Middle Tennessee Universities and Colleges:

American Baptist College

Aquinas College

Austin Peay State University

Belmont University

Columbia State University

Cumberland University

Fisk University

Free Will Baptist College

Lipscomb University

Martin Methodist College

Meharry Medical College

Middle Tennessee State University

Motlow State Community College

Nashville State Technical Community College

Tennessee State University

Tennessee Technological University

Trevecca Nazarene University

University of the South

Vanderbilt University

Volunteer State Community College

HIGHER EDUCATION INSTITUTIONS IN MIDDLE TENNESSEE: AN IN-DEPTH ANALYSIS OF THEIR IMPACT ON THE REGION FROM A COMPARATIVE PERSPECTIVE

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Executive Summary:
Higher Education in Middle Tennessee:
An Engine for Growth and Progress

Middle Tennessee's 20 colleges and universities make up one of the region's most important economic sectors, enrolling nearly 100,000 students, accounting for 75,000 people and generating a $5.5 billion economic impact, according to a study conducted by the Business and Economic Research Center (BERC) at the Jennings A. Jones College of Business at Middle Tennessee State University and funded by the Nashville Area Chamber of Commerce. The study's findings demonstrate the significant role that higher education plays in the regional economy through direct expenditures, workplace preparedness and enhancing the appeal of the area to current and new business and industry.

The BERC study was commissioned by the presidents and chancellors of Middle Tennessee's colleges and universities, who meet on a regular basis to discuss issues of mutual concern. In addition to estimating the economic impact of higher education institutions on the regional economy, it also analyzes the value of higher education using econometric models, compares skilled labor supply and demand conditions, and compares the region with the peer areas.

Using the most recent data, the BERC study found that Middle Tennessee's colleges and universities were responsible for:

- $5.597 billion in business revenue for higher education institutions
- 75,178 employees earning $2.898 billion in annual personal income
- 98,931 students with an annual business revenue impact of $1.5 billion
- 17,000 annual graduates, 60% of whom remain in the region
- 234,322 alumni working in the region

- 553,926 annual visitors with an annual business revenue impact of $72.5 million
- $134 million in charitable contributions (excluding charitable health care services provided by academic medical centers)

In addition, a comparison with regional peer cities found that Middle Tennessee ranks first in diversity of educational opportunity and as the fourth-largest provider of educational services.

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CHAPTER I:
ECONOMIC GROWTH, KNOWLEDGE, AND UNIVERSITIES: AN INTRODUCTION

I.1. Overview.

Middle Tennessee is home to 20 major universities with an annual enrollment of nearly 100,000 students. The region includes 41 Tennessee counties, including Davidson, where capital city Nashville is located; Williamson, one of the wealthiest counties in the U.S.; and Rutherford, one of the fastest-growing counties in the U.S. Although the middle Tennessee region includes such vibrant counties, its makeup is quite similar to Tennessee counties overall in terms of per capita income and rural–urban county designations.

What role do these universities play in middle Tennessee? The primary goal of this study, prepared by the Business and Economic Research Center (BERC) of the Jennings A. Jones College of Business at Middle Tennessee State University for the Presidents' Summit in middle Tennessee[1] is to address this broad question. To this end, this endeavor draws insights from many theoretical and empirical studies dealing with such broader topics as economic growth, the knowledge economy, and regional economic competitiveness. We must emphasize at the outset that this study is neither just an economic impact study nor a cost-benefit analysis for public funding purposes. Universities are multifaceted institutions, and the value of their output is often hard to quantify. Therefore, any economic impact figure associated with a group of universities at a regional level represents the least of their many contributions to the health of the regional economy.

[1] The Presidents' Summit refers to the regular gathering of 20 university presidents in middle Tennessee.

The BERC designed a comprehensive survey of higher education institutions in middle Tennessee including a comprehensive set of questions regarding these institutions' spending patterns, students, employment, and other operational and qualitative information as well as several questions regarding these institutions' interaction with the broader regional environment. In designing the survey, the BERC took into account several notable surveys such as the Association of University Technology Managers (www.autm.net) survey and British Higher Education–Business and Community Interaction (www.hefce.ac.uk) survey. The detailed survey questions help us understand the broader dynamics in the university–community interactions in middle Tennessee.

Given the multifaceted nature of these institutions, this study analyzes the broader role of universities in their economic environment. As highlighted by the research on regional economic dynamics, universities are increasingly placed (directly or indirectly) at the center of a regional economy, from which economic and social benefits radiate outward. At the center of the debate is the source of economic growth and regional competitiveness, a complex process that generally involves the interaction of several factors including investment in physical and human capital, technological advances, and institutional and policy changes that improve the efficiency of economic organization. In this section, we briefly review some of the key concepts and then explore their relationships with the universities.

I.2. Economic growth

The fundamental issue in macroeconomic theory since Adam Smith has been to explain the sources of the variations in economic growth (fortune) across countries. Adam Smith's *Wealth of Nations* (1776) epitomized the basic precepts of modern macroeconomic theory. Since then, however, the nature of factors that generate nations' wealth has changed considerably. For example, natural endowment is transformed into capital stock, and population into human capital. Furthermore, especially since the early 1990s, the process by which economic growth occurs has been redefined to allow the impact of endogenously determined technological progress. A review of economic growth literature indicates that emphasis on technology, knowledge, or human capital in the economic development process is not new. What is new, however, is the understanding of economic growth dynamics, which have changed long-held views on the limits of economic growth (diminishing versus increasing returns). In light of this new understanding, economic growth is defined as a function of growth in capital stock, labor force, and technological progress (Armstrong and Taylor, 2000).

At the micro level, sources of economic growth and regional competitiveness are closely tied to the productivity of a region's workforce. The most prominent of this line of work is Michael Porter's *The Competitive Advantage of Nations* (1990), which treats labor productivity as the single most important factor differentiating one country from another. Labor productivity in turn is determined by the capital-labor ratio, endogenous technical progress, and human capital (Armstrong and Taylor, 2000).

In his empirical investigation of the sources of economic prosperity, Richard Florida (2005) further advances the notion of human capital and technology as driving forces for regional prosperity. Florida (2005) argues that economic prosperity is a function of three Ts: talent, technology, and tolerance. The last of these, tolerance, as a source of economic growth ties economic growth and regional competitiveness to another strand of theoretical approach related to the quality of civic life or human capital: social capital.

The social capital literature has gained interdisciplinary prominence after such seminal works as Coleman (1990), Putnam (1993), and OECD (2001). Although some economists disagree on whether social capital could be treated the same as human capital, many nevertheless acknowledge that social capital enhances human capital. In an extensive treatment of the issue, Westlund (2006) argues that social capital can be treated as a type of knowledge that enhances the level of human capital (p. 41).

I.3. Knowledge

It appears that knowledge, either in the form of human capital or technological advancement, has become the common denominator in much economic growth and regional competitiveness literature. Prominent treatment of the issue can be found in literature on human capital (Romer, 1986), labor productivity and knowledge (Porter, 1990), talent and technology (Florida, 2005) and science and technology (Kozmetsky et al., 2004). At the forefront of economic development literature, knowledge—its creation, dissemination, and transfer—is considered an important part of wealth creation (Wignaraja, 2003, p. 4; Westlund, 2006, p. 11).

Making knowledge a source of wealth creation has important implications for the role of universities and communities. Garmise (2005) emphasize two critical components of knowledge: investment in both knowledge production and human capital. These investments are inherent in the production function of modern universities. Furthermore, not only these investments but also other characteristics of knowledge societies such as tolerance (Florida, 2005) and social capital (Putnam, 1993) are critically linked to the presence of knowledge institutions in a community.

I.4. Universities

A summary treatment of economic growth literature indicates that the quality of many factors of production depends on investment in knowledge production and human capital. The role of universities in the U.S. increased dramatically after the Bayh-Dole Act of 1980. This increasing role also coincides with the development of theories on the role of human capital and knowledge in economic prosperity. The title of Kozmetsky et al.'s (2004) book, *New Wealth: Commercialization of Science and Technology for Business and Economic Development*, aptly describes community and university interactions in the knowledge economy.

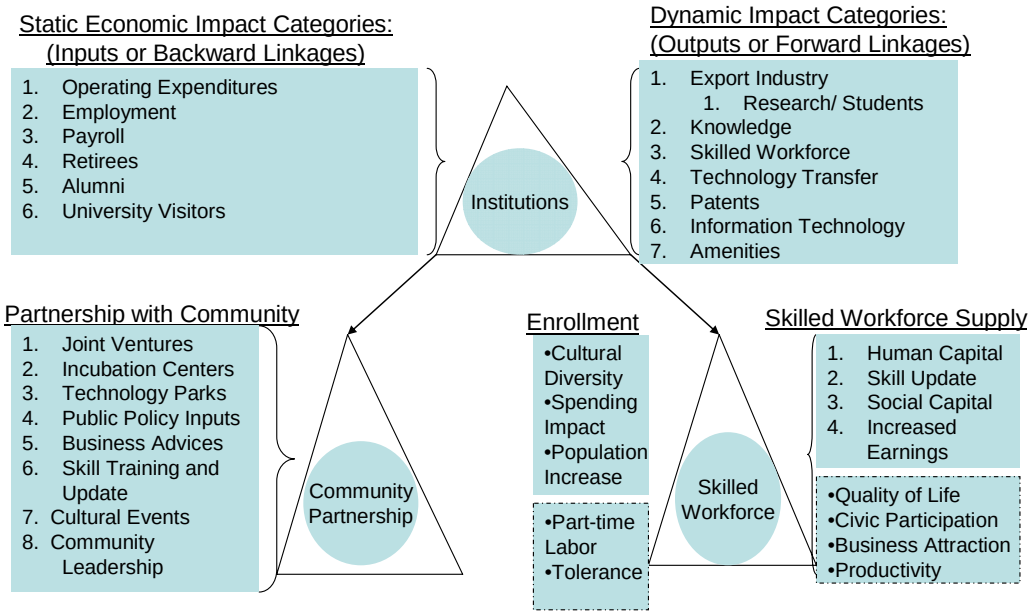
Universities' role in their communities is not, however, limited to technological development and human capital creation: they play a critical leadership role in transforming the economic landscape of their communities.[2] In many communities, universities are often the largest employers, transforming the urban landscape through their employment, spending, and land purchases (Perry and Wiewel, 2005).

[2] For a broader discussion of their leadership roles, see Saxenian (1996) and Perry and Wiewel (2005).

The literature on modern universities shows a diverse set of missions and organizational goals that differently affect their surrounding regions, ranging from the traditional functions of teaching and public service to the recent activities of licensing inventions and engaging collaboratively in research with private sector industries (Glasson, 2003; Thanki, 1999). Goldstein, Maier, and Luger (1995) indicate eight university functions leading to economic development impact: (a) knowledge creation, (b) human capital creation, (c) transfer of existing know-how, (d) technological innovation, (e) capital investment, (f) regional leadership, (g) influence on regional milieu, and (h) knowledge infrastructure production.

Figure 1 below describes the multifaceted role universities play in their communities. Three major categories described in Figure 1—knowledge institutions, a skilled labor force, and strategic partnerships with the community—also represent three foundations of a knowledge economy. In general, there are two major strands in the literature on the growth of a regional economy: one focusing on higher education institutions' effects on regional economies, also called backward linkages or inputs, the other on the contribution of human capital and technological advancements to regional economies. However, the often-understated aspect of university–community relationship is their strategic partnership.

Figure I.1: The Knowledge Economy and Higher Education Institutions: Institutions, Skilled Workforce, and Strategic Partnership



I.5. Economic impact of universities

Measurable economic impacts of universities may involve either the impact of universities as operating institutions and their related activities or the impact of an additional year of schooling on economic growth. Over the years, a substantial number of studies have emerged dealing with the former issue. A sample of reviewed studies regarding the economic impact of universities is provided in the reference section. A study that treats the role of these institutions somewhat differently is Goldstein and Drucker (2006), which examines the influences of four-year colleges and universities in the U.S. at the metropolitan level, focusing on the internal and external factors that affect the generation of regional economic development impacts. They found that knowledge-

based university activities, such as teaching and basic research, have a substantial impact on regional earnings gains. Furthermore, the impacts are higher in small and medium sized regions than in large regions.

Similar to the economic impact assessment, many studies deal with the return to higher education and the contribution of an additional year of schooling to economic growth.[3] Human capital accumulation may allow people to better obtain and use the technologies already existing worldwide or better produce new, previously nonexistent technologies. Mankiw et al. (1992) use school enrollment rates as a human capital investment proxy for human capital stocks in cross-county growth regressions to examine whether the Solow growth model is consistent with the international variation in the standard of living. It shows that an augmented Solow model that includes accumulation of human as well as physical capital provides an excellent description of the cross-country data. Benhabib and Spiegel (1994) use a cross-country sample and find that human capital is more important in technology adoption (balanced growth path effect) than in technology development (balanced growth rate effect).

Groot and Oosterbeek (1994) show that not all years of education are rewarded at the same rate. A review of studies for the U.S. shows that the rate of return for vocational qualifications is 5–10 percent higher than for general qualifications.

Yong, Levy, and Higgins (2004) use county-level data to investigate the roles of different types of human capital accumulation in U.S. growth determination. Their findings suggest that the percent of the population with an advanced degree (college and above) is positively correlated with growth.

[3] For a comprehensive review of some major studies about this issue, see OECD (1999).

Some analyses of the economic effects of education have focused on an assessment of the rate of return. A comparison of the incomes of the educated with those of the uneducated allows education's rate of return to be calculated. Christopher and Martin (1994) argue that education raises the effective size of the labor force because it increases the labor productivity of individuals. During a period in which the education standard of the population is rising, this stock adjustment effect will lead to economic growth. Lucas (1988) indicates that knowledge does not completely disappear with the death of an educated generation but that some of it is inherited by its successors. Then high levels of education will be associated with rapid rates of technical progress.

I.6. Study goals

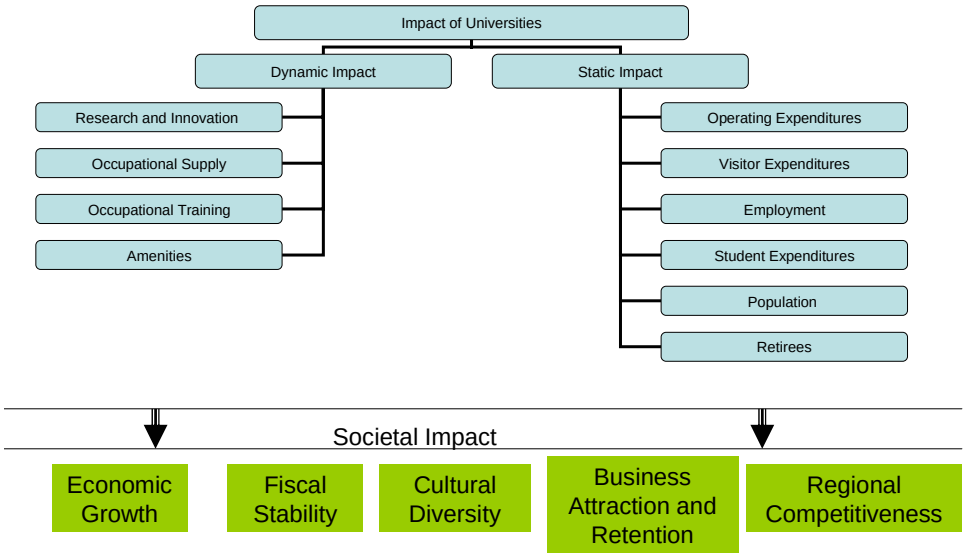
The goal of this study is to provide a comprehensive assessment of the role of higher education institutions in middle Tennessee. To this end, this study:

- estimates the economic impact of higher education institutions on the regional economy,
- analyzes the value of higher education using econometric models,
- compares skilled labor supply and demand conditions in middle Tennessee,
- provides an analysis of university-community interactions, and
- compares the middle Tennessee region with peer areas utilizing publicly available higher education indicators.

I.7. General methodology

As the summary conceptual framework in Figure I.2 below illustrates, this study highlights both static and dynamic impacts of universities and how they lead to the societal impacts of economic growth, fiscal stability, cultural diversity, business attraction and retention, and regional competitiveness. We must acknowledge, however, that not all aspects of universities depicted in Figure I.2 are easily quantifiable.

Figure I.2: The Role of Higher Education in a Community: Conceptual Framework



Data. This study relies on data from a BERC survey, IPEDS (Integrated Postsecondary Education Data System) database, and several governmental and institutional websites. First, the BERC surveyed 20 higher education institutions in middle Tennessee. The BERC received completed surveys from 15 institutions (75 percent response rate). For the remaining five (5) institutions, the BERC utilized the IPEDS and the websites of

individual institutions. The following 20 institutions are profiled in this study in alphabetical order:

- American Baptist College
- Aquinas College
- Austin Peay State University
- Belmont University
- Columbia State Community College
- Cumberland University
- Fisk University
- Free Will Baptist College
- Lipscomb University
- Martin Methodist College
- Meharry Medical College
- Middle Tennessee State University
- Motlow State Community College
- Nashville State Technical Community College
- Tennessee State University
- Tennessee Technological University
- Trevecca Nazarene University
- University of the South
- Vanderbilt University
- Volunteer State Community College

Additionally, BERC consulted the following data sources to construct regional profiles:

- U.S. Census Bureau (www.census.gov),
- Bureau of Labor Statistics (www.bls.gov),
- Tennessee Department of Labor and Workforce Development (http://tennessee.gov/labor-wfd),
- Tennessee Department of Health (www.state.tn.us/health/),
- Bureau of Economic Analysis (www.bea.gov),
- U.S. Department of Education (www.ed.gov), and
- websites of individual higher education institutions across the selected MSAs (Metropolitan Statistical Areas).

Study region and MSAs. The study region in this study is defined as 41 middle Tennessee counties. The selection of MSAs for comparison was guided by the Nashville Area Chamber of Commerce. These MSAs are Columbus, OH; Indianapolis, IN; Atlanta, GA; Raleigh-Cary, NC; Charlotte, NC; Jacksonville, FL; Dallas, TX; Kansas City, MO; Louisville, KY; Birmingham, AL; Denver, CO; and Richmond, VA. In comparing the middle Tennessee region to these selected MSAs, we must emphasize that we did not attempt to define similar regions for the MSAs involved in this study.

Universities in the selected MSAs. In selecting universities in other MSAs, we used the following criteria; all private, nonprofit universities, public universities, and community colleges are included in the analysis. The total number of higher education institutions involved in this study was about 206 across all regions including middle Tennessee.

The rest of the report is structured as follows. Chapter 2 provides an economic impact analysis of higher education institutions in middle Tennessee. Chapter 3 develops an econometric study to assess the value of higher education in Tennessee. Chapter 4 looks at skilled labor supply and demand conditions in middle Tennessee. Chapter 5 addresses higher education's relationship with the business community. Chapter 6 provides a comparative perspective on higher education in middle Tennessee and concludes the report.

CHAPTER II:
ECONOMIC IMPACT OF HIGHER EDUCATION INSTITUTIONS IN MIDDLE TENNESSEE: INPUT-OUTPUT ANALYSIS

II.1. Overview

Universities benefit many segments of a community, from individuals through higher earnings, to governments through a stable tax revenue base, to the community itself through creating a competitive business environment and enhancing civic participation. Many of these benefits are difficult to quantify. Universities, however, also have a function similar to many businesses in a community: they purchase goods and services from local vendors, they employ people, and they host events and conferences attracting people from other areas to the region. These functions of universities alone may have a significant economic impact on a region.

Considering the fact that some universities are the largest employers in their communities, their impact on their community amounts to a sizable figure. We must acknowledge, however, that the traditional economic impact of universities is only one of their many contributions to their communities, as highlighted in the first chapter.

This chapter solely deals with the traditional economic impact of universities on their communities. First, we provide an overview of economic impact studies, study assumptions, and methodology. Second, we examine major economic impact categories and underlying assumptions for each category using the survey results. Finally, we provide the results of the economic impact analysis.

II.2. An overview of economic impact studies

The role a university plays in its community is widely acknowledged. In the past two decades, a significant number of economic impact studies emerged, many of which address the economic impact of a single university on its community. A selected list of reviewed studies for this report is provided in the reference section. Methodologically, many of these studies utilize at minimum data on capital expenditure, operating expenditure, payroll, and student expenditure. Furthermore, economic impact studies often utilize one of the following three economic impact programs: Regional Economic Impact Modeling, Inc. (REMI at www.remi.com); IMpact Analysis for PLANning (IMPLAN at www.implan.com); and the Bureau of Economic Analysis' regional multipliers (RIMS II at www.bea.gov).

Although many university economic impact studies deal with a single university or university system's economic impact, in recent years, there is a resurgence of interest at the regional level to engage universities in economic development or revitalization efforts. In these efforts, the role of universities in the success of Silicon Valley or Route 128 plays an important role.[1] A notable recent example of a multi-university economic impact study *Engines of Economic Growth: The Economic Impact of Boston's Eight Research Universities.* Similarly, this study looks at the economic impact of 20 middle Tennessee higher education institutions on 41 counties.

A university's impact on its community is significant due to both backward and forward linkages. Backward linkages (also called inputs or static) are usually easy to quantify by examining university spending on goods and services, employee spending,

[1] For a detailed analysis of university and community interaction in Silicon Valley and Route 128, see Saxenian (1996).

student spending, and visitor spending. Forward linkages (also called outputs or dynamic impacts) are actually more important than backward linkages, but they are not easily quantifiable. One forward linkage is the impact a university's research has on labor productivity or the university's production of a skilled labor force supply. Additionally, universities improve their regions' quality of life through diversity, preservation, and cultural activities, and they supply much needed public policy input on a variety of regional issues.

Given the difficulty of capturing all dynamic impacts of a university on a community, many studies attempt to capture the economic impact of backward linkages while acknowledging the broader community impacts of the universities. Similarly, this chapter deals with the impact of 20 universities on middle Tennessee through backward linkages , and we treat some of the forward linkages in the next chapters.

II.3. Study assumptions

As mentioned previously, this chapter deals with the impact of backward linkages, examining capital expenditures, noncapital operating expenditures, payroll, visitor expenditures, and student expenditures. Every economic analysis relies on several general assumptions or guiding principles regarding the economic activity under investigation. In measuring economic impact, we make several assumptions and adjustments as follows.

- *The region.* A meaningful regional boundary is critical to any economic impact study. Since we are dealing with 20 universities spread across

middle Tennessee, we constructed a regional model that involves 41 middle Tennessee counties.

- *Substitution effect.* We assume that 20 universities represent the entire universe of higher education in the study region. In other words, if these universities were closed down, the region would lose all student population. Therefore, total enrollment in these 20 universities is treated as "net new" to the region.
- *Counterfactual approach.* Many universities in the region have a history of more than a century. Since they are already in the baseline economy, in order to measure the impact of their operations, we need to remove them from the baseline economy. The difference between the baseline economy and the new equilibrium level after the removal of university operation and related activities represents the total economic impact.
- *Physical buildings remains intact.* In measuring economic impact, we are dealing only with the current operation of these universities and related activities. The assumption is that if a university were closed down, like any business, all activities would cease to operate. We are not, however, tearing down the physical buildings; they remain intact.
- *Local versus out of region.* All capital and noncapital expenditures are adjusted using the university-supplied survey data. Only expenditures made in middle Tennessee were included in the analysis.

- *Residency adjustment.* Similar to the expenditure data, only university employees residing in middle Tennessee and their payrolls were included in the analysis.
- *Visitor expenditures.* The number of university visitors was estimated from a variety of sources including survey data. University visitors from outside middle Tennessee were included in the final calculations of visitor expenditures. A certain number of assumptions were developed to calculate a minimum number of university visitor days. Visitors' spending pattern is estimated from surveys conducted for non–university related events in Tennessee.

II.4. Methodology

Concept of economic impact. University-related spending initiates a round-by-round sequence of impacts on local business revenue, value added, wages, and employment. University spending for goods and services, for example, increases sales by companies that provide these goods and services. These companies purchase inputs including labor, machinery, and supplies and materials in order to produce output. The effect of the initial expenditure eventually works its way through the local economy.

The round-by-round increases in economic activity that characterize the multiplier process become smaller with every round due to leakages from the spending stream. Leakages consist of spending for goods or services not produced in the local economy. For example, university spending for personal computers from a manufacturer in North

Carolina generates no economic impact for the middle Tennessee economy aside from the provision of delivery services.

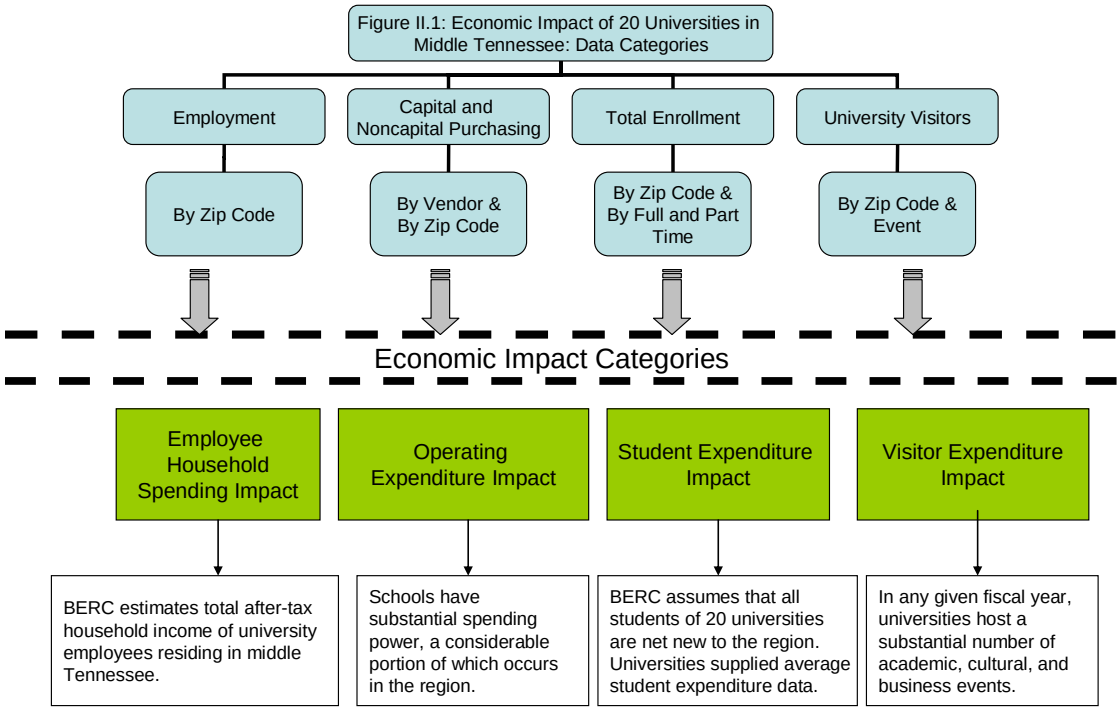
Economists use multipliers to estimate the sum of the round-by-round effects of expenditures. Typically, multipliers estimate three effects: direct, indirect, and induced. The direct effect consists of the initial change in expenditures. The indirect effect is the sum of the round-by-round increases in business spending for inputs, not including labor. The induced effect is the sum of the round-by-round increases in employee spending due to increased payrolls and household incomes.[2]

Economic impact model and modeling approach. Many economists use IMPLAN (Impact Analysis for Planning) software to help estimate multipliers for local economies. The IMPLAN software package was originally developed by the U.S. Forest Service and is now maintained and sold by a private research company. Our model estimates 20 universities' impact on the 41-county middle Tennessee region by examining the effects if the 20 universities were to close down.

[2] Summarized from Murat Arik and Christian Nsiah (2004), *Measuring the Economic Impact of Middle Tennessee State University*, Business and Economic Research Center, Jennings A. Jones College of Business, Middle Tennessee State University (www.mtsu.edu/~berc/studies.html).

Conceptual Framework. The basic framework of this study is built around a conceptual model that treats 20 universities as an economic entity nested in the middle Tennessee economy. Economic impact radiates from these universities across the 41-county region. Figure II.1 below identifies the economic impact categories of 20 universities considered by this study that have both direct and indirect effects upon the regional economy.

In this chapter, we seek to quantify five (5) major impact categories as presented in Figure II.1: capital expenditures, noncapital operating expenditures, employee spending, visitor expenditure, and student expenditure. In the following sections, a detailed explanation of expenditure estimates is provided.



II.5. Economic impact categories, assumptions, and impact results

For each of five economic impact categories as well as a separate Vanderbilt Hospital economic impact, we first provide assumptions regarding the underlying data and then present the detailed economic impact results.

II.5.A. Capital expenditures

Assumptions and estimates

Based on the BERC survey and IPEDS data for nonreporting institutions, in FY 2004–2005, 20 universities in middle Tennessee spent an estimated $303 million on capital projects. This figure does not include capital expenditures associated with Vanderbilt Hospital. Of this amount, an estimated $249 million was spent in middle Tennessee, mostly in the construction sector. Table II.1 presents details of the capital expenditures by the 20 universities.

Table II.1. Capital Expenditures (20 Universities) (FY 2004-2005)

Expenditure Categories	Total Expenditure	In Middle Tennessee	Outside Middle Tennessee
Construction	$199,780,958	$186,603,764	$13,177,194
Maintenance	$13,991,354	$13,226,790	$764,564
Computer	$12,634,905	$7,175,245	$5,459,660
Other Equipment	$69,508,372	$36,944,518	$32,563,854
Other Major Spending 1	$1,047,923	$0	$1,047,923
Other Major Spending 2	$588,095	$91,616	$496,479
Other Major Spending 3	$396,321	$0	$396,321
All Others	$4,511,571	$4,511,571	$0
Total	$302,459,499	$248,553,504	$53,905,995

Source: BERC Survey and IPEDS data for nonreporting universities

In examining the impact of capital expenditures, we take into account the expense of building and maintaining university facilities as well as equipment costs. The capital expenditures in Table II.1 are then distributed among the appropriate IMPLAN sectors constructed for the middle Tennessee region.

Economic impact of capital expenditures

Universities in middle Tennessee directly injected $248.550 million into middle Tennessee in construction and equipment-related expenditures. Taking into account indirect and induced impacts, the capital expenditures of the 20 universities generated a total of:

- $456 million in business revenue,
- $183 million in personal income,
- 4,722 jobs, and
- $13.6 million in state and local taxes.

Table II.2 below presents a breakdown of the economic impact of capital expenditures by impact type (direct, indirect and induced).

Table II.2. Economic Impact of Middle Tennessee Higher Education Institutions:
Capital Expenditures (2005) (Employment in Thousands, Dollar Figures in Millions)

Type	Direct	Indirect	Induced	Total	Multiplier*
Business Revenue (Million $)	$248.550	$90.130	$117.830	$456.510	1.84
Value Added (GDP Equivalent) (Million $)**	$108.600	$55.080	$73.730	$237.410	2.19
Personal Income (Million $)	$106.070	$35.480	$41.500	$183.050	1.73
Employment (thousands)	2.738	0.839	1.145	4.722	1.72
Estimated State and Local Taxes (Million $)***	n/a	n/a	n/a	$13.600	n/a

*Multipliers are SAM multipliers, calculated by dividing the total impact by the direct impact.
**Value-added impact is equivalent to gross regional or gross domestic product. As a measure of economic impact, value added differs from business revenue. Business revenue includes a substantial amount of regional trade (circulation of money in the regional economy).
***Estimated state and local taxes are derived from the model.

Of the 4,722 jobs attributed to universities' capital expenditures, more than half (52 percent) were in construction, followed by 10 percent in retail and 9 percent in manufacturing. When we examine the distribution of business revenue resulting from universities' capital expenditures, we find that of $456.510 million in business revenue, 44 percent was in construction, 16 percent in manufacturing, and 6 percent in retail trade. Figures II.2 and II.3 present distribution of business revenue and jobs by major sectors of the regional economy.

Figure II.2: Business Revenue Impact of Capital Expenditures: Percent Distribution by Major Sectors (20 Universities)

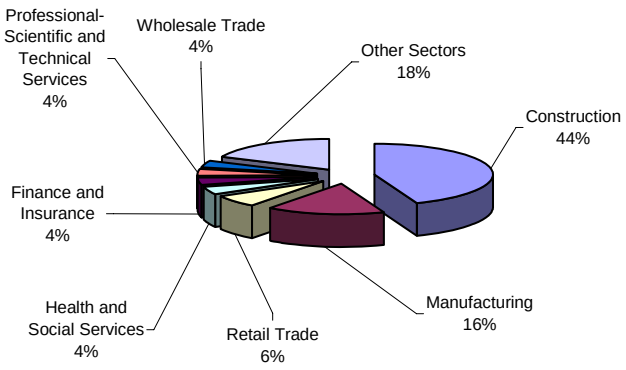
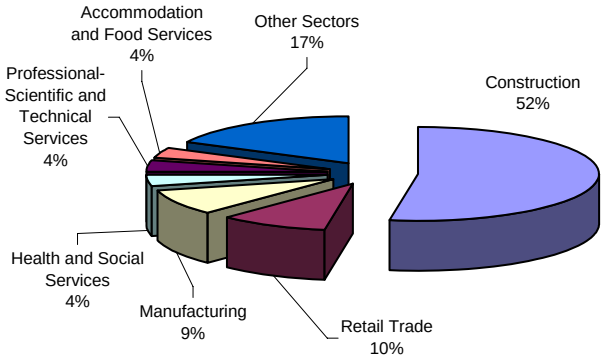


Figure II.3: Employment Impact of Capital Expenditures: Percent Distribution by Major Sectors (20 Universities)



II.5.B. Noncapital operating expenditures

Assumptions and estimates

In addition to capital expenditures, middle Tennessee universities impact the region through noncapital operating expenditures. Not taking into account the contributions of Vanderbilt University Hospital (which will be treated separately) and payroll, total noncapital operating expenditures in the middle Tennessee region amount to $748.456 million.

Table II.3. Noncapital Operating Expenditures (20 Universities)

Major Expenditure Categories	Total	In Middle Tennessee	Outside the Region
Travel Expenditures	$78,926,426	$39,708,155	$39,218,271
Printing Expenditures	$12,940,186	$8,414,244	$4,525,942
Communications and Shipping	$34,768,367	$12,368,872	$22,399,496
Maintenance/Repairs/Services by Others	$70,292,036	$48,930,860	$21,361,176
Consulting Services	$125,937,359	$81,513,923	$44,423,436
Advertising Services	$12,579,314	$7,901,385	$4,677,928
All Other Organizational and Administrative	$71,988,217	$45,606,972	$26,381,245
Office Supplies	$58,514,488	$21,465,139	$37,049,350
All Other Supplies	$116,127,293	$90,438,421	$25,688,871
Rental	$15,897,929	$6,767,080	$9,130,850
Insurance	$23,316,429	$21,362,352	$1,954,077
Grants and Subsidies	$101,185,023	$98,711,894	$2,473,130
Other Services and Expenses	$78,505,302	$69,210,134	$9,295,167
Electricity	$66,679,305	$66,679,305	$0
Water and Sewage	$17,306,825	$17,306,825	$0
Natural Gas	$31,656,334	$15,394,318	$16,262,016
Other Utilities/Fuel	$36,044,331	$22,177,146	$13,867,185
Books	$32,242,575	$4,411,364	$27,831,211
Interest Payments	$55,516,599	$50,150,566	$5,366,033
All Other Expenditures	$47,130,657	$19,886,785	$27,243,872
Total	$1,087,554,994	$748,405,739	$339,149,255

Source: The BERC survey and IPEDS for nonreporting universities.

As depicted in Table II.3 above, total nonoperating expenditure of 20 universities was estimated at $1.088 billion in 2005, of which 68.8 percent ($748 million) remained in middle Tennessee. These estimates are primarily based on the survey responses of 75 percent of 20 universities in middle Tennessee.

Economic impact of noncapital operating expenditures

The spending of 20 universities on goods and services in middle Tennessee was substantial in 2005. As presented in Table II.4 below, the estimated total impact of noncapital operating expenditures of 20 universities was as follows:

- $1.254 billion in business revenue,

- $446 million in personal income,
- 10,452 jobs (excluding employees of 20 institutions), and
- $42 million in state and local taxes.

Table II.4. Economic Impact of Middle Tennessee Higher Education Institutions:
Noncapital Operating Expenditures (2005) (Employment in Thousands, Dollar Figures in Millions)

Type	Direct	Indirect	Induced	Total	Multiplier*
Business Revenue (Million $)	$748.456	$223.707	$281.607	$1,253.770	1.68
Value Added (GDP Equivalent) (Million $)**	$415.634	$130.078	$176.206	$721.918	1.74
Personal Income (Million $)	$263.363	$83.138	$99.177	$445.678	1.69
Employment (thousands)	5.734	1.980	2.738	10.452	1.82
Estimated State and Local Taxes (Million $)***	n/a	n/a	n/a	$41.932	n/a

*Multipliers are SAM multipliers, calculated by dividing the total impact by the direct impact.
**Value-added impact is equivalent to gross regional or gross domestic product. As a measure of economic impact, value added differs from business revenue. Business revenue includes a substantial amount of regional trade (circulation of money in the regional economy).
***Estimated state and local taxes are derived from the model.

Which sectors of the regional economy benefit most from noncapital operating expenditures of the 20 universities? According to Figures II.4 and II.5, the largest business revenue impact took place in manufacturing (13 percent), professional-scientific and technical services (12 percent), and finance and insurance (11 percent). In terms of distribution of employment impact, of 10,452 jobs, educational services accounted for the largest share (16 percent), followed by professional-scientific and technical services (14 percent).

Figure II.4: Business Revenue Impact of Noncapital Operating Expenditures: Percent Distribution by Major Sectors

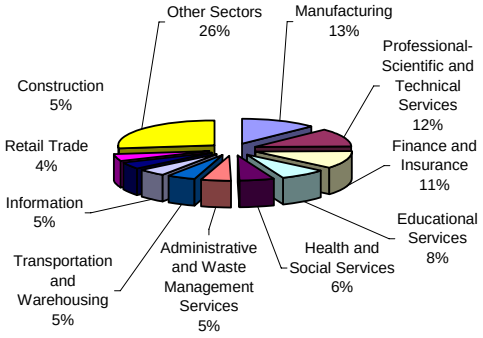
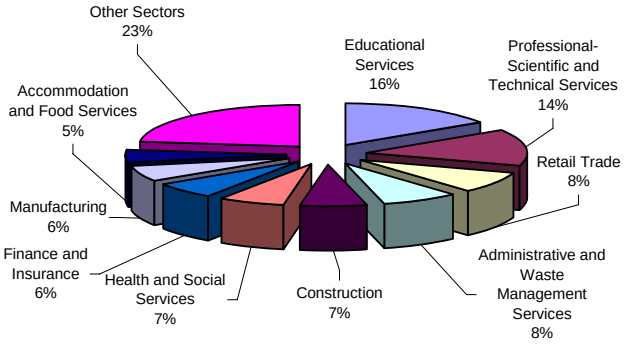


Figure II.5: Employment Impact of Noncapital Operating Expenditures: Percent Distribution by Major Sectors



II.5.C. Employee household expenditures

Assumptions and estimates

In this section, we do not include the wages, salaries, and employment figures from Vanderbilt University Hospital, which will be treated separately. Universities in middle Tennessee employ 29,422 people in the region, including part-time employees and student workers (Table II.5). Of 29,422 employees, only two (2) percent live outside the study region.

Table II.5. Total Employment (20 Universities)

Type	Full-Time	Part-Time	Total FTE
Faculty	6,504	1,589	7,034
Staff	13,707	2,240	14,454
Student Workers		4,342	
Graduate Students		1,040	
Total	20,211	9,211	21,487

Source: BERC survey and IPEDS;
FTE (Full-time equivalent) includes all full-time employees plus one-third of part-time employees.

According to survey data, employees in middle Tennessee earned an estimated $988 million in 2005: nearly $13 million paid to student workers and graduate assistants and $20 million earned by employees residing outside middle Tennessee. Total adjusted payroll for faculty and staff is estimated at $955.603 million before taxes.

Economic impact

As highlighted in Table II.6, the economic impact of the 20 universities' payroll is significant. After taking into account federal taxes and other deductions, the payroll impact of the 20 universities is estimated at:

- $1.340 billion in business revenue,
- $443 million in personal income (in addition to initial earnings of university employees),
- 33,556 jobs (including 21,487 FTE of 20 universities), and
- $74 million in state and local taxes.

Table II.6: Economic Impact of Middle Tennessee Higher Education Institutions:
Household (Employee) Expenditures (2005) (Employment in Thousands, Dollar Figures in Millions)

Type	Direct	Indirect	Induced	Total	Multiplier*
Business Revenue (Million $)	$828.007	$234.031	$278.008	$1,340.046	1.62
Value Added (GDP Equivalent) (Million $)**	$482.600	$137.966	$173.954	$794.520	1.65
Personal Income (Million $)	$264.816	$80.115	$97.909	$442.840	1.67
Employment (thousands)****	21.487	5.729	6.340	33.556	1.56
Estimated State and Local Taxes (Million $)***	n/a	n/a	n/a	$73.718	n/a

*Multipliers are SAM multipliers, calculated by dividing the total impact by the direct impact.
**Value-added impact is equivalent to gross regional or gross domestic product. As a measure of economic impact, value added differs from business revenue. Business revenue includes a substantial amount of regional trade (circulation of money in the regional economy).
***Estimated state and local taxes are derived from the model.
****A total higher education employment of 21,487 (FTE) is included under direct employment.

How are business revenue and employment impacts distributed across the major sectors? The largest business payroll revenue impact occurred in health and human services (13 percent), manufacturing (11 percent), finance and insurance (11 percent),

and retail trade (10 percent). In terms of jobs, due to the ownership mix of universities (public and private, not-for-profit), the two largest sectors are education (40 percent) and government (26 percent).

Figure II.6: Business Revenue Impact of Household (Employee) Expenditures: Percent Distribution by Major Sectors

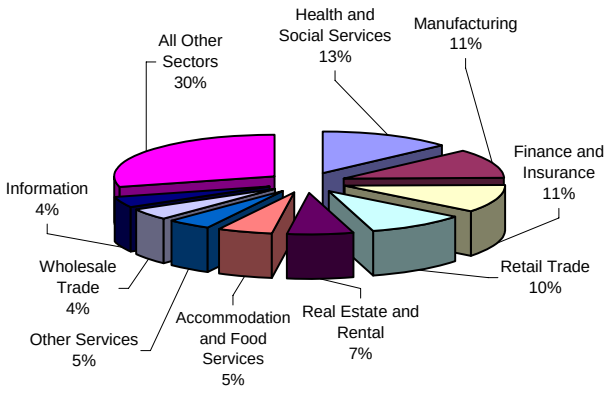
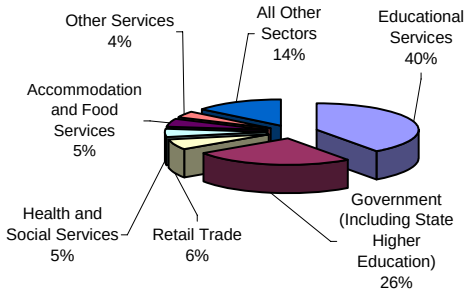


Figure II.7: Employment Impact of Household (Employee) Expenditures: Percent Distribution by Major Sectors



II.5.D. Visitor expenditures

Assumptions and estimates

In addition to employee expenditures, visitors to middle Tennessee universities create a significant economic impact. Not including visitors to Vanderbilt University Hospital, the total number of "net new" visitors to middle Tennessee universities is estimated at 307,795 day-trippers and 116,938 overnight visitors. Those visitors staying overnight accounted for an estimated 264,092 hotel nights in middle Tennessee (Table II.7).

Table II.7: Visitor Assumptions and Total Number of Daytrippers and Hotel Nights (20 Universities)

	Attendance/Events	Daytrippers	Overnight Stays	Hotel Nights*****
Families of Freshmen	14267	6,661	7,606	11,300
Youth Camp Attendance	10,216	10,216	0	0
Home Games-Events*	796	201,000	40,200	80,400
Cultural Events**	870	43,500	0	0
Business Events***	437	42,826	874	1,748
Conferences****	479	3,592	68,258	170,644
Total	n/a	307,795	116,938	264,092

Source: BERC survey, IPEDS data, and Web sites of individual universities
*Assumes that average home game attendance is 5,000 and five percent of attendees are daytrippers while one percent of attendees stay two days in hotels and motels
**Assumes that the average cultural event attracts 50 attendees, who are daytrippers
***Assumes that the average business event attracts 100 attendees, of whom 98 percent are daytrippers and two percent stay overnight
****Assumes that the average conference attracts 150 people of whom 95 percent stay 2.5 nights in hotels and motels

As reported in Table II.8, university visitors in middle Tennessee spent an estimated $49.868 million on goods and services: nearly $14 million spent by day-trippers and $36 million by those visitors staying overnight in the region. We must, however, emphasize that visitor estimates and their total spending reflect conservative figures, as the assumptions in Table II.7 demonstrate.

Table II.8: Estimated Visitor Expenditures (20 Universities)

Events	Average Spending Per Hotel Day	Average Daytripper Spending	Total Spending of Overnight Visitors	Total Daytripper Spending	Total Visitor Spending
Motel, hotel, cabin or B&B	$70.00	$0.00	$18,486,440	$0	$18,486,440
Restaurants and bars	$29.55	$18.25	$7,804,483	$5,617,425	$13,421,908
Groceries, take-out food/drinks	$5.18	$7.45	$1,367,969	$2,291,628	$3,659,597
Gas and oil	$12.08	$12.00	$3,189,687	$3,694,025	$6,883,713
Clothing	$7.64	$1.69	$2,016,662	$521,002	$2,537,665
Sporting goods	$0.89	$0.83	$235,277	$254,625	$489,903
Souvenirs and other expenses	$10.89	$4.91	$2,877,105	$1,512,082	$4,389,187
Total	$136.23	$45.13	$35,977,623	$13,890,788	$49,868,412

Source: Visitor expenditure data for nonuniversity-related events in Tennessee are utilized in this study. A modified version of the BERC survey of Bonnaroo music festival attendees is used for this purpose.

Economic impact of university visitors

Even though estimates are conservative, university visitors have a significant impact on the regional economy. The findings suggest that universities are major visitor

centers, attracting people with diverse backgrounds from all over the world. As Table II.7 shows, there are many venues through which the 20 universities attract people to the region. The diversity of venues signifies the contribution of the 20 universities to social and cultural as well as academic life in middle Tennessee.

In terms of university visitors' contribution to the regional economy, visitors' spending generates (Table II.9 below):

- $73 million in business revenue,
- $22 million in personal income,
- 858 jobs, and
- $5 million in state and local taxes.

Table II.9: Economic Impact of Middle Tennessee Higher Education Institutions:
University Visitor Expenditures (2005) (Employment in Thousands, Dollar Figures in Millions)

Type	Direct	Indirect	Induced	Total	Multiplier*
Business Revenue (Million $)	$49.868	$8.831	$13.775	$72.474	1.45
Value Added (GDP Equivalent) (Million $)**	$25.340	$5.182	$8.620	$39.142	1.54
Personal Income (Million $)	$14.532	$2.684	$4.851	$22.067	1.52
Employment (thousands)	0.649	0.075	0.134	0.858	1.32
Estimated State and Local Taxes (Million $)***	n/a	n/a	n/a	$5.328	n/a

*Multipliers are SAM multipliers, calculated by dividing the total impact by the direct impact.
**Value-added impact is equivalent to gross regional or gross domestic product. As a measure of economic impact, value added differs from business revenue. Business revenue includes a substantial amount of regional trade (circulation of money in the regional economy).
***Estimated state and local taxes are derived from the model.

Which sectors of the economy are impacted most by the visitor spending? It is not surprising that 54 percent of the business revenue is in accommodation and food services, followed by 12 percent in retail trade. In terms of employment impact, 68 percent of jobs are in accommodation and food services and 14 percent in retail trade (Figures II.8 and II.9).

Figure II.8: Business Revenue Impact of University Visitor Expenditures: Percent Distribution by Major Sectors

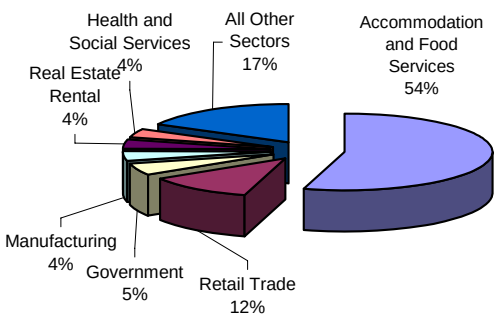
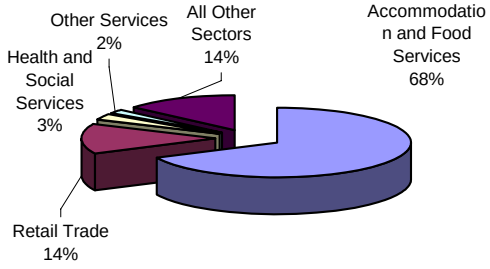


Figure II.9: Employment Impact of University Visitor Expenditures: Percent Distribution by Major Sectors



II.5.E. Student Expenditures

Assumptions and estimates

Students represent an important part of economic impact study of higher education institutions. Apart from their contribution to the regional economy as part-time employees in their respective universities and across businesses, their spending in the regional economy is significant. Based on the BERC survey data, total enrollment including continuing education and online enrollment is estimated at 110,182 in 2005. These students injected more than $1 billion into the regional economy. As Table II.10 indicates, an estimated 20.75 percent of students stayed on campus, 56.5 percent off-campus, and 22.7 percent with family.

Table II.10: Enrollment by Type of Accommodation (20 Universities)

Type of Students	Number	Percent
On-Campus	22,867	20.75%
Off-Campus	62,258	56.50%
Staying with Family*	25,057	22.74%
Total	110,182	100.00%

Source: BERC survey and IPEDS
*Represents a portion of students attending community colleges and all enrollees for continuing education and online degree programs

Estimated student expenditures are based on three categories of full-time and part-time students: on-campus, off-campus, and staying with family. Estimated student expenditure profiles are derived from the BERC survey of higher education institutions. Table II.11 provides total student expenditures in middle Tennessee by type of accommodation and major sector. As Table II.11 shows, of $1.061 billion in student expenditures, $792 million belongs to students living off campus, $185 million to those living on campus, and $84 million those staying with family. In terms of expenditure categories, housing is the largest with $253.4 million, followed by food and beverages ($218.4 million) and transportation-related ($156 million).

Table II.11: Distribution of Student Expenditure by Type of Accommodation (20 Universities)

Expenditure Type	On-Campus	Off-Campus	Stay with Family	Total
Housing	$0	$253,390,060	$0	$253,390,060
Household Operation	$0	$58,304,617	$0	$58,304,617
Other Durables	$0	$29,977,227	$0	$29,977,227
Food and Beverages	$64,202,914	$154,163,260	$0	$218,366,173
Vehicles and Parts	$19,093,945	$51,985,430	$20,922,595	$92,001,970
Transportation	$33,711,675	$87,161,200	$35,079,800	$155,952,675
Clothing	$19,536,040	$37,448,187	$0	$56,984,227
Other Service	$29,345,983	$69,189,391	$27,838,327	$126,373,701
Computer and Furniture	$11,433,500	$31,129,000	$0	$42,562,500
Medical Care	$7,164,993	$19,507,507	$0	$26,672,500
Total	$184,489,050	$792,255,878	$83,840,722	$1,060,585,650

Source: BERC survey and IPEDS

Note: Housing expenses for on-campus students are excluded, as they are part of the university revenue stream from auxiliary services.

Economic impact of student expenditures

What is the total economic impact of student expenditures on the middle Tennessee economy? As Table II.12 shows, it is quite substantial. The total economic impact of student expenditures is estimated at:

- $1.475 billion in business revenue,
- $384.4 million in personal income,
- 10,064 jobs, and
- $79.2 million in state and local taxes.

Table II.12: Economic Impact of Middle Tennessee Higher Education Institutions:
Student Expenditures (2005) (Employment in Thousands, Dollar Figures in Millions)

Type	Direct	Indirect	Induced	Total	Multiplier*
Business Revenue (Million $)	$1,060.586	$170.951	$242.976	$1,474.513	1.39
Value Added (GDP Equivalent) (Million $)**	$449.373	$105.729	$152.034	$707.136	1.57
Personal Income (Million $)	$238.446	$60.390	$85.572	$384.408	1.61
Employment (thousands)	6.178	1.524	2.362	10.064	1.63
Estimated State and Local Taxes (Million $)***	n/a	n/a	n/a	$79.173	n/a

*Multipliers are SAM multipliers, calculated by dividing the total impact by the direct impact.

**Value-added impact is equivalent to gross regional or gross domestic product. As a measure of economic impact, value added differs from business revenue. Business revenue includes a substantial amount of regional trade (circulation of money in the regional economy).

***Estimated state and local taxes are derived from the model.

Which major sectors of the regional economy benefited most from student spending? Figures II.10 and II.11 indicate that the largest business revenue impact occurred in real estate and rental (27 percent), retail trade (18 percent), and transportation and warehousing (16 percent). In terms of employment impact, retail trade (31 percent), real estate and rental (17 percent), and transportation and warehousing (13 percent) were the largest beneficiaries.

Figure II.10: Business Revenue Impact of Student Expenditures: Percent Distribution by Major Sectors

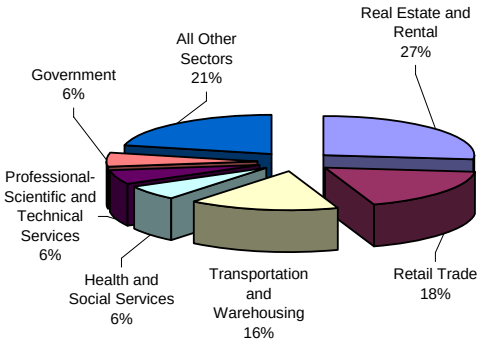
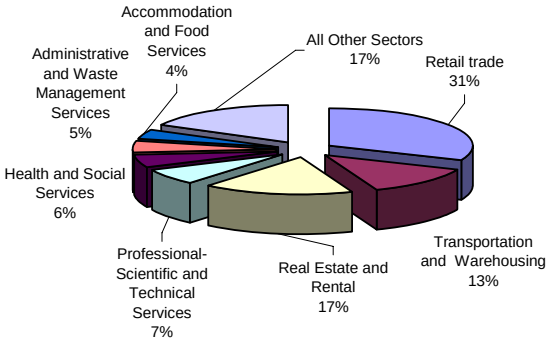


Figure II.11: Employment Impact of Student Expenditures: Percent Distribution by Major Sectors



II.5.F. Total higher education economic impact

Middle Tennessee's 20 universities have a significant impact on the regional economy. Taking into account expenditures of the institutions themselves, their employees, visitors, and students, they generate a total of:

- $4.597 billion in business revenue,
- $1.478 billion in personal income (in addition to $955 million for their own initial payroll),
- 59,652 jobs, and
- $213.8 million in state and local tax revenues (Table II.13).

Table II.13: Economic Impact of Middle Tennessee Higher Education Institutions:
Total Higher Education Economic Impact (2005) (Employment in Thousands, Dollar Figures in Millions)

Type	Direct****	Indirect	Induced	Total	Multiplier*
Business Revenue (Million $)	$2,935.467	$727.650	$934.196	$4,597.313	1.57
Value Added (GDP Equivalent) (Million $)**	$1,481.547	$434.035	$584.544	$2,500.126	1.69
Personal Income (Million $)	$887.227	$261.807	$329.009	$1,478.043	1.67
Employment (thousands)	36.786	10.147	12.719	59.652	1.62
Estimated State and Local Taxes (Million $)***	n/a	n/a	n/a	$213.751	n/a

*Multipliers are SAM multipliers, calculated by dividing the total impact by the direct impact.
**Value-added impact is equivalent to gross regional or gross domestic product. As a measure of economic impact, value added differs from business revenue. Business revenue includes a substantial amount of regional trade (circulation of money in the regional economy).
***Estimated state and local taxes are derived from the model.
****Direct impact is defined as the direct impact for each of the five types of economic activities: (1) capital expenditures, (2) noncapital operating expenditures, (3) household (employee) expenditures, (4) visitor expenditures, and (5) student expenditures.

II.5.G. Vanderbilt University Hospital

Above and beyond the economic impacts described heretofore, Vanderbilt University Hospital, as a major research hospital, makes its own unique and significant contribution to middle Tennessee's economy. This study does not provide a comprehensive assessment of Vanderbilt University Hospital's clinical services. Such an assessment would be likely to increase the magnitude of the hospital's economic impact because several unique services keep patients in the region. Furthermore, a substantial amount of charity care is not discussed in this report. That said, Vanderbilt University Hospital's economic impact is nonetheless remarkable.

As presented in Table II.14, Vanderbilt University Hospital employed 8,670 people residing in middle Tennessee at an estimated payroll of $417 million, of which $346 million was disposable income. The hospital's operating expenditures (excluding payroll) totaled more than $500 million, of which 46 percent ($223 million) was spent in the region. Furthermore, Vanderbilt is the largest hospital in terms of inpatient and outpatient days in Tennessee. One million clinical visitors seek treatment at Vanderbilt,

of which more than a quarter were from outside the region. These clinical visitors spend a total of 279,383 days at Vanderbilt, 54,149 of which include hotel stays for family members accompanying patients, injecting a total of $17.5 million into the region's economy.

Table II.14: Vanderbilt University Medical Center

Hospital-Related Assumptions	
Total Employment (FTE)*	8,670
Estimated Payroll**	$346,405,465
Hospital Operating Expenditures***	$222,853,812
Total Clinical Visitors****	1,000,000
Total Out of Region Patient Days	279,383
*daytrippers****	*225,234*
*hotel nights****	*54,149*

*Employees residing in the region.

**Disposable income of Vanderbilt employees living in the region, representing nearly 17 percent of deductions from total wages and salaries.

***Estimated hospital operating expenditures spent in the region (approximately 46 percent of total operating expenditures)

****Vanderbilt University Hospital is the largest hospital in terms of inpatient and outpatient days in Tennessee. According to a Tennessee Department of Health survey, nearly 54,149 inpatient days are from outside middle Tennessee counties. Similarly, an estimated 26 percent of nearly 900,000 outpatient visits are from outside the region. Inpatient days are modeled as hotel nights assuming at least one family member accompanies a patient. Outpatient visits from outside the region are modeled as daytrippers.

Economic impact of Vanderbilt University Hospital

Based on the assumptions in Table II.14, Vanderbilt University Hospital's total economic impact was estimated at:

- $871.851 million in total business revenue,

- $245.616 million in personal income (in addition to its own payroll of $346 million),
- 15,526 jobs in the region, and
- $41.296 million in state and local taxes.

Table II.15 below presents detailed results on the economic impact of Vanderbilt University Hospital on the regional economy. It is important to emphasize that due to the modeling approach we followed, the initial personal income (payroll) associated with Vanderbilt University Hospital and the 20 universities does not appear in the personal income category throughout the tables. Therefore, the personal income figures in the tables should be interpreted as "in addition to these institutions' payroll."

Table II.15: Economic Impact of Middle Tennessee Higher Education Institutions:
Vanderbilt University Hospital Economic Impact (2005) (Employment in Thousands, Dollar Figures in Millions)

Type	Direct****	Indirect	Induced	Total	Multiplier*
Business Revenue (Million $)	$592.302	$125.245	$154.304	$871.851	1.47
Value Added (GDP Equivalent) (Million $)**	$267.419	$74.190	$96.550	$438.159	1.64
Personal Income (Million $)	$148.564	$42.709	$54.343	$245.616	1.65
Employment (thousands)	8.670	3.247	3.609	15.526	1.79
Estimated State and Local Taxes (Million $)***	n/a	n/a	n/a	$41.296	n/a

*Multipliers are SAM multipliers, calculated by dividing the total impact by the direct impact.
**Value-added impact is equivalent to gross regional or gross domestic product. As a measure of economic impact, value added differs from business revenue. Business revenue includes a substantial amount of regional trade (circulation of money in the regional economy).
***Estimated state and local taxes are derived from the model.
****Direct impact is defined as the direct impact for each of the three types of economic activities: (1) operating expenditures, (2) household (employee) expenditures, and (3) visitor expenditures.

II.5.H. Grand total

In calculating the total economic impact of the 20 universities and Vanderbilt University Hospital, the BERC included the initial payroll of the 20 universities and the hospital in value added (GDP equivalent) and personal income. Therefore, the results in Table II.16 below should be interpreted as the total economic impact figures inclusive of all university and hospital activities as well as the initial payroll of these institutions. In Tables II.6, II.13, and II.15, the personal income effect of household expenditures was

presented as being in addition to initial payroll of these universities. According to Table II.16, in 2005, the 20 universities and Vanderbilt University Hospital accounted for:

- $5.597 billion in business revenue,
- $2.898 billion in personal income (including initial payrolls),
- 75,178 jobs, and
- $255 million in state and local taxes.

Table II.16: Economic Impact of Middle Tennessee Higher Education Institutions, Including Vanderbilt University Hospital: Grand Total (2005) (Employment in Thousands, Dollar Figures in Millions)

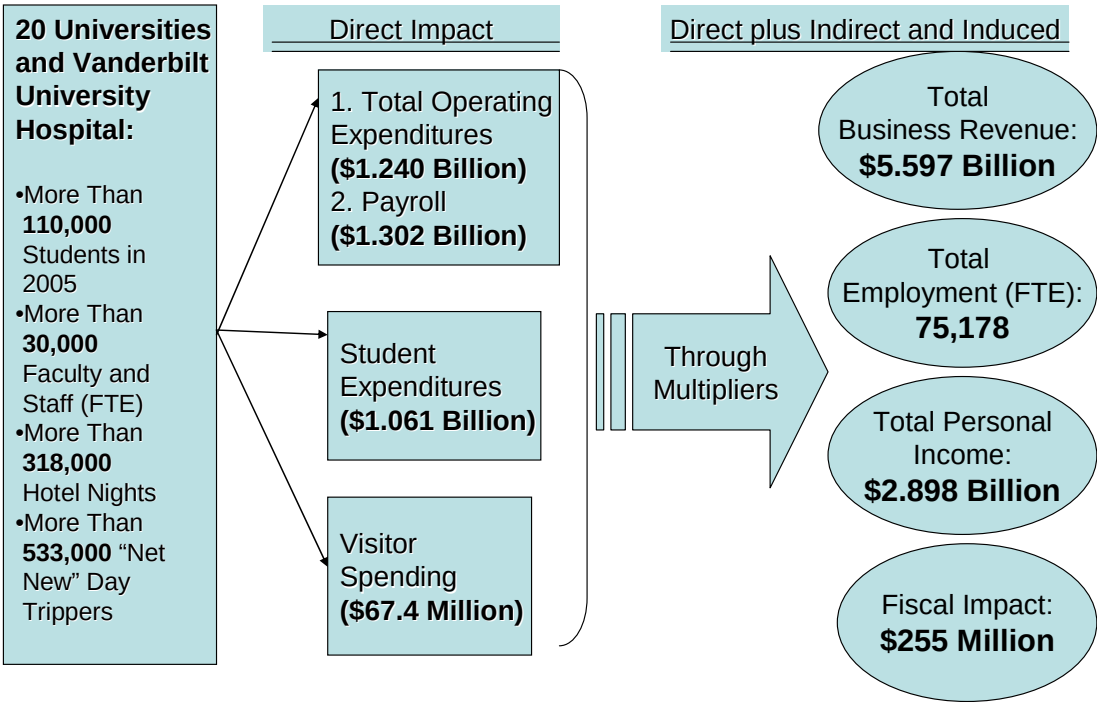
Type	Direct****	Indirect	Induced	Total	Multiplier*
Business Revenue (Million $)	$3,655.365	$852.895	$1,088.500	$5,596.760	1.53
Value Added (GDP Equivalent) (Million $)**	$2,292.219	$714.915	$887.784	$3,894.918	1.70
Personal Income (Million $)*****	$1,796.823	$511.206	$590.042	$2,898.071	1.61
Employment (thousands)	45.456	13.394	16.328	75.178	1.65
Estimated State and Local Taxes (Million $)***	n/a	n/a	n/a	$255.047	n/a

*Multipliers are SAM multipliers, calculated by dividing the total impact by the direct impact.
**Value-added impact is equivalent to gross regional or gross domestic product. As a measure of economic impact, value added differs from business revenue. Business revenue includes a substantial amount of regional trade (circulation of money in the regional economy).
***Estimated state and local taxes are derived from the model.
****Direct impact is defined as the direct impact for each of the five types of economic activities: (1) capital expenditures, (2) noncapital operating expenditures, (3) household (employee) expenditures, (4) visitor expenditures, and (5) student expenditures.
*****Initial payroll of 20 universities and Vanderbilt University Hospital is included in value added and personal income. The results in this table then should be interpreted as total economic impact, inclusive of all activities plus initial payroll amounts.

II.6. Conclusion

This chapter of the study analyzed the economic impact of five university-related economic activities as well as Vanderbilt University Hospital. As mentioned frequently throughout this study, the economic impact figures related to these activities represent only a small portion of the broader economic contribution of the 20 universities to the middle Tennessee economy. However, given the scope of the economic impact of these institutions, it is accurate to portray these institutions as "engines of growth." Figure II.12 below provides a further summary of these institutions' contributions to economic prosperity in middle Tennessee.

Figure II.12: Contributing to Regional Prosperity: 20 Universities and Vanderbilt University Hospital in Middle Tennessee



CHAPTER III:
VALUE OF HIGHER EDUCATION IN TENNESSEE COUNTIES[1]

III.1. Overview

Economic growth is a complex process that generally interacts with several factors, mainly investment in physical and human capital, technological advances, and institutional and policy changes that improve the efficiency of an economic organization. These three factors are all related to education.

The ultimate question in much economic development and growth literature has been what role human capital, measured as years of schooling or educational attainment level, plays in economic prosperity. Micro-level studies often look at the variations in the earnings of individuals and account for those variations by an individual's years of schooling and experience. While micro-level modeling has suggested a significant return on education, a different type of inquiry has been developed that aims to explain significant variations in economic growth across nations. Some of these macro-level studies focus on the convergence hypothesis, which analyzes how schooling affects output growth per capita over five-, 10-, or 20-year periods, given the initial income level. A critical review of some theoretical and empirical studies indicates that competitiveness of countries, regions, governments, businesses, and individuals vitally depends on investment in education.

What is the value of higher education in Tennessee? How and how much does higher education affect Tennessee's economic growth? These are key questions this paper will address based on Tennessee's regional characteristics. Tennessee has more

[1] Zhijie Qi, graduate research associate in the BERC, coauthored this chapter.

than 150 postsecondary educational institutions. However, in terms of educational attainment, Tennessee's workforce is far behind the U.S. average.

This study analyzes the value of higher education in Tennessee, particularly with respect to individual counties using aggregate county-level data. The study universe is 95 Tennessee counties. The model is informed by labor economics and neoclassical growth models. Before presenting the study's findings, we will overview current literature and highlight the relationship between different county characteristics in Tennessee.

The rest of the chapter is organized as follows. The second section provides a brief overview of the literature. The third section discusses the characteristics of Tennessee counties as they relate to educational attainment. The fourth section deals with the model and sources of data. The fifth section presents and discusses the regression results, and a conclusion follows.

III.2. Overview of the literature

The relationship between human capital and economic growth is widely treated in different strands of economic theory. While micro-level analyses utilize a Mincerian relationship to estimate returns on an additional year of schooling, macro-level studies emphasize the role of schooling in economic growth. Especially the studies dealing with the knowledge economy put the investment in broader education and related spillovers at the center of economic development arguments. Looking back at three decades of economic growth literature using a Mincer (1974) equation model, subsequent micro-level analyses find that additional years of schooling result in statistically significant monetary returns.

While Mincerian modeling has suggested a significant return on education, a different type of inquiry has evolved that aims to explain significant variations in economic growth across nations. Some of these macro-level studies focus on the convergence hypothesis, which analyzes how schooling affects output growth per capita over five-, 10-, or 20-year periods, given the initial income level. Examples of macro-level analyses include Romer (1990), Mankiw et al. (1992), Barro and Lee (1993), and Benhabib and Spiegel (1994). Krueger and Lindahl (2001) provide useful discussions of these studies, their data, and measurement issues. Although some of the findings in growth literature are contradictory in terms of contribution of an additional year of schooling on economic growth, the overall literature nevertheless suggests that the return on an additional year of schooling is five to 15 percent in general. In developing countries, this return goes up to 20 percent.

A critical review of economic growth studies in the literature, however, reveals several problems with regard to the return on investment in education.[2] According to Krueger and Lindahl (2001), some of the discrepancy in the literature with regard to the contribution of an additional year of schooling on economic growth may be due to measurement error. Other study-specific problems often encountered are a possible simultaneity bias (association is not causality) and interpretation of the coefficients of educational attainment in semi-log growth related model specifications.

In this chapter, BERC utilized a Mincerian equation treating income per capita (in natural log form) as a function of educational attainment at the aggregate level as well as several county-specific factors. Furthermore, the BERC developed a system of three

[2] For a comprehensive review of these problem areas, see Krueger and Lindahl (2001).

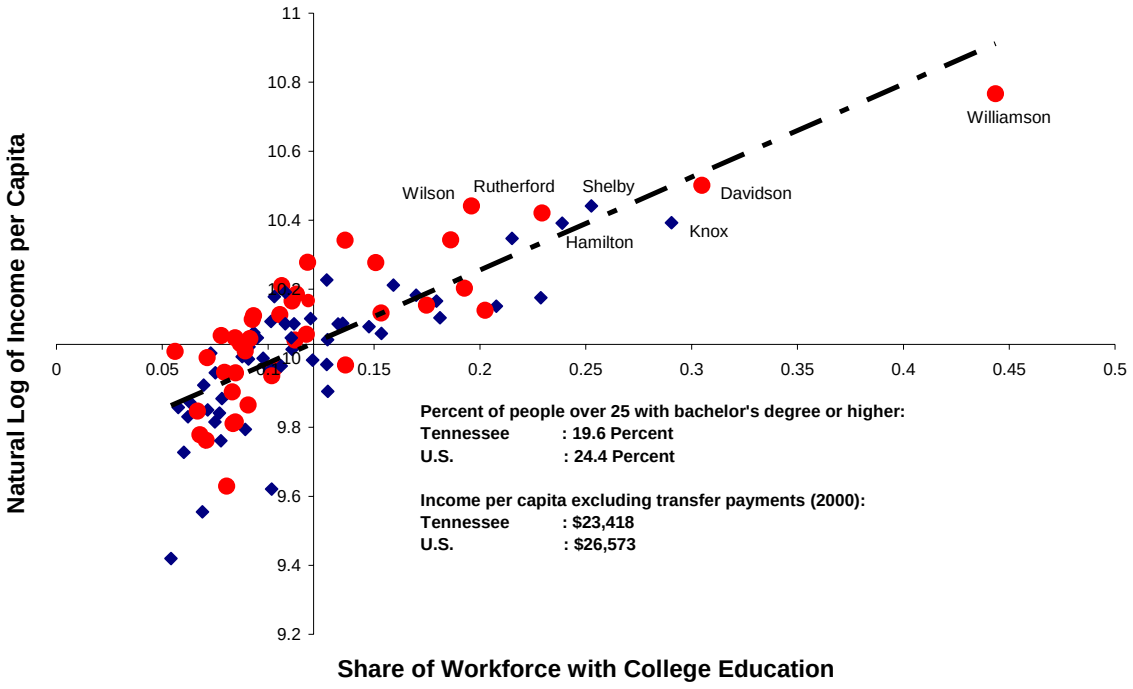
equations to eliminate any simultaneity bias. In addition, the Three Stage Least Square (3SLS) method rather than 2SLS is used because of the contemporaneous correlations among residuals of system equations.

III.3. How is educational attainment related to county characteristics?

Income versus college

As Figure III.1 shows, there is a close relationship between income per capita and college education. Middle Tennessee counties are represented by red dots. In terms of distribution, there is no regional difference.

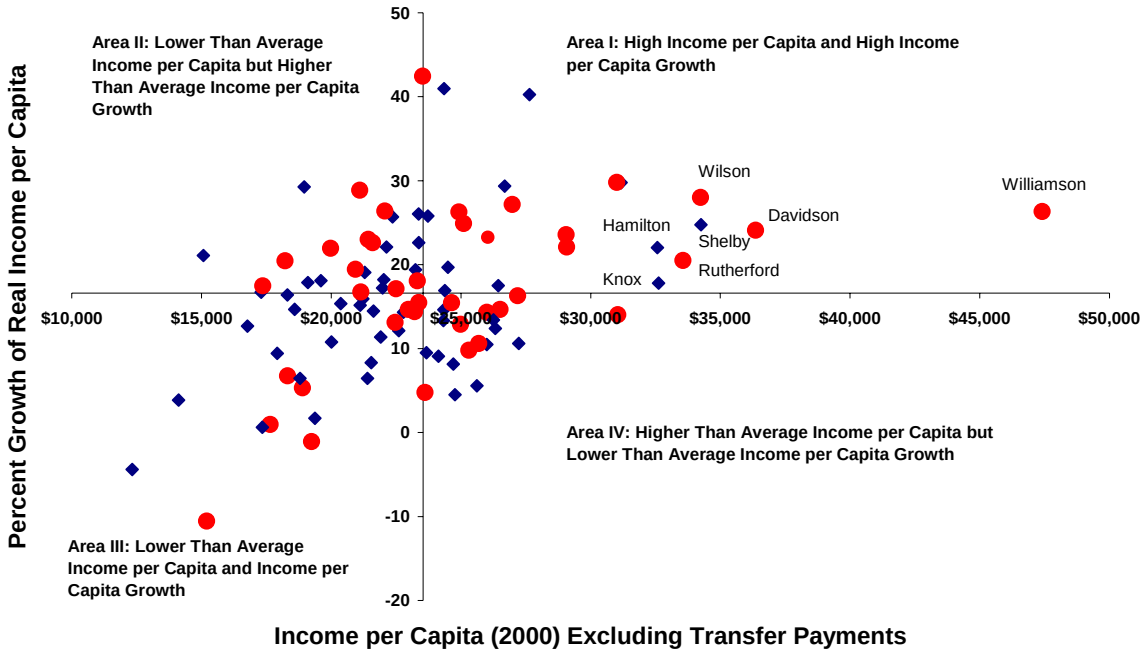
Figure III.1: Income per Capita and College Education in Tennessee Counties



Income versus income growth

Not only does higher education correlate with higher income, but apparently higher income correlates with income growth. In this visual representation, red dots represent middle Tennessee counties. As you can see in area one of Figure III.2, nearly 22 counties with high income experienced strong growth. In terms of distribution, 11 of these high-income and high-growth counties are in middle Tennessee.

Figure III.2: Income per Capita and Growth of Real Income per Capita between 1990 and 2000

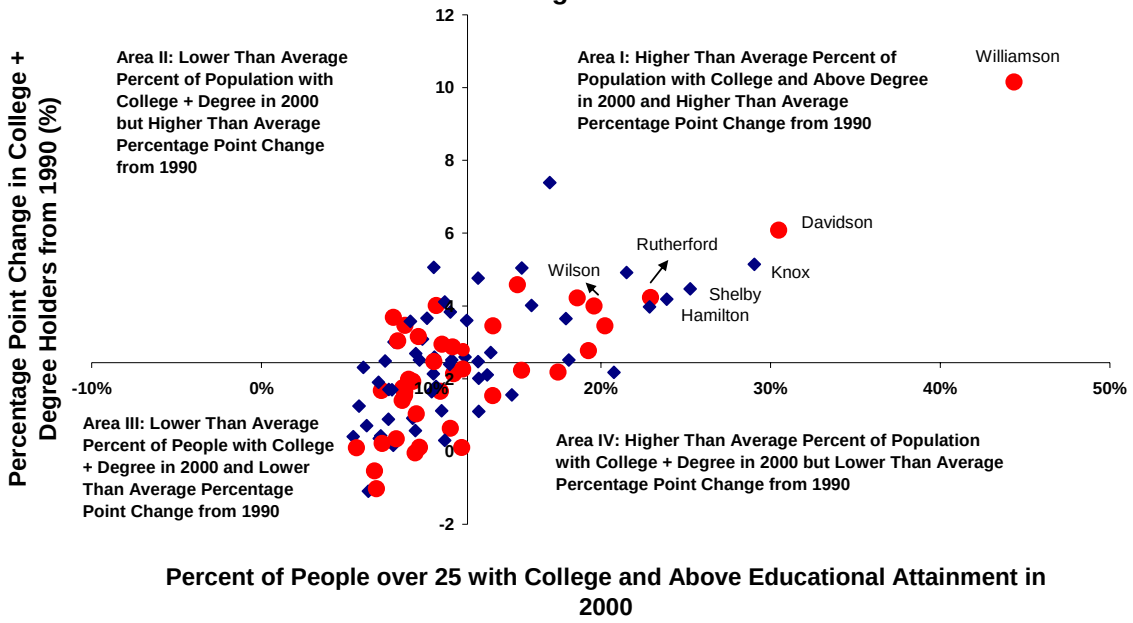


College education in 2000 versus growth from 1990

Furthermore, higher rates of college education correlate with higher levels of growth in the education level of the population. In other words, an educated population attracts (or begets) even more educated people. As Figure III.3 illustrates, nearly 22

counties with high numbers of college-educated people experienced a higher than average rate of growth in the number of college-educated people between 1990 and 2000.

Figure III.3: Educational Attainment: Percent of Population with College and Above Educational Attainment in 2000 and Percentage Point Change from 1990

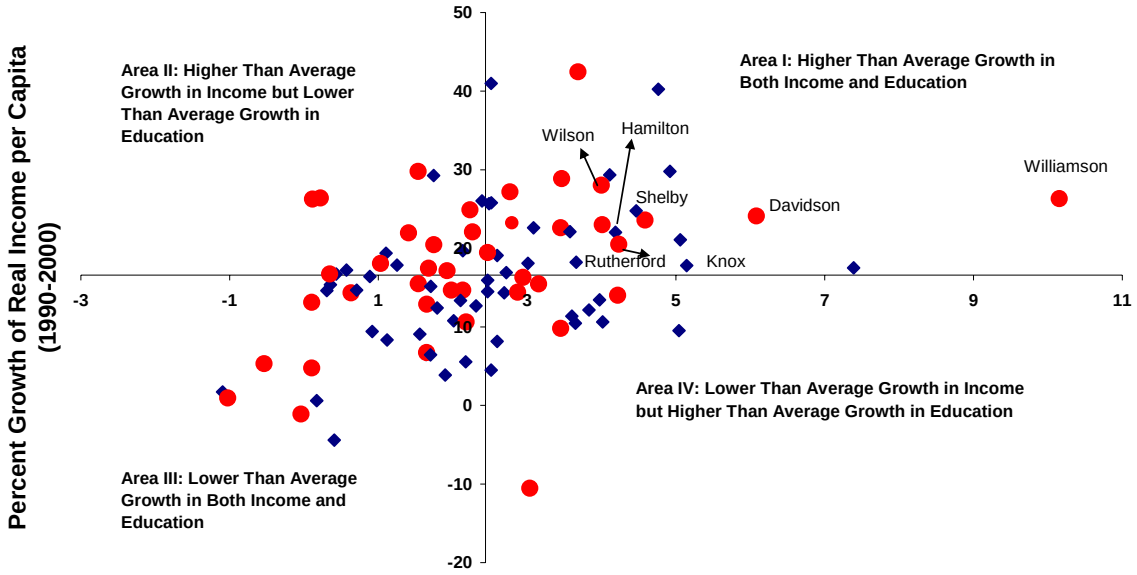


In terms of distribution, nine of these highly educated, high-growth percentage counties are in middle Tennessee. Nearly half of the counties represented fall into area three, where a lower than average number of people have college educations and a lower than average rate of educational change occurred between 1990 and 2000. While educated people seem to attract educated people, the opposite also seems to be true: where education levels are lower, they tend to stay that way.

Growth of income versus growth of college-educated workforce

Figure III.4 compares the rate of growth of education level to the rate of growth in income level. The red dots show that nearly 28 counties enjoyed both higher than average growth in the level of education of their populace and higher than average growth in income levels. In terms of distribution, 13 of these high-growth counties are in middle Tennessee. In fact, nearly half of middle Tennessee counties are experiencing high income growth.

Figure III.4: Growth of Real Income per Capita and College-Educated Workforce in Tennessee Counties between 1990 and 2000

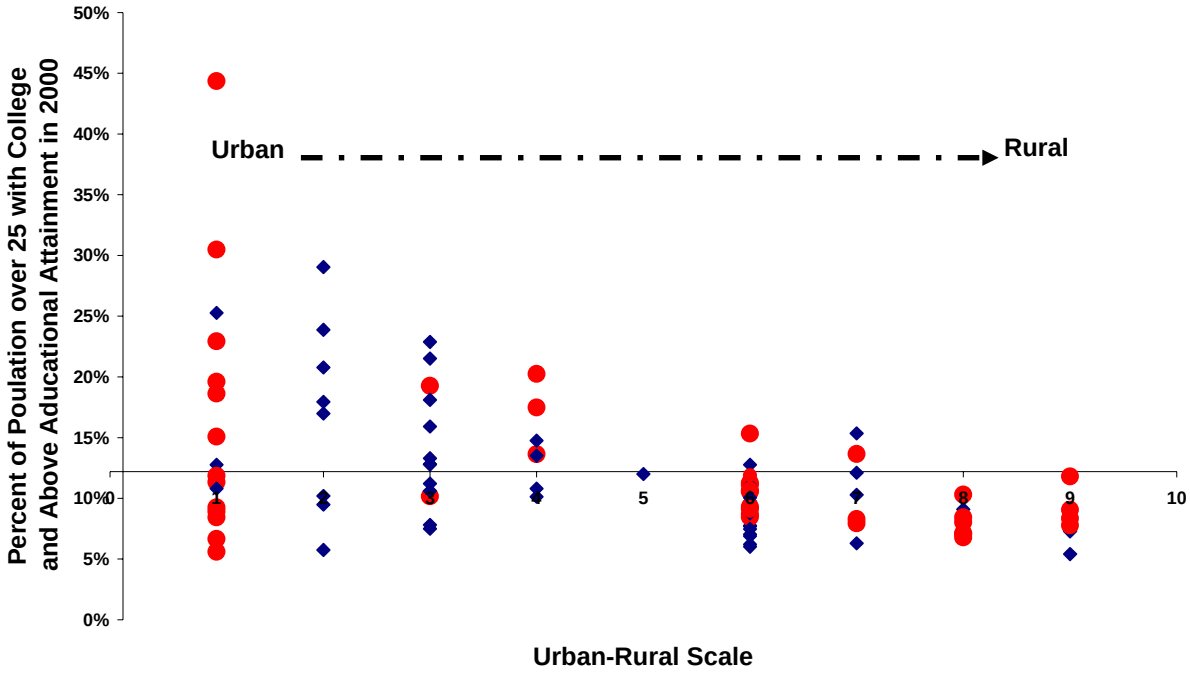


Urban-rural difference versus college-educated workforce

As indicated in Figure III.5, it is not surprising that the difference between urban and rural communities is reflected in the difference in education level. The more urban counties enjoy a much higher level of educational attainment in their 25-and-over population. However, the correlation doesn't necessarily go both ways. In fact, some

middle Tennessee counties have low educational attainment even though they are considered urban.

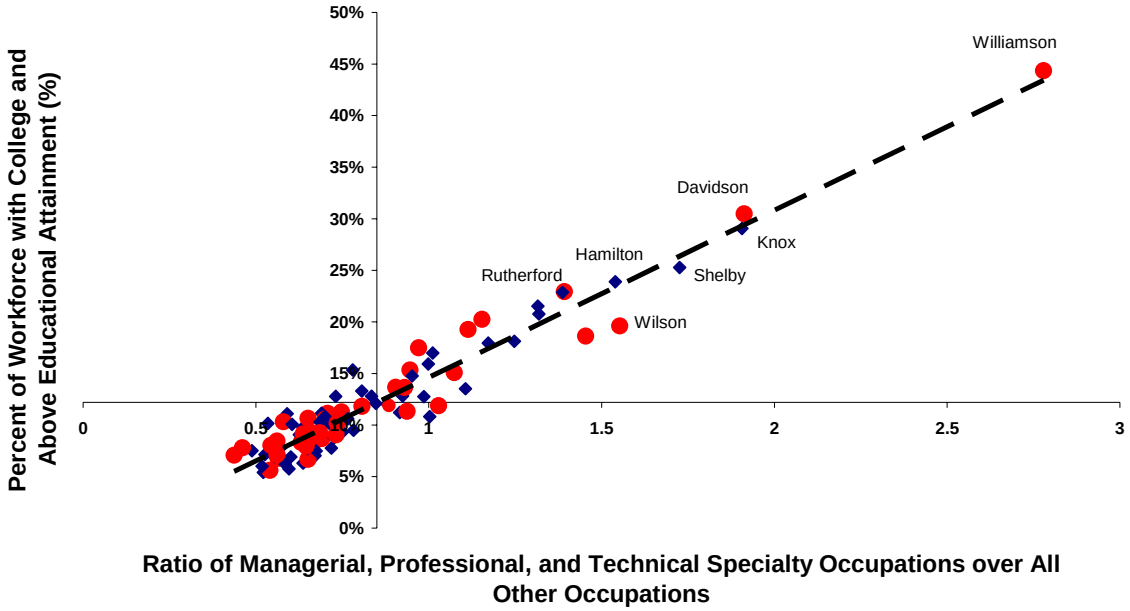
Figure III.5: Rural-Urban Characteristics and Percent of Population with College and Above Degree in 2000



Managerial and technical occupations versus college-educated workforce

What types of occupations employ a more educated population? There is a strong correlation between managerial and technical occupations and college level education. As Figure III.6 suggests, middle Tennessee counties are not different from other counties in terms of distribution.

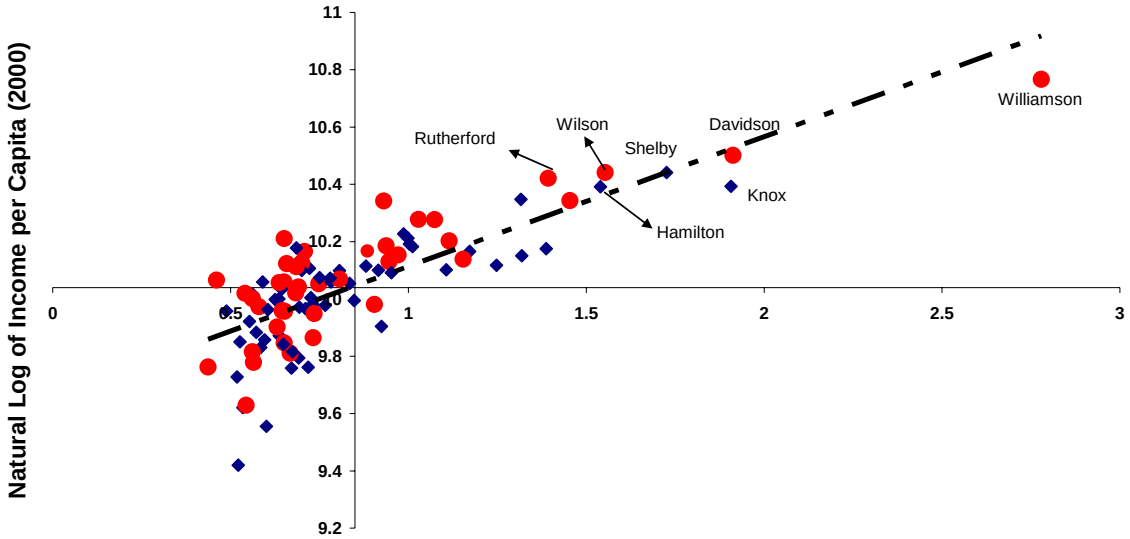
Figure III.6: Ratio of Managerial and Technical Occupations over Other Occupations and Percent of Workforce with College and Above Degree in Tennessee Counties (2000)



Managerial and technical occupations versus income per capita

Similarly, the relationship between managerial and technical occupations and income per capita is very strong. As indicated in Figure III.7, once again, middle Tennessee counties are not different from other counties in terms of distribution.

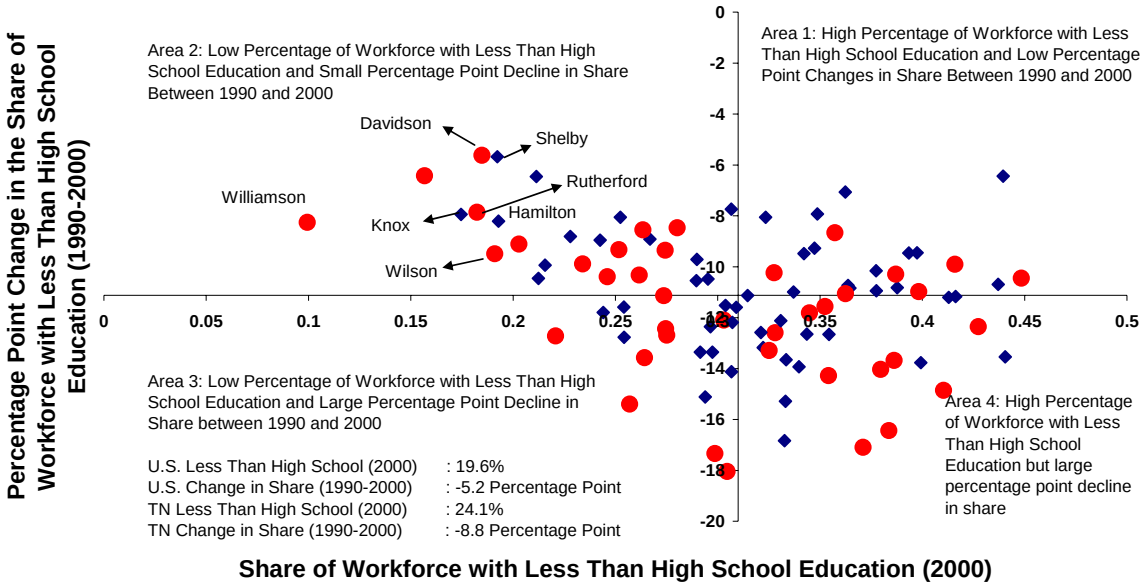
Figure III.7: Income per Capita and Ratio of Managerial, Professional, and Technical Specialty Occupations over All Other Occupations in Tennessee Counties



Workforce with less than high school versus percentage point change

When we compare the share of the workforce with less than a high school (LHS) education in 2000 to the percentage point change from that share in the preceding decade, we see two significant trends in Tennessee counties. First, they have a substantial number of people with LHS education. However, only a handful of counties (eight) have an LHS-educated workforce comparable to the national average, and five are in middle Tennessee (Figure III.8).

Figure III.8: Share of Workforce with Less Than High School Education (2000) and Percentage Change in the Share of Workforce with Less Than High School Education (1990-2000)



Summary observations

Overall, college education is strongly associated with high income across counties. In terms of level and change, middle Tennessee counties are not different from other Tennessee counties. It is not surprising that urban-rural characteristics reflect differences among counties in terms of their college-educated workforce. In addition, counties with a large share of their workforce in managerial and technical occupations have higher numbers of college-educated employees and higher income. The reverse is also true. A large share of Tennessee's workforce has less than a high school education. Only eight counties have LHS figures comparable to the national average of 19.4 percent: Davidson, Hamilton, Knox, Montgomery, Rutherford, Shelby, Williamson, and Wilson.

It is not surprising that all of these counties are home to institutes of higher learning. Taking into account these county characteristics, efforts to increase educational attainment levels beyond high school are most likely to generate a substantial positive impact in the region.

III. 4. Model and data

As Figure III.1-8 clearly demonstrates, several regional characteristics are closely associated with education and income. A modeling of value of higher education then should take into account many of these regional characteristics as well as other population characteristics. In order to model these regional characteristics, we used a conceptual framework that follows Mincer's (1974) seminal work, which shows the relationship between earnings and educational attainment at the micro level. The standard form of this Mincerian equation can be specified as

$$\ln Y = \alpha + \beta_1 S + \beta_2 MAGE + \beta_3 MAGE^2 + \varepsilon,$$

where *lnY* = natural log of individual's earning, *S* = years of schooling for given individuals, and *MAGE* and *MAGE2* = experience of person and square of experience, respectively. For simplicity, subscripts are eliminated.

However, data at the county level for detailed educational attainment is not readily available. Furthermore, a similar problem exists for measuring the experience of people at the county level. Therefore, in this analysis, we substituted years of schooling for educational attainment levels and median age for experience. In addition, based on Figure III.1-8, we included several regional characteristics in a Mincerian equation.

Our construction of an income equation is informed by the literature with respect to determinants of income. In the final form, the income equation is defined as a function of college education, high-school education, median age as proxy for experience and square of median age, young age workforce (ages 25-34), occupational structure, and population size (standardized). Furthermore, we created two interaction variables that reflect industrial and occupational diversity as well as the rural-urban continuum.

Occupational and industrial diversity index. This indicator is created in two steps: first, we obtained the diversity index for industry structure and occupational structure separately using the formula[3]

$$Diversity\_Index = 1 - \sum_{i=1}^{n} (p_i)^2 ,$$

where p_i is the ratio of occupational employment to total employment. The higher the index, the more diversified is the occupation in the county. The industrial diversity index is calculated the same way. From an economic perspective, a more diversified job market will lead to higher per capita income.

Second, we then created an interaction variable, defined as

$$OCIND_i = OccupDiversity_i XIndDiversity_i ,$$

where subscript (i) refers to county. The reason for this interaction variable is that, used separately, industrial diversity is highly correlated with occupational diversity, creating a spurious relationship in the regression.

[3] Diversity index is also called the Rae Index and has widespread application in political science.

Rural-urban continuum index. We also created an interaction variable that measures the relationship of a county with the surrounding urban environment. For this purpose, we utilized two separate indicators: (1) urban-rural continuum codes developed by USDA Economic Research Service (www.ers.usda.gov) and (2) distance of a county to the core of the nearest metropolitan area using Yahoo's mapping tool (http://maps.yahoo.com/). We then multiplied these two indicators to create an interaction variable.

Income equation is specified as

$$\begin{aligned} Ln(WAGE) = \lambda_{(0)} + \ & \lambda_{(1)} \times HBD + \lambda_{(2)} \times HS + \lambda_{(3)} \times CODDIS + \lambda_{(4)} \times MEDIAN \\ & + \lambda_{(5)} \times AGESQ + \lambda_{(6)} \times G34 + \lambda_{(7)} \times OCIND + \lambda_{(8)} \times RMT \\ & + \lambda_{(9)} \times STDPOP \end{aligned} \quad .$$

Previous empirical analyses of the relationship between income and education suggest that although educational attainment level determines income, it is also true that individuals' income is especially important for them to be able to obtain a college education. Because of these concerns, we constructed an education equation that is a function of income, distance to urban areas, ratio of managerial occupation employment to total employment, industry and occupational diversity interaction variable, percent of high school graduates, and young workforce (ages 24-34). *Education equation* is specified below

$$\begin{aligned} HBD = \alpha_{(0)} + \ & \alpha_{(1)} \cdot Ln(WAGE) + \alpha_{(2)} \cdot CODDIS + \alpha_{(3)} \cdot RMT + \alpha_{(4)} \cdot OCIND \\ & + \alpha_{(5)} \cdot HS + \alpha_{(6)} \cdot G24 \end{aligned} \quad .$$

Since our concern is to estimate the value of a college education across Tennessee counties, *education equation* and *income equation* includes the percent of the workforce

with college and above education and the ratio of managerial and technical occupation employment to total employment (RMT). However, a diagnostic analysis of the relationship among several indicators shows that RMT is strongly associated with college and above educational attainment. Therefore, in order to address the endogeneity problem, we constructed an *occupation equation* that is a function of the percent of the workforce with college and above education, a distance to urban core index, an occupational and industry diversity interaction index, and population size. *Occupation equation* is specified as

$$RMT = \beta_{(0)} + \beta_{(1)} \times HBD + \beta_{(2)} \times CODDIS + \beta_{(3)} \times OCIND + \beta_{(4)} \times STDPOP .$$

Table III.1 below presents the name, a short definition, year, and source of variables used in the econometric analysis.

Table III.1: Variables Used in Econometric Model

Variable	Definition	Period	Source
LNWG	Natural log of income per capita excluding transfer payment	1990-2000	BEA
HBD	Bachelor's and higher education (ratio)	1990-2000	Census
HS	High school education (ratio)	1990-2000	Census
MEDIAN	Median age	1990-2000	Census
AGESQ	Median age squared		
G24	Age 15 to 24 (ratio)	1990-2000	Census
G34	Age 25 to 34 (ratio)	1990-2000	Census
Code2003	2003 Rural-Urban Continuum Code		USDA/ESR
Distance	Distance between the county and the major city nearby		Maps.yahoo.com
CODDIS	Rural-urban code multiplied by distance		
INDDI	Industry Diversity Index	1990-2000	Census
OCCDI	Occupation Diversity Index	1990-2000	Census
OCIND	INDDI multiplied by OCCDI		
RMT	Ratio of managerial and technical occupations over all other occupations	1990-2000	Census
STDPOP	Standardized population	1990-2000	Census

Note: In addition to these indicators, the following indicators are used as instruments: SCAD = share of some college and associate's degree, G64 = age 35 to 64 (ratio).

Because of the interrelationship among these three equations (income, education, and occupation), we set up a system Two Stage Least Square Analysis, using all the indicators in the equations as well as some college and associate degree level educational

attainment and ratio of labor force ages 35 to 64 over total labor force as instruments. However, a diagnostic check of the equation results indicate that these three equations have contemporaneous correlations among them. Table III.2 clearly shows the extent of contemporaneous correlations among the equations. To avoid the simultaneity bias then, we use a system 3SLS (Three Stage Least Square) analysis.

Table III.2: Cross Model Correlation Matrix

	Income Equation	Education Equation	Occupation Equation
Income Equation	1.000	-0.704	0.328
Education Equation	-0.704	1.000	-0.841
Occupation Equation	0.328	-0.841	1.000

III.5. Study findings

Results of this econometric study suggest a significant return on investment in higher education in Tennessee. All critical indicators are statistically significant and have expected signs except the occupation indicator. This is due to a strong relationship between occupation and the college education indicator. We draw the following conclusions from the findings. First, all other things being equal, on average, one percentage point growth in the share of college-educated workforce leads to a 9.25 percent increase in income per capita, excluding transfer payments. Using the median income of counties, on average this increase corresponds to a $2,120 increase in per capita income, as the following graph illustrates. Table III.3 below presents the result of both OLS and 3SLS regression results.

Table III.3: Income per Capita and College Education Regression Results
Income Equation: LNWG00 (Natural Log of Income per Capita)

Income Equation			OLS Coefficients*	OLS t-value	3SLS Coefficients	3SLS t-value
Intercept	Intercept	λ_0	10.921	5.81	7.139	3.57*
HBD00	Bachelor's and higher education	λ_1	2.335	3.78	8.847	4.50*
HS00	High school education	λ_2	2.478	6.46	4.189	5.73*
CODDIS	Urban code multiplied by distance	λ_3	-0.016	-4.08	-0.018	-3.67*
MEDIAN00	Median age	λ_4	-0.040	-0.43	0.026	0.33
AGESQ00	Age square	λ_5	0.000	0.12	-0.001	-0.58
G0034	Age group (25 - 34)	λ_6	-5.903	-5.90	-2.325	-2.07*
OCIND00	Occupation diversity multiplied by industrial diversity index	λ_7	-0.234	-0.46	1.732	2.02*
RMT00	Ratio of managerial and technical occupations to all other	λ_8	0.092	0.90	-0.527	-2.19*
STDPOP00	Standardized population	λ_9	0.319	2.44	-0.131	-0.73
Education Equation (HBD00)						
Intercept	Intercept	α_0			-0.161	-1.45
lnwg00	Natural log of income	α_1			0.040	3.71*
CODDIS	Occupation diversity index multiplied by distance	α_2			0.002	2.43*
RMT00	Ratio of managerial and technical occupation to all other occupations	α_3			0.124	11.98*
OCIND00	Occupation diversity multiplied by industrial diversity index	α_4			-0.249	-3.27*
HS00	High school education	α_5			-0.193	-3.42*
G0024	Age group (15 - 24)	α_6			-0.069	-1.57
Occupation Equation (RMT00)						
Intercept	Intercept	β_0			-0.926	-2.53*
HBD00	Bachelor's degree and above	β_1			5.945	16.76*
OCIND00	Occupation diversity multiplied by industrial diversity index	β_2			1.652	2.98*
CODDIS	Urban code multiplied by distance	β_3			-0.006	-1.55
STDPOP00	Standardized population	β_4			0.128	1.44
R^2			0.8502		0.856**	

*Coefficients are significant at 5 percent and below levels

**System Weighted R^2 as reported by SAS

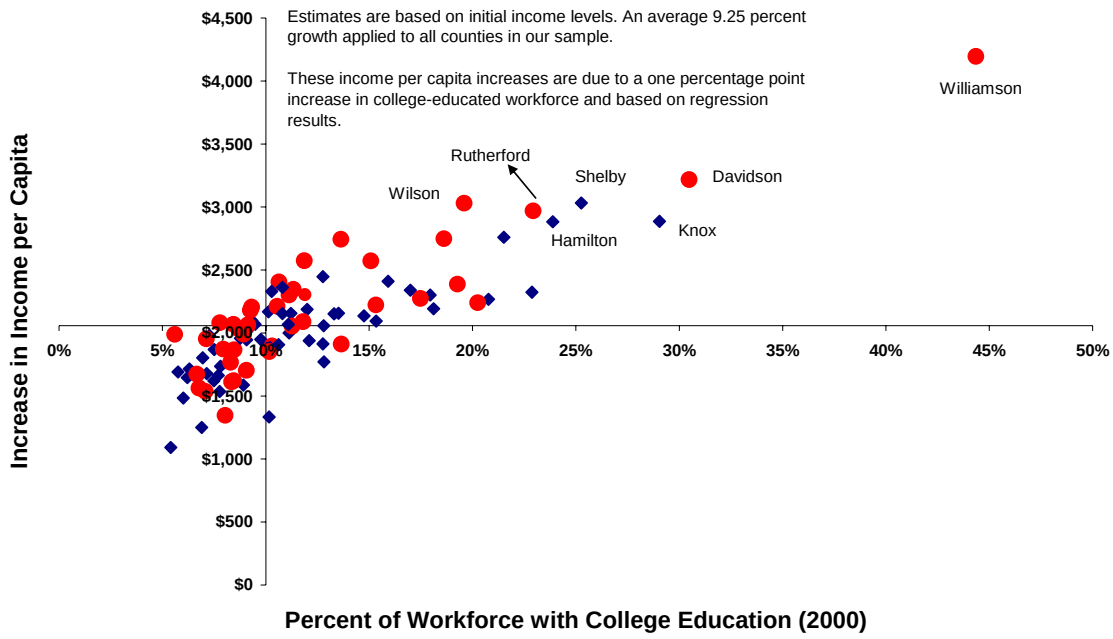
Note: Analysis includes 95 counties in Tennessee.

In general, both OLS and 3SLS estimations have adjusted R-squared values of above 85 percent, high in cross-sectional analysis. As for the other results, distance emerges as an important control variable for all the estimations in terms of significance and expected sign. As can be seen, the 3SLS is superior to the OLS method because it has more significant estimated parameters and the coefficient of diversity index is positive as expected.

The coefficients of the bachelor's and higher education ratio and high school attainment ratio are 8.85 and 4.19, respectively, and both are statistically significant, suggesting that the variables favorably influence the income per capita. This study takes the educational attainment level of less than high school as baseline. For this reason, this educational attainment level is left out of the model. In terms of high school level education, findings suggest that a 1 percentage point increase in the high school education ratio improves the per capita income by 4.28 percent. When we take the average of per capita income into account, a 1 percentage point increase in the high school education ratio will increase per capita income by $981.[4] Figure III.9 below shows how much additional per capita income would be generated if the percent of the workforce with college and above education is improved 1 percentage point. Figure III.9 plots the projected increase in per capita income against the percent of people over 25 with college and above educational attainment.

[4] Since the dependent variable (income) is in natural log form, we need to follow several steps to interpret the coefficient of HBD00 (higher education). In order to do that, we first take the anti-log of income education coefficients. We then calculate the impact of increasing college-educated population 1 percentage point (0.01 because we used fractions rather than percentages in the regression) by holding all other indicators constant.

Figure III.9: Changes in Income per Capita Due to One Percentage Point Increase in College-Educated Workforce



III.6. Conclusion and discussions

What do these results imply for the counties, given the state of educational attainment in Tennessee? First, in order to achieve a 1 percentage point increase in the college- educated workforce, nearly 30,000 additional adults should continue their education through high school and college in Tennessee. Nearly 8,000 of these adults should come from middle Tennessee (net shift). Furthermore, in middle Tennessee counties, other things being equal, a 1 percentage point increase in the share of college and higher educated workforce is equivalent to an increase of more than $3.8 billion in personal income, excluding transfer payments. This amount may be considered a gross return to investment in education, as this figure does not reflect the cost associated with college education and foregone potential income due to college attendance.

Although the results indicate a handsome return on investment in college education, how realistic is it for counties to achieve that additional percentage point in their college-educated workforce? According to 1990 and 2000 Census data, this is not an easy task for many Tennessee counties. Between 1990 and 2000, four Tennessee counties experienced a decline in their college-educated workforce. Fifteen counties experienced an increase of less than 1 percentage point. Five counties achieved about a 1 percentage point increase. Twenty-five counties enjoyed a 1 to 2 percentage points increase. Nineteen counties saw a 2 to 3 percentage points increase, and 27 counties experienced an increase of more than three percentage points.

How do middle Tennessee counties stack up? The results are similar to statewide findings. Three middle Tennessee counties (out of four statewide) actually saw a decline in their college-educated workforce. Six counties experienced less than a 1 percentage point increase. Two counties saw about a 1 percentage point increase. Eleven counties experienced a 1 to 2 percentage points increase. Eight counties enjoyed a 2 to 3 percentage points increase, and 11 counties achieved an increase of more than 3 percentage points.

The study results suggest that emphasis on higher education generates substantial benefits across Tennessee counties. These benefits, however, do not accrue to these communities and individuals in a vacuum: the presence of a highly educated workforce attracts new businesses to the region, and some of these educated workers create their own businesses. Therefore, placing greater emphasis on creating a highly skilled workforce from within these communities is critical.

CHAPTER IV:
SKILLED LABOR FORCE: SUPPLY AND DEMAND ANALYSIS

IV.1. Overview

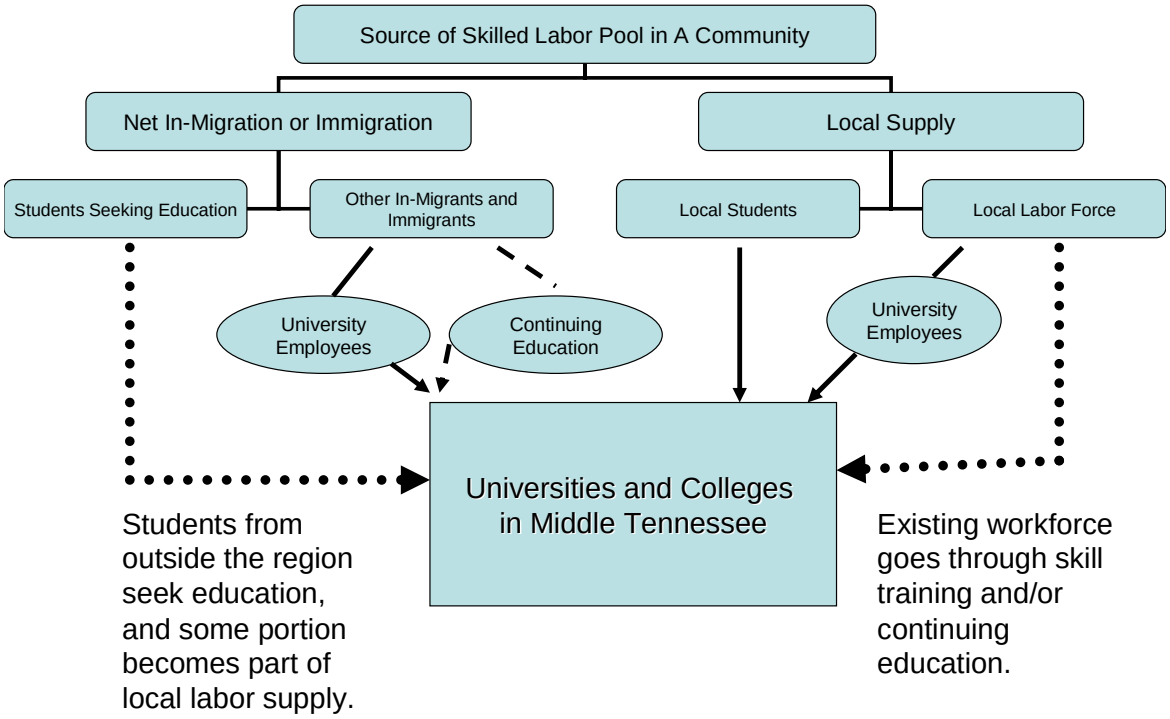
In the knowledge economy, skill is an important source of wealth. As the structure of the economy changes, so does the demand for a skilled workforce. Any discussion about the knowledge economy puts universities and colleges at the center of the debate, as they are major suppliers of a skilled workforce in a community. The universities and colleges in a community are on both sides of the skilled labor demand and supply equations.

As depicted in Figure IV.1 below, the major sources of a skilled workforce are net in-migration and immigration and local supply through universities and colleges. Net in-migration and immigration includes (1) students and (2) skilled adults. Students come to region to enroll in local higher education institutions. After graduation, some students choose to stay in the region and become part of the local skilled labor force. There are also skilled adults who are attracted to the region. An important portion of these skilled adults works at the local higher education institutions. In this sense, the local universities and colleges themselves are magnets for skilled workers from other regions. Furthermore, local universities and colleges play a major role by providing life-long training opportunities for the non-university or college related skilled workforce.

The local supply of skilled workers takes place through two major channels. High school graduates find educational opportunities in regional institutions. After graduation, they work at local businesses or set up their own businesses. Universities provide lifelong learning opportunities for regional workers to update their skill levels. On the demand

side, some skilled workers in the region find employment opportunities at the local higher education institutions at various levels of their careers.

Figure IV.1: Universities Are at the Center of the Skilled Labor Pool in Middle Tennessee



While universities and colleges play a considerable role in both sides of the labor supply and demand equation in a region, their roles have become critically important because of the changes in the demand for a skilled workforce. Nationwide long-term occupational growth projections indicate a growing demand for a college-educated workforce. As a large portion of workforce (baby boomers) is expected to retire in the next five to 10 years, replacements for many positions will require a different skill set from that of the retiring workforce. As Table IV.1 below clearly demonstrates, in the

U.S., the top 15 "much faster growing" occupations[1] are expected to add nearly 3.7 million jobs, of which 1.8 million are expected to require at least a bachelor's degree. Overall, these 15 occupations represent nearly six (6) percent of total occupations profiled but 20 percent of total projected job growth between 2004 and 2014. The projected 1.8 million jobs in the 15 occupations, for which at least a college education is required, alone represent nearly 10 percent of total projected job growth between 2004 and 2014.

Table IV.1: Top 15 Much Faster Growing Occupations in the U.S. and Higher Education Requirement (2004 - 2014)

	Much Faster Growing Occupations			Higher Education Requirement	
	Percent (%)	Number	Weighted Rank*	Percent (%)**	Number
Computer Software Engineers	46	368,600	1	83.20	306,675
Medical Assistants	52	201,500	2	11.40	22,971
Personal and Home Care Aides	41	287,300	3	10.10	29,017
Computer Scientists and Database Administrators	40	200,100	4	72.40	144,872
Nursing, Psychiatric, and Home Health Aides	32	676,300	5	6.60	44,636
Dental Assistants	43	114,300	6	10.40	11,887
Teachers--Postsecondary	32	524,400	7	92.90	487,168
Physician Assistants	50	30,800	8	68.60	21,129
Dental Hygienists	43	68,400	9	30.00	20,520
Registered Nurse	29	702,600	10	58.20	408,913
Physical Therapist Assistants and Aides	40	40,600	11	30.30	12,302
Physical Therapists	37	56,800	12	90.20	51,234
Computer Support Specialists and System Administrators	28	226,100	13	41.10	92,927
Computer Systems Analysts	31	153,000	14	65.80	100,674
Veterinary Technologists and Technicians	35	21,200	15	14.70	3,116
Total		3,672,000		48.00	1,758,041

Source: BERC and BLS Occupational Employment Projections (2004 - 2014) at www.bls.gov

*"Much faster growing" occupations (based on BLS classification of 27 percent or above growth rate) are weighted by the growth in the number of jobs.

**Reflects percent of workers in a given occupation holding a college or above degree (ages 25 - 44)

What are the supply and demand conditions for skilled labor in middle Tennessee? How well do higher education institutions in middle Tennessee meet the demand for a skilled labor force? A detailed analysis of supply and demand conditions

[1] "Much faster growing" occupations are defined as those expected to grow more than 27 percent between 2004 and 2014. For more information, see *Occupational Outlook Quarterly*, Spring 2006, www.bls.gov.

and how well middle Tennessee's higher education institutions are meeting demand is critically important for both higher education institutions and local businesses. In particular, a substantial supply shortage is expected across all occupations throughout the region as the baby boomer generation approaches retirement age. Furthermore, more and more occupations require additional education, suggesting that estimates based on 2004 educational attainment levels may be substantially biased toward a lower educational attainment level.

As part of the larger study, this chapter addresses skilled labor force supply and demand conditions in middle Tennessee. The rest of the chapter is organized as follows. The first section deals briefly with methodological issues. The second section highlights the findings on the supply side of the workforce and looks at the supply and demand relationship. The third section deals with the demand side of the issue and highlights the role higher education plays in meeting the demand for a skilled labor force. The fourth section concludes the chapter.

IV.2. Methodology

The BERC utilized several sources of data to analyze supply and demand for a skilled labor force in middle Tennessee. We must acknowledge, however, that the estimates provided here do not reflect the price accounting of the skilled labor force demand and supply due to the following reasons. First, the BERC's estimates of the skilled labor force supply are based on the survey of higher education institutions. Extrapolating to the entire universe from the limited number of responses includes a certain level of measurement error. Second, the skilled labor supply analysis does not

include in-migration and immigration of the skilled labor force to the region. Third, the skilled workforce demand analysis does not include job turnover as a source of demand. Finally, employment by occupation projections is used to estimate the total growth for each occupation. Furthermore, net replacement rates for each occupation are estimated from national employment by occupations projections. Since Tennessee's underlying population dynamics are different from those of the nation, the net replacement rates may be more or less different in middle Tennessee than in the U.S. Similarly, BLS estimates are used to estimate the number of occupations requiring a certain level of educational attainment. The BLS calculates this information using Current Population Survey results. The local employment conditions may not completely overlap with the national conditions.

Data Source. In this analysis, the underlying data are drawn from the following sources.

- *A BERC survey of higher education institutions*. The BERC surveyed 20 major middle Tennessee universities and colleges. Even though the response rate for specific alumni-related questions was low, we nevertheless received some responses, which allowed us to extrapolate the findings to all 20 universities and colleges. The BERC specifically asked the following questions to 20 universities and colleges for the purpose of identifying the true scope of the skilled labor supply.
  - *What is the number of alumni living in middle Tennessee?*
  - *What is the average number of graduates each year?*
  - *What is the percent of graduates remaining in the region?*

- *Please provide the number of graduates by occupation.*

- *Integrated Postsecondary Data System (IPEDS).* Where the information about a college is missing, we utilized this rich higher education database to fill the information gap.
- *U.S. Bureau of Labor Statistics (BLS).* This is the key source of data for a variety of workforce characteristics. We obtained employment projections by replacement as well as occupational employment by educational attainment data from the BLS.
- *Tennessee Department of Labor and Workforce Development*. Employment projections by occupations between 2004 and 2014 are constructed from the Tennessee Department of Labor and Workforce Development. We first obtained complete employment projections datasets for individual Local Workforce Investment Area (LWIA), and we then aggregated LWIA projections to get middle Tennessee projections.
- *Websites of individual higher education institutions.* The BERC staff visited the website of each university and college to get information about its students' characteristics, alumni information, university publications dealing with alumni relations, and other information regarding the characteristics of graduates.

Although the BERC has made every attempt to capture skilled labor force dynamics as they are related to higher education institutions, the BERC's calculations do not reflect precise figures because of low survey response rates. The findings, however,

do provide some insights about the skilled labor supply and demand conditions in middle Tennessee.

IV.3. Profile of enrollment and graduates: Supply side

According to survey data, nearly 100,000 degree-seeking students are enrolled in the 20 middle Tennessee higher education institutions. Of these potentially skilled workers, 23 percent are enrolled in associate's degree programs, 61 percent are pursuing bachelor's degrees, and 16 percent are enrolled in master's or doctoral programs (Table IV.2).

Table IV.2: Total Enrollment by Type of Degree in Middle Tennessee Universities (2005)

Degree Type	Number	Percent
Associate's Degree	23,164	23.41
Bachelor's Degree	60,180	60.83
Master's Degree	13,552	13.70
Doctorate	2,035	2.06
Total	98,931	100.00

Source: BERC Survey

Based on survey results and extensive review of alumni-related data from the websites of the 20 universities and colleges, we estimated that nearly 60 percent of new graduates become a part of the local skilled workforce. As reported in Table IV.3, nearly 17,144 students graduate each year from the 20 area institutions. Of those, about 60 percent (10,286) remain in the region.

Table IV.3: Supply of Skilled Workforce in Middle Tennessee

Average Number of Graduates Each Year	17,144
Estimated Percent Remaining in the Region	60%
Number of Graduates Remaining in the Region	10,286
Estimated Distribution of Graduates Remaining in the Region by Degree Type	
Associate's Degree	2,408
Bachelor's Degree	6,257
Master's Degree	1,409
Doctorate	212
Total	10,286

Source: BERC's estimates based on survey responses and other information from Web sites of higher education institutions in middle Tennessee

The calculation of the total number of alumni of the 20 universities in middle Tennessee is based on several assumptions. A few universities supplied us detailed alumni information. In this case, we used the university or college supplied alumni data. For some universities or colleges, we obtain alumni information through their alumni newsletter and websites of their university foundations and alumni relations. For the remaining universities and colleges, the BERC used the following assumptions:

- average number of students graduating in the last three to five years depending on data availability;
- average percent of graduating students remaining in the region;
- history of the university in the region (all available years of operation for those institutions established after 1975 or a 30-year time frame for those established before 1975 as the basis for an estimate of the number of alumni);

- alumni by occupational categories tabulated from university-supplied data about distribution of graduates by occupation (a very general assumption that may not reflect the actual occupational makeup of graduates of these universities and colleges 30 years ago); and
- no assumption regarding the current employment status of alumni.

An estimated 234,322 alumni of middle Tennessee higher education institutions live and work in the region. As Table IV.4 shows, they primarily work in the areas of education, training, and library occupations; healthcare occupations; and business and financial occupations.

Table IV.4: Occupational Supply and Demand in Middle Tennessee

Estimated Number of Alumni	234,322			
	Alumni Data		Annual Supply and Demand	
	Occupational Distribution of Graduates	Estimated Distribution of Alumni by Occupations	Annual Supply of Graduates by Occupation	Annual Demand by Occupation
Management Occupations	7.89%	18,482	811	2,712
Business and Financial Operations	11.23%	26,318	1,155	1,522
Computer and Mathematical Operations	2.85%	6,680	293	2,390
Architecture and Engineering	1.66%	3,888	171	53
Life, Physical, and Social Science	5.45%	12,759	560	218
Community and Social Services	7.49%	17,542	770	908
Legal	5.56%	13,029	572	720
Education, Training, and Library	23.00%	53,906	2,366	3,188
Arts, Design, Entertainment, Sports, and Media	4.81%	11,272	495	798
Healthcare Practitioners and Technical	11.97%	28,046	1,231	3,391
Healthcare Support	3.32%	7,784	342	2,304
Protective Services	1.02%	2,383	105	500
Food Preparation and Serving	1.00%	2,348	103	2,729
Building and Grounds Cleaning and Maintenance	0.04%	104	5	1,328
Personal Care and Services	0.68%	1,583	69	956
Sales and Related	6.52%	15,281	671	2,223
Office and Administrative Support	1.63%	3,818	168	4,323
Farming, Fishing, and Forestry	1.56%	3,653	160	105
Construction and Extraction	0.76%	1,774	78	1,431
Installation, Maintenance, and Repair	0.14%	330	15	1,499
Production	0.79%	1,853	81	1,292
Transportation and Material Moving	0.55%	1,287	57	2,653
Total*		234,119	10,277	37,243

Source: BERC's estimates from a variety of sources; this table reflects estimates from different surveys and does not reflect a precise accounting of occupations

*Totals may not reflect the actual estimates because these totals do not include those alumni serving in the military.

Table IV.4 includes two types of information: (1) alumni data columns take the current distribution of graduates by occupation and apply it to the alumni data, and (2) annual supply and demand columns include the estimated number of graduates remaining in the region and an estimated annual workforce demand by occupation. It is important to emphasize here that the demand for workforce column represents total demand for that occupational category and does not make any assumption about the skill content of the given occupational demand. Therefore, information in the last two columns in Table IV.4 should be evaluated accordingly and in conjunction with the information provided in the following detailed tables.

IV.4. Demand for Workforce and Educational Characteristics of Occupations

What is the demand for a skilled labor force in middle Tennessee? How well do higher education institutions meet the demand for a skilled workforce? To calculate annual demand for a skilled workforce, we utilized workforce projections from the Tennessee Department of Labor and Workforce (TDLW) and educational attainment by occupation from the BLS. According to TDLW data as presented in Table IV.5, the region is expected to add nearly 193,000 new jobs between 2004 and 2014. This corresponds to a little over 18 percent growth in the next 10 years.

Table IV.5: Occupational Employment and Projections (Growth) in Middle Tennessee

Estimated Employment (2004)	1,056,000
Projected Employment (2014)	1,247,600
Total Change in Occupational Employment	192,590
Percent Change in Occupational Employment	18.14%

Source: BERC's calculation from Tennessee Department of Labor and Workforce Development

Calculations in Table IV.5 include only job growth due to "new additions." Taking into consideration job growth due to "net replacement," average annual job growth is estimated to be about 37,000 new positions in Tennessee. As estimated in Table IV.6, more than 12,000 of those jobs require at least a college degree, and nearly 11,000 more jobs require some college or an associate's degree. Information regarding the educational requirement of new occupations is summarized from the BLS. We must also emphasize the fact that these job growth projections and estimates do not take into account job turnovers or job changes. Although turnover rate is quite low in certain occupations, it may be well over 50 percent in certain age groups and occupations such as nursing. The BLS (www.bls.gov) provides nationwide estimates of different separations by occupational groups. In addition to job turnover, Table IV.6 does not reflect local conditions regarding aging workforce. Replacement rates are calculated from national averages.

Table IV.6: Analysis of Annual Occupational Change*** in Middle Tennessee

		Educational Requirement*		
Change in Occupational Employment	Annual Averages (Number)	High School or Less Than High School	Some College	College or Higher
Total Annual Average Change	37,090	13,902	10,991	12,346
Annual Average Change Due to Growth	18,958	7,829	5,479	5,620
Annual Average Change Due to Replacement**	18,282	6,073	5,496	6,696

Source: BERC's calculations from BLS and TDLWD sources

*Educational requirement is estimated using U.S. Bureau of Labor Statistics (BLS) tabulations from Current Population Survey and reflects educational attainment of current population holding certain occupations as of 2004

**Average annual employment change due to replacement is estimated using ratios from BLS estimates and reflects net replacement rates.

***Data for employment by occupations is from Tennessee Department of Labor and Workforce Development (TDLWD). BERC aggregated data at the middle Tennessee level.

Taking into account average number of graduates staying in the region, Table IV.6 makes it clear that 20 higher education institutions are far from meeting the demand for skilled workforce in the region. A substantial number of in-migration or other

postsecondary training institutions fill the skilled workforce supply and demand gap in middle Tennessee.

In order to understand workforce demand, it is useful to examine several perspectives. The detailed information about certain occupations may be very useful for workforce professionals. Based on estimates from several sources, first we examine the fastest growing occupational areas and average annual openings by level of education as ranked by numbers of jobs. Tables IV.7a and IV.7b present the 24 fastest-growing jobs by source of growth and level of education.

Table IV.7a: High Growth Occupations, Average Annual Openings, and Educational Requirement in Middle Tennessee

	Current and Projected Employment		Change (2004 - 2014)		Annual Average Change*		
Occupational Title	Estimated Employment (2004)	Projected Employment (2014)	Number	Percent	Due to Growth	Due to Replacement	Total Change Due to Growth and Net Replacement
Customer Service Representatives	18,810	24,630	5,830	31%	583	896	1,479
Registered Nurses	19,370	24,700	5,330	28%	533	748	1,281
Retail Salespersons	29,410	36,510	7,100	24%	710	338	1,048
General and Operations Managers	20,400	25,260	4,870	24%	487	440	927
Nursing Aides, Orderlies, and Attendants	10,420	13,740	3,330	32%	333	568	901
Janitors and Cleaners	14,610	18,380	3,800	26%	380	371	751
Truck Drivers, Light or Delivery Services	9,980	12,550	2,570	26%	257	440	697
Preschool Teachers except Special Education	4,510	6,150	1,650	37%	165	460	625
Truck Drivers, Heavy and Tractor-Trailer	24,310	27,720	3,410	14%	341	268	609
Waiters and Waitresses	17,580	21,900	4,310	25%	431	140	571
Home Health Aides	2,130	3,230	1,080	51%	108	462	570
Combined Food Preparation and Serving	16,420	20,370	3,940	24%	394	155	549
Paralegals and Legal Assistants	2,080	3,180	1,110	53%	111	411	522
Laborers and Freight, Stock, and Material Movers	22,350	26,160	3,820	17%	382	119	501
Bill and Account Collectors	5,530	7,790	2,260	41%	226	257	483
Team Assemblers	31,500	35,250	3,740	12%	374	105	479
Computer Software Engineers, Applications	1,480	2,250	780	53%	78	382	460
Personal and Home Care Aides	4,550	5,840	1,280	28%	128	327	455
Office Clerks, General	21,540	24,710	3,170	15%	317	120	437
Computer Systems Analysts	2,850	4,000	1,140	40%	114	317	431
Maintenance and Repair Workers, General	11,580	13,890	2,300	20%	230	182	412
Elementary School Teachers except Special Education	8,800	11,000	2,200	25%	220	181	401
Network Systems and Data Communications Analysts	910	1,600	700	77%	70	324	394
Food Preparation Workers	8,610	11,070	2,470	29%	247	138	385
Subtotal	309,730	381,880	72,190	23%	7,219	8,148	15,367
Total All Occupations	1,056,000	1,247,600	191,600	18%	18,958	18,282	37,090

Source: BERC's estimates from BLS and Tennessee Department of Labor and Workforce Development databases

*Net replacement figures are calculated from national level estimates (www.BLS.gov).

According to Table IV.7a, customer service, nursing, and retail occupations show the fastest growth in terms of number of jobs, each area generating more than one thousand new jobs annually in the projected decade (2004–2014). When looking at growth in percentages, network systems and data communications analysts are projected to enjoy a 77 percent increase, while paralegals and legal assistants and computer software engineers are each projected to experience 53 percent growth.

What kind of education will be required of these growing occupations? Table IV.7b presents the same occupations as Table IV.7a from a different perspective: the number of jobs that may be filled by different educational attainment levels. As Table IV.7b indicates, nearly one-third of jobs in these fastest-growing middle Tennessee occupations require some college education, 27 percent college and higher, and the rest high school or less.

Table IV.7b: Growth of Occupations Ranked by Average Annual Growth

Occupational Title	Total Change by Educational Requirement**		
	High School and Less Than High School	Some College and Associate's Degree	College and Higher
Customer Service Representatives	546	603	329
Registered Nurses	22	513	745
Retail Salespersons	426	348	274
General and Operations Managers	194	287	446
Nursing Aides, Orderlies, and Attendants	547	295	59
Janitors and Cleaners	592	127	31
Truck Drivers, Light or Delivery Services	500	163	34
Preschool Teachers except Special Education	131	194	300
Truck Drivers, Heavy and Tractor-Trailer	437	143	30
Waiters and Waitresses	306	181	84
Home Health Aides	346	187	37
Combined Food Preparation and Serving	379	138	32
Paralegals and Legal Assistants	82	221	219
Laborers and Freight, Stock, and Material Movers	357	117	27
Bill and Account Collectors	222	190	71
Team Assemblers	344	108	27
Computer Software Engineers, Applications	18	60	382
Personal and Home Care Aides	272	137	46
Office Clerks, General	169	182	87
Computer Systems Analysts	40	107	283
Maintenance and Repair Workers, General	237	139	35
Elementary School Teachers except Special Education	11	19	371
Network Systems and Data Communications Analysts	37	122	235
Food Preparation Workers	302	56	26
Subtotal	6,518	4,638	4,211
Total All Occupations	13,902	10,991	12,346

Source: BERC's estimates from BLS and Tennessee Department of Labor and Workforce Development databases

**Educational requirement is based on national level Current Population Survey 2004 and reflects educational attainment level of individuals holding that specific job.

Since our primary concern in this study is to highlight the role of universities and colleges in skilled workforce supply and demand in middle Tennessee, we process the occupational projections data by occupations that require primarily college or above educational attainment. As Table IV.8a shows, many of the high-growth areas, like

nursing, computer software engineering, and customer service, are also high on the list of occupational areas that require college-level education.

Table IV.8a: Employment Projections and Annual Average Growth Ranked by Number of Jobs That Require at Least a College Degree

	Current and Projected Employment		Change (2004 - 2014)		Annual Average Change*		
Occupational Title	Estimated Employment (2004)	Projected Employment (2014)	Numebr	Percent	Due to Growth	Due to Replacement	Total Change Due to Growth and Net Replacement
Registered Nurses	19,370	24,700	5,330	28%	533	748	1,281
General and Operations Managers	20,400	25,260	4,870	24%	487	440	927
Computer Software Engineers	1,480	2,250	780	53%	78	382	460
Elementary School Teachers	8,800	11,000	2,200	25%	220	181	401
Customer Service Representatives	18,810	24,630	5,830	31%	583	896	1,479
Preschool Teachers	4,510	6,150	1,650	37%	165	460	625
Computer Systems Analysts	2,850	4,000	1,140	40%	114	317	431
Retail Salespersons	29,410	36,510	7,100	24%	710	338	1,048
Computer Software Engineers	960	1,500	550	57%	55	239	294
Network Systems and Data Communications Analysts	910	1,600	700	77%	70	324	394
Secondary School Teachers	7,500	9,110	1,610	21%	161	83	244
Accountants and Auditors	5,720	7,100	1,360	24%	136	162	298
Paralegals and Legal Assistants	2,080	3,180	1,110	53%	111	411	522
Physical Therapists	1,260	1,680	420	33%	42	157	199
Network and Computer Systems Administrators	1,540	2,300	760	49%	76	263	339
Lawyers	2,710	3,420	730	27%	73	85	158
Business Operations Specialists	4,280	5,520	1,240	29%	124	197	321
Financial Managers	5,170	6,240	1,080	21%	108	111	219
Computer and Information Systems Managers	2,390	3,130	740	31%	74	106	180
Management Analysts	2,250	2,910	640	28%	64	94	158
Chief Executives	4,680	5,670	990	21%	99	78	177
Computer Support Specialists	3,740	4,740	980	26%	98	183	281
Clergy	2,280	3,190	930	41%	93	56	149
Middle School Teachers	3,830	4,560	740	19%	74	46	120
Subtotal	156,930	200,350	43,480	28%	4,348	6,355	10,703

Source: BERC's estimates from BLS and Tennessee Department of Labor and Workforce Development databases

*Net replacement figures are calculated from national level estimates (www.BLS.gov).

According to Table IV.8a, the occupations that primarily require at least a college education represent nearly 28 percent of total projected employment growth in middle Tennessee, adding more than 10,000 jobs annually. Table IV.8b presents further details about the number of jobs in each occupation requiring different types of educational attainment. For instance, the nursing field is projected to generate 1281 new jobs. Of those, only 22 will be for employees with high school or less than high school education, and the majority (745) will require college-level education or higher. Likewise, of the 244 projected new jobs in the area of secondary education, nearly all of them (232) will

require a college-level education or higher. Clearly, the occupational areas that are experiencing job growth demand greater educational attainment.

Table IV.8b: High Growth Occupations and Educational Attainment in Middle Tennessee

	Total Change by Educational Requirement**		
Occupational Title	High School and Less Than High School	Some College and Associate Degree	College and Higher
Registered Nurses	22	513	745
General and Operations Managers	194	287	446
Computer Software Engineers	18	60	382
Elementary School Teachers	11	19	371
Customer Service Representatives	546	603	329
Preschool Teachers	131	194	300
Computer Systems Analysts	40	107	283
Retail Salespersons	426	348	274
Computer Software Engineers	11	38	244
Network Systems and Data Communications Analysts	37	122	235
Secondary School Teachers	4	8	232
Accountants and Auditors	20	53	225
Paralegals and Legal Assistants	82	221	219
Physical Therapists	4	15	179
Network and Computer Systems Administrators	45	119	174
Lawyers	1	2	155
Business Operations Specialists	64	122	135
Financial Managers	31	58	130
Computer and Information Systems Managers	12	42	126
Management Analysts	12	25	121
Chief Executives	23	36	118
Computer Support Specialists	46	119	115
Clergy	16	21	112
Middle School Teachers	3	6	111
Subtotal	1,803	3,139	5,761

Source: BERC's estimates from BLS and Tennessee Department of Labor and Workforce Development databases

**Educational requirement is based on national-level Current Population Survey 2004 and reflects educational attainment level of individuals holding that specific job.

Overall, Table IV.8b indicates that of more than 10,000 new job openings in these occupations, more than 73 percent require an education beyond high school, while 54

percent require at least a college degree. Only 27 percent of these jobs may be filled by workers with a high school education or less.

Finally, we examine the occupations that are expected to experience decline in job growth during the same decade (2004 - 2014). Bearing out the trend demonstrated in the earlier tables, the following table shows that occupations experiencing decline tend to be those that require less education.

Table IV.9: Occupations with the Largest Projected Decline in Middle Tennessee and Educational Requirement

	Current and Projected Employment		Change (2004 - 2014)		Annual Average Change*			Total Change by Educational Requirement**		
Occupational Title	Estimated Employment (2004)	Projected Employment (2014)	Number	Percent	Due to Growth	Due to Replacement	Total Change Due to Growth and Net Replacement	High School and Less Than High School	Some College and Associate Degree	College and Higher
Computer Operators	2,260	1,660	-610	-27%	-61	0	-61	-20	-26	-15
Sewing Machine Operators	2,450	1,930	-530	-22%	-53	0	-53	-46	-6	-2
File Clerks	1,240	850	-390	-31%	-39	0	-39	-16	-16	-7
Stock Clerks and Order Fillers	13,120	12,780	-340	-3%	-34	0	-34	-21	-10	-3
Cutting, Punching, and Press Machine Setters	3,480	3,210	-280	-8%	-28	0	-28	-21	-6	-1
Order Clerks	1,550	1,310	-260	-17%	-26	0	-26	-12	-10	-4
Meter Readers, Utilities	670	430	-240	-36%	-24	0	-24	-14	-9	-1
Mail Clerks and Mail Machine Operators except Postal	600	370	-220	-37%	-22	0	-22	-13	-7	-2
Office Machine Operators except Computer	570	390	-180	-32%	-18	0	-18	-11	-5	-2
Machine Feeders and Offbearers	1,660	1,510	-160	-10%	-16	0	-16	-14	-2	0
Woodworking Machine Setters, Operators, and Tenders	860	710	-140	-16%	-14	0	-14	-10	-2	-2
Switchboard Operators, including Answering Service	2,740	2,630	-110	-4%	-11	0	-11	-5	-5	-1
Credit Authorizers, Checkers, and Clerks	290	200	-100	-34%	-10	0	-10	-3	-5	-2
Subtotal	31,490	27,980	-3,560	-11%	-356	0	-356	-206	-109	-41

Source: BERC's estimates from BLS and Tennessee Department of Labor and Workforce Development databases

*Net replacement figures are calculated from national level estimates (www.BLS.gov).

**Educational requirement is based on national-level Current Population Survey 2004 and reflects educational attainment level of individuals holding that specific job.

To conclude, overall, findings indicate that demand for a college-educated workforce is growing in the occupational areas that are experiencing growth, while demand for workers with a high school education or less is actually declining. In terms of meeting the demands for a skilled labor force, 20 higher education institutions are unable to meet the demand. Increasing in-migration and immigration of people into middle Tennessee in recent years is partially helping to fill the gap. In addition, a variety of for-profit postsecondary training institutions is also helping meet the demand for a skilled workforce.

CHAPTER V:
BUSINESS, COMMUNITY, AND HIGHER EDUCATION INSTITUTIONS IN TENNESSEE COUNTIES

V.1. Overview

What role do higher education institutions play in the business community? This chapter presents findings from the business-interaction survey about the strategic relationships between universities and colleges and communities in middle Tennessee. As we highlighted in the previous chapters, the strategic interactions among the higher education institutions and business communities constitute an essential building block of the knowledge economy, not only because of higher education institutions' key role in supplying a skilled labor force but also because of their influence on broader socioeconomic dynamics that make up the quality of life and economic prosperity in a region.

Many studies explore the role higher education institutions play in their communities. The studies that deal with the so-called "forward linkages" focus on the effects of institutions of higher education on the business community. For example, they generate new ideas and inventions, advise and help businesses, commercialize new research findings and patents, supply a skilled labor force, and provide input to business and community leaders. Furthermore, higher education institutes cultivate tolerance and civic culture by attracting diverse groups of individuals to the region from across the world and providing an environment in which culturally diverse populations interact. They promote athletic and cultural events and improve the quality of life in the region through a multitude of venues.

Higher education institutions attract new businesses and help retain existing ones as well as promote local business activities through many channels. Many studies cite the presence of higher education, quality of life, and availability of a skilled labor force as three critical factors in business relocation decisions. These three factors are strongly linked to each other, but the presence of higher education institutions is foundational because it generates and perpetuates the other two factors.

In the sections that follow, we briefly review methodological issues. Next, we provide some general information about the role of universities in economic, social, and cultural areas. We finally analyze the survey results to highlight the strategic interactions among higher education institutions and communities in middle Tennessee. A conclusion and discussion of some findings will follow.

V.2. Methodology

In an attempt to address broader higher education-business interaction, the BERC initiated a supplemental business interaction survey in middle Tennessee. The survey was distributed to 20 higher education institutions, 15 of which responded. Thirteen of these responded in some way to a supplemental business interaction survey. Although documenting the interaction between higher education and the business community is necessary in order to understand the role these institutions play in the region, a lack of complete data is a limiting factor in this study.

The BERC survey asked the following major questions to higher education institutions:

- *In what areas does your institution make the greatest contribution to economic development in middle Tennessee?*

- *Does your institution work closely with particular businesses? What are the reasons for your institution's involvement in those businesses?*
- *What is the level of incentives for your staff to engage with local businesses?*
- *How many teaching and research-related contracts were signed with businesses in the last fiscal year in middle Tennessee?*
- *Does your institution provide analysis, measurement, and testing services for businesses?*
- *Does your organization have a central unit that provides business consulting?*
- *Does your organization provide any of the following support to spinoffs, startups, or alumni startups?*
- *How responsive is your organization to skill needs and changes in the labor market? Do you provide flexible business courses?*
- *To what extent is your institution involved in partnership with local and regional economic development agencies?*

We benefited from several surveys, especially the British Higher Education-Business and Community Interaction (www.hefce.ac.uk) survey, in designing these questions. While answering these questions provides important insights into the dynamics of the knowledge economy, the response rate to certain portions of these questions was not at the desirable level particularly because of the time frame involved in this study. As we surveyed the websites of the 20 higher education institutions, we noted that many have programs specifically dealing with partnerships with business communities. Yet the very same institutions were unable to respond to the related question in the survey within the given time frame of the study. We believe that in subsequent studies the response rate

will increase dramatically. What follows are the findings from the survey and BERC estimates regarding the interaction between higher education institutions and the business community.

V.3. Higher education institutions in the business community

In the process of fulfilling their primary mission, to educate, middle Tennessee's higher education institutions affect business and economic dynamics in other critical ways that improve the lives of middle Tennessee residents. First, universities contribute a substantial amount of academic research that generates new ideas and innovations that promote business activities. In fact, universities themselves are actively involved in commercializing their innovations, investing in the community, and providing employment opportunities to many community members.

Additionally, in the process of educating the labor force, universities attract a significant number of people to the region. Many of these students are employed either by the universities or by local businesses. Each year, a substantial number of students work as interns in local businesses.

Universities can be considered "export industries," as they bring a substantial amount of out-of-state money to the region. They do this through federal research grants, Pell grants and other federal scholarships for students, and out-of-state student tuition and fees. In addition, universities in middle Tennessee often act as consultants to the business community. They promote the formation of new businesses through business incubators, research centers, institutes, policy input, and incubation centers.

Institutes of higher learning contribute to businesses and local communities via several avenues. First, they graduate an educated workforce. A total of 17,144 people obtained degrees from middle Tennessee higher education institutions in 2005. An estimated 4,607 students interned in local businesses and governments, both providing support and gaining experience. These institutions obtained $478 million in research funding[1] and provided 39 business incubation centers to help local businesses. Furthermore, 111 institutes and 36 research centers provided critical input to local businesses and communities (Table V.1).

Table V.1: Community and Business Outreach Activities/ Events

Business	
Number of Graduates	17,144
Number of Internships	4,607
Amount of Research Funding	$477,670,166
Number of Incubation Centers	39
Number of Institutes	111
Number of Research Centers	36

BERC Survey and Estimates

To what extent did these higher education avenues affect the business community in 2004? The sheer size of research and in-flow of a substantial amount of federal and tuition money from other regions demonstrate the extent of these institutions' contribution to the regional economy. They generated $316 million in research spending, $54 million in public service spending, $480 million in federal operating grants, $73 million in federal student grants, $274 million in student scholarships, and $463 million in investment income (Table V.2).

[1] Research funding reported in Tables V.1 and V.2 is from different sources and for different years.

Table V.2: University-Business Community Interactions: Some Indicators of Middle Tennessee Higher Education Institutions (2004)

Selected Sources of Revenues and Expenditures	Amount (Million $)	Percent in Total Expenditures
Research Spending	$315.859	10.75%
Public Service Spending	$54.118	1.84%
Federal Operating Grants	$480.074	16.34%
Federal Student Grants (including Pell)	$73.196	n/a
Total Student Scholarships	$273.614	n/a
Investment Income	$463.056	15.76%

Source: BERC and IPEDS database

In addition to education and research avenues, institutes of higher education affect middle Tennessee businesses and communities through campus events. In 2005, for example, middle Tennessee higher education institutes hosted an estimated 796 athletic events, 870 cultural events, 437 business events and 479 conferences. As shown in Table V.3, these campus activities along with numerous youth camps attracted at least 553,926 net new visitor days to area campuses.

Furthermore, the community benefits from more than seven million books in area libraries and at least $134 million in estimated charitable contributions from higher education institutions and their employees. In addition to the traditional education they provide, these schools offer more than 50 online degree programs across the region, serving 5,454 people, many of whom are professionals improving their skills while continuing to work. Nearly 292 people graduated from these programs in 2005.

Table V.3: University-Community Interactions: Business and Cultural Events

Cultural/Community/Athletic Events	Events	Estimated Net New Visitor Days
Home Games/Events	796	281,400
Cultural Events	870	43,500
Business Events	437	44,574
Conferences	479	174,236
Youth Camp Attendance	n/a	10,216
Number of Library Books	n/a	7,471,149
Value of Charitable Contributions	n/a	$133,862,307
Online Outreach (Educational/Professional Services)		
Online Degree Programs	50	
Number of Enrollment	5,454	
Number of Online Program Graduates	292	

BERC Survey and Estimates

V.4. Survey Findings

Institutional contribution to economic development. The BERC survey results provide insight into how universities perceive their contributions to and interaction with local businesses. First, as Table V.4 demonstrates, the strongest contribution to the business community is cited in the areas of access to education, graduate retention in the region, developing local partnerships, and meeting skill needs. The weakest areas are cited in the areas of research collaboration with industry, attracting inward investment to the region, technology transfer, strategic analysis of the regional economy, and spin-off activity. While the higher education community demonstrates a greater desire to provide more leadership for local economic development initiatives, the current level of strategic interaction in the areas of research collaboration and technology transfer seems to require additional efforts on the part of higher education communities. Just 13 out of 20 surveyed education institutions responded. Therefore, results should be interpreted accordingly.

Table V.4: In what areas does your institution make the greatest contribution to economic development? (N = 13)

Area of Strength	(Please mark all that apply)	County	Middle Tennessee
Strong	Access to education	100.00%	53.85%
	Graduate retention in local region	61.54%	53.85%
	Developing local partnerships	61.54%	53.85%
	Meeting skill needs	61.54%	53.85%
Medium	Attracting nonlocal students to the region	38.46%	38.46%
	Supporting small and medium-sized enterprises	38.46%	30.77%
	Support for community development	46.15%	30.77%
	Management development	38.46%	23.08%
Weak	Research collaboration with industry	23.08%	15.38%
	Attracting inward investment to region	23.08%	7.69%
	Technology transfer	23.08%	23.08%
	Strategic analysis of regional economy	15.38%	7.69%
	Spin-off activity	7.69%	7.69%

Source: BERC Survey

Close business interactions. As Tables V.5 and V.6 reveal, a considerable number of respondents work closely with businesses in health care and social assistance; finance and real estate; not-for-profit organizations; and arts, entertainment and recreation. In the manufacturing sector, businesses in machinery and computer/electronic products subsectors work closely with several higher education institutions. A moderate level of interaction takes place with businesses in accommodation and food services and government and related enterprises.

When asked why higher education institutions interacted with business sectors cited in the preceding table, 69 percent of respondents indicated the demand from businesses, 39 percent cited specialization in given business areas, 46 percent claimed expertise in the area, 31 percent indicated they follow regional and national demand, and 15 percent cited the lack of other institutions addressing the needs in the given sector.

Table V.5: Does your institution work closely with particular businesses in the following sectors? (N = 13)

(Please mark all that apply)	County	Middle Tennessee
Manufacturing		
Computer and Electronic Products	30.77%	15.38%
Electrical Equipment and Appliances	15.38%	7.69%
Transportation Equipment	15.38%	7.69%
Chemical	7.69%	7.69%
Plastics and Rubber Products	7.69%	7.69%
Machinery	38.46%	15.38%
Finance and Real Estate	53.85%	15.38%
Healthcare and Social Assistance	69.23%	46.15%
Arts, Entertainment, and Recreation	46.15%	23.08%
Accommodation and Food Services	38.46%	15.38%
Repair, Maintenance and Personal Services	7.69%	7.69%
Non-for-profit Organizations	53.85%	30.77%
Government and Related-Enterprises	38.46%	30.77%
Other (Please Specify)_____	7.69%	7.69%
Other (Please Specify)_____	7.69%	7.69%
Other (Please Specify)_____		7.69%

Source: BERC Survey

Table V.6: If you specified any sectors above, what are the reasons for your institution's involvement in those sectors?

Our institution responds to demand from businesses in those areas,	69.23%
Our institution has expertise in those areas,	46.15%
Our institution is specialized in those areas,	38.46%
Our institution is guided by regional and national trends in those sectors,	30.77%
No other institution in the region is addressing the needs of businesses in those sectors	15.38%

Source: BERC Survey

Teaching and research-related contracts. Teaching and research-related contracts are another avenue for interaction between institutes of higher learning and businesses. As Table V.7 shows, middle Tennessee higher education institutions signed 403 contracts with businesses worth more than $25 million and involving 3,102 students and 167 businesses.

Table V.7: How many teaching and research related contracts were signed with businesses in the last fiscal year in middle TN? (N = 13)

Fiscal Year: 2005-2006	
Number of Contracts	403
Value of Contracts	$25,054,219
Number of Students Involved	3,102
Number of Businesses Involved	167

Source: BERC Survey

VI. Conclusion and discussions

While 20 higher education institutions in middle Tennessee are involved in academic, socioeconomic, and cultural aspects of life in the region as demonstrated by the survey data, the response rate for the areas that deal with community leadership and strategic interaction was not at the desirable level. Although the results do not represent all 20 universities, we nevertheless briefly provide information about the responses of those institutions regarding strategic community interactions.

Incentive for faculty and staff to engage with local businesses. One area that may be promoted by higher education institutions is to provide incentives for faculty and staff to engage with local communities. According to survey results, out of seven (7) respondents, only two institutions indicated the presence of strong incentive systems for faculty and staff engagement in the business community.

Providing analysis, measurement and testing services, and the presence of a central unit for business consulting. As indicated by the survey results, these two important areas are also underrepresented within the higher education communities. Out of nine (9)

respondents, only three (3) higher education institutions provided analysis, measurement, and testing services involving 62 businesses. Furthermore, 11 higher education institutions responded to the question regarding central business consulting. The two (2) respondents with a central business consulting unit helped a total of 72 businesses in 2005.

Business support services. Likewise, few institutions reported offering business support services in the form of on-campus business incubators, entrepreneurship training, business advice, or off-campus business incubators. Of the higher education institutions responding to this question, three provided business support in the form of an on-campus incubator, one an off-campus incubator, two entrepreneurship training, and two business advice.

Responsiveness to skill needs. In terms of responsiveness to skill needs and changes in the labor market, a few institutions conduct rigorous analysis, while some institutions only collect data without a systematic effort to realign programs. Some institutions do not monitor skill changes at all. Seven (7) higher education institutions responded to this question. Of the seven institutions, two (2) do not have a skill monitoring system, four (4) collect data about skill changes but do not show systemic efforts to realign the programs, and one (1) has a sophisticated monitoring system and responds to changes in labor market demands.

Flexible learning environment for businesses. In terms of providing a learning environment for businesses and professionals, a few institutions indicated they offer distance learning for businesses and continuing work-based learning. Continuing work-based learning involved 979 individuals and generated $1.8 million. In addition, nearly half of responding institutions offer short courses for businesses either on or off campus. These courses benefited 435 individuals. Of course, we must again reiterate the fact that less than 10 higher education institutions responded to this question. Out of seven (7) respondents, two (2) provide distance learning for businesses, but five (5) indicated they do not have such a program. One higher education institution indicated the presence of a continuous work-based learning system involving 979 individuals and $1.8 million in revenue. Finally, five (5) of the nine (9) responding higher education institutions offer on- or off-campus short business courses.

Partnership with economic development agencies. Finally, the BERC asked universities about the extent of their partnerships with local and regional development agencies. Five (5) of seven (7) responding institutions indicated they are somewhat involved in development efforts at the senior management level. Two (2) institutions indicated they are very active in local and regional development efforts.

As the survey results indicate, the higher education institutions are involved in regional efforts in varying capacities. Their full involvement in the areas the BERC survey covers would potentially create a powerful positive impact throughout the region. We must acknowledge in this chapter that the BERC survey has limitations in capturing the full extent of the 20 universities' involvement in community affairs due to the low

response rate. In the future, a systematic monitoring of the business-higher education interaction may provide significant policy insights for universities, businesses, and local and state government agencies alike.

CHAPTER VI:
HIGHER EDCUATION INDICATORS FROM A COMPARATIVE PERSPECTIVE

VI.1. Overview

Where does Middle Tennessee stand in relation to peer regions in the area of higher education? This chapter will address this question by analyzing higher education indicators in peer regions. Indicators of higher education provide critical insight into a region's competitive advantages. These advantages include the region's access to higher education, science and innovation, cultural diversity, and export of educational services, among others.

The broad categories of indicators we will examine include educational attainment, regional characteristics, higher education institutions, cultural diversity, research and development, science and engineering, faculty and staff, fiscal indicators, and other competitive indicators. In the sections that follow, we first briefly discuss methodological issues when analyzing diverse regions from a comparative perspective. Second, we provide a snapshot of the middle Tennessee region in terms of educational attainment. Third, we provide a comprehensive set of indicators for the selected peer regions. Finally, we conclude with the composite rankings of regions according to these indicators.

VI.2. Methodology

An analysis of regions from a comparative perspective in the area of higher education requires processing an extensive number of indicators involving large number of universities and colleges. In constructing higher education indicators in this study, we were guided by three important principles: *consistency, relevancy,* and *comparability*. In addition, the *availability of data* and *time frame for the study* were two important limiting

factors. We were nevertheless able to extract nearly 100 indicators that were further processed for category and composite rankings.

For *consistency*, the BERC utilized data from publicly available sources to construct indicators of higher education for peer regions. Primary data come from IPEDS (Integrated Postsecondary Education Data System). In addition to IPEDS, we also consulted the National Science Foundation, Census Bureau, and Bureau of Economic Analysis. For certain specific indicators, we utilized data from Department of Education websites for each peer region.

For *relevancy*, in identifying the indicators, the BERC took into account the broader functions of higher education institutions in a community. Therefore, we included a few environmental indicators in which higher education institutions and their communities interact. All other indicators are closely related to the broader mission of higher education institutions in a knowledge economy. Of course, the *availability* of data was critically important in the selection process.

For *comparability*, the BERC used the pre-defined peer regions used by the Nashville Area Chamber of Commerce in its marketing efforts: Atlanta, GA; Denver, CO; Dallas, TX; Columbus, OH; Charlotte, NC; Indianapolis, IN; Raleigh, NC; Jacksonville, FL; Kansas City, MO; Louisville, KY; Richmond, VA; and Birmingham, AL. These 12 metropolitan statistical areas (MSAs) along with middle Tennessee region, which includes 41 counties, are used for comparison.

On many occasions, these MSAs are often used to compare performance of the Nashville MSA in certain economic areas. However, because of the focus of this study, which includes 20 higher education institutions scattered across middle Tennessee, the

BERC defined the study region as middle Tennessee instead of the Nashville MSA. Regarding the use of population or student-weighted indicators, the inclusion of the middle Tennessee region should not cause any problems. However, this definition may pose a methodological issue in terms of comparing middle Tennessee with the Raleigh-Cary MSA, as the research triangle region is split into two MSAs: Raleigh-Cary and Durham-Chapel Hill. In interpreting the results in this study, the reader should be aware of this boundary issue. The BERC did not attempt to redefine the regions primarily because of the time constraint for the project.

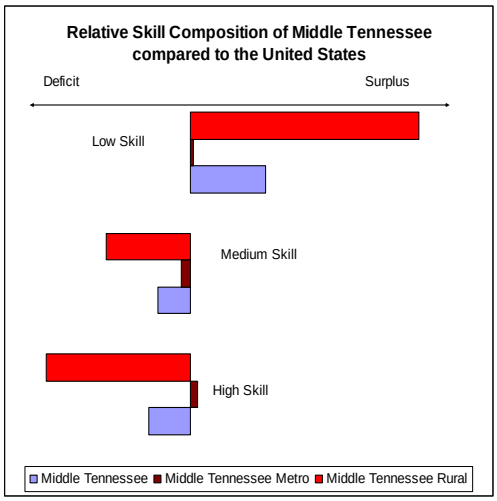
This study introduces a set of indicators in each section. For each subsection, we create several summary indicators, which are then standardized. Each region is ranked based on its relative score for a given indicator.

VI.3. A profile of middle Tennessee

Skill composition

In terms of educational attainment, middle Tennessee lags behind national averages substantially. As regional economies experience structural changes in the manufacturing sector, there is a pressing need for people with higher education, defined as education beyond high school, in order to produce a competitive labor force. As Figure VI.1 and the accompanying table show, middle Tennessee has a substantial surplus of low skilled workers compared to the rest of the nation.

Figure VI.1: What Is the Skill Composition in Middle Tennessee?



Skill Composition from a Comparative Perspective

	High Skill	Medium Skill	Low Skill
Middle Tennessee	20.9	24.5	54.6
Tennessee	19.6	24.8	55.7
United States	24.4	27.4	48.2
MT Metro	25.0	26.6	48.5
MT Rural	12.1	20.2	67.7

Source: Census & BERC

- Middle Tennessee's skill composition is slightly better than Tennessee's, but substantially worse than the United States average.
- While metro counties are positioned relatively well in overall skill composition, rural counties face significant challenges.

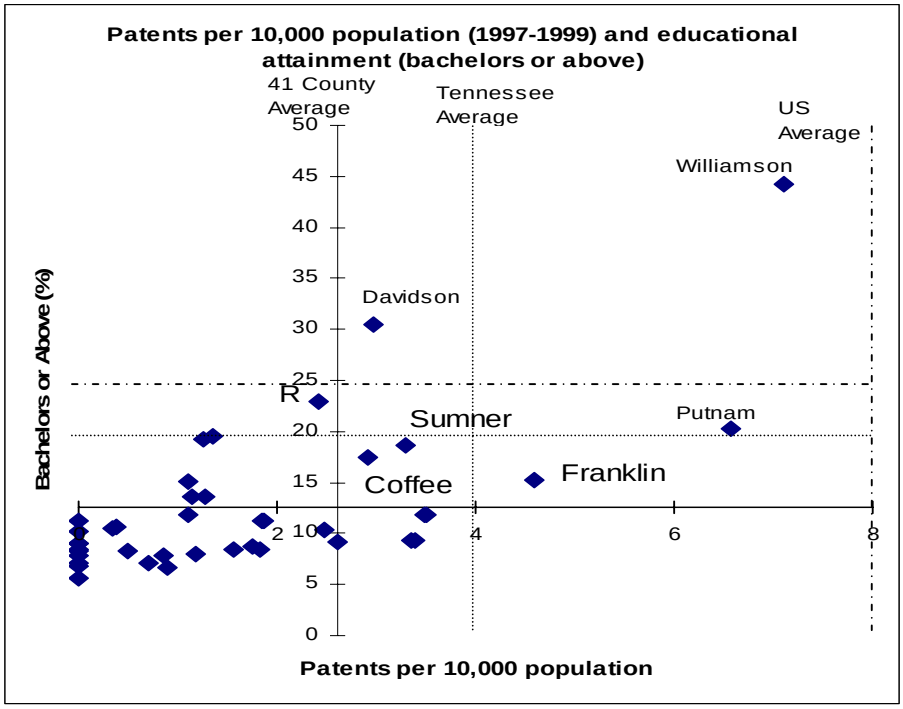
Note: Regional skill composition assessment is based on Census educational attainment data for the population over 25 years old.

While middle Tennessee's skill composition is slightly higher than the state as a whole, it is still much lower than the national average. It is also significant to note that while urban counties are positioned relatively well in overall skill composition, rural counties face significant challenges in meeting the market's demand for a skilled workforce.

Science and innovation

Science and innovation are the lifeblood of a competitive regional economy. However, this lifeblood depends on the educational attainment of a region's labor force. Using 1999 patent data, Figure VI.2 illustrates how middle Tennessee counties are doing in terms of patents per capita.

Figure VI.2: Education and Innovation in Tennessee



As one can see in Figure VI.2, all of middle Tennessee is below the national average for patents, and most of the 41 counties we examine here fall below the Tennessee average both for educational attainment and patents.

VI.4. Indicators of higher education

In the following section, we examine 13 different indicators of higher education in 13 different peer regions, including middle Tennessee.

Regional characteristics

Compared to its peers, middle Tennessee has the fourth largest population, but population growth between 2000 and 2004 was slower than in its eight peer regions.

Furthermore, as presented in Table VI.1, middle Tennessee has the lowest income per capita but is relatively better off than other regions in terms of labor force dynamics.

Table VI.1: Selected Characteristics of Peer Regions

	Population		Income Per Capita		Labor Force		Unemployment Rate	
MSA	2004	% Change from 2000	2004	% Change from 2000	2004	% Change from 2000	2004	% Point Change from 2000
Atlanta	4,796,268	12.02%	$33,838	2.16%	2487720	4.64%	4.8	1.7
Birmingham	1,081,722	2.69%	$33,067	16.51%	532,213	-0.15%	4.5	1.1
Charlotte	1,474,843	10.07%	$34,816	8.19%	777,007	5.86%	5.6	2.2
Columbus	1,690,721	4.44%	$34,128	11.01%	916,064	3.83%	5.4	2.2
Dallas	5,696,045	9.62%	$35,502	4.50%	2,971,827	4.46%	5.8	2.2
Denver	2,326,310	7.12%	$40,939	8.17%	1,290,595	3.78%	5.8	3.2
Indianapolis	1,617,414	5.65%	$35,266	10.50%	866,838	5.60%	4.7	2.3
Jacksonville	1,223,741	8.66%	$32,283	9.67%	611,078	3.69%	4.7	1.5
Kansas City	1,927,240	4.58%	$34,585	9.42%	1,073,844	7.08%	5.8	2.5
Louisville	1,199,424	2.94%	$33,058	12.46%	603,660	-1.06%	5.3	1.7
Middle Tennessee	2,233,002	5.11%	$31,242	14.23%	1,127,044	1.98%	4.9	1.1
Raleigh	914,963	13.78%	$34,498	2.51%	485,676	6.87%	4.3	1.8
Richmond	1,156,849	5.16%	$35,422	15.96%	609,040	7.83%	3.8	1.8

Note: Since many of the indicators used in this part of the study are available for 2004, we only reported figures for the same year to give a contextual framework for the indicators for higher education.
Source: BERC, Census Bureau, Bureau of Economic Analysis, and BLS

Educational attainment

Compared to its peers, middle Tennessee has very low educational attainment. It has the highest percent of population with less than a high school education (27.70 percent) and the lowest number of college graduates holding bachelor's degrees or higher (20.90 percent). Looking at the Nashville MSA by itself, the city has rates of educational attainment comparable to half of the peer regions, but its overall ranking is still lower than the peer average. In terms of bachelor's and above educational attainment, Raleigh (38.9 percent), Denver (35.5 percent), and Atlanta (32.1 percent) have the highest population over 25 with a bachelor's degree and above. As Table VI.2 indicates, middle Tennessee, Louisville, and Jacksonville are the worst performers.

Table VI.2: Selected Educational Attainment Levels of Population over 25

Regions	Less Than High School (%)	Associate Degree and Above (%)	Bachelor's and Above (%)
Middle Tennessee	27.70	25.60	20.90
Atlanta, GA	16.01	37.80	32.10
Birmingham, AL	19.40	30.30	24.70
Columbus, OH	14.20	34.80	29.10
Charlotte, NC	19.50	33.20	26.50
Raleigh, NC	14.60	45.90	38.90
Indianapolis, IN	16.00	31.80	25.80
Dallas, TX	20.10	33.90	28.40
Richmond, VA	17.40	34.40	29.20
Louisville, KY	18.70	27.90	22.20
Kansas City, MO	13.30	34.30	28.50
Jacksonville, FL	16.40	30.40	22.90
Denver, CO	13.40	42.00	35.50
Nashville, TN	18.60	31.90	26.90

Source: Census Bureau and BERC

Note: Associate's degree and above includes bachelor's degree and above

Exporting educational services

In constructing Table VI.3, we followed several steps utilizing data from a variety of sources. First, we obtained high school graduation data for each peer region by aggregating graduation data for each school jurisdiction. Then, we estimated “potentially college-bound” students utilizing educational attainment data for each region. Finally, we used IPEDS data to estimate net student inflow from other regions to each of the peer MSAs. According to Table VI.3, more than 9,500 students from other regions go to college in middle Tennessee, making it the fourth largest exporter of educational services outside the region after Atlanta, Dallas, and Denver.

Table VI.3: Net Student Inflow to the Region's Higher Education Institutions

Regions	Estimated Number of High School Graduates**	Potentially College-Bound Students*	Estimated First-Time In-State Freshmen from Outside the Region***	Total Entering Freshmen***	Net Student Inflow from Other Regions****
Middle Tennessee	18,132	4,642	5,931	14,231	9,589
Atlanta, GA	36,692	13,870	9,764	30,109	16,239
Birmingham, AL	6,811	2,064	4,506	7,568	5,504
Columbus, OH	16,538	5,755	3,898	12,306	6,551
Charlotte, NC	11,491	3,815	1,918	7,570	3,755
Raleigh, NC	8,213	3,770	4,008	8,755	4,985
Indianapolis, IN	14,265	4,536	2,742	7,993	3,457
Dallas, TX	51,073	17,314	13,902	33,527	16,213
Richmond, VA	8,814	3,032	4,556	9,389	6,357
Louisville, KY	9,986	2,786	4,077	9,276	6,490
Kansas City, MO	18,310	6,280	637	7,461	1,181
Jacksonville, FL	9,513	2,892	4,554	8,323	5,431
Denver, CO	10,628	4,464	11,022	17,934	13,470

Sources: BERC, Census, IPEDS, and individual state department of education websites

*Potentially college-bound students are estimated using educational attainment level of "associate's degree and above."

**Number of high school graduates are estimated from the state department of education websites for each region.

***Estimated first-time in-state freshmen from outside the region is the difference between total first-time in-state freshmen and potentially college-bound students from the region. Origin of firs- time freshmen data is IPEDS.

****Net student inflow from outside the region is the difference between total first-time entering freshmen and college-bound students from the region.

Higher education institutions

The BERC identified 206 nonprofit (public and private) higher education institutions in these 13 regions. Given the presence of these institutions, what options do the residents of the regions have for pursuing the education programs they desire? In order to address this question, the BERC calculated a summary "educational opportunity diversity" score for each region, taking into account Carnegie classifications and the highest degree offered by each institution.[1] To eliminate any bias, the summary diversity score includes the number of both institutions and students enrolled in each program area. The regions with higher diversity scores present more opportunities to their residents in terms of academic programs. Using this score, we find that middle Tennessee and Atlanta

[1] We used the following standard formula to calculate "educational opportunity diversity index": $DiversityIndex = 1 - \sum p_i^2$, where (p_i) represents the fraction of each program area in total in terms of number of institutions or total enrollment. This index is also called the Rae Index.

provide more diverse educational opportunities in terms of program areas than any other peer regions.

Table VI.4: Educational Opportunity Diversity Indices by Type of Programs

MSA/ Region	Carnegie Classification		Highest Degree Offered		Educational Opportunity Diversity
	Number*	Enrollment**	Number*	Enrollment**	Average Score
Atlanta	0.89	0.71	0.79	0.74	0.78
Birmingham	0.76	0.69	0.72	0.62	0.70
Charlotte	0.72	0.59	0.76	0.59	0.67
Columbus	0.88	0.69	0.75	0.68	0.75
Dallas	0.81	0.68	0.78	0.63	0.72
Denver	0.84	0.77	0.77	0.71	0.77
Indianapolis	0.77	0.64	0.79	0.67	0.71
Jacksonville	0.69	0.57	0.69	0.61	0.64
Kansas City	0.86	0.71	0.79	0.66	0.76
Louisville	0.78	0.68	0.65	0.56	0.67
Middle Tennessee	0.87	0.77	0.81	0.69	0.78
Raleigh	0.83	0.67	0.76	0.63	0.72
Richmond	0.78	0.69	0.76	0.67	0.72

Note 1: Carnegie Classification includes (1) institutions not classified, (2) associate's colleges, (3) BA-General, (4) BA-Liberal Arts, (5) BA/Associate's, (6) Doctoral/Research-Extensive, (7) Doctoral/ Research-Intensive, (8) MA I, (9) MA II, (10) Medical School, (11) other separate health profession, (12) other specialized, (13) schools of arts, (14) schools of business, (15) schools of engineering and technology, and (16) theological seminaries and other specialized faith-related institutions.
Note 2: Highest degree offerings includes (1) associate's, (2) BA, (3) BA and first-professional, (4) doctoral, (5) doctoral and first-professional, (6) first-professional only, (7) MA, (8) MA and first-professional, and (9) non-degree granting.
*Number refers to number of institutions.
**Enrollment refers to number of students enrolled by type of institution.

Cultural diversity

Another important indicator of higher education is cultural diversity. Middle Tennessee's institutions are relatively less culturally diverse than those in peer regions with the exception of Indianapolis and Columbus. One particular component of the cultural diversity score is nonresident alien enrollment. In Tennessee, nonresident alien enrollment is lower than nine of 12 peer regions. As presented in Table VI.5, Dallas and Atlanta institutes of higher learning have the highest diversity scores.

Table VI.5: Cultural and Racial Diversity*

Region	% Nonresident Alien	Cultural Diversity Score**
Atlanta	4.79%	0.59
Birmingham	2.89%	0.51
Charlotte	5.72%	0.52
Columbus	5.15%	0.45
Dallas	5.19%	0.64
Denver	2.45%	0.51
Indianapolis	2.25%	0.42
Jacksonville	1.49%	0.54
Kansas City	1.72%	0.51
Louisville	2.12%	0.49
Middle Tennessee	1.86%	0.46
Raleigh	3.04%	0.52
Richmond	1.34%	0.51

*Diversity score includes both racial and cultural diversity as the BERC included percent of "nonresident alien" segment as a separate category in addition to six (6) other racial categories.
**Higher score means more culturally diverse higher education institutions.

Research and development

The amount of research and development that universities contribute is another important indicator of the quality of higher education in a region. As presented in Table VI.6, middle Tennessee experienced significant growth between 2000 and 2004 in university-based research and development expenditures, but the region is still far behind Raleigh, Columbus, Birmingham, Atlanta, and Indianapolis in terms of per capita research and development spending. The BERC utilized data from the National Science Foundation to calculate university-based research and development spending.

Table VI.6: Research and Development Expenditures per Capita (2000-2004)

MSA	Total Research and Development per Capita(2000)	Total Research and Development per Capita (2004)	Percent Change (2000-2004)
Atlanta	$197.66	$242.62	22.75%
Birmingham	$221.63	$289.61	30.67%
Charlotte	$5.81	$12.11	108.33%
Columbus	$223.60	$309.73	38.52%
Dallas	$46.34	$70.44	51.98%
Denver	$95.38	$123.81	29.81%
Indianapolis	$148.75	$240.12	61.42%
Jacksonville	$0.00	$2.53	n/a
Kansas City	$10.66	$16.75	57.13%
Louisville	$54.98	$93.00	69.15%
Middle Tennessee	$96.82	$171.45	77.08%
Raleigh	$345.77	$331.14	-4.23%
Richmond	$115.55	$166.38	43.98%

Source: BERC and NSF

Figure VI.3: University Research and Development Expenditures and Percent Change (2002-2004)

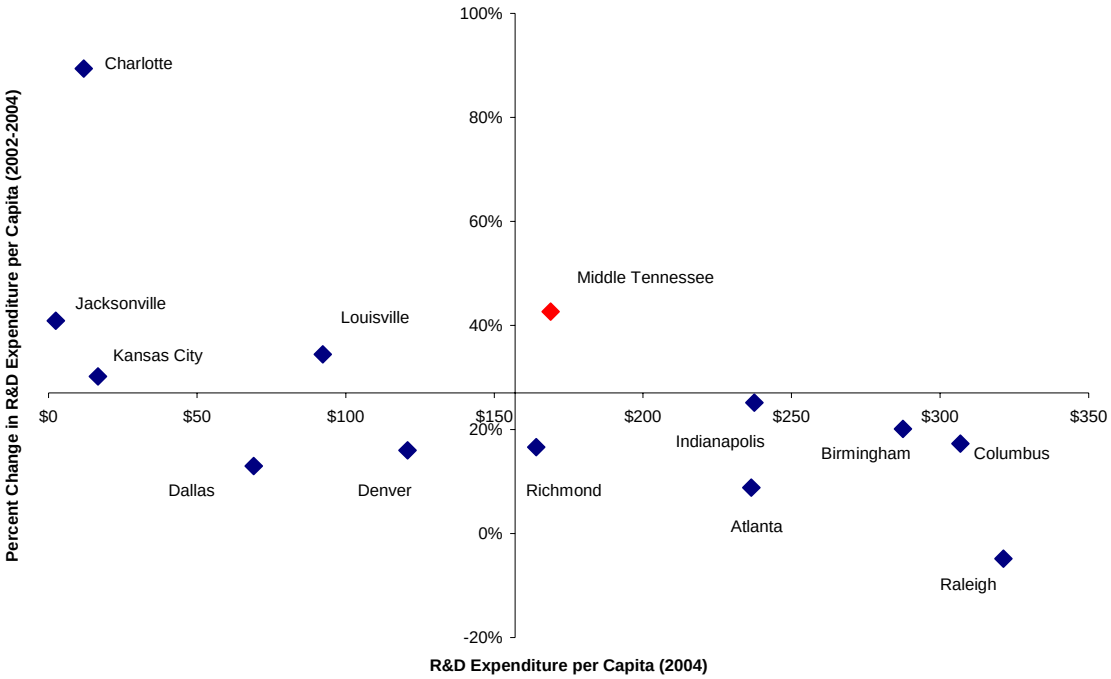


Figure VI.3 above presents trends in research and development in middle Tennessee and peer regions between 2002 and 2004. According to Figure VI.3, middle Tennessee universities stand out clearly from other regions in terms of per capita growth of university-based research and development.

In addition to measuring the amount of money universities are spending on research and development, it is important also to look at the funding sources. A very diverse funding base indicates that a region's institutions are benefiting from a variety of sources, an indicator of success. A low diversity score indicates the region's reliance on a few sources for funding, mainly the federal government. As Table VI.7 demonstrates, middle Tennessee's higher education institutions rely heavily on federal funding for research and development.

Table VI.7: Funding Sources of University Research and Development Expenditures (2004)

MSA	Federal	State and Local	Industry	Institutional Funding	Other Sources	Diversity of Funding Source
Atlanta	56.80%	7.15%	5.11%	28.00%	2.93%	0.59
Birmingham	84.15%	0.10%	3.02%	8.31%	4.42%	0.28
Charlotte	79.29%	0.95%	9.21%	10.25%	0.30%	0.35
Columbus	54.96%	11.92%	8.24%	18.82%	6.07%	0.64
Dallas	61.91%	9.58%	4.44%	4.57%	19.51%	0.57
Denver	80.98%	2.26%	5.63%	5.72%	5.41%	0.33
Indianapolis	43.45%	1.11%	2.07%	40.39%	12.98%	0.63
Jacksonville	49.29%	20.80%	29.91%	0.00%	0.00%	0.62
Kansas City	49.10%	0.00%	3.27%	43.65%	3.98%	0.57
Louisville	49.23%	5.11%	2.59%	26.65%	16.42%	0.66
Middle Tennessee	80.34%	1.18%	1.52%	12.11%	3.52%	0.34
Raleigh	35.59%	29.45%	13.86%	20.14%	0.97%	0.73
Richmond	64.09%	4.36%	5.44%	22.03%	4.07%	0.53

Source: BERC and NSF

Note: High diversity of funding source score means that a region's institutions are benefiting from R&D funding from a variety of sources. Low diversity score indicates the reliance of the region's institutions on a few sources of R&D funding, i.e., federal government.

Compared to peer regions, middle Tennessee ranks 11th out of 13 in terms of diversity of funding sources. Regions with the highest funding diversity are Raleigh, Louisville, and Columbus. Therefore, while middle Tennessee's universities are experiencing much growth in the area of funding and research, they are not yet garnering as large a variety of funding sources as their peer regions.

Science and engineering graduate students

How well is middle Tennessee performing relative to peer regions in terms of science and engineering graduate students? This indicator is often utilized to measure a region's innovative capacity. It is, therefore, critically important to have a large number of per capita science and engineering graduate students. As Table VI.8 shows, unfortunately, middle Tennessee was substantially behind other peer regions in terms of science and engineering students per capita in 2003.

Table VI.8: Graduate Students in Science and Engineering per 100,000 Population

MSA	Science and Engineering per Capita (per 100,000 population) (2000)	Science and Engineering per Capita (per 100,000 population) (2003)	Percent Change (2000-2003)
Atlanta	165	189	14.70%
Birmingham	175	183	4.76%
Charlotte	33	35	7.17%
Columbus	262	277	5.64%
Dallas	94	109	16.46%
Denver	123	139	13.37%
Indianapolis	169	174	2.74%
Jacksonville	0	0	n/a
Kansas City	25	25	-0.75%
Louisville	78	97	24.35%
Middle Tennessee	87	94	8.09%
Raleigh	333	357	7.16%
Richmond	156	142	-9.14%

Source: BERC and NSF

In fact, only three regions—Kansas City, Charlotte, and Jacksonville—had fewer science and engineering graduate students than middle Tennessee.

Estimated patents

Related to the science and engineering students as well as the presence of higher education institutions in a region is the number of patents filed. As Table VI.9 indicates, all 13 peer regions experienced a decrease in per capita patents filed between 2000 and 2005. Middle Tennessee ranks nearly in the middle of peer regions in terms of patents per capita in 2005. Indictors in Table VI.9 are estimated from statewide patent data. A region's share of patents in a state is estimated by multiplying the total patents by the ratio of the given region's college students to total college students.

Table VI.9: Estimated Patents per Capita in Study Areas

MSA	Patents per Capita (Per 100000 Population) (2000)	Patents per Capita (per 100,000 population) (2005)	Percent Change (2000-2005)
Atlanta	5.02	3.54	-29.35%
Birmingham	3.40	2.69	-20.83%
Charlotte	3.79	2.79	-26.35%
Columbus	8.50	6.89	-18.93%
Dallas	5.13	3.83	-25.23%
Denver	8.49	6.41	-24.51%
Indianapolis	3.83	2.88	-24.95%
Jacksonville	7.25	6.20	-14.56%
Kansas City	4.75	3.29	-30.64%
Louisville	2.07	1.63	-21.30%
Middle Tennessee	4.86	3.72	-23.52%
Raleigh	7.91	5.75	-27.30%
Richmond	6.38	4.89	-23.38%

Source: BERC's estimates from U.S. Patent Office

Note 1: BERC estimated regional patents activity using total number of patents at the state level.

Note 2: For 2000 figures, BERC used the three-year state average of patents (2000-02) and multiplied it by the ratio of region's college enrollment to state's college enrollment. For 2005, the three-year state average (2003-05) is multiplied by the ratio of the region's higher education enrollment to the state's higher education enrollment.

Enrollment

In comparing enrollment numbers between middle Tennessee's universities and those in peer regions, interesting trends emerge. In terms of enrollment per capita, middle Tennessee falls in the middle of peer region rankings. As reported in Table VI.10, Raleigh, Richmond, Columbus, Denver, and Kansas City have higher per capita enrollment than middle Tennessee. However, middle Tennessee has the highest percentage of full-time students enrolled (72.34 percent). In addition, when we examine retention rates, middle Tennessee universities' retention of both full-time and part-time students is higher than three-fourths of its peer region institutions.

Table VI.10: Enrollment (2004)

	Total Enrollment	Total Enrollment per Capita	12-Month Headcount per Capita (per 10,000 population)	Full-Time (%)	Part-Time (%)	Average Full-Time Retention Rate	Average Part-Time Retention Rate
Atlanta	189,381	395	504	69.14%	30.86%	67.86	43.36
Birmingham	42,123	389	514	66.82%	33.18%	70.20	41.89
Charlotte	54,933	372	483	57.52%	42.48%	71.23	60.58
Columbus	97,749	578	768	70.79%	29.21%	73.69	42.90
Dallas	236,702	416	579	51.27%	48.73%	65.76	40.59
Denver	115,287	496	690	46.60%	53.40%	66.14	28.25
Indianapolis	58,467	361	517	55.23%	44.77%	65.50	42.71
Jacksonville	46,614	381	561	48.78%	51.22%	64.43	31.00
Kansas City	87,066	452	706	40.99%	59.01%	61.90	29.00
Louisville	42,282	353	428	57.20%	42.80%	67.33	45.83
Middle Tennessee	98,030	439	528	72.34%	27.66%	70.63	46.56
Raleigh	59,757	653	846	64.93%	35.07%	69.75	48.30
Richmond	64,601	558	683	60.10%	39.90%	70.56	33.25

Source: BERC and IPEDS

Cost of education

The cost of higher education is an important consideration in comparing middle Tennessee to peer regions. First, when we look at living expenses, it is clear that middle Tennessee institutions are relatively better suited to provide on-campus living opportunities, and the average room charge is relatively lower than those in peer regions.

In terms of cost of living for out-of-state students, middle Tennessee's universities fall somewhere in the middle of peer rankings. In this study, we only used average cost of living for out-of-state students (Table VI.11).

Table VI.11: Average Cost of Education (2004)

	Dorm Capacity (per 1,000 enrollees)	Average Room Charge	Average Cost for Out-of State Students Living OnCampus	Average Cost for Out-of-State Students Living OffCampus
Atlanta	181	$3,715	$24,714	$21,617
Birmingham	168	$2,890	$18,941	$18,174
Charlotte	170	$2,988	$21,205	$19,249
Columbus	181	$3,107	$25,281	$23,611
Dallas	118	$2,966	$21,147	$18,867
Denver	52	$4,889	$27,428	$24,987
Indianapolis	78	$2,981	$25,307	$23,187
Jacksonville	102	$2,712	$18,978	$18,370
Kansas City	65	$2,419	$22,847	$20,200
Louisville	96	$2,738	$20,288	$17,999
Middle Tennessee	233	$2,915	$23,110	$23,408
Raleigh	248	$2,951	$21,937	$22,986
Richmond	206	$3,207	$26,452	$22,737

Source: BERC and IPEDS

How do students finance their education? In middle Tennessee, more than 11 percent of students receive one or a combination of the following: federal grant aid, state and local grant aid, and institutional grant aid. Furthermore, nearly 7 percent of students receive loan aid, a rate higher than in many peer regions. Only Raleigh and Richmond have higher percentage of students receiving loan aid than middle Tennessee (Table VI.12). Unlike the case with grants, students or their parents repay loans after graduation.

Table VI.12: How do Students Finance Their Education?

	Total Number of Undergraduates	Aid Receiving Students	Percent of Students Receiving Aid	Percent of Students Receiving Loan Aid
Atlanta	157,060	20,949	13.34%	4.79%
Birmingham	34,251	4,363	12.74%	5.74%
Charlotte	39,460	3,231	8.19%	4.80%
Columbus	85,260	10,382	12.18%	6.61%
Dallas	189,010	11,651	6.16%	3.27%
Denver	75,864	5,182	6.83%	4.16%
Indianapolis	44,813	4,546	10.14%	6.15%
Jacksonville	44,747	4,150	9.27%	4.22%
Kansas City	70,903	3,953	5.58%	2.73%
Louisville	31,322	3,451	11.02%	3.62%
Middle Tennessee	81,883	9,241	11.29%	6.67%
Raleigh	50,063	5,697	11.38%	7.29%
Richmond	50,631	5,974	11.80%	8.06%

Source: BERC and IPEDS

When we look at the diversity of funding opportunities for students to pay for their education, we find that while middle Tennessee higher education institutions rank second in terms of total grants per enrollee after Columbus, its diversity score ranks 12th out of 13 peer regions. As presented in Table VI.13, this low diversity score indicates heavy reliance on a few sources, especially unfunded institutional sources. Funding source diversity scores are higher in Raleigh, Richmond, Jacksonville, and Birmingham, indicating that higher education institutions in these MSAs have more balanced sources of funding for students.

Table VI.13: Diversity of Funding Opportunities at Higher Education Institutions (2004) (Per Enrollee)

Per Capita	Federal (Pell and Other)	State and Local	Institutional	Total per Enrollee	Diversity of Funding Source
Atlanta	$699.79	$99.85	$1,460.66	$2,260	0.68
Birmingham	$1,167.73	$48.23	$1,282.83	$2,499	0.73
Charlotte	$880.13	$199.87	$440.60	$1,521	0.69
Columbus	$700.52	$308.73	$1,840.97	$2,850	0.65
Dallas	$522.13	$140.91	$781.39	$1,444	0.71
Denver	$455.27	$193.38	$747.66	$1,396	0.71
Indianapolis	$645.82	$205.67	$1,286.21	$2,138	0.67
Jacksonville	$752.47	$292.13	$560.99	$1,606	0.73
Kansas City	$335.23	$96.41	$762.94	$1,195	0.64
Louisville	$341.16	$386.83	$1,074.95	$1,803	0.63
Middle Tennessee	$746.67	$118.42	$1,926.04	$2,791	0.62
Raleigh	$887.80	$346.67	$1,197.13	$2,432	0.77
Richmond	$580.19	$352.94	$916.18	$1,849	0.74

Source: BERC and IPEDS

Note: Sources of scholarships reported are (1) Pell Grants, (2) other federal sources, (3) state, (4) local, (5) institutional, and (6) institutional (unfunded). These six sources are collapsed into three categories in this table. Diversity scores are based on the original six sources of student grants.

Employment

Table VI.14 below compares 13 regions in terms of higher education employment and functional distribution of employment. The average salary for higher education employees in middle Tennessee is $51,245, very close to the average salary range for the 13 peer regions examined. The average salary presented here does not reflect cost-of-living adjustments. However, examining employment by function reveals significant differences. As the following table illustrates, only a small percentage of those middle Tennessee employees, 22 percent, are involved primarily in instruction. Ten of the 13 peer regions rank higher than middle Tennessee in terms of their percentages of primarily instruction-related employment. A positive aspect of middle Tennessee higher education employees is that many wear several hats simultaneously (as researchers, public service providers, and teachers). Considering the fundamentals of a knowledge economy,

engagement of faculty and staff at different levels of community involvement is beneficial to local communities.

Table VI.14: Employment by Function

	Total Employees	Average Salary	Primarily Instruction (%)	Combined Instruction, Research and Public Service (%)	Primiraly Research (%)	Primiraly Public Service (%)	Executive/ Manegerial (%)	Other Professional (%)
Atlanta	41,401	$52,440	21.49%	16.58%	3.53%	4.84%	7.70%	45.52%
Birmingham	13,966	$48,420	44.52%	0.29%	0.00%	0.00%	5.24%	49.88%
Charlotte	7,503	$41,891	60.52%	0.01%	0.00%	0.00%	9.69%	29.35%
Columbus	28,100	$53,558	14.74%	16.34%	0.00%	2.30%	10.27%	55.62%
Dallas	36,266	$53,106	43.36%	10.01%	1.95%	2.76%	11.47%	30.50%
Denver	16,502	$52,229	58.97%	1.87%	10.70%	0.37%	10.32%	17.93%
Indianapolis	13,183	$48,647	28.14%	15.59%	0.01%	3.17%	6.03%	47.04%
Jacksonville	5,123	$44,762	59.29%	0.09%	0.00%	0.00%	16.16%	24.44%
Kansas City	14,431	$46,441	54.20%	1.87%	1.46%	1.00%	11.68%	29.58%
Louisville	8,700	$53,295	22.40%	31.64%	0.00%	0.00%	10.40%	36.32%
Middle Tennessee	30,919	$51,245	21.83%	17.15%	3.31%	0.10%	9.76%	47.81%
Raleigh	11,740	$46,148	42.87%	8.18%	0.05%	0.00%	12.37%	37.05%
Richmond	10,512	$53,508	26.55%	30.95%	2.72%	0.16%	12.70%	26.37%

Source: BERC and IPEDS

Table VI.15 presents weighted higher education employment data from a comparative perspective. We used total number of enrollment and population as weights for employment. According to Table VI.15, middle Tennessee has the highest rate of employment per 10,000 enrollment: 2,622 faculty and staff per 10,000 students. Likewise, it has the second highest rate of employment per 10,000 people after Columbus. In middle Tennessee, for every 10,000 people, there are 138 higher education staff and faculty members.

Table VI.15: Total Employment per Capita

	Employment per 10000 12-month enrollment	Employment per 10,000 population
Atlanta	1,714	86
Birmingham	2,510	129
Charlotte	1,053	51
Columbus	2,165	166
Dallas	1,099	64
Denver	1,028	71
Indianapolis	1,578	82
Jacksonville	746	42
Kansas City	1,060	75
Louisville	1,694	73
Middle Tennessee	2,622	138
Raleigh	1,517	128
Richmond	1,331	91

Source: BERC and IPEDS

Sources of revenue

In this section, we look at the sources of revenues of higher education institutions from three different perspectives: tuition and federal, state and local, and other significant sources such as investment income and gifts. Universities' revenue sources constitute another important indicator of higher education's role in a region. In fact, tuition and federal revenue sources may be considered net inflow to the region, making universities an important export industry.

When examining tuition and federal sources of revenue, middle Tennessee is either in the middle or at the lower end of the peer rankings in terms of percent share. Tuition as a source of higher education revenues accounts for 14.95 percent of revenue, ranking middle Tennessee 11th out of 13 peer regions. Federal sources account for 13.83 percent of its revenue, ranking it fifth. However, middle Tennessee is at the higher end of rankings in terms of per capita tuition: its tuition per enrollee is $5,294, second only to Columbus, and its federal funding per enrollee is $4,897, ranking third on the list.

As reported in Table VI.16, Jacksonville, Denver, and Charlotte derive one-fourth of their total revenues from tuition. In terms of federal sources, Denver, Birmingham and Richmond top the list, as they have the highest percent of revenues derived from federal sources. In terms of per capita federal revenue, Birmingham receives $8,449 per enrollee, ranking first among 13 regions. Atlanta ranks second with $4,975 per enrollee.

Table VI.16: Sources of Revenue: Tuition and Federal Sources (2004)

	Tuition as Percent in Total	Tuition per Enrollee	Federal Sources as Percent	Federal per Enrollee
Atlanta	14.43%	$4,625	15.52%	$4,975
Birmingham	7.94%	$3,856	17.41%	$8,449
Charlotte	24.40%	$2,843	10.70%	$1,247
Columbus	18.40%	$6,950	8.59%	$3,244
Dallas	21.37%	$3,388	10.75%	$1,704
Denver	27.43%	$3,911	21.13%	$3,013
Indianapolis	23.32%	$4,893	13.44%	$2,822
Jacksonville	27.77%	$2,429	12.33%	$1,079
Kansas City	24.03%	$3,246	9.75%	$1,318
Louisville	19.83%	$3,180	12.26%	$1,967
Middle Tennessee	14.95%	$5,294	13.83%	$4,897
Raleigh	17.00%	$4,360	11.32%	$2,904
Richmond	22.50%	$4,064	14.75%	$2,665

Source: BERC and IPEDS

State and local sources also provide revenue to higher education. However, both as a percentage of revenue and on a per enrollee basis, state sources do not provide a significant portion of revenue to middle Tennessee higher education institutions. Similarly, local sources are a negligible source of income for middle Tennessee as compared to peer region universities, contributing just 79 dollars per enrollee, less than half a percent of revenue.

As Table VI.17 clearly shows, Jacksonville, Raleigh and Louisville derive more than one-fourth of their total revenues from thestate, with $3,608, $8,260, and $4,345 per enrollee, respectively. In terms of local sources, Dallas, Kansas City, and Indianapolis top the list, as they received nearly one-tenth of their revenues from local sources with $1,702, $1,245 and $1,390 per enrollee, respectively.

Table VI.17: Sources of Revenue: Local and State Sources (2004)

	State as Percent	State per Enrollee	Local as Percent	Local per Enrollee
Atlanta	18.43%	$5,906	2.93%	$939
Birmingham	14.06%	$6,823	2.08%	$1,009
Charlotte	25.53%	$2,974	3.80%	$443
Columbus	13.85%	$5,233	4.63%	$1,750
Dallas	18.89%	$2,995	10.73%	$1,702
Denver	13.41%	$1,912	3.29%	$469
Indianapolis	21.75%	$4,564	6.62%	$1,390
Jacksonville	41.24%	$3,608	1.42%	$124
Kansas City	17.54%	$2,370	9.21%	$1,245
Louisville	27.09%	$4,345	2.05%	$329
Middle Tennessee	7.87%	$2,786	0.22%	$79
Raleigh	32.21%	$8,260	3.55%	$910
Richmond	21.58%	$3,898	0.30%	$54

Source: BERC and IPEDS

Other sources of revenue, such as gifts, investment income, and auxiliary operations represent higher education institutions' efforts to generate income. Investment income may be the result of commercialization of university inventions. Middle Tennessee institutions perform relatively better than peer regions in attracting gifts and generating investment income. In fact, middle Tennessee ranks highest in both percentage and per capita numbers when it comes to gifts, bringing in more than two thousand dollars per enrollee. Likewise, middle Tennessee ranks first in garnering investment income per enrollee ($4,724) and second in investment income as a percentage of revenue. Middle Tennessee's auxiliary operations rank in the middle of peer regions as a source of revenue (Table VI.18).

Table VI.18: Sources of Revenue: Other Significant Sources

	Gifts as Percent	Gifts per Enrollee	Investment Income as Percent	Investment per Enrollee	Auxiliary as Percent	Auxiliary per Enrollee
Atlanta	3.45%	$1,105	9.08%	$2,910	8.61%	$2,760
Birmingham	2.74%	$1,329	7.36%	$3,572	2.76%	$1,341
Charlotte	4.27%	$498	2.77%	$323	9.25%	$1,078
Columbus	3.00%	$1,134	8.99%	$3,396	34.40%	$12,992
Dallas	3.83%	$608	7.36%	$1,167	5.63%	$893
Denver	5.42%	$772	3.22%	$459	9.53%	$1,359
Indianapolis	3.69%	$774	3.51%	$736	13.12%	$2,754
Jacksonville	1.39%	$122	1.93%	$169	5.44%	$476
Kansas City	6.02%	$814	3.82%	$517	6.81%	$920
Louisville	5.28%	$846	3.91%	$626	5.85%	$939
Middle Tennessee	6.80%	$2,409	13.34%	$4,724	5.30%	$1,875
Raleigh	5.70%	$1,461	3.07%	$787	12.04%	$3,086
Richmond	5.13%	$928	15.71%	$2,837	11.54%	$2,084

Sources: BERC and IPEDS

Expenditures

Where do universities spend their revenue? Two areas that are critically important for a region's economy are research and public service spending. Middle Tennessee higher education institutions spend a smaller share of their income on research than peer regions; only five peer regions spend less on research. In terms of public service expenditures, middle Tennessee's relative position is also relatively weak, spending only $552 per enrollee on public service. Only two peer regions spend smaller percentages of their income on public service.

As presented in Table VI.19, Birmingham, Atlanta and Columbus top the list in terms of per capita research expenditures with $5,544, $5,192 and $3,252 per enrollee. Birmingham, Raleigh, and Louisville are have the highest per capita public services expenditures with $4,264, $1,788, and $1,331 per enrollee, respectively.

Table VI.19: Expenditures: Research and Public Services Expenditures (2004)

	Research Expenditures (percent)	Research Expenditures (per Enrollee)	Public Services Expenditures (percent)	Public Services Expenditures (per Enrollee)
Atlanta	18.16%	$5,192	4.16%	$1,191
Birmingham	12.53%	$5,544	9.64%	$4,264
Charlotte	2.40%	$221	1.65%	$151
Columbus	9.92%	$3,252	3.58%	$1,172
Dallas	10.27%	$1,346	3.51%	$459
Denver	14.41%	$1,905	3.32%	$439
Indianapolis	13.00%	$2,489	6.05%	$1,158
Jacksonville	1.50%	$123	2.86%	$235
Kansas City	8.70%	$1,076	2.07%	$256
Louisville	15.53%	$2,384	8.67%	$1,331
Middle Tennessee	10.75%	$3,222	1.84%	$552
Raleigh	13.82%	$3,045	8.12%	$1,788
Richmond	12.32%	$1,789	1.49%	$217

Source: BERC and IPEDS

When it comes to spending on student-related areas, middle Tennessee spends more per enrollee than most of its peer regions. On instruction, middle Tennessee universities spend $8,425 per student, more than any other peer region. On academic support, middle Tennessee spends $1,643 per student, ranking fifth among its peer regions. On student services, middle Tennessee spends $1,312 per student, more than any other peer region. Overall, while middle Tennessee higher education institutions spend a relatively smaller share of their budgets on student-related areas, they spend a much higher amount per capita (Table VI.20).

Table VI.20: Expenditures: Spending on Instructional, Academic Support, and Student Services (2004)

	Instructional (Percent)	Instructional (per Enrollee)	Academic Support (Percent)	Academic Support (per Enrollee)	Student Services (Percent)	Student Services (per Enrollee)	Total University Expenses (per Enrollee)
Atlanta	24.03%	$6,871	6.10%	$1,745	3.83%	$1,096	$28,597
Birmingham	17.49%	$7,740	4.76%	$2,108	2.84%	$1,255	$44,246
Charlotte	40.01%	$3,682	7.44%	$685	7.47%	$687	$9,204
Columbus	22.96%	$7,526	4.35%	$1,426	3.69%	$1,208	$32,782
Dallas	37.52%	$4,916	6.93%	$908	5.97%	$782	$13,102
Denver	31.29%	$4,137	7.52%	$995	5.02%	$664	$13,222
Indianapolis	35.28%	$6,755	12.79%	$2,448	3.54%	$677	$19,148
Jacksonville	33.24%	$2,727	9.50%	$779	12.88%	$1,056	$8,202
Kansas City	31.99%	$3,954	7.03%	$869	5.33%	$659	$12,359
Louisville	32.73%	$5,025	8.53%	$1,310	3.91%	$600	$15,355
Middle Tennessee	28.10%	$8,425	5.48%	$1,643	4.38%	$1,312	$29,980
Raleigh	30.25%	$6,667	7.52%	$1,658	4.44%	$978	$22,035
Richmond	36.26%	$5,264	8.02%	$1,164	4.00%	$580	$14,519

Source: BERC and IPEDS

VI.5. Conclusion and Discussions

In all, BERC compared middle Tennessee higher education institutions to 12 peer region institutions using eight different categories. In ranking each region, the BERC took into account nearly 100 indicators falling under eight (8) broad categories: regional characteristics, education, R&D and science and engineering, diversity of educational opportunity, cultural diversity, enrollment and cost of education, sources of school revenues, and areas of school expenditures.

As we highlighted each of eight broader categories and selected indicators in Tables VI.1-20, within a given category, several indicators may be moving in opposite directions. By estimating category rankings and scores, we provide a general perspective on how a region is performing compared to its peers in that given broader area such as diversity of educational opportunity. As Table VI.21 indicates, middle Tennessee ranks high in the areas of diversity of educational programs and diversity of revenue sources.

However, the region ranks 12 out of 13 in the area of cultural diversity and at the very bottom in terms of educational attainment.

Table VI.21: Component Rankings of Higher Education Indicators

	Regional Characteristics		Education		R&D and Science and Engineering		Diversity of Educational Opportunity		Cultural Diversity		Enrollment and Cost of Education		Sources of School Revenues		Expenditures	
MSA	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank
Atlanta	0.55	6	0.79	2	0.52	5	0.90	2	0.89	2	0.36	11	0.57	4	0.60	4
Birmingham	0.51	7	0.29	12	0.46	10	0.28	10	0.45	6	0.68	2	0.52	5	0.68	1
Charlotte	0.56	5	0.32	10	0.33	12	0.11	12	0.75	3	0.56	6	0.32	12	0.34	12
Columbus	0.40	11	0.59	4	0.75	1	0.73	5	0.52	5	0.44	9	0.64	2	0.49	7
Dallas	0.44	9	0.57	5	0.49	6	0.51	6	0.95	1	0.59	5	0.35	11	0.39	9
Denver	0.33	13	0.89	1	0.49	7	0.86	3	0.43	7	0.26	13	0.52	6	0.39	10
Indianapolis	0.47	8	0.39	9	0.54	4	0.42	9	0.17	13	0.27	12	0.48	8	0.65	2
Jacksonville	0.60	3	0.39	8	0.44	11	0.04	13	0.41	8	0.65	3	0.25	13	0.36	11
Kansas City	0.44	10	0.49	6	0.29	13	0.76	4	0.35	9	0.51	8	0.37	9	0.29	13
Louisville	0.38	12	0.30	11	0.57	3	0.11	11	0.32	10	0.59	4	0.36	10	0.55	5
Middle Tennessee	**0.56**	**4**	**0.24**	**13**	**0.47**	**9**	**0.91**	**1**	**0.19**	**12**	**0.41**	**10**	**0.70**	**1**	**0.52**	**6**
Raleigh	0.63	2	0.68	3	0.63	2	0.49	8	0.53	4	0.72	1	0.49	7	0.65	3
Richmond	0.68	1	0.48	7	0.47	8	0.50	7	0.30	11	0.53	7	0.62	3	0.40	8

Note 1: Nearly 100 indicators are processed, and more than 40 indicators are assigned a relative score based on mean and standard deviation of each series. Component score represents a linear combination of the scores of each series under the given component, i.e., education.
Note 2: In certain cases, both percent share and per capita version of indicators are used to calculate the rankings.

Table VI.22 below gives a snapshot of findings in Table VI.21 by comparing middle Tennessee's rankings with the highest (best performing) and the lowest (worst performing) regions for each of eight (8) broader categories. According to Table VI.22, the following regions appeared at least once in the highest-performing column across all categories: middle Tennessee, Richmond, Denver, Columbus, Raleigh, Dallas, and Birmingham. The following regions frequented the lowes-performing column in Table VI.22: middle Tennessee, Denver, Kansas City, Jacksonville, and Indianapolis.

Table VI.22: Snapshot of Rankings Based on Table VI.21

Ranking Categories	Middle Tennessee	Highest	Lowest
Regional Characteristics	4th	Richmond	Denver
Education	13th	Denver	Middle Tennessee
R&D and Science and Engineering	9th	Columbus	Kansas City
Diversity of Educational Opportunity	1st	Middle Tennessee	Jacksonville
Cultural Diversity	12th	Dallas	Indianapolis
Enrollment and Cost of Education	10th	Raleigh	Denver
Sources of School Revenues	1st	Middle Tennessee	Jacksonville
Expenditures	6th	Birmingham	Kansas City

Note: See Table VI.21.

Note 1: Lowest = 13, Highest = 1; Highest = the best performance, Lowest = the worst performance.

Composite rankings

Taking into account all higher education indicators, the BERC's composite rankings of peer regions are as follows: Atlanta ranks first, Raleigh second, and Columbus third. Middle Tennessee ranks seventh, just about average among its peers. As presented in Table VI.23, Jacksonville ranked last at 13th, Louisville 12th, and Charlotte 11th.

Table VI.23: Composite Rankings of the Peer Regions Based on Higher Education Indicators

MSA	Average Score	Rankings
Atlanta	0.65	1
Birmingham	0.48	8
Charlotte	0.41	11
Columbus	0.57	3
Dallas	0.54	4
Denver	0.52	5
Indianapolis	0.42	10
Jacksonville	0.39	13
Kansas City	0.44	9
Louisville	0.40	12
Middle Tennessee	**0.50**	**7**
Raleigh	0.60	2
Richmond	0.50	6

Source: BERC

Data Sources

IPEDS: Integrated Postsecondary Education Data System. http://nces.ed.gov/ipeds/
Tennessee Department of Labor and Workforce Development. http://tennessee.gov/labor-wfd/
Bureau of Labor Statistics. http://www.bls.gov/
The U.S. Census Bureau, http://www.census.gov/
Bureau of Economic Analysis, http://www.bea.gov/
The Tennessee Department of Health, http://www.state.tn.us/health/
Yahoo Map, http://maps.yahoo.com
USDA Economic Research Service, http://www.ers.usda.gov
The U.S. Department of Education, http://www.ed.gov
National Science Foundation, http://www.nsf.gov
BERC Survey of Higher Education Institutions
Websites of each university or college
Websites of each state's Department of Education (Tennessee, North Carolina, Virginia, Florida, Georgia, Alabama, Ohio, Indiana, Kentucky, Missouri and Kansas, Texas, and Colorado)

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