

Appalachian State University

Economic and Tax Revenue Impacts FY 2010-2011

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Appalachian State University

Executive Summary

Appalachian State University is a public master's comprehensive 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 2011, the university employed 2,531 full time personnel and 428 part time personnel. This included 862 full time faculty and 354 part time faculty. Total enrollment was 17,222 (full and part-time) students, nearly all of whom would be elsewhere without the presence of Appalachian.

University Impact. The annual economic impact of Appalachian for fiscal year 2010-11 includes the creation of approximately 6,100 jobs, \$140 million in earnings, and a total dollar impact on the regional economy of \$560 million. In terms of economic output, this represents an approximate 10 percent increase in contribution to the local economy from the period 2006-07 (when Appalachian's economic impact was previously estimated – see Cherry, McKee & Millsaps, 2008). The increased economic activity arising from the presence and operation of Appalachian led to \$36 million in additional indirect business taxes to local governments.

University Revenue. Appalachian State University received \$125.75 million in state appropriations, \$85 million in tuition and fees, and \$60 million in grants, contracts and gifts. These revenues represent a shift of economic activity to the region from across the state.

The Marginal Impact of Funding Cuts. Over the past 3 years Appalachian has seen its level of State appropriation funding fall by 17 percent. While some of this revenue decline has been offset through enrollment growth and tuition increases, Appalachian has reduced spending through staff reductions, leaving some faculty positions unfilled and cutting adjunct instructors. Through larger class sizes and reduced course offerings Appalachian has absorbed the increased enrollment. Thus, the impact of the State budget cuts has been ameliorated. In nominal terms, overall spending related to Appalachian has increased slightly over the period FY 2006-07 to FY 2010-11 due primarily to increased enrollment (student spending in the region) and current construction projects on campus. To examine the impacts of the recent budget cuts, a scenario in which the state appropriations are assumed to remain at the 2008 levels is investigated.

I. Introduction

Universities are engines for regional economic development. The presence of a university contributes to the regional economy by enhancing human capital through education, creating new knowledge through research activity, developing and transferring new technology, and creating favorable environments that attract innovative businesses and individuals (Goldstein, Maier & Luger 1995). For universities located in rural areas, the contribution to the region can be especially noteworthy because they are often one of the largest employers and account for much of spending that supports local businesses.

This has always been the case with Appalachian State University. 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 growth and 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 yielded a corresponding increase in the university's role in the regional economy; enhancing the standards of living and quality of lives in the region. Recent declines in Appalachian State's budget have dampened the economic impact. However, enrollment growth since 2008 has ameliorated the effect of the budget cuts.

This study estimates the incremental economic impacts of Appalachian State University on the northwestern North Carolina region. A regional input-output model is constructed to compute the impact of Appalachian on the region's economic activity, employment, earnings, and local tax revenues. Projections are derived from expenditures by the university, its employees, students and visitors, which contribute to economic activity and stimulate the regional economy. This study follows previous reports on Appalachian's impact on Watauga County in 2008, 1999 and 1988. In particular, to facilitate comparison with the 2008 study (Cherry, McKee & Millsaps), we have employed the same methodology including the modeling approach and the identification of the region for the purposes of the assessment of economic impacts. We note here, and discuss more fully below, that our study omits a substantial component of the economic benefits of higher education that flow to the residents of North Carolina.

II. 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 7 undergraduate colleges and schools and one graduate school. These academic units offer 170 undergraduate and graduate degree and certificate programs. The university is situated on a 410-acre main campus that consists of 19 academic buildings, 11 recreational and athletic facilities, 20 residence halls and 3 dining facilities.

Appalachian State University is a traditional residential campus, with 93 percent of the students being enrolled full-time. Approximately 35 percent of the students live on campus. The student body largely originates from outside the region, with only 13 percent being from the campus' home county or adjacent counties. Nine percent of students are from outside North Carolina. The student body is 90 percent white, with 46 percent being male and 54 percent being female. The 2,972 students entering as freshman for the 2010 Fall semester had an average SAT score of 1,141 and an average high school GPA of 3.94. According to *U.S. News and World Report*, Appalachian is ranked fifth among the South's top 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. In the following decade, enrollment doubled to about 9,500.

Today, Appalachian has over 17,000 students and more than 100,000 alumni living in all 50 states and several foreign countries. The university employs 2,531 full-time people and has an operating budget of \$375 million and physical assets valued at over \$500 million. Belk Library

holdings are valued at more than \$2 million and include 917,000 books and bound periodicals, and over 1.6 million microforms and electronic titles.¹

Located in Boone (NC), in the heart of the Blue Ridge Mountains, the university’s contributions extend well beyond the campus. Appalachian provides the local community and region a multitude of educational, cultural and entertainment opportunities; such as 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 An Appalachian Summer program.

University Revenues

Appalachian State University revenues in fiscal year 2010-11 were \$375,011,027. State appropriations, the largest single source of revenues, accounted for \$125.7 million or 33.5 percent of the total revenue. Tuition and fees was the second largest category of revenue, with \$85.1 million or 22.7 percent of the total. Auxiliary enterprises such as the bookstore, New River Light and Power, and food services represented \$58.7 million or 15.6 percent of total revenues.

Table 1. Revenues by Source 2010-11

Revenue Source	Dollar Amount (in thousands)	Percent of Total
State Appropriations	125,743	33.5
Tuition & Fees	85,123	22.7
Auxiliary Enterprises	58,674	15.6
Independent Operations	13,189	3.5
Capital Grants & Gifts	59,919	15.9
Grants & Contracts	1,228	0.3
Investment Income	4,415	1.2
Independent Operations	10,193	3.5
Other Non-operating Revenue	12,213	3.3
Other Sources	2,127	0.6

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

¹ It is important to note that Appalachian’s enrollment in 2006 was approximately 15,000 and the current (2010-2011) enrollment is more than 2,000 higher despite substantial cuts in State funding to the University.

III. Measuring the Economic Impact of Appalachian State University

Research Method

This study reports computations of the annual economic output and indirect business tax revenue impacts of Appalachian State University on the northwestern North Carolina regional economy. A 13 sector regional input-output model was constructed to investigate 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, some of which is spent locally for consumer goods; the expenditures of students on (off-campus) housing and other items; the expenditures of visitors who come to the area to enjoy university-related activities such as sports events, musical events, and other events.

The economic effects of these injections of money consist of the direct impacts of the local spending and the subsequent indirect and induced impacts as these dollars circulate through local businesses and are, in turn, spent locally again. The initial injections of money and subsequent spending would not occur in the region in the absence of the university. The total impact is the net effect of spending, considering that some leakage of spending will occur to domestic and international trade. These funds do not remain in the local economy and do not contribute to indirect or induced spending. The regional economic model is based on the database generated by the Minnesota IMPLAN Group (MIG). These data incorporate adjustments using regional purchase coefficients accounting for leakages from the local economy. The economic impact simulations themselves are conducted using an input-output model programmed in GAUSS (Aptech, 1991). This model is derived from previous applications (e.g., Starbuck, Berrens & McKee, 2006; Berrens, McKee & Farmer, 1999). The IMPLAN database is available at the county level and the impact region consists of five counties as described below. See Appendix A for a more detailed discussion of the input-output model.

The Region

Appalachian's reach extends beyond its location in Boone, NC in Watauga County. Contributions from Appalachian faculty and graduates contribute to the economies around the world. However, the material effects of university operations are more concentrated geographically, 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. Meyer (1963) lists 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. Richardson (1969) echoes this classification scheme. 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. The “student shed” is of course considerably larger but students are considered to be here primarily for schooling and to shift little of the incomes they earn in the region back to the permanent homes. Thus, we do not account for such income flows. In effect, we assume that all student earnings are spent locally.

Figure 1. NW North Carolina Five County Region



Table 2. Resident to Workplace Flows, 2006

Residence County	Workplace County	Number
Catawba	Watauga	55
Forsyth	Watauga	61
Mecklenberg	Watauga	69
Wilkes	Watauga	244
Caldwell	Watauga	271
Avery	Watauga	557
Ashe	Watauga	1350
Watauga	Watauga	18083

Source: U.S. Census Bureau

Table 3. Economic Indicators for the Region

Category	Measure
Area	2,215 sq. mi.
Population (2010)	248,526
Private Non-Farm Employment (2010)	116,128
Total Employment (2010)	120,204
Total Wages and Salaries (2010)	\$3,429,733

Sources: U.S. Census Bureau and Bureau of Labor Statistics REIS.

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 reports the commuting patterns of the seven neighboring counties to Appalachian’s host county of Watauga. 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, so for the purpose of this analysis, the region is defined as the five counties of Watauga, Ashe, Avery, Caldwell and Wilkes.² Table 3 provides a general description of the region.

² The definition of the region in this analysis is the same as that used in the 2008 study (Cherry, McKee & Millsaps, 2008). Though the specific commuting figures have changed, the 5-county region supplied the bulk of the Appalachian workforce over both periods.

Table 4. Aggregated Economic Sectors for the I-O Model

Sector Name	Sector Output (million \$)	Sector Employment (jobs)
Primary	698.22	3,854
Construction	796.15	9,203
Food Processing	739.80	3,315
Manufacturing	2,798.46	10,096
Furniture Making	447.98	3,500
Wholesale & Retail Trade	1,495.65	18,481
Transportation, Communication, & Utilities	501.62	3,778
Business Services	1,091.77	10,219
Finance, Insurance, & Real Estate	1,631.46	7,669
Education and Health Services (Private)	736.96	12,613
Recreation Services	505.75	11,053
Personal Services	334.38	7,771
Government Services	738.55	18,652
TOTAL	12,746.44	120,204

Source: REIS Employment Data

The regional database was constructed by combining the IMPLAN data files for Watauga, Wilkes, Caldwell, Avery, and Ashe counties.³ Industry level transactions and employment are aggregated for 13 economic sectors that illustrate the regional economy. Table 4 reports the economic output and employment for the region by sector. Sector definitions are provided in Appendix A.

An important observation here is that total employment in the region is lower than it was when the 2006-07 study was completed. The decline in employment is approximately 1 percent of the total for the region despite population growth over the period.

The Appalachian State 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

³ The IMPLAN project constructs input-output and social accounts data at the county level for all counties in the U.S. In addition, state level databases are constructed. For the present study the 2004 inter-industry matrix is used and the aggregate output and income data are projected to 2010 using the county-level industry employment and earnings data from the Bureau of Economic Analysis REIS data (BEA, 2012).

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 events such as An Appalachian Summer, summer camps, home football games, etc. Appalachian Events and Athletics Department supplied attendance data, while spending estimates were drawn from a recent survey on Appalachian visitor spending (Dave et al., 2003) updated where possible with newer data.

Several adjustments were made to the raw data provided by the Appalachian State University sources. These adjustments were necessary to correct for expenditure leakages (money that flows directly out of the region) from the regional economy and to ensure that the direct impacts did not include such items as payroll taxes paid by employees of Appalachian and were not subject to problems arising from double counting. The details are provided in Appendix C.⁴

The expenditures by Appalachian employees from their salaries and wages were adjusted to eliminate leakages and transfers. Fringe benefits (e.g., retirement and health benefits) and income and payroll taxes were excluded. 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.

Expenditures by students are entirely attributed to Appalachian because students are presumed to live in the region for the purpose of attending the university. This includes those students 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 and 66 percent respectively). In particular, room and board expenditures by students living on campus

⁴ As Siegfried, Sanderson & McHenry (2007) note, many studies of the economic impacts of universities overstate these impacts through erroneous use of input data (double counting in particular). The resulting overstated impacts (sometimes reported to be in excess of 10 times the direct State spending) damage the credibility of studies of university driven regional economic impacts. The direct impact data was adjusted to eliminate double counting, false counterfactuals and other types of errors that would lead to incorrect results.

are excluded because they are captured in university expenditures by the student housing department.

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 Camps, and home football games. Visitor behavior and spending patterns are drawn from previous studies, and are adjusted to differentiate between visitor origins. In particular, expenditures by football game attendees were adjusted to differentiate between students, locals, and non-locals to account for spending differences.

The unadjusted direct expenditures created by the presence of Appalachian are reported in Table 5. As the table illustrates, these expenditures fall into four categories: direct expenditures by Appalachian on instruction and research, direct spending by Appalachian on operations and capital; direct expenditures of visitors attending Appalachian functions, and direct expenditures of students attending Appalachian.

Unadjusted expenditures by the university in the 2010-2011 fiscal year increased from the previous study year (2005-2006), due primarily to three factors: increased faculty and staff wages; increased capital spending on building construction; and increased student spending on housing, food, recreation, and entertainment due to the larger student body (an approximate 2,000 additional students). In this period, wage increases driven by the BOG desire to get faculty salaries adjusted toward 80th percentile of peer institutions, and the provision of enrollment growth funds helped maintain per student resources. In most areas (e.g., except business disciplines), replacement faculty cost less than the departure of senior faculty.

Table 5. Expenditures (Unadjusted) by Appalachian State University

Category	2011 Expenditures
Appalachian Personnel ^a	
Teaching: Faculty and Staff Salaries	\$ 77,730,488
Non-teaching Staff Salaries and Wages	\$ 81,305,543
Non-teaching: Part-time Wages	\$ 10,985,523
Faculty and Staff Benefits	\$ 41,650,363
Faculty and Staff Travel	\$ 7,953,821
Appalachian Operations ^a	
Buildings and Grounds Maintenance	\$ 1,554,484
Utilities	\$ 15,394,825
Contract Professional Services	\$ 9,232,502
Supplies	\$ 35,442,917
Appalachian Students ^b	
Off Campus Housing and Food	\$ 94,310,000
Recreation and Entertainment	\$ 12,665,000
Transportation	\$ 30,740,000
Miscellaneous Retail	\$ 14,697,500
Appalachian Capital Spending ^a	
Building Construction	\$ 54,630,872
Furniture	\$ 97,475
Equipment	\$ 10,444,158
Visitor Spending ^c	
Athletic Events	\$ 4,677,249
Appalachian Summer	\$ 2,236,000
Summer Music Camp	\$ 240,000
All Other App Events	\$ 290,000
Total	\$506,278,720

Sources: ^a Office of Business Affairs^b Office of Financial Aid^c Appalachian Events and Athletics Department

IV. Appalachian State University's Impacts on the Regional Economy

Direct Impact

Table 5 reports the (unadjusted) direct expenditures by university employees, students and visitors that determine Appalachian's direct impacts on the regional economy. To compute the indirect and induced impacts, the adjusted direct expenditures are allocated to the 13 sectors of the input-output model as shown in Table 6.⁵ These direct expenditures represent the direct impact of the introduction of increased final demand for goods and services within the region due to Appalachian. The subsequent indirect and induced impacts on the regional economy are then computed via the input-output model. The figures in Table 6 are derived from those in Table 5 after adjustments are made to correct for leakages that flow out of the region as (explained in detail in Appendix C) and after the wages and salaries paid to Appalachian faculty and staff are allocated as spending across the 13 sectors in the input-output model. This allocation follows the average spending patterns for the region.

Table 7 presents the total economic impacts of direct expenditures on the five-county regional economy. The aggregate increase in regional economic activity, as measured by the value of goods and services produced, is \$560 million. This increase in activity requires an additional 6,098 jobs and payment of additional earnings of \$141 million. The total impact—direct plus indirect plus induced—of Appalachian constitutes approximately 5 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 also translates to greater indirect taxes to the region. The increased activity associated with Appalachian yields \$36 million in additional indirect business taxes (sales, excise and property taxes).

⁵ The various adjustments required to correct for leakages and transfers amounts to approximately 30 percent of the unadjusted direct impacts reported in Tables 5 and 6. Fringe benefits to faculty and staff leak out of the region as does half of student spending on transportation. Other leakages account for the remaining difference. See Appendix C for details.

Table 6. Direct Economic Impacts (Adjusted) by Sector

Sector	Direct Impacts (million \$)
Primary Industries	3.586
Construction and Repair	58.185
Food Processing	6.177
Manufacturing	14.921
Furniture Making	0.445
Wholesale & Retail Trade	81.546
Transportation, Communication, & Utilities	36.474
Business Services	12.265
Finance, Insurance, & Real Estate	80.518
Education (Private) and Health Services	21.002
Recreation Services	25.803
Personal Services	7.883
Government Services	0.564
TOTAL Direct Impacts	349.369

Table 7. Total Economic Impacts by Sector – Actual Appalachian Budget

Sector	Change in Output (million \$)	Change in Employment (jobs)	Change in Earnings (million \$)
Primary	4.729	26	0.369
Construction	97.678	1129	22.392
Food Processing	11.076	50	1.563
Manufacturing	20.318	73	2.927
Furniture Making	0.709	6	0.180
Wholesale & Retail Trade	138.303	1709	46.858
Transportation, Comm, & Utilities	59.798	450	14.710
Business Services	20.974	196	8.318
Finance, Insurance, & Real Estate	111.333	523	8.472
Education (Private) and Health Services	36.305	621	17.491
Recreation Services	45.053	985	12.668
Personal Services	13.051	303	4.125
Government Services	1.022	26	0.885
TOTAL Direct + Indirect + Induced Impacts	560.348	6098	140.956

Effects of Budget Cuts at Appalachian

Over the past three years the level of State appropriation to Appalachian State has fallen by 17 percent. At the same time enrollment has increased by approximately 14 percent. The enrollment growth results in greater overall student spending (housing, food, entertainment, etc.) and this expenditure has flowed to the regional economy offsetting, in part, the lack of growth of university spending on instruction (faculty salaries) and operations (staff salaries). It is likely that further budget cuts cannot be absorbed in similar fashion. As class sizes increase further, course offerings (sections and courses) are often reduced, which could lead to lower four-year graduation rates.⁶ Thus, prospective students may well explore other options.⁷

To examine the impacts of the recent budget cuts, a scenario was investigated that assumed the State appropriations would remain at the 2008 levels. This simulates a scenario under which Appalachian is able to maintain higher enrollment without cancelling class sections and/or reducing course offerings. The results are reported in Table 7.

Table 7. The Impact of Cuts in Appalachian Budgets

	Baseline Impact	With Zero Appropriation Cuts Impact	Increment
Output	\$560 Million	\$592 Million	\$32 Million
Employment	6098	6451	353
Earnings	\$141 Million	\$150 Million	\$9 Million

In the Zero Appropriation Cuts case, the per-student resources (faculty and staff) are maintained at the levels in effect prior to the appropriation reductions. Spending is increased on materials and supplies by the same fraction. This results in an increase in total spending due to the enrollment growth from 2006 through 2011. As Table 7 shows, the regional impacts will, of

⁶ Appalachian's 6-year graduation rate was 66% for the 2004 cohort (IRAP report 2009-2010). While this is undoubtedly low, Appalachian's rate is higher than the national rate of 60 percent (see Edmiston, Brooks & Shepelwich, 2012).

⁷ Of course, Appalachian may have revenue options to partially address the lower state appropriations. External funding through gifts, grants, and contracts are being pursued, but given its lack of PhD programs and professional programs, Appalachian will be less able to pursue these avenues than a research intensive university.

course, be much higher, yielding an additional \$32 million in regional output over the baseline estimates. Correspondingly, employment and earnings increase as well.

It remains to be seen whether Appalachian can maintain the current enrollment and student selection standards under long term budget cuts similar to that seen over the past 3 years. As the impacts on class sizes and course offerings continue to play out, barriers to higher education will increase for current and incoming students.

V. 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 may be useful. Table 8 provides the results from the previous studies that compute Appalachian's economic impact. Table 9 reports the findings from studies that examine various universities in the southeast United States.

Several studies have been omitted from the comparison due to methodological flaws. When Cherry, McKee & Millsaps (2008) completed their previous analysis of the impacts arising from Appalachian, they were careful to avoid some of the mistakes they had detected in studies completed at other universities notably Bowling Green State University (Carroll & Smith, 2006).⁸ By relying on careful application of economic theory, the current analysis has similarly avoided these types of errors. As Siegfried, Sanderson & McHenry (2007) note in their critical review of similar studies:

Such studies often claim local benefits that imply annualized rates of return on local investment exceeding 100 percent. We address problems in these studies pertaining to the specification of the counterfactual, the definition of the local area, the identification of "new" expenditures, the tendency to double count economic

⁸ A recent study by East Carolina University makes similar claims. In the ECU Alumni magazine of Summer 2012, reference is made to a recent study that asserts every dollar of State appropriation to the university provides a 13 dollar impact to the local regional economy.

impacts, the role of local taxes, ... If these economic impact studies were conducted at the level of accuracy most institutions require of faculty research, their claims of local economic benefits would not be so preposterous, and, as a result, trust in and respect for higher education officials would be enhanced. [Abstract]

A comparison of the computed total economic impacts of Appalachian with similar analyses of other universities or university systems is informative. Clearly research intensive universities generate larger overall impacts. This is due mainly to the relatively large levels of external (grant and contract) funding these universities generate. Further, these universities all have a full spectrum of professional schools (e.g., law, medicine, and engineering) that often lead to spinoff activities in the region. Within its comparable cohort universities, Appalachian generates a commensurate level of impacts. Marshall University includes several sites across the state and, of course, has a medical school. Kennesaw State is located in the metropolitan area of Atlanta, the effect of which is to substantially reduce the extent of leakages of expenditures of the university out of the local economy. The greater diversity and scope of the regional economy of Atlanta implies larger induced impacts than are experienced in the Appalachian region. On the other hand, Appalachian State represents a much larger *relative* contribution to the local economy through the impacts generated from the instructional and research activities as well as the ancillary activities associated with athletics and cultural events. In the current recession this effect has been magnified as total employment in the region has fallen by approximately one percent as compared with the total employment when the previous study was undertaken.

Table 8. Comparison with Previous Studies of Appalachian

Study Year	Enrollment	Impact on Output*	Impact on Employment
1988	4,500	133	1,850
1999	6,500	203	3,200
2008	15,117	506	5,121

Notes: enrollment is at the time of study; Output is measured in millions of dollars

Table 9. Comparison with Similar Studies

Institution	Year	Institution Category	Student Enrollment	Impact on Output*	Impact on Employment
USC Upstate ^R	2003	Undergraduate	4,500	133	1,850
Winthrop Univ ^L	2006	Undergraduate	6,500	203	3,200
Valdosta State ^R	2005	Comprehensive	11,000	258	3,635
Georgia Southern ^R	2005	Comprehensive	16,646	439	6,252
Kennesaw State ^R	2005	Comprehensive	20,000	441	4,287
Appalachian St ^R	2006	Comprehensive	15,117	506	5,121
Appalachian St ^R	2011	Comprehensive	17,222	560	6,098
Marshall Univ ^S	2006	Comprehensive	13,996	547	7,735
Univ of Virginia ^L	2005	Research	20,400	1,097	16,000
USC Columbia ^R	2003	Research	25,000	1,400	20,339
Univ of Georgia ^R	2005	Research	33,400	2,052	22,458

Notes: L, R and S indicate the scope of study is on local, regional or statewide impacts
Enrollment is at the time of study; Output is measured in millions of dollars

VI. Concluding Remarks

Appalachian State University contributes significantly to the regional economy. The annual economic impact of Appalachian for fiscal year 2010-11 includes the creation of approximately 6,100 jobs, \$141 million in earnings, and a total dollar impact on the regional economy of \$560 million. The increased economic activity arising from the presence and operation of Appalachian led to \$36 million in additional indirect business taxes to local governments.

The university's direct impact and subsequent indirect impacts, conservatively estimated, represent about 5 percent of regional economic activity, 5 percent of regional employment, and 4 percent of salaries and wages in the region. These totals are not large but the stability of the employment and output is important to the regional economy.

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.

In particular, higher education contributes through changes in various social outcomes that are beneficial to the larger society. As Watts (2001) demonstrates, using individual level data from Kentucky, higher education leads to increased propensity for individuals to engage in their community through volunteer activities, voting, and charitable contributions. Higher education also leads to beneficial health outcomes such as lower levels of obesity and tobacco use.

As noted above, the impact of the previous budget cuts may not have been fully felt as yet. Applications by prospective students appear to be maintaining their historic levels and Appalachian has absorbed additional students by increasing class sizes and/or limiting some course offerings.

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Appendices

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 we have aggregated these 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: 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: banking, financial services, insurance carriers, and real estate brokers.

Personal Services: 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 Method

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 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 impact region.

Table A2.1 Sector Level Type I and II Output Multipliers

Sector Name	Output Multiplier	
	Type I	Type II
Primary Industries	1.202	1.319
Construction and Repair	1.250	1.679
Food Processing	1.584	1.793
Manufacturing	1.210	1.362
Furniture Making	1.219	1.592
Wholesale & Retail Trade	1.224	1.696
Transportation, Communication, & Utilities	1.327	1.639
Business Services	1.255	1.710
Finance, Insurance, & Real Estate	1.169	1.383
Education (Private) and Health Services	1.234	1.729
Recreation Services	1.481	1.746
Personal Services	1.277	1.656
Government Services	1.028	1.811

The interpretation of the 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 1.746. Thus a direct injection of \$100 to this sector will increase output by a total of \$175 or approximately a 75 percent gain in total output of this sector.

To conclude the discussion of the methodology used for this analysis, a summary of the steps taken in the analysis is presented:

1. Choose a study region – the 5 counties based on the daily commuting patterns of workers in Watauga Co.
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. Update the model to 2010 – 2011 FY data using the REIS dataset (employment and earnings by sector) generated by the Bureau of Labor Statistics.
5. Construct an impact dataset to represent the direct impact of Appalachian on the regional economy using the data provided by Appalachian. The dataset includes all of the direct expenditures made by Appalachian (e.g., faculty and staff salaries) and by Appalachian students.
6. 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 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 by this. 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, we reduce the wages and salaries paid by Appalachian 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 occur 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 higher computed economic impacts of Appalachian.

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, the analysis was based on a conservative approach here as well. In any case, the proportion of such personnel is not large so the full 6.5 percent from our wage and salary figures is deducted. 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 was applied on gross income for the Appalachian employees. This is likely to be a bit of an overstatement as is the 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 & 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 current analysis focuses on the impact for a sub-region of North Carolina, the assumption applied is that 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 (see Seigfried, et al, 2007). The adjusted data are reported in Table 5C (corresponds to Table 5 in the body of the report).

The raw supplies data included purchases for resale that constitute inventory for resale. This includes the cost of goods sold in Appalachian Food Services, Book Store, and Warehouse, as well as purchases of electricity for resale by New River Light and Power. No purchases for resale were included as this will be picked up within expenditures, for example, student fees on textbooks or food expenditures etc.

All faculty travel is assumed to leak from the region. By definition, faculty conference travel (incurring registration fees, plus meals and lodging expenditures) will occur outside the region, as will all spending on air travel. This assumption may be a slight underestimate as some local spending may occur as faculty and staff purchase gas locally before a trip but this effect will be minimal.

Building construction expenditures are based on a five-year average of construction-based activity. In any given year, construction activity may fluctuate significantly from the previous period, so a five-year moving average measure is perceived to be more appropriate in smoothing the expenditure flows.

Visitor spending on athletic events adjusts for local attendees and does not include ticket sales as these generate income for future spending by the Athletics Program.

Table 5C. Adjusted Expenditures by Appalachian State University

Category	2011 Expenditures
Appalachian Personnel^a	
Teaching: Faculty and Staff Salaries	\$ 53,333,661
Non-teaching Staff Salaries and Wages	\$ 48,149,142
Non-teaching: Part-time Wages	\$ 7,538,266
Faculty and Staff Benefits	\$ 0
Faculty and Staff Travel	\$ 0
Appalachian Operations^a	
Buildings and Grounds Maintenance	\$ 1,554,484
Utilities	\$ 15,394,825
Contract Professional Services	\$ 9,232,502
Supplies	\$ 6,696,163
Appalachian Students^b	
Off Campus Housing and Food	\$ 94,310,000
Recreation and Entertainment	\$ 12,665,000
Transportation	\$ 15,370,000
Miscellaneous Retail	\$ 11,022,275
Appalachian Capital Spending^a	
Building Construction	\$ 54,630,872
Furniture	\$ 97,475
Equipment	\$ 10,444,158
Visitor Spending^c	
Athletic Events	\$ 4,677,249
Appalachian Summer	\$ 2,236,000
Summer Music Camp	\$ 240,000
All Other App Events	\$ 290,000
Total	\$349,369,297

Sources: ^a Office of Business Affairs^b Office of Financial Aid^c Appalachian Events and Athletics Department