets/pdf/ia-impact-report-2016-2017.pdf
[15] Innovation Academy 2016/2017 Impact Report. Retrieved from: http://innovationacademy.unm.edu/assets/pdf/ia-impact-report-2016-2017.pdf
[16] UNM Business Plan Competition. http://bizplan.unm.edu/
[17] Robinson-Avila, K. "Biz competition more than an academic exercise." Albuquerque Journal online version, September 15th, 2015. https://www.abqjournal.com/644698/biz-competition-more-than-an-academic-excercise.html?utm_source=abqjournal.com&utm_medium=related+posts+-+business&utm_campaign=related+posts
[18] Blaich, J. (2016). Economic Impacts for the University of New Mexico Small Business Institute at Anderson (Rep.). Albuquerque, NM: Mid-Region Council of Governments. Retrieved April 20, 2018, from https://sbi.mgt.unm.edu/pdf/2016-unm-sbi-final-report.pdf.
[19] Blackwell, Melanie and Steven Cobb and David Weinberg. 2002. "The Economic Impact of Educational Institutions: Issues and Methodology." Economic Development Quarterly. 16:1, pp. 88-95.
[20] Grossman, M. Chapter 10 Education and Nonmarket Outcomes, Handbook of the Economics of Education, Editor(s): E. Hanushek, F. Welch, Elsevier, Volume 1, 2006, Pages 577-633,
[21] Lochner, L. and Moretti, E. (2004). "The Effect of Education on Criminal Activity: Evidence from Prison Inmates, Arrests and Self-Reports." American Economic Review. 94:1, pp. 155-189
[22] John J. Siegfried & Allen R. Sanderson & Peter McHenry, 2006. "The Economic Impact of Colleges and Universities," Vanderbilt University Department of Economics Working Papers 0612, Vanderbilt University Department of Economics.
[23] John J. Siegfried & Allen R. Sanderson & Peter McHenry, 2006. "The Economic Impact of Colleges and Universities," Vanderbilt University Department of Economics Working Papers 0612, Vanderbilt University Department of Economics.

THE UNIVERSITY OF NEW MEXICO®