



Appalachian
STATE UNIVERSITY
BOONE, NORTH CAROLINA 28608

ECONOMIC AND TAX REVENUE IMPACTS

APPALACHIAN FAST FACTS

Appalachian State University is a public institution and part of The University of North Carolina system.

ENROLLMENT

15,871 (13,997 undergraduate, 1,874 graduate) in the 2007-08 school year

ACADEMICS

6 undergraduate colleges and schools, 1 graduate school

140 undergraduate and graduate degree programs

More than 700 full-time faculty; 97 percent have the highest degree awarded in their field

ALUMNI

More than 90,000 living alumni

CAMPUS

- 1,300 acres, including a 410-acre main campus
- 19 academic buildings, including a 210,000 square-foot library
- 20 residence halls, housing 5,302 students on campus
- 11 recreational and athletic facilities

KIPLINGER 100 BEST VALUES

US NEWS & WORLD REPORT AMERICA'S BEST COLLEGES

PRINCETON REVIEW AMERICA'S BEST VALUE COLLEGES

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APPALACHIAN STATE UNIVERSITY
ECONOMIC AND TAX REVENUE IMPACTS
FY 2006

Prepared by:

Todd L. Cherry
Michael McKee
Stephen W. Millsaps

CENTER FOR ECONOMIC RESEARCH & POLICY ANALYSIS
Walker College of Business | Appalachian State University

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TABLE OF CONTENTS

Executive Summary	3
Introduction	3
Appalachian State University	4
Institutional Profile and Background	4
University Revenues	4
Measuring the Economic Impact of Appalachian State University	4
Research Method	5
The Region	5
The Data	7
Appalachian State University's Impact on the Regional Economy	8
Direct and Total Impact	8
Effects of Enrollment Growth at Appalachian	9
Comparisons with other Studies	10
Concluding Remarks	11
Appendix A: Sector Definitions	11
Appendix B: The Input-Output Method	12
Appendix C: Data Adjustments	13
Bibliography and Data Sources	14
Notes	14

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About The Authors

Dr. Todd L. Cherry is the Director of the Center for Economic Research and Policy Analysis and Associate Professor of Economics in the Walker College of Business.

Dr. Michael McKee is the Director of the Appalachian Experimental Economics Laboratory and Professor of Economics in the Walker College of Business.

Dr. Stephen W. Millsaps is Professor Emeritus of Economics in the Walker College of Business.

The Language of Economic Impact

Regional Output

A measure of regional economic activity as measured by the total value of goods and services produced in the region

Leakage

Economic activity that flows out of the region and thus does not contribute to regional impacts

Direct Impact

Expenditures on goods and services by the university to regional businesses

Indirect Impact

Economic activity of regional businesses that arises from them providing goods and services to the university

Induced Impact

Economic activity undertaken by individuals who receive their incomes either from the university or from businesses that supply the university

Total Economic Impact

A combined measure of the direct, indirect and induced effects of the university on the regional economy

APPALACHIAN STATE UNIVERSITY

ECONOMIC AND TAX REVENUE IMPACTS

FY 2006

EXECUTIVE SUMMARY

Appalachian State University is a public institution and part of The University of North Carolina System. As a traditional residential campus in a rural area, Appalachian is a major generator of economic activity in northwestern North Carolina. In 2006, the university employed 2,632 people and enrolled 15,117 students, nearly all of whom would be elsewhere without the presence of Appalachian.

UNIVERSITY IMPACT

The annual economic impact of Appalachian for fiscal year 2006 includes the creation of approximately 5,121 jobs across the region, \$125 million in additional earnings in the region, and a total dollar impact on the regional economy of \$506 million.

UNIVERSITY REVENUE

In FY 2006, Appalachian State University received \$102 million in state appropriations, \$57 million in tuition and fees, and \$26 million in grants, contracts and gifts, which represents a shift of economic activity to our region from across the state.

THE IMPACT ON LOCAL TAX REVENUES

The increased economic activity arising from the presence and operation of Appalachian State University led to \$39 million in additional indirect business taxes to local governments.

THE MARGINAL IMPACT OF ENROLLMENT GROWTH

A 10 percent increase in enrollment (1,500) at Appalachian State University will generate \$56 million in additional economic activity that will lead to 572 additional jobs (campus and regional employment), \$13 million in additional earnings, and \$5 million in additional indirect business taxes to local governments.

A 20 percent increase in enrollment (3,000) will generate \$107 million in additional activity that will lead to 1,090 additional jobs (campus and regional employment), \$26 in additional earnings, and \$10 million in additional taxes to local governments.

INTRODUCTION

Universities are engines for economic development. The presence of a university contributes to the regional economy by enhancing human capital through education, by creating new knowledge through research activity, by developing and transferring new technology, and by creating favorable environments that attract innovative businesses and individuals.¹ For universities located in rural areas, the contribution to the region can be especially noteworthy because the universities are often one of the largest employers and account for much of the spending that supports local businesses.²

Appalachian State University has always played a significant role in regional economic and community development. Founded as Watauga Academy in 1899 to educate teachers for the mountains of northwestern North Carolina, the institution's original mission was to enhance the development of northwestern North Carolina. Today, Appalachian's mission has expanded beyond training teachers, and its reach has extended well beyond northwestern North Carolina. The growth of Appalachian has enhanced the university's role in the regional economy, and its impact on the standard of living of those living in the region.

This study examines the economic and tax revenue impacts of Appalachian State University on the northwestern North Carolina region. A regional input-output model was constructed to compute Appalachian's effect on regional economic activity, employment and earnings. The model also enabled a calculation of the university's impact on local indirect business tax revenues. Estimates are derived from expenditures by the university, its employees, students and visitors, which directly contribute to economic activity and indirectly stimulate the regional economy.

The results confirm that Appalachian is a significant contributor to the regional economy, though the numbers do not fully capture all of Appalachian's impacts on the region, state and beyond. The university's instruction increases opportunities for individuals that migrate beyond the region. Its research activities contribute knowledge to society at large. And its service activities enhance the quality of life of those living in and out of the region. It is suggested that the narrowly defined impacts reported here be interpreted within this broader context.

APPALACHIAN STATE UNIVERSITY

INSTITUTIONAL PROFILE AND BACKGROUND

Appalachian State University is a public institution and part of The University of North Carolina System. Appalachian consists of five undergraduate colleges and schools and one graduate school. These academic units offer 95 undergraduate majors and 81 graduate majors. The university is situated on a 410 acre main campus that consists of 19 academic buildings, 11 recreational and athletic facilities, 21 residence halls and four dining facilities.

Appalachian State University is a traditional residential campus, with 93 percent of the students enrolled full-time. The student body originates largely from outside the region, with only 13 percent of the students arriving from the campus' home or adjacent counties. Nine percent of students are from outside North Carolina. The student body is 90 percent white and 52 percent female. The 2,716 students entering the 2006 Fall semester had an average SAT score of 1,129 and an average high school GPA of 3.74. According to *U.S. News and World Report*, Appalachian is ranked fifth among the South's masters-degree granting public universities and 10th among public and private universities in the South.

Founded in 1899 with 53 students, Watauga Academy sought to educate the region's teachers. In 1929, the school became a four-year, degree-granting institution named Appalachian State Teachers College. Enrollment had grown to more than 1,300. After evolving from a teachers college to a comprehensive regional university during the 1950s and 60s, the school adopted the current name Appalachian State University in 1967 and became a constituent institution of the University of North Carolina in 1972. Enrollment doubled over the subsequent decade to 9,500 students.

Today, Appalachian has more than 15,000 students and more than 95,000 alumni living in all 50 states and several foreign countries. The university employs 2,632 people – 710 full-time instructional faculty, 332 part-time instructional faculty, 389 administrative staff, and 1,201 general staff. In FY 2006, the university had an operating budget of \$255 million. Physical assets were valued at more than \$480 million. Belk Library and Information Commons holdings are valued at \$2 million and include 917,000 books and bound periodicals, and more than 1.6 million microforms and electronic titles.

Located in the heart of the Blue Ridge Mountains in Boone, N.C., the university's contributions to the region are numerous. Appalachian provides the local community and region with a multitude of educational, cultural and entertainment opportunities including the events and programs offered by the Hayes School of Music, the Institute for Senior Scholars, the Turchin Center for the Visual Arts, and the renowned festival An Appalachian Summer.

UNIVERSITY REVENUES

Appalachian State University revenues in fiscal year 2006 were \$262,705,373. State appropriations, the largest source of revenues, accounted for \$101.8 million or 39 percent of total revenue. Tuition and fees was the second largest category with revenues of \$56 million or 22 percent of the total. Auxiliary enterprises such as the bookstore and food services represented \$48.3 million or 18 percent of total revenues.

TABLE 1. REVENUES BY SOURCE FY 2006

Revenue Source	Dollar Amount (in thousands)	Percent of Total Revenue
State Appropriations	101,787	38.75
Tuition & Fees	56,923	21.67
Auxiliary Enterprises	48,277	18.38
Grants	17,812	6.78
Capital Grants & Gifts	13,649	5.20
Independent Operations	10,193	3.88
Gifts	5,879	2.24
Investment Income	4,047	1.54
Grants & Contracts	2,367	0.90
Other Sources	1,613	0.61
Other Non-operating Revenue	158	0.06

Source: Institutional Research, Assessment, & Planning, Appalachian State University

MEASURING THE IMPACT OF APPALACHIAN STATE UNIVERSITY

RESEARCH METHOD

The regional analysis computes the annual economic and tax revenue impacts of Appalachian State University on the economy of northwestern North Carolina. A 13-sector regional input-output model was constructed that organizes the basic economic relations that describe the regional economy. The model estimates the total regional economic impacts of Appalachian by computing the combined effects of four types of direct impacts: university expenditures, university employee spending, university student spending, and university-related visitor spending. Each year, the university provides injections of money in the form of the wages and salaries of employees of which some is spent locally for consumer goods. In addition, students attending Appalachian and visitors coming to the area to enjoy university related activities introduce additional spending to the regional economy.

The total economic impact of these activities consists of the direct impact from local spending plus the subsequent indirect and induced impacts that accrue as these dollars are circulated among local businesses and households. These impacts – direct, indirect and induced – are associated with the university because the initial injection of money and the corresponding subsequent spending would not occur in the region in the absence of the university. Faculty, staff and students would be employed and studying at universities elsewhere, and the associated economic impacts would be occurring elsewhere.³

The regional economic model is based on the database generated by the Minnesota IMPLAN Group (MIG). The simulations themselves are conducted using an input-output model programmed in GAUSS.⁴ The analysis attempts to capture the net effects by considering two issues: (1) some university employees would remain working in the region if Appalachian did not exist, and (2) some leakage of university-related spending occurs when money flows outside the region and no longer contributes to regional economic activity.⁵ See Appendix A for a detailed discussion of the input-output model.

THE REGION

Appalachian's reach extends beyond Boone. Contributions from Appalachian faculty and graduates add to economies across the United States and around the world. However, the material effects of university operations are more geographically concentrated, and are determined by the spending patterns of the university, its employees and students, and visitors to its athletic and cultural events.

Defining the appropriate extent for what is called a region is always problematic and, of necessity, somewhat imprecise. The literature provides three criteria: *homogeneity* with respect to physical, social, or economic characteristics; *polarization* around some urban place; and *policy-oriented* that relates to the administrative coherence of the area.⁶ For the purposes of this study, defining the region should consider the geographic distribution of economic activity. A common criterion is the "commuter shed" or the area supplying the majority of Appalachian employees. Considering employees rather than students provides a better definition of the commuter shed. While employees shift much of their earnings back to their place of permanent residence, students reside in the region primarily for schooling and shift little of any locally earned income back to their permanent homes.

The Population Division of the Census Bureau conducts periodic surveys of commuting patterns and these are published in the *Residence County to Workplace County Flows* reports for each state. Table 2 provides the commuting patterns of the seven neighboring North Carolina counties to Appalachian's host county of Watauga.⁷

TABLE 2. RESIDENT TO WORKPLACE FLOWS, 2006

Residence County	Workplace County	Number
Catawba	Watauga	55
Forsyth	Watauga	61
Mecklenburg	Watauga	69
Wilkes	Watauga	244
Caldwell	Watauga	271
Avery	Watauga	557
Ashe	Watauga	1,350
Watauga	Watauga	18,083

Source: U.S. Census Bureau

FIGURE 1. NW NORTH CAROLINA FIVE COUNTY REGION



While the bulk of people working in Watauga County also live in the county, substantial numbers commute daily from neighboring counties. The numbers reveal a natural delineation between Wilkes and Mecklenburg Counties. This report focuses on and the five counties of Watauga, Ashe, Avery, Caldwell and Wilkes. Figure 1 illustrates the geographic location of the region and Table 3 provides a general description of the economic indicators for the region.

The regional database was constructed by combining the IMPLAN data files for Watauga, Wilkes, Caldwell, Avery, and Ashe counties.⁸ An aggregate of industry level transactions and employment for 13 economic sectors illustrates the regional economy. Table 4 reports the economic output and employment for the region by sector. Sector definitions are provided in Appendix B.

TABLE 3. ECONOMIC INDICATORS FOR THE REGION

Category	Measure
Area	2,215 sq. mi.
Population (2004)	231,522
Personal Income (2004)	\$5.989 billion
Private Non-Farm Employment (2004)	52,880
Total Employment (2004)	121,436
Total Wages and Salaries (2004)	\$3.393 billion

Source: IMPLAN 2004

TABLE 4. AGGREGATED ECONOMIC SECTORS FOR THE I-O MODEL

Sector	Output (million \$)	Employment (# jobs)
Primary	628.66	3,470
Construction	732.92	8,472
Food Processing	781.09	3,500
Manufacturing	2,936.89	10,581
Furniture Making	984.91	7,695
Wholesale & Retail Trade	1,326.35	16,389
Transportation, Communication, & Utilities	442.93	3,336
Business Services	1,347.00	12,608
Finance, Insurance, & Real Estate	1,292.15	6,074
Education and Health Services (Private)	687.76	11,771
Recreation Services	533.84	11,667
Personal Services	344.07	7,996
Government Services	707.87	17,877
TOTAL	12,746.44	121,436

THE DATA

The Office of Business Affairs at Appalachian State University provided data on university expenditures, which included employee compensation, operation and maintenance costs, capital spending, and spending on special programs and events. The Office of Student Financial Aid at Appalachian State University provided estimates for student spending on housing and food, recreation and entertainment, and transportation. Visitor spending was derived from the attendance and spending data related to university-related events such as An Appalachian Summer, summer camps, home football games, etc. The Office of Cultural Affairs, the Office of Conferences and Institutes and the Department of Athletics supplied attendance data, while spending estimates were drawn from a recent survey on Appalachian visitor spending.⁹

The direct expenditures created by the presence of Appalachian are reported in Table 5. As the table illustrates, these expenditures fall into three categories: (1) direct expenditures by Appalachian, (2) direct expenditures of visitors attending Appalachian functions, and (3) direct expenditures of students attending Appalachian.

TABLE 5. UNADJUSTED EXPENDITURES BY APPALACHIAN STATE UNIVERSITY

Category	FY 2006 Expenditures
ASU Personnel ^a	
Teaching: Faculty and Staff Salaries	55,112,131
Non-teaching: Staff Salaries and Wages	58,812,511
Non-teaching: Part time wages	7,370,094
Athletics: Staff Salaries and Wages	2,613,219
Teaching: Faculty and Staff Benefits	11,868,266
Non-teaching: Staff Benefits	13,266,750
Non-teaching: Benefits	563,812
Athletics: Staff Benefits	615,922
ASU Operations ^a	
Buildings and Grounds Maintenance	2,628,221
Utilities	17,972,300
Contract Professional Services	2,887,499
Supplies	35,694,458
Special Programs and Events ^a	
Cultural Affairs Programming and Support	925,902
Cannon Summer Music Camp: Staff Salaries & Wages	106,680
ASU Athletics: Staff Salaries and Wages	2,250,174
ASU Athletics: Equipment and Supplies	2,515,409
Appalachian Summer: Supplies and Equipment	502,617
ASU Students ^b	
Off-campus Housing and Food	58,208,800
Recreation and Entertainment	18,140,400
Transportation	20,573,800
ASU Capital Spending ^a	
Building Construction	25,132,274
Infrastructure Construction	2,846,848
Furniture	48,322
Equipment	4,494,464
Visitor Spending ^c	
Athletic Events	4,059,000
Appalachian Summer	3,250,000
Summer Music Camp	240,000
All Other ASU Events	290,000
TOTAL	\$ 352,989,873

Sources: ^a Office of Business Affairs; ^b Office of Financial Aid; ^c ASU events and athletics departments

Several adjustments were made to the raw data to isolate the impacts on the region from those outside the region. Specifically, the adjustments were necessary to correct for expenditure leakages resulting from spending that flows outside the region and to avoid miscalculations arising from double counting.

The regional expenditure deriving from employee salaries and wages was adjusted to eliminate leakages and transfers. Fringe benefits (e.g., retirement and health benefits) and payroll taxes were excluded since these items represent spending that leaks outside the region. The salary and wage data were further adjusted to reflect that some of the total wages and salaries paid to university employees would have been earned in the absence of Appalachian as some of these workers would have found jobs in other local sectors.

Student expenditures are entirely attributed to Appalachian because students are presumed to live in the region for the purpose of attending the university. This includes those from the region since, in the absence of Appalachian, they would be attending a university elsewhere. Student expenditures exclude tuition and fees to avoid double counting; these figures are included as part of university direct spending on instruction and support. Student spending is also adjusted to capture differential impacts of those living on- and off-campus (34 percent and 66 percent respectively). In particular, room and board expenditures by students living on campus are excluded because they are captured in university expenditures by the Office of Student Housing.

University-related visitor expenditures present a number of difficult issues to consider. First, visitors generally have multiple motives for travel and spending on accommodation and meals. These motives include reasons that are related to the university and those that are not. Consequently, attributing all of the spending by a university patron to the university would lead to an overstatement of the university's economic impact. Visitor spending therefore focuses on the most significant university-related events, such as An Appalachian Summer, Cannon Music Camp, and home football games. Visitor behavior and spending patterns are drawn from previous studies, and are adjusted to differentiate between visitor place of origin. In particular, expenditures by football game attendees were adjusted to differentiate between students, local residents, and non-local residents to account for spending differences. The details of the data adjustments are provided in Appendix C.

APPALACHIAN STATE UNIVERSITY'S IMPACTS ON THE REGIONAL ECONOMY

DIRECT AND TOTAL IMPACTS

Table 5 reports the unadjusted direct expenditures by the university, students and visitors that determine Appalachian's direct impacts on the regional economy. These figures were adjusted to correct for leakages that flow out of the region, and then allocated to the 13 sectors of the input-output model.¹⁰ Salaries paid to Appalachian faculty and staff were allocated as spending across the 13 sectors according to average spending patterns for the region. Table 6 reports the adjusted direct expenditures by sector. The \$317 million in expenditures represents the direct impact of the introduction of increased final demand for goods and services within the region due to Appalachian. Four sectors account for nearly three-fourths of the direct impact; Finance, Insurance & Real Estate (27 percent), Wholesale & Retail Trade (26 percent), Recreation Services (11 percent) and Construction and Repair (10 percent).

The direct expenditures by the university stimulate subsequent spending in the regional economy. The input-output model estimates the indirect and induced economic activity that results from the initial direct expenditures. The indirect impact represents the additional spending by businesses as they supply goods and services to Appalachian, and the induced impacts result from the spending of individuals who receive their incomes directly from Appalachian or from businesses that work with Appalachian. Aggregating the direct, indirect and induced effects provides the total impact of Appalachian on the regional economy.

Table 7 reports the aggregate increase in regional economic activity attributed to Appalachian, as measured by the value of goods and services produced, is \$505.9 million. This increase in activity requires an additional 5,121 jobs and payment of additional earnings of \$124.7 million. The total impact of Appalachian constitutes nearly 10 percent of the regional economy. As expected, the sectors that experience the largest impacts are Wholesale and Retail Trade, Recreational Services, Education and Health Services, and Finance, Insurance and Real Estate. Construction, which included building maintenance, also experiences a substantial positive impact.

Appalachian's impact on regional economic activity translates to greater indirect tax revenues to local governments in the region. While the university does not pay sales taxes and property taxes, the subsequent economic activity that results

from the university does generate additional indirect business tax revenues (sales, excise and property). Estimates indicate the increased activity associated with Appalachian yields \$39.4 million in additional indirect tax revenue for local governments.

TABLE 6. ADJUSTED DIRECT ECONOMIC IMPACTS BY SECTOR (MILLION \$)

Sector	Direct Impacts
Primary Industries	3.40
Construction and Repair	31.26
Food Processing	6.80
Manufacturing	15.86
Furniture Making	0.39
Wholesale & Retail Trade	82.36
Transportation, Communication, & Utilities	24.02
Business Services	6.35
Finance, Insurance, & Real Estate	84.37
Education (Private) and Health Services	21.52
Recreation Services	34.46
Personal Services	5.66
Government Services	0.58
TOTAL (Direct)	317.01

TABLE 7. TOTAL ECONOMIC IMPACTS BY SECTOR (MILLION \$)

Category	Output (million \$)	Employment (# jobs)	Earnings (million \$)
Primary	4.46	23	0.34
Construction	51.02	542	11.20
Food Processing	11.95	45	1.49
Manufacturing	21.85	75	3.13
Furniture Making	0.60	5	0.15
Wholesale & Retail Trade	138.20	1508	43.06
Transportation, Comm, & Utilities	38.77	256	8.71
Business Services	10.84	94	4.15
Finance, Insurance, & Real Estate	123.85	939	15.83
Education (Private) and Health Services	37.11	833	25.90
Recreation Services	57.24	635	8.51
Personal Services	9.00	91	1.29
Government Services	1.02	25	0.88
TOTAL (Direct + Indirect + Induced)	505.91	5121	124.65

IMPACTS OF ENROLLMENT GROWTH

Population and demographic changes across North Carolina continue to push enrollments higher on UNC campuses. For Appalachian, enrollment increased 10 percent during the five years prior to 2006, and increased more than 4 percent between 2006 and 2007. Therefore it is worthwhile to consider the incremental impacts of increased enrollment at Appalachian on the regional economy. Two scenarios are considered—a 10 percent increase or 1,518 additional students, and a 20 percent increase or 3,035 additional students.¹¹

As Table 8 reports, increasing enrollment by 10 percent at Appalachian State University will generate \$56 million in additional economic activity that will lead to 572 additional jobs across the region, \$13 million in additional earnings in the region, and \$5 million in additional indirect business taxes to local governments. An increase of 20 percent in enrollment will generate \$107 million in additional activity that will lead to 1,090 additional jobs in the region, \$26 million in additional earnings in the region, and \$10 million in additional taxes to local governments.

TABLE 8. THE IMPACT OF UNIVERSITY GROWTH

	Baseline	10% Case	20% Case
Measure	Impact	Impact	Change
Output (mil \$)	505.9	562.4	56
Employment (#)	5121	5693	572
Earnings (mil \$)	124.6	138.6	13

COMPARISONS WITH OTHER STUDIES

Previous studies have examined the economic impact of Appalachian and other universities. Though differences in scope and methodology make exact comparisons problematic, reviewing the results can be informative. Table 9 provides the findings from studies that examine universities in the southeast United States. The studies differ in methodology by employing different regional models, and differ in scope by computing the impacts on local, regional or statewide economies. The list represents universities of various sizes and types, including a range of undergraduate, comprehensive and research institutions.

Generally, the numbers indicate that larger enrollments and increased research activity lead to a greater economic impact. Larger enrollments introduce new activity to the area by bringing in new students and employees. Greater research activity leads to a greater impact by bringing in external funding. Research universities also generate a larger impact per student because they include a wider range of professional schools (e.g., law, medicine, and engineering).

TABLE 9. COMPARISON WITH OTHER UNIVERSITY STUDIES

Institution Study^a	Year of Study	Inst Type^b	Student Enrollment^c	Input on Output^d	Impact on Employment
USC Upstate ^R	2003	U	4,500	133	1,850
Winthrop Univ ^L	2006	U	6,500	203	3,200
Valdosta State ^R	2005	C	11,000	258	3,635
Georgia Southern ^R	2005	C	16,646	439	6,252
Kennesaw State ^R	2005	C	20,000	441	4,287
Appalachian St^R	2006	C	15,117	506	5,121
Marshall Univ ^S	2006	C	13,996	547	7,735
Univ of Virginia ^L	2005	R	20,400	1,097	16,000
USC Columbia ^R	2003	R	25,000	1,400	20,339
Univ of Georgia ^R	2005	R	33,400	2,052	22,458

Notes: ^aL, R and S indicate the scope of the study is on Local, Regional or Statewide impacts

^bU, C and R indicate institution is Undergraduate, Comprehensive or Research

^cenrollment is at the time of the study

^dimpact on output is measured in millions of dollars

The studies highlight some of the issues in deciding whether to compute the impacts at the local, regional or statewide level. The decision, in conjunction with local conditions, dictates the degree that university-related spending will flow out of the region, while also dictating the degree that university-related activity represents new activity to the region. For instance, it is clear that Appalachian is responsible for the regional impacts of its students since they would attend college elsewhere without Appalachian. However, it is not clear Appalachian is responsible for the statewide impacts of its students since they would likely enroll at another North Carolina public university without Appalachian. Among the studies listed, most computed the university's impact on the regional economy. The exceptions include the Marshall University study that computed the statewide impact, and the Winthrop University and University of Virginia studies that calculated the local or city impact.

Reviewing the impacts of comparable universities, Appalachian generates a commensurate level of economic impacts. Kennesaw State is estimated to generate a lower economic impact than Appalachian despite having an enrollment that is about 30 percent larger. The Kennesaw campus is located in the metropolitan area of Atlanta, which introduces factors that mitigate its impact. This campus is not primarily residential and a larger proportion of university-related activity would occur in the absence of Kennesaw. Marshall University's reported impact is somewhat larger than Appalachian's. While enrollment was slightly less, Marshall employed more people due to its medical school and multiple sites across the state. Georgia Southern is similar to Appalachian in terms of enrollment, institution type and campus setting (rural), and correspondingly, the estimated economic impact of the two universities is similar.

CONCLUDING REMARKS

Appalachian State University contributes significantly to the regional economy. The annual economic impact of Appalachian for fiscal year 2006 includes the creation of approximately 5,121 jobs across the region, \$125 million in earnings in the region, and a total dollar impact on the regional economy of \$506 million. The increased economic activity arising from the presence and operation of Appalachian State University led to \$39 million in additional indirect business taxes to local governments.

The direct impact of the university plus the indirect impacts represent about 8.5 percent of regional economic activity, 4.2 percent of regional employment, and 3.6 percent of salaries and wages in the region. To provide some perspective, one of every 12th dollar spent in the region and one of every 24th person employed in the region was related directly or indirectly to Appalachian.

These numbers however fail to capture all of Appalachian's impacts on the region, state and beyond. While the analysis is comprehensive in accounting for activity measured in dollars, universities provide substantial additional benefits such as greater opportunities to graduates, enhanced diversity and culture to the local community, and the contribution to new knowledge for society at large. The reported economic impacts provide insights that should be interpreted within a broader context. The region, and indeed the state, is better because of Appalachian State University.

APPENDIX A: SECTOR DEFINITIONS

The Aggregation Scheme – each of the 13 sectors in the regional input-output Model is be briefly described here. The IMPLAN database consists of approximately 500 individual sectors. For the analysis, information from the individual sectors was aggregated into the 13 sectors discussed in the report.

Primary: this sector consists of the sectors in the IMPLAN database that relate to agriculture (cropping, livestock, and agricultural services), mining (including sand and gravel operations), and forestry.

Construction: all construction activities are included in this sector. These include new buildings, and roads, as well as maintenance of existing structures.

Food Processing: all food production including both human and animal food products. Includes dairy, cereal, and vegetable production.

Manufacturing: this includes all manufacturing sectors (except furniture) located in the region.

Furniture: all sectors in the furniture manufacturing activity in the region.

Wholesale and Retail Trade: all retail establishments and wholesale trade.

Transportation, Communications, and Utilities: all transportation providers (except those that arrange travel), all television and radio, telephone, electrical and other utilities.

Business Services: R&D, consulting, accounting, advertising, personnel services, and protective services.

Finance, Insurance, and Real Estate: includes banking, financial services, insurance carriers, and real estate brokers.

Personal Services: this sector consists of those services that are primarily provided to individuals rather than businesses. Included in this sector are hairdressers, laundry, cleaning and shoe repair, and repair facilities.

Educational and Health Services: hospitals, nursing homes, legal services, doctors and dentists, and educational services not state provided.

Recreation Services: lodging, restaurants, movies, bowling alleys, golf, racing, and membership sports and clubs.

Government Services: all federal, state, and local government services (including education).

APPENDIX B: THE INPUT-OUTPUT MODEL

Input-output models are a device for organizing the basic accounting relations that describe the production sectors of the economy and represent these transactions within a general equilibrium framework. The input-output method starts with a very simple idea: all sectors of the economy are tied together by virtue of economic relations called “linkages” and the production of a good or service can be described by a “recipe” with the ingredients being the outputs of the other sectors of the economy as well as the primary inputs such as labor, capital, and other raw resources.

Thus, the steel used to produce other commodities in the economy reflect the “linkages” mentioned above. The extent to which an economy is an integrated whole depends on the strength of these linkages. Linkages that tie steel to the output of more finished products are known as forward linkages while those (not shown in this example) that relate steel to basic raw materials and labor are known as backward linkages. A similar table could be constructed for every commodity in the economy and taken together these would describe the entire economy. A common unit of measurement is necessary if the sectors are to be linked into a single model of the economy. Thus, all inputs and outputs are measured in dollar units rather than physical units. To make use of all of these tables for the various commodities in the economy requires an analytical device that relates all of the backward and forward linkages in the economy in a manner, which permit investigation of “what if” scenarios. This analytical device is the input-output table.

The attraction of input-output models for computing regional impacts arising from a single source such as Appalachian State University is that these models represent the full set of economic linkages. Thus, all of the indirect effects are mapped as they feed through the sectors of the regional economy through the interrelated purchases that occur within the region. At the same time, these models capture the leakages that arise when local expenditures are used to buy goods and services that are imported from outside our region. Thus, they are not prone to overstating the overall impacts as are some other methods (notably the use of simple impact multipliers).

The leakages described above are represented in this stylized example as imports by each sector. Imports to the region represent outflows of expenditures to producers located elsewhere. The more integrated the local economy the fewer the leakages. The regional economy of the five counties is not as integrated as would be the economy of the state of North Carolina. There are considerable leakages and the result is that local multipliers are not large. The individual sector Type I and II multipliers are reported in Table A2.1 for the Appalachian State University impact region.

TABLE AB1. SECTOR LEVEL TYPE I AND II OUTPUT MULTIPLIERS

Sector	Type I	Type II
Primary Industries	1.202	1.313
Construction and Repair	1.250	1.632
Food Processing	1.584	1.758
Manufacturing	1.210	1.378
Furniture Making	1.219	1.554
Wholesale & Retail Trade	1.224	1.678
Transportation, Communication, & Utilities	1.327	1.614
Business Services	1.255	1.708
Finance, Insurance, & Real Estate	1.169	1.468
Education (Private) and Health Services	1.234	1.724
Recreation Services	1.481	1.661
Personal Services	1.277	1.589
Government Services	1.028	1.795

The interpretation of our multipliers is fairly straightforward. For the Recreation Services sector, the Type I output multiplier is 1.481 indicating that a direct injection of \$100 into this sector (such as spending by a visitor to an Appalachian football game) will increase output of this sector by a total of \$148 or almost a 50 percent additional output through the regional economic linkages. The additional spending by workers earning wages and salaries in this sector provide the induced impacts and the Type II multiplier for this sector is 1.661. Thus a direct injection of \$100 to this sector will increase output by a total of \$166 or approximately a 66 percent gain in total output of this sector.

To conclude the discussion of the methodology, the five steps in the analysis of the impacts of Appalachian State University on the regional economy are summarized below:

1. Choose a study region – the five counties based on the daily commuting patterns of workers in Watauga County.
2. Construct a baseline I-O data set for 2004 using the IMPLAN database and software (IMPLAN Pro version 2.0).

3. Aggregate the 300 sectors present in the Regional economy to 13 sectors. Purpose of aggregation is to reduce the dimensionality and to combine some very small sectors into larger ones that are more relevant for analysis since they are likely to experience similar impacts.
4. Construct an impact dataset to represent the direct impact of Appalachian on the regional economy. This dataset includes all of the direct expenditures made by Appalachian (e.g., faculty and staff salaries) and by Appalachian students.
5. Conduct impact analysis using an I-O model developed for the purpose.

APPENDIX C: DATA ADJUSTMENTS

The raw or unadjusted expenditures attributed to the presence of Appalachian State University in the region are reported in the text (Table 5). Not all of the expenditures constitute net new money to the region. Some of the employment would exist absent Appalachian and thus the expenditures recorded by Appalachian must be discounted. As discussed in the text, all faculty employment is deemed to be attributable to Appalachian. In the baseline scenario 90 percent of the support staff is attributed to the presence of Appalachian. Some of these workers would find jobs with other employers in the region (perhaps even self-employment). Thus, the wages and salaries paid by Appalachian were reduced by 10 percent to reflect the “crowding out” effect of Appalachian – that, in the absence of Appalachian these workers would be employed elsewhere in the region.

Faculty and staff compensation includes payments for fringe benefits (health care and pensions primarily). These are assumed to leak entirely out of the region. The pensions are managed outside the region and the management jobs associated with this activity occurs elsewhere – Charlotte, for example. Similarly, while health services are supplied locally the bulk of the management occurs outside the region. These are somewhat conservative assumptions. Relaxing these would lead to a higher computed economic impact of Appalachian State University.

These same methods are applied to income and payroll tax payments by faculty and staff – these are also assumed to leak out of the region. Payroll taxes constitute 6.5 percent of wages and salaries up to the ceiling for Social Security contributions. Although some faculty and staff earn in excess of the Social Security ceiling, a conservative approach here as well. In any case, the proportion of such personnel is not large, so the full 6.5 percent was deducted from wage and salary figures. North Carolina State Income Tax is progressively structured. The average rate applied here was estimated as 3.5 percent based on Appalachian average wages and salaries. The Federal Personal Income Tax (PIT) rate is also progressive. Individual household economic positions determine the actual rates. A 10 percent average tax rate on gross income was applied for Appalachian employees. This is likely to be a bit of an overstatement as is the report’s imputed State PIT rate. Thus, the total PIT and payroll tax payments were imputed to be 20 percent for the wage and salary payments made by Appalachian. This estimate is likely a small overstatement. Carroll and Smith (2006) imputed 85 percent of gross pay would appear in the local economy. They assumed that state and local taxes would be spent within the state. Since the impact for a sub-region of North Carolina was analyzed, this assumption was not applied and it is assumed that the state income taxes leak out of the region. Erring in this direction is consistent with the overall approach of using the most conservative measures for this study.

BIBLIOGRAPHY AND DATA SOURCES

Appalachian State University *Fact Book 2006-2007*, <http://irap.appstate.edu>, accessed on November 20, 2007.

Aptech Systems, Inc. (1991) GAUSS, Kent, Washington.

Carroll, M.C. and B.W. Smith (2006) "Estimating the Economic Impact of Universities: The Case of Bowling Green State University," *The Industrial Geographer*, 3(2): 1-12.

Dave, D., D. Stoddard, and T.L. Cherry (2003) *The Economic Impact of the Arts in Watauga County, North Carolina*, Office of Cultural Affairs, Appalachian State University.

Goldstein, H.A., G. Maierm and M. Luger (1995) "The University as an Instrument for Economic and Business Development: U.S. and European Comparisons," in Dill, D. and B. Sporn (eds), *Emerging Patterns of Social Demand and University Reform: Through a Glass Darkly*, Oxford, England: Pergamon.

Meyer, J.R. (1963) "Regional Economics: A Survey," *American Economic Review*, 53 (1): 19-54

Minnesota IMPLAN Group (2006) 2004 Database for North Carolina, Stillwater, MN.

Richardson, H.W. (1972) *Input-Output and Regional Economics*. London, UK: Weidenfeld and Nicholson.

Seyfried, W. "The Economic Impact of Winthrop University in York County, Metropolitan Charlotte and South Carolina," <http://cba.winthrop.edu/announcements/econ.impact.study06.pdf>, accessed January 24, 2008.

Siegfried, J.J., A.R. Sanderson, and P. McHenry (2008) "The Economic Impact of Colleges and Universities," *Change*, Volume 40, Number 2, March/April 2008.

Starbuck, M., R. Berrens, and M. McKee (2006) "Simulating Economic Impacts from Hazardous Fuels Treatment and Forest Restoration Management Activities," *Forest Policy and Economics*, 8 (1): 52-66.

The Economic Impact of Marshall University, Center for Business and Economic Research, Marshall University, April 19, 2006.

The Economic Impact of the University of South Carolina, USC Upstate, http://www.sc.edu/economic_impact/index.html, accessed on December 12, 2007.

The Economic Impact of University System of Georgia Institutions on their Regional Economies in FY 2004, Selig Center for Economic Growth, Terry College of Business, January 2005

The Economic Impact of the University of Virginia: How a Major Research University Affects the Local and State Economies, Weldon Cooper Center for Public Service, 2007.

The Economic Impact of Winthrop University in York County, Metropolitan Charlotte and South Carolina, <http://cba.winthrop.edu/announcements/econ.impact.study06.pdf>, accessed January 24, 2008.

U.S. Census Bureau. *North Carolina: Residence County to Workplace County Flows*, 2006.

U.S. News and World Report's 2008 America's Best Colleges Guide. August 27, 2007.

NOTES

1 Source: Goldstein, Maier and Luger, 1995

2 As noted in Siegfried et al. (2008), while previous impact analyses have estimated the economic impact of all types of universities, the methodology is particularly applicable for rural universities.

3 The analysis assumes that 10 percent of university staff employees would remain working in the region if Appalachian was present or not, meaning the spending of these employees is not linked to Appalachian. Sensitivity analyses indicate varying this assumption does not significantly alter the results. For example, assuming 20 percent of university staff employees would remain working in the region only lowers the reported economic impact on regional output would decrease by 2.9 percent.

4 Source: Aptech Systems, Inc. (1991); The GAUSS program is derived from a previous application reported in Starbuck, M., R. Berrens, and M. McKee (2006).

5 Siegfried et al. (2008) review 138 college economic impact studies completed since 1992 and find systematic problems in the analysis and presentation. They highlight common pitfalls found in such work and identifies measures to improved the analysis and presentation of university impact studies. This study undertakes these measures when applicable.

6 Sources: Meyer (1963); Richardson (1972)

7 Since the primary constituents of a public university are state residents, only North Carolina counties are considered in determining the extent of the region.

8 The IMPLAN project constructs input-output and social accounts data at the county level for all counties in the US. In addition, state-level databases are constructed.

9 Source: Dave, Stoddard and Cherry (2003)

10 The various adjustments required to correct for leakages and transfers amounts to approximately 10 percent of the unadjusted direct impacts.

11 The computations for enrollment growth assume a constant return to scale for the university, which implies that all activities are presumed to increase in equal proportions.

12 While most studies employ some form of input-output model, the degree of sophistication varies considerably. A few studies simply use a single economy-wide multiplier; rather than sector specific multipliers.

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