Economic and Fiscal Impact of Alabama A&M University on Alabama and Huntsville Metropolitan Area: 2011-2012

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Note: This report reflects the analysis and opinions of the authors, but not necessarily those of the faculty and staff of the Culverhouse College of Commerce or the administrative officials of The University of Alabama.

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- For the 2011-2012 academic year, the economic and fiscal impacts of AAMU on Alabama were $349.8 million, 1,612 jobs, and $12.3 million in income and sales taxes ($7.8 million for the state and $4.5 million for local jurisdictions). The nearly $350 million impact means that AAMU created an impact of $8.66 for every $1 of state appropriation.

- The AAMU economic impacts on the two-county Huntsville metro area totaled $227.8 million, 1,404 jobs, and $2.9 million in local sales tax.

- From a public investment perspective, Alabama will realize a 6.7 percent annual rate of return on the $40.4 million state appropriation because over their working life the AAMU 2011-2012 graduating class will pay $164.5 million in additional income and sales taxes ($122.7 million state and $41.8 million local) than they would have without their AAMU degrees.

- The AAMU real annual return on investment (ROI) for the 2011-2012 graduating class ranges from 9.0 percent to 11.9 percent depending on the degree attained compared to a high school graduate; marginal real annual ROIs ranges from 9.0 percent to 23.1 percent.

- Clearly, AAMU is an attractive investment for both its graduates and the State of Alabama. The University provides many other public and private benefits as well, some of which are difficult to quantify.

Economic and Fiscal Impact of Alabama A&M University on Alabama and Huntsville Metropolitan Area: 2011-2012

Introduction

This report presents the economic and fiscal impacts of Alabama Agriculture and Mechanical University (AAMU) on both the State of Alabama and the two-county Huntsville metropolitan area for the 2011-2012 academic year. Established in 1890 as land-grant institution, AAMU functions as a teaching, research, and public service institution. AAMU is a dynamic and progressive institution with a strong commitment to academic excellence. The AAMU campus is situated on more than 2,300 acres, a 5-minute commute from downtown Huntsville. The university currently enrolls 5,024 students from 44 states and 11 foreign countries, almost 42 percent being first-time college students. The university also employs 1,024 faculty and staff members across all undergraduate, graduate and professional programs.

The focus in this economic report is on output, employment, and fiscal (income and sales tax) impacts of AAMU on the state and metro area. Output refers to total or gross business sales and contains value-added (the contribution to gross domestic product (GDP) or the value of goods and services produced on a value-added basis within a specific region or state), which in turn contains earnings impacts (the wages and salaries of the workers recognized by the employment impact). The fiscal impacts focus on income and sales and are derived from earnings impacts, but are conservative because only income and sales taxes are considered in this report; other taxes and fees (e.g., utility taxes, car tags and fees, rental/leasing, alcoholic beverages, cigarettes and tobacco, insurance premiums, lodgings, driver's license, auto title, and other personal property, etc.) are not.

To determine the total economic and fiscal impacts of AAMU, two types of economic impacts are estimated. The first type, household impacts, deals with the economic and fiscal impacts derived from AAMU spending that affect households (i.e., jobs and earnings to households). The second focuses on broad economy-wide impacts that take all expenditures into consideration—gross business sales. Payroll, employment, and nonpayroll expenditure data was provided by AAMU for 2011-2012 academic year. This study uses multipliers for the higher education (junior colleges, colleges, universities, and professional schools) industry for both the State of Alabama and Huntsville metro area to determine the impacts.

The earnings and employment household impacts generate tax revenues. Not all of the earnings impact is taxable; spending on sales taxable items generally constitute 42.4 percent of total household earnings and state taxable income (net income) is about 66 percent of earnings. The state income tax rate is 5.0 percent on net income. Sales tax rates used in this study were 4.0 percent for the state and 4.0 percent combined for Huntsville metro area and its cities. Combined county and

city sales tax rates in the state vary between 3.0 to 7.0 percent among Alabama counties, but are most frequently at 5.0 percent.

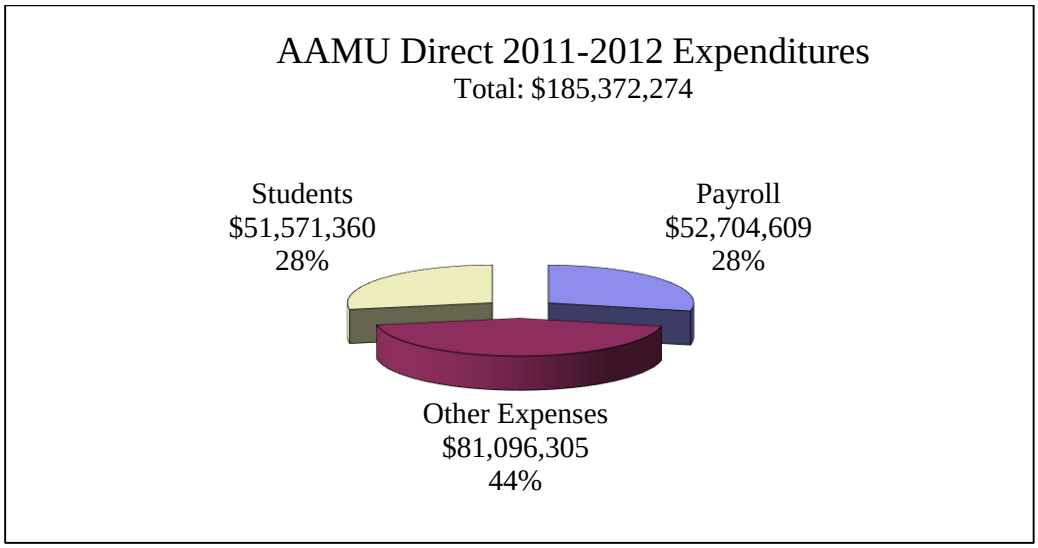
Expenditure and employment impacts are presented as well as public and private return on investment analyses of the AAMU education because state appropriations and tuition and other attendance costs can be considered as investments by the state and students, respectively. The results show that these investments are worthwhile and that AAMU had significant impacts on the state and metro area economies. With an increase in both student enrollment and employment of faculty and staff over time, the university's impacts will also continue to rise.

AAMU focuses on being a student-centered academic community primarily committed to enhancing the quality of life for all Alabamians. The University's mission also includes advancing the intellectual and social condition of the people of Alabama and Huntsville metro-area through quality programs of teaching, research, and service.

Through its teaching, research, and service related activities, AAMU provides numerous benefits that have lasting impacts on the general public and its graduates. The University provides jobs, generates tax revenues, promotes innovation, assists in business creation and growth, and facilitates economic development by making the region and state attractive for business and industry location and expansion. AAMU also improves workforce skills and the general quality of life in the Huntsville metro area, the state, and the nation. Graduates learning abilities and intellectual growth are enhanced, enabling them to earn relatively higher incomes, and contribute significantly in various ways to society. Higher incomes generate more tax revenues for the state and other tax jurisdictions. AAMU's contribution to economic development is through extensive service and outreach programs with links to communities, business, industry, government, and individuals.

The University employed 1,024 faculty and staff in the 2011-2012 academic year and had additional student employment that we estimate to be an extra 44 AAMU faculty/staff equivalent. Total AAMU expenditures for the year were $133.8 million and comprised University spending of $52.7 million on payroll and $81.1 million on purchases; students spent $51.6 million on off-campus housing, food, books, clothing, etc. for a total AAMU expenditure of $185.4 million. Visitors to the University also make additional expenditures that increase the AAMU spending impact. AAMU visitors include athletic event spectators, parents and relatives, other institutions' academic personnel, business representatives, and others.

Direct AAMU expenditures generate rounds of spending in the area and the state that are captured by multipliers determined from the Regional Input-Output Modeling System (RIMS II). RIMS II is an input-output model developed and maintained by the U.S. Department of Commerce's Bureau of Economic Analysis; the model is available for states, metro areas and county groupings, and counties in the nation. An economic and fiscal impacts model that uses RIMS II multipliers for Alabama and the Huntsville metro area was developed and used in this study.



AAMU Economic Impacts on Alabama

Of the $185.4 million total 2011-2012 AAMU spending, it is estimated that $166.7 million was made in Alabama from 80 percent of payroll, 90 percent of purchases, and all student expenses (Table 1). In addition, there is a visitor impact of $9.2 million. The economic impacts of AAMU on the state for the academic year totaled $349.8 million and 1,612 jobs. Fiscal impacts totaled $12.3 million statewide and comprised $7.8 million in state tax revenues ($3.6 million sales and $4.2 million income) and $4.5 million in local sales taxes.

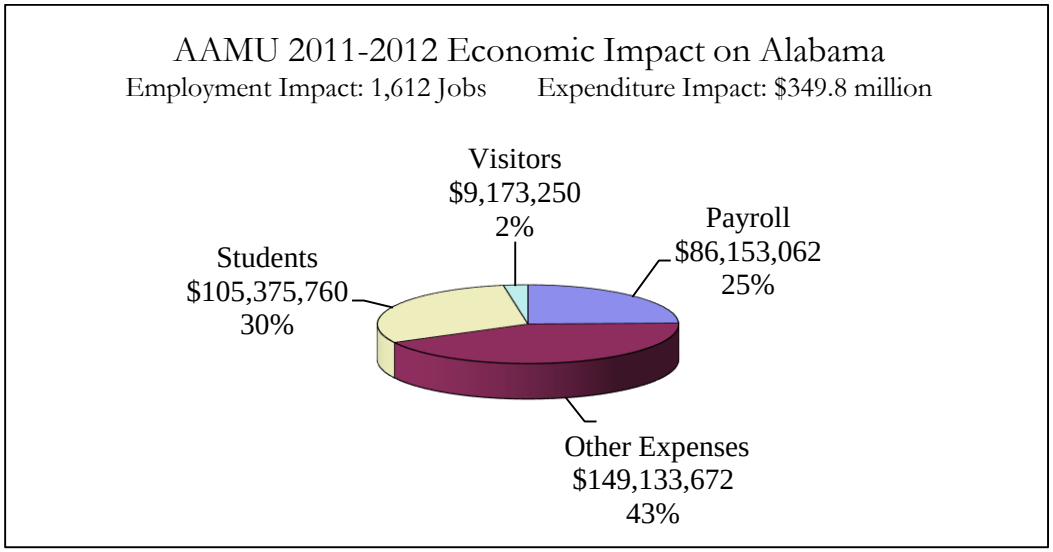


Table 1. AAMU 2011-2012 Expenditure Impacts on Alabama

(Millions of dollars)

Source	Direct Spending	Spent in Alabama	Indirect Impact	Total Impact
AAMU				
Payroll	$52.7	$42.2	$44.0	$86.2
Purchases	$81.1	$73.0	$76.1	$149.1
Subtotal	$133.8	$115.2	$120.1	$235.3
Student Spending	$51.6	$51.6	$53.8	$105.4
Visitor Spending				$9.2
Total	**$185.4**	**$166.7**	**$173.9**	**$349.8**
Contribution to GDP				$199.5
Employment Impact (Jobs)				**1,612**
Statewide Fiscal Impact				**$12.3**
State Sales Tax				$3.6
State Income Tax				$4.2
Local (City and County) Sales Tax				$4.5

Note: Rounding effects may be present.

Source: Center for Business and Economic Research, UA and AAMU.

AAMU Education as Public Investment by State

The 2011-2012 economic and fiscal impacts on the state are only part of what Alabama gets in return for the state appropriation to AAMU. Many public benefits of education are hard to measure—innovation promotion, direct and indirect new business development and job creation, general improvements in quality of life, public service, etc.—but others such as additional tax receipts can be determined. From a public investment perspective, additional tax revenues can be considered as returns to state appropriation. To determine the return on this investment, we assume that sales and income taxes stay at current rates and use an AAMU estimate of 73 percent of alumni residing in the state.

Over the working life of the 2011-2012 graduating class, an AAMU education will enable generation of $164.5 million additional income and sales taxes; $122.7 million in state only sales and income tax collections and $41.8 million local sales taxes. The $40.4 million state funding for 2011-2012 is offset in the same year by the statewide sales and income tax receipts noted above (Table 1). Thus, the state's net investment is actually $32.6 million if just state tax receipts are considered or $28.1 million if both state and local tax receipts are considered. The $122.7 million of state tax receipts yields a 5.2 percent annual rate of return if the focus is only on state tax receipts. Alternatively, the total $164.5 million additional taxes gets annual rates of return of 6.7 percent on a $32.6 million net investment and 7.6 percent on a net investment of $28.1 million. These rates of return are conservative as there are additional tax and other government revenues that are not considered here (e.g., property taxes and vehicle registration and tag fees).

AAMU Economic Impacts on Huntsville Metro Area

Of the total AAMU expenditure, we estimate that 70 percent of payroll, 60 percent of purchases, and all student expenditures were made in the metro area for a total of $137.1 million (Table 2). This resulted in an impact of $227.8 million, including a visitor expenditure impact of $5.4 million. The University also had an employment impact of 1,404 jobs for the metro area. About $2.9 million in local sales tax revenues for the area's counties and cities are generated.

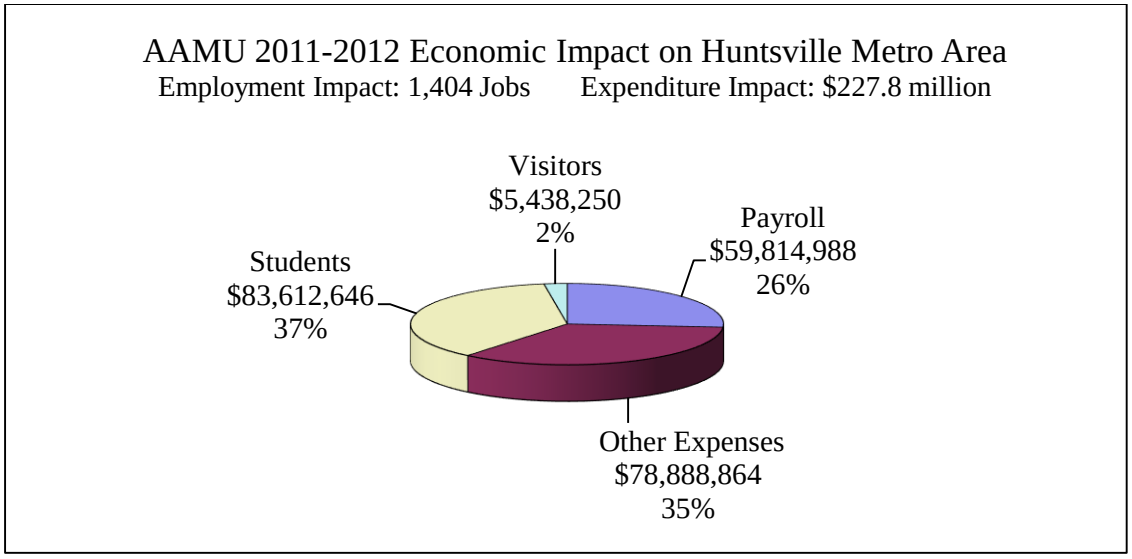
Table 2. AAMU 2011-2012 Expenditure Impacts on Huntsville Metro Area

(Millions of dollars)

Source	Direct Spending	Spent in Metro Area	Indirect Impact	Total Impact
Alabama AAMU				
Payroll	$52.7	$36.9	$22.9	$59.8
Purchases	$81.1	$48.7	$30.2	$78.9
Subtotal	$133.8	$85.6	$53.2	$138.7
Student Expenditures	$51.6	$51.6	$32.0	$83.6
Visitor Expenditures				$5.4
Total	**$185.4**	**$137.1**	**$85.2**	**$227.8**
Employment Impact (Jobs)				**1,404**
Local (City and County) Sales Tax				**$2.9**

Note: Rounding effects may be present.

Source: Center for Business and Economic Research, and AAMU.



AAMU Education as Private Investment

An AAMU education is also an investment by the students who enroll in the degree programs. There are many benefits for these students from getting an AAMU education including the fact that education is its own reward. The ability to learn and grow intellectually greatly increases graduates' earning potential. However, a college degree comes at a cost that includes the obvious cost of the education (tuition, room and board, books, etc.), as well as forgone earnings while in school.

The forgone earnings, often called the opportunity cost, is taken to be the earnings potential of the educational level immediately below the graduate's highest degree. For example, the opportunity cost of getting a master's degree is the earnings potential of a bachelor's degree holder. The cost of study is therefore the opportunity cost plus the direct expenditure to obtain the degree. This cost is the actual marginal cost of pursuing the degree, which can be compared to the marginal benefit or addition to value (called value added) for the graduate, to determine whether the decision to obtain an AAMU degree is prudent. Value added is the difference in salaries of a particular degree graduate with that of a specified reference. High school graduation is used as general reference, but for marginal value added the reference is the prior degree level.

Only half the opportunity cost is included in the marginal cost of the AAMU degree since many students work while pursuing their education. A category of people with "some college" is included in the study to capture individuals who began college but did not complete the bachelor's degree requirements. These individuals will earn more income in their working lives than high school graduates will without college experience.

In the marginal analysis, the average doctoral degree salary is compared to that of the master's degree, a master's is compared to a bachelor's, and a bachelor's to a high school graduate with some college experience. The value added of people with some college is obtained by comparing their income to that of high school graduates. Table 3 shows the results of the investment analysis with the assumption that graduates will retire at 67 years of age. The table also shows lifetime earnings in both current and real (year 2012) dollars. Expected lifetime earnings increase from about $2.5 million for a high school graduate to $8.1 million for the doctoral degree; the corresponding real lifetime earnings range is $1.1 million to $4.2 million.

The investment analysis was performed using real or constant year 2012 dollars. The real annual return on investment (ROI) for students with an AAMU education was determined by generating annual cost and income streams over the different working lifetimes of the categories being considered. People with some college will have real lifetime earnings of about $1.4 million, $326,123 more than a high school graduate, which yields a 9.0 percent real annual ROI on their AAMU investment. Bachelor's and master's degree holders will earn marginal value added of $698,350 (a 12.5 percent ROI) and $981,655 (a 23.1 percent ROI), respectively. A doctorate will earn $1,122,114 more than a master's, yielding a 16.6 percent real annual ROI. Using high school graduation as a

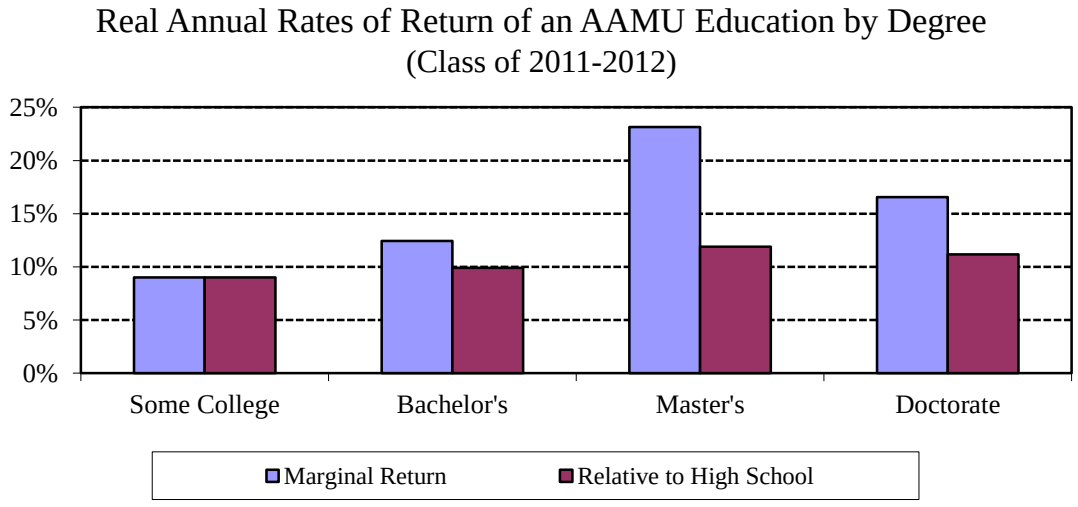
reference (i.e., attending AAMU instead of ending schooling at high school graduation), the master's degree yields the greatest real annual ROI with 11.9 percent, followed by 11.2 percent for the doctorate, 9.9 percent for the bachelor's, and 9.0 percent for some college.

The positive real rates of return and their magnitude indicate that the decision to pursue an AAMU degree is very sensible. The master's degree has the highest marginal return on investment, but the doctoral degree earns the most, even over the shorter working life. These real investment returns are better than the long term returns on investment in U.S. equity markets.

Table 3. AAMU Education as Private Investment (Class of 2012)

	Degree/Diploma				
	High School	Some College	Bachelor's	Master's	Doctorate
Average Starting Salary ($)	20,617	25,205	37,527	58,172	86,743
Total Cost of Degree (2012 $)		62,803	168,478	252,607	409,768
Lifetime Earnings (2012 $)	1,119,099	1,445,222	2,143,573	3,125,227	4,247,341
Incremental Income (2012 $)		326,123	698,350	981,655	1,122,114
Real Annual Return on Investment		9.0%	12.5%	23.1%	16.6%
Real Return Relative to High School		9.0%	9.9%	11.9%	11.2%
Lifetime Earnings (Current $)	2,529,157	3,201,047	4,531,154	6,347,381	8,135,455
Incremental Income (Current $)		671,890	1,330,107	1,816,227	1,788,074

Note: Rounding effects may be present. Total cost of degree is the direct cost of the education (tuition, room and board, books, etc.), as well as forgone earnings while in school.
Source: Center for Business and Economic Research, and AAMU.



Conclusions and Discussions

The 2011-2012 AAMU economic impacts on the State of Alabama were $349.8 million expenditure impact and 1,612 jobs. The university is also an excellent investment opportunity for the state, yielding a 6.7 percent annual rate of return on its state appropriations. The economic impacts on the Huntsville metro area are $227.8 million and 1,404 jobs.

An AAMU education is a very high-yielding investment for students. The real annual rate of return on some college attendance is 9.0 percent over a high school graduate. The bachelor's degree has a 12.5 percent real annual rate of return over some college attendance, and the master's degree yields a 23.1 percent return over a bachelor's degree. The doctorate provides a 16.6 percent marginal return over the master's and has the highest lifetime earnings.

Any study of this kind has some uncertainties. The real rates of earnings growth may change. So can income and sales tax rates, rate of alumni residence in the state, etc. However, under the assumptions of this report, an AAMU education is a very sound investment for students (better than most stocks and stock indexes) and a better investment for the state than most bonds.

In addition, there are several intangible benefits of an AAMU education that cannot be measured. The university produces skilled and knowledgeable people; provides valuable research, adding to the stock of knowledge; enhances graduates' ability to learn and grow intellectually and to contribute in various ways to society; facilitates economic development; and provides valuable service to Alabama and its counties and communities. Thus AAMU delivers tangible and intangible benefits to its graduates and the state economy; since some of the graduates leave the state after completing their education at AAMU, there are also benefits to the national economy that are not highlighted here.

It is important to note that there is no economic development without education. Higher education, in particular, plays a real and critical role in the modern high-tech economy. This is because economic growth is attributable mostly to the knowledge economy which is characterized by increasing returns, rather than the physical economy with its diminishing returns. Physical products depreciate and become obsolete. Knowledge builds on prior knowledge and does not depreciate or become obsolete. The physical products and services consumed in society are made better mainly with the gains in knowledge provided by higher education. This makes AAMU essential to the economic and community development of the metro area, the state, and the nation. The 2011-2012 economic impacts of AAMU on Alabama and the Huntsville metro area certainly exceed by far those we have presented in this report.

APPENDIX

Methodology - Economic Impact Analysis

Economic impact analysis measures the effects of a specific economic activity or event on a specified geographic area. Examples include the economic impact on a state or county of a proposed industrial plant, an existing industry, closing a military installation, or expansion of an existing industrial facility. In some cases, federal laws, as well as state and local regulations, require economic impact studies prior to the implementation of a particular policy (relocation of an economic activity, change in tax policy, changes in zoning ordinance, etc.). No matter what the justification, impact studies are designed to provide information for instituting policies to facilitate positive economic impacts and/or mitigate potential negative impacts. Economic impact analysis is therefore an important decision making tool which can enhance the quality of decisions made, as well as the decision making process in both public and private sectors. The analysis typically focuses on one or more of the major economic indicators: output, value-added, employment, and income. The purpose of an impact study usually determines which socioeconomic variable(s) should be monitored. In this study, the primary focus is on output, employment, and fiscal (income and sales tax) impacts impact of AAMU on the State of Alabama and the Huntsville metro area.

Economic impacts comprise direct and indirect impacts. Direct impacts are those that are most obvious and include the wages and salaries of the employees who work directly for an economic entity (e.g., firm, industry, or institution) as well as all other expenditures of the entity, including any taxes and distributed profits. Indirect economic impacts, often referred to as the "ripple" or "multiplier" effects, occur because of additional demand arising from new income and expenditures for inputs (products and services) related to the economic entity of focus. New income creates demand for consumer products and services and their associated indirect impacts are often called induced impacts. Indirect and induced impacts may spark demand for the output of the entity under study. For example, expenditures made by AAMU create impacts on its vendors and also on consumer products and services industries. These industries and their workers in turn make purchases from other vendors in the area, and so forth, which can include AAMU education and training for the industries' workers and their workers' children. In this interconnected manner, businesses increase their production of goods and services to meet the direct and indirect demands created by AAMU. All of this results in development of the economy at both state and metro levels. The total economic impacts capture all the direct, indirect, and induced impacts effects. The ratio of the total economic impact to the direct effect is the multiplier that can be used to summarize the economic effects of the organization on the region or area of focus.

Economic relationships do not obey strict geographic boundaries as spending by industries and their workers flow across such boundaries enabled by transportation and communication. Thus a portion of the indirect effects of purchases or expenditures may occur beyond the boundaries of the specified region. Such occurrences are called *leakages* and are more likely for small geographic areas while *linkages* (supplier-purchaser relationships) are more likely for large areas. Generally, small geographic areas will have small *absolute* economic impact due to a high likelihood of leakage. A large region will have a bigger absolute economic impact, but a smaller *relative* economic impact. The closure of one plant within a state, for example, may have only a small relative impact even if the plant employs thousands of workers; the absolute impact could be very large. The important point is that the effect or size of the economic impact is influenced by the size of the study area. If

the area is too broadly defined, the relative impact will be small. If narrowly defined, the relative impact will be large.

Determining the Multiplier

Several methodological approaches are used in estimating economic impacts. These include the construction of econometric, economic base, computable general equilibrium (CGE), and input-output (I-O) models. Econometric and CGE models can be very costly and time-consuming to build. Economic base models require a very detailed set of information that is sometimes not available. The other methodological approaches generate slightly smaller multipliers than I-O models because of assumptions on factors such as input substitution and optimization behavior by economic agents. The I-O modeling framework is used in this study. The technique generates multipliers for the economic activity of interest by focusing on economic interactions among all industries and all other economic transactions in the specified region. Interindustry relationships exist in backward (suppliers and other upstream linkages and leakages) and forward (distributors, retailers, customers, and other downstream linkages and leakages) directions. The number and strength of these backward and forward linkages and leakages determines the multiplier effects of the industry. In general, products and services that require a small number of inputs and little additional processing (little value addition) will have smaller multiplier effects than complex products that require lots of inputs and extensive processing.

The four main types of multipliers—output, value-added, income or earnings, and employment—are defined as follows. Output multipliers represent the total dollar change in output that occurs in all industries for each additional dollar of output delivered to final demand (final consumption) by the industry of the economic entity under study. Value-added multipliers are similarly defined except that they represent the total dollar change in value-added across all industries. Earnings multipliers represent the total dollar change in earnings of households employed by all industries for each additional dollar of payroll expenditure (or each dollar of output delivered to final demand) by the industry whose economic impact is being estimated. Employment multipliers represent the total change in the number of jobs in all industries for each direct job (or for each million dollars of output delivered to final demand) by the industry whose economic impact is being estimated.

The nature of the product and technology largely determine the degree of interindustry linkages and leakages (and thus the overall impact), and the specific impact on a region depends upon the degree to which these interindustry relationships are localized. Technology determines inputs and economics determines the geographic source of supply and destination of products or services. Leakage involves purchases outside the economic impact study area and represents activities of local firms that have no economic impact on the local economy. Identifying leakage can provide valuable planning information to local economic development authorities for commercial or industrial development that provides opportunities for "localizing" such impact. An activity's maximum impact on a specific area is obtained when all interindustry linkages occur within the area. An economywide view is required for impact estimation and the I-O technique permits the incorporation of such a perspective. To estimate the economic impact of AAMU on Alabama and Huntsville metro area, linkages between the University and all its suppliers and vendors must be traced. This task is greatly facilitated by the Regional Input-Output Modeling System (RIMS II), an input-output model developed and maintained by the U.S. Department of Commerce's Bureau of Economic Analysis. The model is available for every state, region, county, and metropolitan area in

the nation. This study uses RIMS II multipliers for the junior colleges, colleges, universities, and professional schools industry in the State of Alabama and Huntsville metro area.

The RIMS II I-O model covers about 500 industries with data on each industry reflecting the value of inputs used per dollar of output in the production of that industry's output in tabular form. Since the rows (outputs) are produced by specific industries, they are also columns (inputs). Demand for a particular input causes supply from its source industry which in turn creates demand for the materials that are used to produce the particular input, and so on. The round-by-round effects decrease and converge; I-O methodology captures the total effect of the rounds of spending with the multiplier. RIMS II multipliers for an economy account for all linkages in and leakages from that economy. I-O models are based on a table of transaction balances, which ensures economy-wide accounting consistency. Total payments equal total receipts for each producing sector. Aggregate final demand equals aggregate value added.

Multipliers are determined mathematically from I-O tables that are constructed from observed and reported data for the economic area of interest. The economy is divided into a number of producing industries or sectors that sell and purchase goods and services to and from each other with *interindustry* or *intersectoral* flows that are key data. Sector goods and services are purchased by domestic consumers (households), international customers (exports), government (federal, state, and local), and for private investment purposes. These external to production purchases are for direct use and termed *final demand*. For an economy with n sectors, if X_i represents total output for sector i, Y_i represents final demand for sector i products, and z_{ij} represent interindustry flows, then

$$X_i = \sum_{j=1}^{n} z_{ij} + Y_i \qquad (1)$$

If a_{ij} represents the I-O technical coefficients where $a_{ij} = z_{ij} / X_j$ so that sectors use inputs in fixed proportions (the constant returns to scale Leontief production function) then equation (1) becomes

$$X_i = \sum_{i=1}^{n} a_{ij} X_i + Y_i \qquad (2)$$

The standard formulation of the basic I-O model and its application, in matrix notation is:

Transactions balance: $X = AX + Y$ (3)

Solving for X: $X = (I - A)^{-1}Y$ (4)

For a change in Y: $\Delta X = (I - A)^{-1}\Delta Y$ (5)

where X is the gross output column vector, A is the matrix of fixed I-O coefficients, Y is the final demand column vector, and I is the identity matrix. This model enables determination of the output given changes in final demand levels (consumption, investment, government, or exports). The Leontief inverse, $(I - A)^{-1}$, provides the I-O multipliers used to determine impacts. The elements of the matrix are really very useful and important. Each captures in a single number, an entire series of direct and indirect effects. Gross output requirements are translatable into employment coefficients in a diagonal matrix that is used together with the Leontief inverse to generate employment impacts. Similar manipulations generate value-added, income, or earnings multipliers.

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